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INVITATION FOR BIDS
AND
CONSTRUCTION DOCUMENTS
FOR

JOB NO. 16-04, WP2020 #WKK-03
MCC, CHLORINATION FACILITIES – KILAUEA WELLS NO. 1 AND NO. 2
KAUA‘I, HAWAI‘I

October 2021

DEPARTMENT OF WATER
COUNTY OF KAUA‘I
LĪHU‘E, KAUA‘I, HAWAI‘I

APPROVED:

Joseph Tait (Oct 21, 2021 14:33 HST)

Chief Procurement Officer

Oct 21, 2021

Date

1 ADMINISTRATION

1.1 INVITATION FOR BIDS.

DEPARTMENT OF WATER, COUNTY OF KAUA'I
JOB 16-04, WP2020 #WKK-03 MCC, CHLORINATION FACILITIES – KILAUEA WELLS NO. 1 AND NO. 2
KAUA'I, HAWAI'I

Pursuant to Chapter 103D, HRS, SEALED TENDERS will be received up to and opened **at 2:00 p.m., Hawaiian Standard Time (HST) on Friday, December 03, 2021**, in the Administration Office of the Department of Water at 4398 Pua Loke Street, Līhu'e, Kaua'i, Hawai'i ("DOW Admin. Office"). Bids received after the date and time specified above shall be rejected. Facsimile offers will not be accepted or considered.

The schedule set out below represents the Department's best estimate of the schedule that will be followed for this competitive sealed bidding procurement process. If an activity in the schedule is delayed, the dates following the delayed activity may be adjusted by the same number of days. All prospective Offerors will be advised by addendum of any changes to the Procurement Schedule.

Activity	Scheduled Date
Invitation For Bids Issued	October 22, 2021
Pre-Bid Conference	November 2, 2021
Deadline: Receipt of Questions / Comments / Material Substitutions	November 9, 2021
Deadline: Notice of Intent	November 19, 2021
Department's Responses to Questions / Comments / Material Substitutions	November 19, 2021
Bid Opening	December 3, 2021
Selection / Award Notification	December 2021
Contract Execution Period	January 2022 – October 2023
Contract Tentative Notice to Proceed Date	January 2022

The Manager and Chief Engineer also reserves the right to reject any or all bids, in whole or in part, if deemed to be in the best interest of the Department of Water.

Bids must be signed in ink by the person or persons duly authorized to sign bids in the space provided for signature on the Offer form. **Bidders shall submit their offer and all related documents as required in this solicitation through Public Purchase at www.publicpurchase.com** .

BIDDERS ARE HEREBY NOTIFIED THAT EVIDENCE OF THE AUTHORITY OF THE PERSON(S) SIGNING THE BID DOCUMENT IS REQUIRED TO BE INCLUDED WITH THE BID DOCUMENTS. FAILURE TO COMPLY WITH THIS REQUIREMENT WILL BE CAUSE FOR REJECTION OF THE BID AS BEING NON-RESPONSIVE.

SCOPE OF WORK: The project's based bid consists of furnishing all materials, labor, tools,

equipment, and appurtenances required to remove and install a temporary and permanent MCC, demolish and install a new roof and other hardening features to the existing pump control building, construct a new shelter for an existing generator, associated site grading for the new generator shelter, and appurtenant items as indicated in the contract drawings and specifications. In addition, there is a bid additive item that consists of furnishing all materials, labor, tools, equipment, and appurtenances required to remove and install a well pump, as indicated in the contract drawings and specifications. The project site is located at the existing Kilauea Wells site off of Kuawa Road. All work shall be in place complete, as indicated in the contract drawings and specifications.

PLANS AND SPECIFICATIONS: The contract documents are to be downloaded electronically. Please email the Department of Water Contracts Officer, Christine Erorita at cerorita@kauaiwater.org for instructions. May be examined and obtained at the DOW Admin. Office. Those who download documents electronically shall be responsible for any and all costs related to printing or reproducing the items as required for offer submission. For inquires on obtaining plans and specifications and all other inquires call the project engineer at (808) 245-5433.

The contract documents may be examined at the following locations:

DOW Admin. Office, Līhu`e, Kaua`i, Hawai`i
Building Industry Digest Plan Room, Honolulu, Hawai`i
General Contractors' Association Plan Room, Honolulu, Hawai`i

Published in: ☐ Garden Island Newspaper
☒ Bid Service Weekly
☒ General Contractors' Association
☒ State Procurement Internet website at: https://hands.ehawaii.gov/hands/welcome
☒ DOW website at: www.kauaiwater.org
☒ DOW electronic procurement system at: www.publicpurchase.com

CONTRACTORS LICENSE: All prospective Bidders must be currently licensed by the State of Hawai'i, Department of Commerce and Consumer Affairs, Division of Professional and Vocational Licensing.

"A" general engineering contractors and "B" general building contractors are reminded that due to the Hawai'i 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 where 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" or "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. 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.

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1.3 INSTRUCTIONS TO BIDDERS.

THESE INSTRUCTIONS TO BIDDERS SHALL BE CONSIDERED TO BE INCORPORATED INTO THE SPECIAL PROVISIONS.

1.3.1 Submission of Bids: Bidders shall read and examine the Special Provisions, Specifications, General Provisions and all other bid documents attached hereto and by reference made a part hereof. Submission of bids shall be deemed a verification of such reading and examination and shall be deemed acknowledgement and agreement to be bound by the terms and conditions, and specifications of such documents. **All Bidders shall complete and submit with its bid, the Offer form found in Appendix C via www.publicpurchase.com** .

All bids for the construction of this project shall be and marked "**Job 16-04, WP2020 #WKK-03 MCC, CHLORINATION FACILITIES – KILAUEA WELLS NO. 1 AND NO. 2.**"

Bidders shall submit their offer and all related documents as required in this solicitation through Public Purchase at www.publicpurchase.com .

1.3.2 Bidding Instructions: In addition to these Instructions to Bidders, Bidders are directed to SECTION 2 - BIDDING / PROPOSAL INSTRUCTIONS of the "GENERAL PROVISIONS FOR CONSTRUCTION CONTRACTS OF THE DEPARTMENT OF WATER", dated April 25, 2016 (hereafter "GENERAL PROVISIONS"), and the General Provisions in its entirety.

1.3.3 Offer Form: The attached form of the OFFER is furnished only for the guidance of bidders and is not to be used for actual bidding. An official copy of the Offer on which the bid shall be made will be furnished to the prospective bidder when plans and specifications are obtained.

1.3.4 Omission or Erasures; Conditioned Offers: Any Offer which contains any omission or erasure or alteration not properly initialed or any attempt by a bidder to condition the bid or other irregularity, and bid samples or descriptive literature, unless expressly requested, will not be examined or tested, and will not be deemed to vary any of the provisions of this solicitation and are submitted at the Bidder's risk and may be rejected. Offerors shall not submit their organization's terms and conditions, standard contracts, or other similar agreements or forms. General reference to such items or attempts to substitute such items for the Department's **shall** result in the disqualification of the Offeror's bid as conditioned.

1.3.5 Solicitation Review; Submission of Questions and Requests For Clarification:

1.3.5.1 Submission of Questions and Requests for Clarification: Offerors are encouraged to submit written questions pertaining to this solicitation. Questions and requests for clarification must be submitted in writing via e-mail or received by post mail to the Procurement Officer not later

than the date specified in the Procurement Schedule in Section 1.1 in order to generate an official answer. All written questions will receive an official written response from the Department and become an addenda to this solicitation. The only official position of the Department is that which is stated in writing and issued in this solicitation as an addenda thereto. All other means of communication, whether oral or written, shall not be formal or official responses/statements and may not be relied upon. **Any addendum issued must be acknowledged by downloading from Public Purchase, signed, and included with offer.**

1.3.5.2 Solicitation Review: Offerors should carefully review this solicitation for defects and/or ambiguities. Comments concerning defects and questionable or objectionable matter must be made in writing either via e-mail or post mailed and should be received by the Procurement Officer not later than the date specified in the Procurement Schedule in Section 1.1. This will allow issuance of any necessary amendments to this solicitation. It will also assist in preventing the opening of offers upon which award may not be made due to a defective solicitation package.

1.3.6 Standard Questionnaire and Financial Statement: When the Manager and Chief Engineer requires a prospective bidder to file a "Standard Qualification Questionnaire for Prospective Offerors on Department of Water Contracts," the prospective bidder shall return a completed Standard Questionnaire, on the form provided by the Department, at least 48 hours prior to opening of bids. If this proves satisfactory, the bidder's Offer will be received.

1.3.7 Bid Bond: A bid bond for the value of **5% of the bid** shall accompany the bid.

1.3.8 Performance and Payment Bonds: If the contract which is awarded exceeds $25,000 and is for construction, performance and payment bonds shall each be in an amount equal to one hundred per cent of the amount of the contract price.

1.3.9 Responsibility of Bidders to Study Site: At the time of opening of bids, the Department shall presume that each Bidder has inspected the project site(s) and has read the Plans, Specifications, and other Contract Documents, including all Addenda and has become thoroughly familiar with them. The failure or omission of any Bidder to receive or examine any form, instrument, or document shall in no way relieve that Bidder from any obligation under the Bid or the Contract.

Each bidder must form an opinion of the character of the work and of the materials to be excavated, from an examination of the project site(s), from studies and inspection of available samples, records and reports and from any other investigations the Bidder may wish to make. Each Bidder must form an independent opinion of all the conditions affecting the work to be done and the

1.3.16.1.1 Describe the nature of work to be performed by the specialty contractor 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 of work to be performed for this Project.

1.3.16.1.2 List only one joint contractor or subcontractor per required specialty contractor classification.

1.3.16.1.3 For projects with alternate(s), fill out the respective "Joint Contractors or Subcontractors List for the Alternate(s)." Bidder shall describe the nature of work to be performed by the specialty contractor on this Project for the respective alternate. Bidders shall fill in the complete firm name and nature of work to be performed by the respective joint contractor or subcontractor. If the joint contractor or subcontractor was previously listed under base bid, listing under Alternate(s) is not required.

1.3.17 Wages and Labor Requirements: Pursuant to HRS Section 103-55, each bidder submitting an offer and list of subcontractors certifies that: WAGES: The service to be rendered shall be performed by employees paid not less than wages paid to public officers and employees for similar work; and COMPLIANCE WITH LABOR LAWS: All applicable laws of the Federal and State governments relating to workmen's compensation, unemployment compensation, payment of wages, and safety will be fully complied with. The successful Bidder shall complete the Wage Certification in Appendix E.

1.3.17.1 In accordance with HRS Section 104-2 et seq., the Hawai‘i Director of Labor and Industrial Relations determines the prevailing wages applicable to the project. The wage rates are the minimum rates to be paid and may be revised. Contractors shall pay the applicable rates, as revised, at no cost to the Department. This is not a representation that labor can be obtained at these rates. It is the responsibility of bidders to inform themselves of local labor conditions and prospective changes or adjustments of wage rates. No increase in the contract price shall be allowed or authorized on account of the payment of wage rates in excess of those listed herein. Wage rate schedules are available at the office of the Department of Labor and Industrial Relations, State of Hawai‘i.

Current Wage Rate Bulletin: **499**

1.3.18 Asbestos Cement Pipe: For all construction contract bids involving asbestos cement pipe, the Contractor shall remove, handle, and dispose of asbestos cement pipe in conformance

with all applicable OSHA, State, and Federal regulations. The asbestos cement pipes shall only be disposed of at an approved disposal site.

1.3.19 Chlorination Subcontractor: All construction contract bids involving any chlorination work shall have a name listed for the C-37d Water Chlorination Subcontractor. Any bid not listing this subcontractor shall be rejected and disqualified.

1.3.20 Substitute Materials: Bidders contemplating submission of bids based on substitute materials must obtain prior written permission from the Department. Lists of substitute materials together with qualifying data shall be submitted on the Department's Request for Substitution form by the date set in the Procurement Schedule in Section 1.1, as evidenced by the time stamp of the Department, to the Procurement Officer for approval (the Request for Substitution form may be obtained from this individual). It is not the intent of the Department to exclude or limit the products. Any substitute material determined by the Department upon evaluation to be an acceptable equal, will be listed in an addendum to this solicitation, issued prior to the bid opening date. The Department is the sole judge as to the comparable quality and suitability of any substitute material and its decision shall be final. If a Bidder offers a product without the Department's pre-approval, the substitute material shall not be considered for award.

1.3.21 Independent Price Determination: By submitting a bid, the bidder certifies that the price submitted was independently arrived at without collusion.

1.3.22 Protests: Any protest shall be submitted in writing within five (5) working days after the posting of the notice of award; provided that a protest based upon the contents of the solicitation shall be submitted in writing prior to the date set for the receipt of offers. Any and all protests pursuant to Hawai‘i Procurement Code, Chapter 103D-701 HRS and Section 3-126-3 HAR shall be submitted in writing to the Procurement Officer for this solicitation.

1.3.23 Incorporation By Reference: Bidders hereby agree that all documents referred to in the Table of Contents are hereby incorporated by reference into this solicitation.

1.3.24 Severability: If any covenant, condition, or provision of this solicitation is held to be invalid by any court of competent jurisdiction, such holding shall not affect the validity of any other covenant, condition, or provision contained herein or incorporated by reference.

1.3.25 Remedies; Attorneys Fees, and Costs: All remedies provided in this solicitation shall be deemed cumulative and additional, and not in lieu of or exclusive of each other or of any other remedy available at law or in equity arising hereunder. Should any legal proceedings at law or in equity arise under or in connection with this solicitation, the Contractor shall be responsible for all attorneys' fees and costs (including reasonable fees and charges for the services of paralegals or other personnel who operate for and under the supervision of such attorneys and whose time is usually charged to clients) and any other expenses incurred in connection with such proceedings.

1.3.26 Department's Right to Audit: Books and Records: The Contractor shall, at all times during the term hereof, maintain complete and accurate books and records of its operations, including employee time records, in a form consistent with good accounting practice, including such books and records as would normally be examined by an independent certified public accountant in performing an audit or examination of the Contractor's receipts and expenses in accordance with generally accepted auditing standards. The Department has the right to designate an independent auditor to review books and records that specifically relate to this project. Subcontractors shall be bound by the same requirements. See: SECTION 6.9 - CONTROL OF THE CONTRACT of the GENERAL PROVISIONS in its entirety.

1.3.27 Confidential Material: All bids are subject to public inspection as set forth in 3-122-30, HAR. Bidders shall request in writing nondisclosure of designated trade secrets or other proprietary data to be confidential. Such data shall accompany the bid and shall be readily separable from the bid in order to facilitate eventual public inspection of the non-confidential portion of the bid. To facilitate the release of the information requested, the Department is prepared to sign a Non-Disclosure Agreement if necessary, however, the Department cannot guarantee that designated data will be kept confidential. The offers are subject to disclosure rules set forth in Chapter 92F, HRS and Non-Disclosure Agreements are enforceable only to the extent that they do not conflict with the provisions of Chapter 92F, HRS. The Bidder bears the burden of establishing that the designated data is exempted from the disclosure requirements set forth in Chapter 92F.

1.3.28 Cancellation of the Solicitation and Offer Rejection: The Department reserves the right to cancel this solicitation and to reject any and all offers in whole or in part, and waive any defects, when it is determined to be in the best interest of the Department, pursuant to HAR 3-122-96 and 3-122-97.

The Department shall not be liable for any costs, expense, loss of profit, or damages whatsoever, incurred by the Offeror in the event this solicitation is cancelled or an offer is rejected.

1.4 GENERAL PROVISIONS, SPECIFICATIONS, AND STANDARD DETAILS.

The Special Provisions, plans, General Provisions, Water Standards, County of Kaua'i Department of Public Works ("DPW") Standard Specifications and Details, as amended, contract documents, and all supplemental documents are essential parts of the contract, and a requirement occurring in one is as binding as though occurring in all. They are intended to be complementary and to describe and provide for the complete work. In case of conflict or discrepancy within any part of the contract, the stricter requirements, including Hawai'i State Statutory requirements, shall govern. Unless it is apparent that a different order of precedence is intended, the special provisions shall govern over plans, general provisions, and Water Standards; plans shall govern over general provisions; general provisions shall govern over Water Standards; Water Standards shall govern over DPW Standard Specifications; figured dimensions and drawings take precedence over measurements by scale, and detail drawings; instructions to proposers shall be incorporated and made a part of the special provisions.

It is the responsibility of the prospective offerors, offerors, and Contractors to review the General Provisions, Water Standards, Specifications, and Standard Details and a submission of an offer to this solicitation shall be deemed an acknowledgement of the incorporation of these into this solicitation and the resulting contract, if any.

1.4.1 General Provisions for Construction Contracts: The General Provisions for Construction Contracts of the Department of Water, dated April 25, 2016 ("General Provisions") are included in this solicitation. A copy may be found in Appendix "B."

1.4.2 Water System Standards. The "Water System Standards", 2002, as amended, as adopted by the Department of Water, County of Kaua'i; Board of Water Supply, City and County of Honolūlū; Department of Water Supply, County of Maui; Department of Water Supply, County of Hawai'i ("Water Standards") is by reference incorporated herein and made a part of these specifications. The Water Standards specifications are not bound in these contract documents, but shall by reference be incorporated herein and made a part hereof.

1.4.3 Department of Public Works, County of Kaua'i Standard Specifications: Whenever reference is made to the DPW Standard Specifications, the specifications referred to is the "HAWAI'I STANDARD SPECIFICATIONS FOR ROAD, BRIDGE, AND PUBLIC WORKS CONSTRUCTION" of the State of Hawai'i, 2005, as amended. These specifications are not bound in the Contract Documents, but shall by reference be incorporated herein and made a part hereof.

1.4.4 Department of Public Works, County of Kaua'i, Standard Details: Whenever reference is made within these Special Provisions or the contract plans to the DPW Standard Details, the Details referred to is the "STANDARD DETAILS FOR PUBLIC WORKS CONSTRUCTION", September 1984 and all subsequent amendments. These specifications are not bound in the Contract Documents, but shall by reference be incorporated herein and made a part hereof.

1.5 PROCUREMENT OFFICER AND CONTRACT ADMINISTRATOR.

The Procurement Officer is responsible for administrating/facilitating all requirements of the solicitation process and is the **sole point of contact for Offerors** from the date of release of the solicitation until the selection of the successful Bidder.

The Contract Administrator shall be responsible for the contract administration once the contract is awarded and shall be the point of contact throughout the term of the contract.

☒ If checked, the Procurement Officer and the Contract Administrator shall be the same individual.

The Procurement Officer and Contract Administrator is:

Michael K. Hinazumi Click here to enter text.
Engineering Division Click here to enter text.

All bids will be compared on the basis of quantities of work to be done, as shown in the bid; the quantities shown in the Unit Price items are estimated, being given as a basis for comparison of bids. The Department reserves the right to increase or decrease the quantities or delete items entirely as may be required during the progress of the work. See: SECTION 7.2 and 7.3 of the GENERAL PROVISIONS.

2.9 MATERIALS FURNISHED FOR THE PROJECT.

All materials necessary for the completion of the project shall be furnished by the Contractor, unless specifically stated otherwise and full compensation thereof shall be included in the various items in the bid. All materials for this Project shall be ordered after the notice to proceed is issued and the shop drawings, if applicable, have been approved by the Department.

2.10 WORK TO BE DONE WITHOUT DIRECT PAYMENT.

Whenever it is specified in the contract that the Contractor is to do work or furnish materials of any kind for which no price is fixed in the contract, it shall be understood that such work or furnishing such materials was included 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.

2.11 INTENT OF THE SPECIFICATIONS.

It is not the intent of the Department to limit Proposers to these specifications; however, the specifications designated as "requirements" contained herein are the minimum acceptable.

2.12 IMPLEMENTATION.

The Contractor will be required to:

2.12.1 Provide required permits for the construction of this Project, trained construction crew and project management necessary to ensure a complete constructed and fully functional water facilities as specified in this solicitation.

2.12.2 Provide all documentation, including all warranties and certification documents, on the construction materials being used.

2.13 GOVERNING LAW; APPLICATION OF LAW.

This solicitation and the Contract awarded based on such solicitation shall be governed by the laws of the State of Hawai‘i. The Contractor shall comply with all federal, State and local laws, regulations and ordinances, including occupational safety and health standards applicable to the performance of the services specified.

Taxation ("DOTAX") and the U.S. Internal Revenue Service ("IRS"). The certificate is valid for six (6) months from the most recent approval stamp date on the certificate and must be valid on the date it is received by the Department of Water.

The tax clearance certificate shall be obtained on the State of Hawai'i, DOT TAX CLEARANCE APPLICATION Form A-6 (Rev. 2003) which is available at the DOTAX and IRS offices in the State of Hawai'i or the DOTAX website and by mail or fax:

DOTAX Website (forms & Information):
http://www.state.hi.us/tax/alphalist.html#a
DOTAX Forms by Fax/Mail: (808) 587-7572 / 1-800-222-7572

Completed tax clearance applications may be mailed, faxed or submitted in person to the Department of Taxation, Taxpayer Services Branch, to the address listed on the application.

DOTAX (fax):	(808) 587-1488
IRS (fax):	(808) 539-1573

The application for the clearance is the responsibility of the Bidder and must be submitted directly to the DOTAX or IRS and not to the Department of Water.

3.3.3 HRS Chapters 383 (Unemployment Insurance), 386 (Workers' Compensation), 392 (Temporary Disability Insurance), and 393 (Prepaid Health Care) Requirements for Award. Instructions are as follows:

Pursuant to HRS §103D-310, the successful Bidder shall be required to submit an approved certificate of compliance issued by the Hawai'i State Department of Labor and Industrial Relations ("DLIR"). The certificate is valid for six (6) months from the date of issue and must be valid on the date it is received by the Department.

The certificate of compliance shall be obtained on the State of Hawai'i, DLIR APPLICATION FOR CERTIFICATE OF COMPLIANCE WITH SECTION 3-122-112, HAR, Form LIR#27 which is available at www.dlir.state.hi.us/LIR#27, or at the neighbor island DLIR District Offices. The DLIR will return the form to the Bidder who in turn shall submit it to the Department.

The application for the certificate is the responsibility of the Bidder and must be submitted directly to the DLIR and not to the Department of Water.

3.4 <u>REQUIREMENT FOR AWARD.</u>

SCHEDULE B
HAWAI‘I PRODUCTS PREFERENCE

In accordance with HRS §103D-1002, the Hawai‘i products preference is applicable to this solicitation. Hawai‘i Products ("HP") are available for those items noted on Schedule B, below. The Hawai‘i products list is available on the SPO webpage at www.spo.hawaii.gov/for-state-county-personnel/manual/procurement/solicitation/goods-services-construction/preferences/hawaii-product-preferences/ or go to the SPO Home page, click on "For Vendors" tab; click on Preferences, Hawai‘i Product Preferences to view. Offeror transmitting a Hawai‘i Product (HP) shall identify the HP on Schedule B-1.

Any person desiring a Hawai‘i product preference shall have the product(s) certified and qualified if not currently on the Hawai‘i products list, prior to the deadline for receipt of offer(s) specified in the procurement notice and solicitation. The responsibility for certification and qualification shall rest upon the person requesting the preference. Persons desiring to qualify their product(s) not currently on the Hawai‘i product list shall complete form SPO-038, Certification for Hawai‘i Product Preference and submit, via email to the Procurement Officer issuing the solicitation, and provide the solicitation number and title in the subject line, and include all additional information required by the Procurement Officer. For each product, one form shall be completed and transmitted (i.e. 3 products should have 3 separate forms completed). Form SPO-038 is available on the SPO webpage at http://hawaii.gov/spo under the 'Quicklinks' menu; click on 'Forms for Vendors, Contractors, and Service Providers'.

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

Change in Availability of Hawai‘i product. In the event of any change that materially alters the Offeror's ability to supply Hawai‘i products, the Offeror shall notify the Procurement Officer in writing no later than five (5) working days from when the Offeror knows of the change and the parties shall enter into discussions for the purposes of revising the contract or terminating the contract for convenience.

The following is a list of products that the Department anticipates will be used in this particular project; however the list is not all inclusive and additional products may be qualified.

HAWAI‘I PRODUCTS LIST

HP Description	Manufacturer/Supplier	Class

Bidders intending to use or supply a Hawai‘i Product must list the price and total cost of each item f.o.b. jobsite, unloaded, including applicable general excise tax and use tax on this form. Failure to designate a Hawai‘i product will mean that the Bidder is offering a non-Hawai‘i product and award, if made to the bidder, will be on the basis that the bidder will deliver or use a non-Hawai‘i product.

The Bidder shall list only the Manufacturers/Suppliers certified and qualified on Schedule B.

If the Department has awarded a contract under HRS, § 103D-1002, finds that in the performance of that contract there has been a failure to comply with HRS, § 103D-1002, the contract shall be voidable and the findings shall be referred for debarment or suspension proceedings under HRS 103D-702. Any purchase made or any contract awarded or executed in violation of this section shall be void and no payment shall be made by the Department on account of the purchase or contract.

SCHEDULE B-1

SCHEDULE OF MATERIAL COST

(if Hawai'i preference requested)

HAWAI'I PRODUCT	MANUFACTURER	CLASS	APPROX. QUANTITY	UNIT	TOTAL COST OF MATERIAL
Aggregates and Sand – Basalt, rock, cinder, limestone and coral					
Aggregates – Recycled asphalt and concrete					
Asphalt and paving materials					
Cement and concrete products					
Pre-cast concrete products					
Signs–traffic, regulatory and construction					
Soil amendments, mulch, compost					

SCHEDULE C
MANDATORY LICENSING REQUIREMENT

"A" general engineering contractors and "B" general building contractors are reminded that due to the Hawai'i 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, that 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 submit an offer on and act as the "prime" contractor on an "A" and "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 "C" specialty 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 subcontracted out to appropriately licensed "C" specialty contractors. 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.

LISTING OF SUBCONTRACTORS

Sec. 103D-302, H.R.S., provides that each offer for Public Works Construction Contracts shall include the name of each person or firm to be engaged by the Offeror as a joint contractor or subcontractor in the performance of the Public Works Construction Contract. The Offer shall also indicate the nature and scope of the work to be performed by such joint contractors or subcontractors. All offers which do not comply with this requirement shall be rejected pursuant to Sec. 103D-302(b) H.R.S.

To comply with the above provisions, the offeror shall complete the schedule of the nature and scope of work by listing, where applicable, the names of the joint contractors and subcontractors to be used after the description of the nature and scope of the work.

ALL JOINT CONTRACTORS OR SUBCONTRACTORS TO BE ENGAGED ON THIS PROJECT

The Offeror certifies that the following is a complete listing of all joint contractors and/or subcontractors who will be engaged by the Offeror on this Project to perform the nature and scope of work indicated **regardless of the percentage of the value of the work to be performed by the joint contractor or subcontractor**, pursuant to Section 103D-302, Hawai'i Revised Statutes, and understands that failure to comply with this requirement shall be just cause for rejection of the Offer.

The Offeror further understands that only those joint contractors or subcontractors listed shall be allowed to perform work on this Project. If no joint contractor or subcontractor for any subdivision of work is listed, it shall be construed that the work shall be performed by the Offeror with Offeror's employees.

All Offerors must be sure that they possess, and that the joint contractors or subcontractors listed in the Offer possess, all the necessary specialty licenses needed to perform the work for this Project. The Offeror shall be solely responsible for assuring that all specialty licenses required to perform the work is covered in the Offer.

The Offeror shall include the license number of the joint contractors or subcontractors listed below. Failure to provide the correct names and license numbers as registered with the Contractors Licensing Board may cause rejection of the offer submitted.

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.

LISTING OF ALL JOINT CONTRACTORS OR SUBCONTRACTORS

	Contractor Classification	Name of Joint Contractor or Subcontractor	License Number
C-1	Acoustical and Insulation Contractor		
C-2	Mechanical Insulation Contractor		
C-3	Asphalt Paving and Surfacing Contractor		
C-3a	Asphalt Concrete Patching, Sealing, and Striping Contractor		
C-3b	Play Court Surfacing Contractor		
C-4	Boiler, Hot-Water Heating and Steam Fitting Contractor		
C-5	Cabinet, Millwork, and Carpentry Remodeling and Repairs Contractor		
C-5a	Garage Door and Window Shutters Contractor		
C-5b	Siding Application Contractor		
C-6	Carpentry Framing Contractor		
C-7	Carpet Laying Contractor		
C-9	Cesspool Contractor		
C-10	Scaffolding Contractor		
C-12	Drywall Contractor		
C-13	Electrical Contractor		
C-14	Sign Contractor		
C-15	Electronic Systems Contractor		
C-15a	Fire and Burglar Alarm Contractor		
C-15b	Telecommunications Contractor		
C-16	Elevator Contractor		
C-16a	Conveyor Systems Contractor		
C-17	Excavating, Grading, and Trenching Contractor		
C-19	Asbestos Contractor		
C-20	Fire Protection Contractor		
C-20a	Fire Repressant Systems Contractor		

	Contractor Classification	Name of Joint Contractor or Subcontractor	License Number
C-21	Flooring Contractor		
C-22	Glazing and Tinting Contractor		
C-22a	Glass Tinting Contractor		
C-23	Gunite Contractor		
C-24	Building Moving and Wrecking Contractor		
C-25	Institutional and Commercial Equipment Contractor		
C-27	Landscaping Contractor		
C-27a	Hydro Mulching Contractor		
C-27b	Tree Trimming and Removal Contractor		
C-31	Masonry Contractor		
C-31a	Cement Concrete Contractor		
C-31b	Stone Masonry Contractor		
C-31c	Refractory Contractor		
C-31d	Tuckpointing and Caulking Contractor		
C-31e	Concrete Cutting, Drilling, Sawing, Coring, and Pressure Grouting Contractor		
C-32	Ornamental, Guardrail, and Fencing Contractor		
C-32a	Wood and Vinyl Fencing Contractor		
C-33	Painting and Decorating Contractor		
C-33a	Wall Coverings Contractor		
C-33b	Taping Contractor		
C-33c	Surface Treatment Contractor		
C-34	Soil Stabilization Contractor		
C-35	Pile Driving, Pile and Caisson Drilling, and Foundation Contractor		
C-36	Plastering Contractor		
C-36a	Lathing Contractor		

	Contractor Classification	Name of Joint Contractor or Subcontractor	License Number
C-37	Plumbing Contractor		
C-37a	Sewer and Drain Line Contractor		
C-37b	Irrigation and Lawn Sprinkler Systems Contractor		
C-37c	Vacuum and Air Systems Contractor		
C-37d	Water Chlorination and Sanitation Contractor		
C-37e	Treatment and Pumping Facilities Contractor		
C-37f	Fuel Dispensing Contractor		
C-38	Post Tensioning Contractor		
C-40	Refrigeration Contractor		
C-40a	Prefabricated Refrigerator Panels Contractor		
C-41	Reinforcing Steel Contractor		
C-42	Roofing Contractor		
C-42a	Aluminum and Other Metal Shingles Contractor		
C-42b	Wood Shingles and Wood Shakes Contractor		
C-42c	Concrete and Clay Tile Contractor		
C-42e	Urethane Foam Contractor		
C-42g	Roof coatings Contractor		
C-43	Sewer, Sewage Disposal, Drain, and Pipe Laying Contractor		
C-43a	Reconditioning and Repairing Pipeline Contractor		
C-44	Sheet Metal Contractor		
C-44a	Gutters Contractor		
C-44b	Awnings and Patio Cover Contractor		
C-48	Structural Steel Contractor		
C-48a	Steel Door Contractor		
C-49b	Hot Tub and Pool Contractor		

	Contractor Classification	Name of Joint Contractor or Subcontractor	License Number
C-51	Tile Contractor		
C-51a	Cultured Marble Contractor		
C-51b	Terrazzo Contractor		
C-52	Ventilating and Air Conditioning Contractor		
C-55	Waterproofing Contractor		
C-56	Welding Contractor		
C-57	Well Contractor		
C-57a	Pumps Installation Contractor		
C-57b	Injection Well Contractor		
C-60	Solar Power Systems Contractor		
C-61	Solar Energy Systems Contractor		
C-61a	Solar Hot Water Systems Contractor		
C-61b	Solar Heating and Cooling Systems Contractor		
C-62	Pole and Line Contractor		
C-62a	Pole Contractor		
C-63	High Voltage Electrical Contractor		
C-68	Classified Specialist		
	Licensed Surveyor		
	Licensed Geotechnical Engineer		
	Licensed Structural Engineer		
	Archaeologist		
	Cultural Monitor		
	Licensed Civil Engineer		
	Supervising Control and Data Acquisition (SCADA) Contractor		
*			
*			
*			
*			

	Contractor Classification	Name of Joint Contractor or Subcontractor	License Number
*			
*			

* Contractor to add licenses as required to complete the scope of work. Attach additional sheet as needed.
It is understood and agreed that the Department reserves the right to reject any and/or all offers and waive any defects when, in the Department's opinion, such rejection or waiver shall be for the best interest of the Department.

For purpose of evaluating the criterion described in this solicitation, it is understood and agreed that offers will be compared on the basis of the Total Sum Offer which shall be considered to be the total sum of actual or corrected amounts proposed on each item. The offerors signed Offer shall constitute the Offeror's official offer. The Department reserves the right to designate the contract amount based on selected Offeror's Total Sum Offer depending on the funds available for this Project.

It is also understood and agreed that the work called for under this Project must and shall be completed within **SIX HUNDRED THIRTY (630)** consecutive calendar days after written notice has been given to the successful Offeror to commence work. 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 increase or decrease, in accordance with the provisions of the specifications.

It is also understood and agreed that the estimated quantities shown for items for which a UNIT PRICE is listed in the Offer are only for the purpose of comparing on a uniform basis offers offered for the work under this contract, and the undersigned agrees that the undersigned is satisfied with and will not dispute said estimated quantities as a means of comparing the offers. It is understood and agreed that the Offeror will make no claims for anticipated profit or loss of profit because of a difference between quantities of the various classes of work done or the materials and equipment actually installed and the said estimated quantities. On UNIT PRICE offers, payment will be made only for the actual number of units incorporated into the finished project at the contract UNIT PRICE.

It is also understood and agreed that if the product of the UNIT PRICE offer and the number of units does not equal the total amount stated by the Offeror in the offer for any item, it will be assumed that the error was made in computing the total amount. For purpose of evaluating the criterion described in this solicitation, the stated UNIT PRICE alone will be considered as representing the Offeror's intention and the total amount offered on such item shall be considered to be the amount arrived at by multiplying the UNIT PRICE by the number of units.

It is also understood and agreed that the liquidated damages in the amount of **ONE THOUSAND AND 00/100 DOLLARS ($1,000.00)** for each and every calendar day in excess thereof prior to completion of the contract beyond the specified and approved completion date, shall be withheld from payments due to the Contractor, pursuant to the Damages for Delay provision contained in this solicitation.

It is also understood and agreed that if this offer is accepted, the successful offeror will contract with the Board and said offeror shall furnish the required bonds to the Board within ten (10) days from the date of receiving from the Board the contract prepared and ready for execution.

It is further understood and agreed that the successful offeror will provide all necessary materials, labor, tools, equipment, and other incidental 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 Department as therein set forth.

The undersigned further understands and agrees that by submitting this Offer, 1) the Offeror is declaring that the Offer is not in violation of Chapter 84, Hawai‘i Revised Statutes, and 2) Offeror is certifying that the price(s) submitted was (were) independently arrived at without collusion.

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

Enclosed herewith is a Bidder’s Bond (Bid Security)	( )	for the sum
Surety Bond	( )	
Legal Tender	( )	
Certificate of Deposit	( )	
Share Certificate	( )	
Cashier’s Check	( )	
Treasurer’s Check	( )	
Teller’s Check	( )	
Certified Check	( )	

of _____DOLLARS
($ _____) payable to the Department of Water, being not less than the sum required under Sub-Section 2.9 “Bid Security” of the “General Provisions for Construction Contracts of the Department of Water”, dated April 25, 2016.

Name	Title

If the Offeror is a CORPORATION, the legal name of the corporation shall be set forth on the Offer, together with the signature(s) of the Officer(s) authorized to sign on behalf of the corporation and the corporate seal affixed thereto. Evidence of the authority of the Officer(s) to sign on behalf of the Corporation SHALL be attached to this page and included in the Offer. Acceptable evidence of authority to sign includes, but is not limited to, a copy of the articles of incorporation, corporate resolution, or corporate by-laws. (See HRS Ch. 415, Hawai‘i Business Corporation Act).

If the Offeror is a LIMITED LIABILITY COMPANY, the legal name of the company shall be set forth on the Offer, together with the signature(s) of the member of the limited liability company or manager of the manger-managed limited liability company authorized to sign on behalf of the entity. Evidence of the authority of the Officer(s) authorized to sign on behalf of the company SHALL be attached to this page and included in the Offer.

If the Offeror is a PARTNERSHIP, the legal name of the firm shall be set forth on the Offer, together with the signature(s) of the General Partner(s) authorized to sign on behalf of the partnership. Evidence of the authority of the General Partner(s) authorized to sign on behalf of the partnership SHALL be attached to this page and included with the Offer. Acceptable evidence of authority to sign for the partnership includes, but is not limited to, a copy of the partnership registration statement or authorization signed by all of the partners. (See HRS Ch. 425, Partnerships).

If Offeror is a SOLE PROPRIETORSHIP, Offeror’s signature shall be placed above.

NOTE: PLEASE DO NOT DETACH THIS SAMPLE OFFER FROM THE SPECIFICATIONS. FILL IN ALL BLANK SPACES WITH INFORMATION REQUIRED OR OFFER MAY BE REJECTED.

APPENDIX D: Insurance.

(Attached separately)

APPENDIX E: Wage Certificate for Service Contracts

WAGE CERTIFICATE FOR CONSTRUCTION CONTRACTS
Projects subject to HRS 104

TO: Manager and Chief Engineer

SUBJECT: Solicitation No.: _____

PROJECT: _____

Pursuant to **HRS 103-55.5 Wages and Hours of Employees on Public Works Construction Contracts**, I hereby certify that if awarded the contract in excess of $2,000, the work to be performed will be performed under the following conditions:

1. Individuals engaged in the performance of the contract on the job site shall be paid:

   a. Not less than the wages that the director of labor and industrial relations shall have determined to be prevailing for corresponding classes of laborers and mechanics employed on public works projects; and

   b. Overtime compensation at one and one-half times the basic hourly rate plus fringe benefits for hours worked on Saturday, Sunday, or a legal holiday of the State or in excess of eight hours on any other day; and

2. All applicable laws of the federal and state governments relating to workers' compensation, unemployment compensation, payment of wages, and safety shall be fully complied with.

Offeror: _____

By: _____

Title: _____

Date: _____

APPENDIX F: Certification of Compliance for Final Payment.

CERTIFICATION OF COMPLIANCE FOR FINAL PAYMENT

(Reference §3-122-112, HAR)

Reference: _____ _____
(Contract Number) (IFB/RFP Number)

_____ affirms it is in
(Company Name)
compliance with all laws, as applicable, governing doing business in the State of Hawai‘i to include the following:

1. Chapter 383, HRS, Hawai‘i Employment Security Law – Unemployment Insurance;
2. Chapter 386, HRS, Worker's Compensation Law;
3. Chapter 392, HRS, Temporary Disability Insurance;
4. Chapter 393, HRS, Prepaid Health Care Act; and

maintains a "Certificate of Good Standing" from the Department of Commerce and Consumer Affairs, Business Registration Division.

Moreover, _____
(Company Name)
acknowledges that making a false statement shall cause its suspension and may cause its debarment from future awards of contracts.

Signature: _____

Print Name: _____

Title: _____

Date: _____

APPENDIX G: Apprenticeship Program.

Bidders seeking preference for this shall:

1. Be a party to an apprenticeship program registered with the State Department of Labor and Industrial Relations (DLIR) at the time of its Offer for each apprenticeable trade the Proposer will employ to construct the public works project for which the Offer is made; and

2. For each apprenticeable trade the proposer will employ for this project, submit with its Offer fully executed and authorized CERTIFICATION OF BIDDER'S PARTICIPATION IN APPROVED APPRENTICESHIP PROGRAM UNDER ACT 17. Schedule F attached to this solicitation verifying participation in apprenticeship program(s) registered with the DLIR.

3. The Contractor shall certify each month that work is being conducted on the project and that it continues to be a participant in the relevant apprenticeship program for each trade it employs. Monthly certification shall be made on MONTHLY REPORT OF CONTRACTOR'S PARTICIPATION IN APPROVED APPRENTICESHIP PROGRAM UNDER ACT 17 (Schedule F-I).

SCHEDULE F - CERTIFICATION OF BIDDER'S PARTICIPATION IN APPROVED APPRENTICESHIP PROGRAM UNDER ACT 17

I. Bidder's Identifying Information			
A. Legal Business Name:			
B. Project Bid Title & Reference No.:			
C. Contact Person's Name:			
1. Phone No.:		2. E-Mail:	
II. Apprenticeable Trades To Be Employed* A. (List)	B. Apprenticeship Sponsor* (One Sponsor Per Form)	C. No. Enrolled (# of apprentices currently enrolled as of bidder's request date)	D. No. Completed (# of apprentices who completed the apprenticeship program in the 12 months prior to request date)
1.			
2.			
3.			
4.			
5.			
6.			

III. Bidder's Certification

I certify that the above information is accurate to the best of my knowledge, I understand that my willful misstatement of facts may cause forfeiture of the preference under Act 17 and may result in criminal action. I give permission for outside sources to be contacted and for them to disclose any information necessary to verify the bidder's preference.

_____ _____
A. Name (Type) B. Title

_____ _____
C. Signature (original signature required) D. Date

IV. Apprenticeship Sponsor's Contact Information

A. Training Coordinator's Name: _____
_____

B. Address: _____
_____

C. Phone No.: _____D. E-Mail: _____E. Fax No:_____

V. Apprenticeship Program Sponsor's Certification

I certify that the above information is accurate to the best of my knowledge. I understand that my willful misstatement of facts may cause forfeiture of the bidder's preference and may result in criminal action. I give permission for outside sources to be contacted and for them to disclose any information necessary to verify the bidder's preference under Act 17.

_____ _____
A. Name of Authorized Official B. Title

_____ _____
C. Signature (original signature required) D. Date

* 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 State Department of Labor and Industrial Relations website. (Rev. 08/25/2010)

SCHEDULE F-1 - MONTHLY REPORT OF CONTRACTOR'S PARTICIPATION IN APPROVED APPRENTICESHIP PROGRAM UNDER ACT 17

I. Contractor's Identifying Information	II. Reporting Period	
A. Legal Business Name:	A. Month: (choose)	B. Year: (choose)
B. Project Bid Title & Reference No.:		
C. Contact Person's Name:		
1. Phone No.:	2. E-Mail:	
III. Apprenticeship Program (Complete a separate form for *each* apprenticeship program in which workers are employed on the project)		
A. Contractor was a party to an apprenticeship program or programs with the following sponsor: (Give sponsor's name(s).*	B. Was the contractor a party to the program during the *entire* report month?	
	1. YES ☐	
	2. NO ☐ If NO, state applicable period and why (may be subject to sanctions.)	

III. Contractor's Certification

I certify that the above information is accurate to the best of my knowledge. I understand that my willful misstatement of facts may cause forfeiture of the preference under Act 17 and may result in criminal action. 1 give permission for outside sources to be contacted and for them to disclose any information necessary to verify the bidder's preference.

A. Name (Type) _____ B. Title _____

C. Signature (original signature required) _____ D. Date _____

IV. Apprenticeship Sponsor's Contact Information

A. Training Coordinator's Name: _____

B. Address: _____

C. Phone No.: _____ D. E-Mail: _____ E. Fax No: _____

V. Apprenticeship Program Sponsor's Certification

I certify that the above information is accurate to the best of my knowledge. I understand that my willful misstatement of facts may cause forfeiture of the bidder's preference and may result in criminal action. I give permission for outside sources to be contacted and for them to disclose any information necessary to verify the bidder's preference under Act 17.

A. Name of Authorized Official _____ B. Title _____

C. Signature (original signature required) _____ D. Date _____

* Name of Name of Apprenticeship Sponsor must be the same as recorded in the list of Construction Trades in Registered Apprenticeship Programs that is posted on the State Department of Labor and Industrial Relations website. (Rev. 08/25/2010)

APPENDIX H: Notice of Intent to Propose.

NOTICE OF INTENT

_____

_____

DATE

Chief Procurement Officer
Department of Water
County of Kaua‘i
4398 Pua Loke Street
Līhu‘e, HI 96766

Dear Sir:

In accordance with the Provisions of Section 103D-310, Hawai‘i Revised Statutes, you are hereby notified that it is the intent of the undersigned to offer on **JOB NO. 16-04, WP2020 #WKK-03 MCC, CHLORINATION FACILITIES – KILAUEA WELLS NO. 1 AND NO. 2, KAUA‘I, HAWAI‘I,** for which Offers will be due on **December 3, 2021** as required.

I am informed that this Notice of Intent must be received by the Chief Procurement Officer no later than 4:30 p.m. Hawai‘i Standard Time on **Friday, November 19, 2021**. (**Please email this NOI to cerorita@kauaiwater.org** .)

VERY TRULY YOURS,

_____
SIGNATURE

_____
PRINT OR TYPE NAME & TITLE OF SIGNER

Hawai‘i State Specialty License
Type and Classification:

_____
NAME OF FIRM

_____

_____
CONTRACTORS LICENSE NO.

Hawai‘i State Business
License No.:

_____
ADDRESS

_____

_____
CITY, STATE & ZIP CODE

_____
TELEPHONE NO.

All prospective offerors must be currently licensed by the Hawai‘i Department of Commerce and Consumer Affairs, Division of Professional and Vocational Licensing.

“A” general engineering contractors and “B” general building contractors are reminded that due to the Hawai‘i 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 where the general contractor has no license. Although the “A” and “B” contractor may still submit a Offer on and act as the “prime” contractor on an “A” or “B” project (See, HRS §444-7 for the definitions of an “A” or “B” project.), respectively, and the “A” and “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. 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.

APPENDIX I: Employment of State Residents on Construction Procurement Contracts.

a. Definitions

"Contract" means contracts for construction under Chapter 103D HRS.

"Contractor" has the same meaning as in section 103D-104, HRS; provided that contractor includes a subcontractor where applicable

"Construction" has the same meaning as in section 103D-104 HRS

"Procurement Officer" has the same meaning as in section 103D-104 HRS

"Resident" means a person who is physically present in the state at the time the person claims to have established the person's domiciled in the state and shows the person's intent is to make Hawai'i the person's primary residence.

"Shortage trade" means a construction trade in which there is a shortage of Hawai'i residents qualified to work in the trade.

b. Requirements of Contractor

The contractor awarded this contract shall ensure that Hawai'i Residents compose not less than eighty percent (80%) of the workforce employed to perform this Contract, calculated as follows:

The eighty percent (80%) requirement shall be determined by dividing the total number of hours worked on a contract by Residents by the total number of hours worked by all employees of the Contractor in the performance of the Contract. Hours worked for any subcontractor of the contractor shall count towards the calculation for purposes of this subsection. The hours worked by employees within shortage trades, as determined by the Department of Labor and Industrial Relations, shall not be included in the calculations for purposes of this subsection.

This requirement shall be applicable during the entire duration of this Contract. A notarized Certification for Employment of State Residents on Construction Procurement Contracts (Schedule I) shall be submitted on a monthly basis with your request for progress payments. If no request for progress payments are made for any month, the Contractor is still responsible to submit the certification on a monthly basis.

c. Penalties

Failure to comply with this requirement shall be subject to any of the following sanctions:

A. Temporary suspension of work on the project until the Contractor or subcontractor complies with Act 68;

B. Withholding of payment on the Contract or subcontract as applicable, until the Contractor or subcontractor complies with Act 68;
C. Permanent disqualification of the Contractor or subcontractor from any further work on the project;

D. Recovery by the Department of any moneys expended on the Contract or subcontract, as applicable; or

E. Proceedings for debarment or suspension of the contractor or subcontractor under section 103D-702.

d. Conflict with Federal Law

Act 68 shall not apply if the application of the Act is in conflict with any federal law, or if application of Act 68 will disqualify the Department from receiving federal funds or aid.

CERTIFICATION OF COMPLIANCE
FOR
EMPLOYMENT OF STATE RESIDENTS
ACT 68, SESSION LAWS OF HAWAI‘I 2010

Project Title: _____

DOW Project No.: _____

Contract No.: _____

As required by Act 68, Session Laws of Hawai‘i 2010 – Employment of State Residents on Construction Procurement Contracts, I hereby certify under oath, that I am an officer of _____ *(Name of Company)* and for the month of _____, 20_____, _____ *(Name of Company)* is in compliance with Act 68, SLH 2010, by employing a workforce of whom not less than eighty percent are Hawai‘i residents, as calculated according to the formula in the solicitation, to perform this Contract.

□ I am an officer of the Contractor for this contract.
□ I am an officer of the Subcontractor for this contract.

CORPORATE SEAL

_____
(Name of Company)

_____
(Signature)

_____
(Print Name)

_____
(Print Title)

NOTARY CERTIFICATION

APPENDIX J: Certification of Compliance with HRS 396-18, Safety and Health Programs for Contractor Bidding On Board Construction Jobs

PROJECT NAME: _____

SOLICITATION NO.: _____

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

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

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

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

(3) The details of:

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

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

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

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

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

Name of Contractor: _____

Signature and Title: _____

Date: _____

DUCTILE IRON
3.01 General
3.02 Submittals
3.03 Trench Excavation and Backfill
3.04 Installation
PVC (C-900) PIPE
3.05 General
3.06 Submittals
3.07 Trench Excavation and Backfill
3.08 Installation

SECTION SP-4 – NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

SECTION	DESCRIPTION
4.01	Hydrotesting Effluent Discharge
4.02	Storm Water Discharge
4.03	Measurement and Payment

SECTION SP-5 – STRUCTURAL WORK

SECTION SP-5.1 – STRUCTURAL DESIGN AND ANCHORAGE REQUIREMENTS FOR NONSTRUCTURAL COMPONENTS AND NONBUILDING STRUCTURES

SECTION	DESCRIPTION
5.1.01	General
5.1.02	Quality Assurance
5.1.03	Submittals
5.1.04	Design Codes
5.1.05	Design Loads
5.1.06	Load Combinations
5.1.07	Foundations
5.1.08	Deflections
5.1.09	Products
5.1.10	Execution
5.1.11	Measurement and Payment

SECTION SP-5.2 – CONCRETE WORK

SECTION	DESCRIPTION
5.2.01	Description
5.2.02	Submittals
5.2.03	Materials
5.2.04	Proportioning of Concrete
5.2.05	Execution
5.2.06	Measurement and Payment

SECTION SP-5.3 – UNIT MASONRY

SECTION	DESCRIPTION
5.3.01	Description
5.3.02	Submittals
5.3.03	Materials
5.3.04	Execution
5.3.05	Measurement and Payment

SECTION SP-5.4 – REINFORCING STEEL

SECTION	DESCRIPTION
5.4.01	Description
5.4.02	Submittals
5.4.03	Materials
5.4.04	Placing
5.4.05	Splicing
5.4.06	Measurement and Payment

SECTION SP-5.5 – GROUT

SECTION	DESCRIPTION
5.5.01	Description
5.5.02	Submittals
5.5.03	Materials

5.5.04 Execution
5.5.05 Measurement and Payment

SECTION SP-5.6 – ANCHORS

SECTION	DESCRIPTION
5.6.01	Description
5.6.02	Submittals
5.6.03	Materials
5.6.04	Execution
5.6.05	Measurement and Payment

SECTION SP-6 – ARCHITECTURAL WORK

SECTION SP-6.1 – LOUVERS

SECTION	DESCRIPTION
6.1.01	Summary
6.1.02	References
6.1.03	Submittals
6.1.04	Quality Assurance
6.1.05	Delivery, Storage and Handling
6.1.06	Manufacturers
6.1.07	Materials
6.1.08	Fabrication, General
6.1.09	Louver Models
6.1.10	Finishes
6.1.11	Bird/Insect Screens
6.1.12	Examination
6.1.13	Installation
6.1.14	Protection
6.1.15	Adjusting and Cleaning
6.1.16	Measurement and Payment

SECTION SP-6.2 – COILING DOORS

SECTION	DESCRIPTION
6.2.01	Summary
6.2.02	References
6.2.03	Submittals
6.2.04	Quality Assurance
6.2.05	Delivery, Storage, and Handling
6.2.06	Project Conditions
6.2.07	Manufacturers
6.2.08	Coiling and Rolling Doors
6.2.09	Examination
6.2.10	Preparation
6.2.11	Installation
6.2.12	Protection
6.2.13	Field Quality Control
6.2.14	Measurement and Payment

SECTION SP-6.3 – METAL DOORS & FRAMES

SECTION	DESCRIPTION
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6.3.02	Related Sections
6.3.03	Submittals
6.3.04	Quality Assurance
6.3.05	Materials
6.3.06	Rolled Steel Frames, Welded Construction
6.3.07	Hardware Preparation
6.3.08	Installation
6.3.09	Adjusting
6.3.10	Cleaning and Protection
6.3.11	Measurement and Payment

SECTION SP-6.4 – FINISH HARDWARE

SECTION	DESCRIPTION

6.4.01 Description
6.4.02 Submittals
6.4.03 Delivery
6.4.04 Representative
6.4.05 Quality Assurance
6.4.06 Materials
6.4.07 Templates
6.4.08 Tools and Instructions
6.4.09 Installation
6.4.10 Measurement and Payment

SECTION SP-6.5 – SEALANTS

SECTION	DESCRIPTION
6.5.01	Description
6.5.02	Materials
6.5.03	Installation
6.5.04	Measurement and Payment

SECTION SP-6.6 – FLUID APPLIED ELASTOMERIC ROOFING

SECTION	DESCRIPTION
6.6.01	General Conditions
6.6.02	Products
6.6.03	Installation
6.6.04	Measurement and Payment

SECTION SP-6.7 – PAINTING

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6.7.02	Submittals
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6.7.04	Materials
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SECTION	DESCRIPTION
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7.1.02	Definitions
7.1.03	References
7.1.04	Materials and Workmanship
7.1.05	Submittals
7.1.06	Departures from Drawings and Specifications
7.1.07	Project/Site Conditions
7.1.08	Delivery, Storage, and Handling of Materials
7.1.09	Pipe Materials – General
7.1.10	Structural Element Penetrations
7.1.11	Preparation for Installation
7.1.12	Joint and Coupling Options
7.1.13	Sleeves
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SECTION SP-7.2 – PUMPING UNITS

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7.2.03	Existing Well Inspection
7.2.04	New Vertical Line Shaft Turbine Pumping Unit Description
7.2.05	Pumps
7.2.06	Pump Motor
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7.2.08	Spare Parts
7.2.09	Refurbishment of Existing Incidental Items
7.2.10	Substitution of Specified Pump
7.2.11	Preliminary Submittals
7.2.12	Manufacturer Laboratory Pump Test
7.2.13	Layout Drawings
7.2.14	Installation of Pumping Unit
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7.2.16	Test of Pumping Units
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SECTION SP-8 – ELECTRICAL WORK

SECTION SP-8.1 – GENERAL CONDITIONS

SECTION	DESCRIPTION
8.1.01	Intent of Specifications and Drawings
8.1.02	Definitions
8.1.03	References
8.1.04	Materials and Workmanship
8.1.05	Drawings
8.1.06	Departures From Drawings and Specifications
8.1.07	Project/Site Conditions
8.1.08	Storage of Materials and Equipment
8.1.09	Construction Methods
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8.1.11 Record Documents
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SECTION SP-8.2 – SCOPE OF WORK

SECTION	DESCRIPTION
8.2.01	Test Complete Installation
8.2.02	Work Shall Include
8.2.03	Electrical Sequencing Constraints
8.2.04	Operational Testing
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SECTION SP-8.3 – SUBMITTALS

SECTION	DESCRIPTION
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8.3.03	Equipment and Material Specific Requirements
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SECTION	DESCRIPTION
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8.4.07 Handholes and Pullboxes
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8.4.09 Connections to Existing Concrete Pads
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8.4.11 Electrical Sealant
8.4.12 Pulling Line
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SECTION SP-8.5 – DEVICES AND EQUIPMENT

SECTION	DESCRIPTION
8.5.01	Wiring Materials
8.5.02	Wiring Devices
8.5.03	Protective Equipment
8.5.04	Control Devices
8.5.05	Control Relays
8.5.06	Magnetic Contactors
8.5.07	Elapsed Time Indicators
8.5.08	Current Transformers and Transducers
8.5.09	Terminal Strips, Blocks, and Devices
8.5.10	Dry-Type Transformers (600 Volts and Less)
8.5.11	Grounding System
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8.5.15	Miscellaneous Details
8.5.16	Measurement and Payment

SECTION SP-8.6 – MOTOR CONTROL CENTERS

SECTION	DESCRIPTION
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8.6.02	Structure and Construction
8.6.03	Finish and Color

8.6.04 Bus
8.6.05 Wiring
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8.6.10 Measurement and Payment

SECTION SP-8.7 – ARC FLASH HAZARD ANALYSIS AND SHORT CIRCUIT/COORDINATION STUDY

SECTION DESCRIPTION
8.7.01 Description and Requirements
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SECTION SP-8.8 – LIGHTING

SECTION DESCRIPTION
8.8.01 Description
8.8.02 References
8.8.03 Warranty
8.8.04 Submittals
8.8.05 Lighting Materials
8.8.06 Exterior Luminaires
8.8.07 LED Electronic Driver
8.8.08 LED Light Engines and Optics
8.8.09 Fixture Finishes
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8.8.14 Measurement and Payment

SECTION SP-9 – CIVIL SITE WORK

SECTION DESCRIPTION

9.01 General
9.02 Field Verification
9.03 Erosion and Sediment Control
9.04 Clearing and Grubbing
9.05 Demolition and Removal Work
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9.07 Excavation and Fill Materials
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9.11 Ordinances, Regulations
9.12 Construction Area Appearance
9.13 Existing Utilities
9.14 Asphalt Concrete Pavement
9.15 Site Restoration
9.16 Measurement and Payment

SECTION SP-10 – GEOTECHNICAL WORK

SECTION SP-10.1 – GEOTECHNICAL MONITORING AND TESTING

SECTION	DESCRIPTION
10.01	General
10.02	Measurement and Payment

SECTION SP-11 – FIELD OFFICE

SECTION	DESCRIPTION
11.01	General
11.02	Measurement and Payment

SPECIAL PROVISIONS

SECTION SP-1 – GENERAL REQUIREMENTS

1.1 GENERAL PROVISIONS, SPECIFICATIONS, AND STANDARD DETAILS: The special provisions, plans, general provisions, Water Standards, DPW Standard Specifications and Details, contract documents and all supplemental documents are essential parts of the contract, and a requirement occurring in one is as binding as though occurring in all. They are intended to be complementary and to describe and provide for the complete work. In case of conflict or discrepancy within any part of the contract, the stricter requirements, including Hawai‘i State Statutory requirements, shall govern. Unless it is apparent that a different order of precedence is intended, the special provisions shall govern over plans, general provisions and Water Standards; plans shall govern over general provisions; general provisions shall govern over Water Standards; Water Standards shall govern over DPW Standard Specifications; figured dimensions and drawings take precedence over measurements by scale, and detail drawings; instructions to proposers shall be incorporated and made a part of the special provisions.

1.1.01 GENERAL PROVISIONS FOR CONSTRUCTION CONTRACTS OF THE DEPARTMENT OF WATER, COUNTY OF KAUA‘I: The “GENERAL PROVISIONS FOR CONSTRUCTION CONTRACTS OF THE DEPARTMENT OF WATER, COUNTY OF KAUA‘I”, April 25, 2016 as amended, is by reference incorporated herein and made a part of these specifications.

1.1.02 WATER SYSTEM STANDARDS: The “WATER SYSTEM STANDARDS”, 2002, as amended, as adopted by the Department of Water, County of Kaua‘i; Board of Water Supply, City and County of Honolūlū; Department of Water Supply, County of Maui; Department of Water Supply, County of Hawai‘i is by reference incorporated herein and made a part of these specifications. These specifications are not bound in these contract documents, but shall by reference be incorporated herein and made a part of these specifications.

SECTION 302 - WATER MAINS AND APPURTENANCES

The following shall supplement the applicable subsections of Division 300 - Construction of the “Water System Standards”, 2002.

Make the following amendments to said section:

SECTION 302.02 – TRENCH EXCAVATION

Add the following paragraph to the “A. General” subsection:

Because construction will occur within residential neighborhoods, the Contractor shall secure all areas under construction with due regard for the safety of all persons and property at all times.

Amend the first paragraph of the “B. Payment” subsection to read:

Payment for trench excavation (without classification), backfill, select borrow, pipe cushion, and cost to safely secure all areas under construction will not be paid for separately but shall

be included in the Unit Price for the furnishing and installation of the various items in the Proposal.

SECTION 302.03 – TRENCH BACKFILL

Add the following paragraph to the "A. General" subsection:

If backfilling ground is continuously wet, pipe cushion and backfill material shall consist of coarse aggregate, ASTM C 33, Size Number 67, and shall be completely encapsulated with non-woven geotextile filter fabric unless approval for other material is granted.

Amend the first paragraph of the "G. Payment" subsection to read:

Payment for aggregate and sand pipe cushion surrounding the pipe, pipe bedding, non-woven geotextile filter fabric pipe cushion encasement, trench backfill, select borrow, warning tape, and backfill at valve boxes, meter boxes, manholes, and handholes will not be paid for separately but shall be included in the Unit Price for the furnishing and installation of the various items in the Proposal.

SECTION 302.04 – SHEATHING

Add the following paragraph to the "A. General" subsection:

Contractor shall provide and maintain sheathing and bracing as necessary to support excavation and trenching and shall comply with Occupational Safety & Health Administration (OSHA) requirements. The contractor shall deem a competent person for trench excavation and that person shall be on-site during all trench excavation and backfill.

Amend the entire "B. Payment" subsection to read:

Payment for installation and removal of sheathing and bracing, and for additional excavation (without classification), additional aggregate and sand cushion to surround the pipe, additional non-woven geotextile filter fabric to surround the cushion, additional bedding, and additional backfill required because of sheathing or bracing work will not be paid for separately but shall be included in the Unit Price for the furnishing and installation of the various items in the Proposal.

SECTION 302.05 – DEWATERING

Amend the first paragraph of the "A. General" subsection to read:

In locations where water is present in the trench, the Contractor must dewater by pumping or other means to keep the trench free of water during the installation of pipe cushion, the pipe itself, the testing, connection, relocation, lowering of the water mains, and until backfilling is completed to a point 12 inches above the top of the pipe. The Contractor shall provide proper facilities for delivering all pump water to its intended outfall location and attain all necessary permits required for discharge.

If the Contractor elects to discharge dewatering effluent into State Waters or existing drainage systems, the Contractor shall obtain NPDES General Permit Coverage authorizing discharges

associated with construction activity dewatering from the Department of Health, Clean Water Branch (DOW-CWB). The Contractor shall prepare and submit permit application (CWB-NOI Form G) to DOH-CWB and shall not begin dewatering activities until DOH-CWB has issued Notice of General Permit Coverage (NGPC) and shall conduct dewatering operations in accordance with the conditions in NGPC. Contractor shall submit a copy of NPDES dewatering Application and Permit to the Manager.

Amend the entire "B. Payment" subsection to read:

Payment for dewatering activities, including but not limited to the preparation and implementation of NPDES General Permit Coverage authorizing discharges associated with construction activity dewatering, and the installation, maintenance, monitoring, and removal of Best Management Practices (BMPs), will not be paid for separately but shall be included in the Unit Price for the furnishing and installation of the various items in the Proposal.

For all fines received by the Department for non-compliance with the Notice of General Permit Coverage (NGPC), the Contractor shall reimburse the Department within 30 days for the full amount of the outstanding cost the Department has incurred, or the Department will deduct the cost from the Contractor's progress payment.

SECTION 302.06 – "ADOBE" OR CLAY

Amend the entire "B. Payment" subsection to read:

Exclusive of the payments due for work defined in Section 302.07 – MUD REMOVAL AND CRUSHED ROCK TRENCH STABILIZATION, no separate payment for excavation (without classification) and removal of adobe, clay or other unsuitable material from the pipe trench or for necessary backfill material approved by the Manager to replace those materials will be made; the compensation for such work shall be deemed to be included in the Unit Price for the furnishing and installation of the various items in the Proposal.

SECTION 302.07 – MUD REMOVAL AND CRUSHED ROCK TRENCH STABILIZATION

Amend the first paragraph of the "B. Payment" subsection to read:

Payment for excavation (without classification) to remove and dispose of mud or undesirable materials from the pipe trench whether native or caused by contractor means and methods will not be paid for separately but shall be included in the Unit Price for the furnishing and installation of the various items in the Proposal.

SECTION 302.08 – BLASTING

Amend the entire "A. General" and "B. Payment" subsections to read:

No blasting shall be allowed on this project.

SECTION 302.09 – EXCAVATION FOR MANHOLES

Amend the second paragraph of the "B. Payment" subsection to read:

Payment for excavation (without classification) for manholes will not be paid for separately but shall be deemed to be included in the Unit Price for the furnishing and installation of Manholes.

SECTION 302.10 – EXCAVATION FOR THRUST BLOCKS, BEAMS, AND TEST BLOCKS

Amend the entire "B. Payment" subsection to read:

Payment for excavation (without classification) and backfill of concrete thrust blocks, thrust beams, reaction blocks, and test blocks will not be paid for separately but shall be included in the Unit Price for installation of Concrete Thrust Blocks, Thrust Beams, Reaction Blocks, and Test Blocks or Waterline installation line items.

SECTION 302.11 – SURPLUS EXCAVATION

Amend the entire "B. Payment" subsection to read:

Payment for the removal and disposal of surplus excavation material will not be paid for separately but shall be included in the Unit Price for the furnishing and installation of the various items in the Proposal.

SECTION 302.12 – DUCTILE IRON PIPE

Add the following paragraph to the "A. General" subsection:

Transition couplings shall be Romac Style "501", Style "RC501", or approved equal. D.I. to A.C. transition couplings shall be 14" in length.

Add the following paragraphs to the "E. Payment" subsection:

The Unit Price for furnishing and installation of the various sizes of Ductile Iron Pipe shall be inclusive of trench excavation (without classification), trench backfill, pipe cushion, warning tape, sheathing and dewatering of trench, removal and disposal of adobe, clay, mud, and other unsuitable material from the trench, and removal and disposal of surplus excavation material, and all associated cost for licensed Geotechnical Engineer monitoring, analysis, and testing.

Payment for furnishing and installation of transition couplings shall not be made directly, costs for furnishing and installation of transition couplings shall be included in the Lump Sum for the various Connections to Existing Water Mains in the Proposal.

SECTION 302.14 – PLASTIC PIPE

Add the following paragraphs to the "A. General" subsection:

The contractor shall furnish and install Polyvinyl Chloride (PVC) pipe for this project if required. All types and sizes of PVC pipes shall be AWWA C900, Pressure Class 200, DR14 pipe for pipes larger than 2 ½" or schedule 80 PVC pipe for sizes 2 1/2" and smaller.

Pipe cushion material as called for on the plans shall adhere to the requirements of "Water System Standards" Section 209.02, Pipe Cushion. When ground water is encountered or when required by the Engineer, the pipe cushion shall be wrapped in non-woven geotextile fabric in accordance with the "Water System Standards" Section 212.05, Geotextile Fabrics. The contractor shall retain the services of a licensed Geotechnical Engineer to monitor the quality of pipe cushion material, installation, and compaction of the pipe cushion, geotextile encasement, and trench backfill. The Department of Water will require periodic sieve testing of the pipe cushion material during the course of construction.

If PVC installation will be within State Highways Right-of-Way, installation, work, and materials used for this project shall comply with the requirements in Section 624 – Water System, Section 703.21 – Trench Backfill Material, Section 716 – Geotextiles, and Section 716.03 – Geotextiles for Underdrain Applications of the "Specifications for Road and Bridge Construction", State of Hawai'i, dated 2005, unless otherwise approved by the authoritative agency.

Transition couplings shall be Romac Style "501", Style "RC501", or approved equal. C-900 PVC to A.C. transition couplings shall be 14" in length.

Amend the first paragraph of the "B. Payment" subsection to read:

Payment for furnishing and installation of various sizes of PVC Pipe including all necessary joints accessories and fusion process and accompanying ground restraints, will be made at the respective Unit Price per linear foot based on the actual linear feet of PVC pipe installed (exclusive of valves, fittings, bends, and adapters), cleaned or pigged and successfully hydrotested in the field.

Add the following paragraphs to the "B. Payment" subsection:

The Unit Price for furnishing and installation of the various sizes of PVC Pipe shall be inclusive of trench excavation (without classification), trench backfill, pipe cushion, geotextile filter fabric encasement, conducting cable, warning tape, sheathing, removal and disposal of adobe, clay, mud, and other unsuitable material from the trench, removal and disposal of surplus excavation material, and all associated cost for licensed Geotechnical Engineer monitoring, analysis, and testing.

Payment for furnishing and installation of transition couplings shall not be made directly, costs for furnishing and installation of transition couplings shall be included in the Lump Sum for the various Connections to Existing Water Mains in the Proposal.

<u>SECTION 302.15 – FITTINGS AND SPECIALS (DUCTILE IRON, CONCRETE CYLINDER, PLASTIC PVC PIPE)</u>

Add the following paragraph to the "A. General" subsection:

The contractor shall furnish and install EBAA Iron Series 2000PV MEGALUG Mechanical Joint Restraint for plain end PVC pipe at all mechanical joint fittings and EBAA Iron Series 2100 MEGAFLANGE Restrained Flange Adapter for plain end PVC pipe at all flange joints. Both shall be installed in accordance with the manufacturer's guidelines.

Amend the first paragraph of the "B. Payment" subsection to read:

Payment for furnishing and installing Cast Iron and Ductile Iron Fittings will be made at the Lump Sum Price, complete in place. The Contractor shall be responsible for the actual number of cast iron and ductile iron fittings furnished, installed and tested in the field. If a line item for Cast Iron and Ductile Iron fittings is not specifically provided, the contractor shall include the cost in the furnishing and installation of the waterline unit price.

Amend the fourth paragraph of the "B. Payment" subsection to read:

Payment for furnishing and installation PVC Fittings, including copper toning wire will not be paid for separately but shall be included in the Unit Price for furnishing and installation of the various sized PVC Pipes in the proposal.

Amend the fifth paragraph of the "B. Payment" subsection to read:

Payment for furnishing and installation Flanged by Bell Adapters, Flanged Dismantling Joints, MEGALUG Mechanical Joint Restraint, and MEGAFLANGE Restrained Flange Adapters will not be paid for separately but shall be included in the Lump Sum Price for Cast Iron and Ductile Iron Fittings, in place complete.

SECTION 302.16 – GATE VALVES AND BUTTERFLY VALVES

Amend the first paragraph of the "A. General" subsection to read:

The contractor shall furnish and install all permanent and temporary gate valves and butterfly valves at locations shown on the plans or as directed by the Engineer. Unless otherwise specified, the installation shall be in accordance with the Standard Details. Specifications for furnishing and installing Temporary Gate Valves will comply with this section of the specification.

Amend the fourth paragraph of the "A. General" subsection to read:

Concrete anchor block with non-corrosive straps will not be required for this project.

Add the following paragraph to the "B. Payment" subsection:

The Unit Price for furnishing and installing Gate Valves and Butterfly Valves and furnishing and installing Temporary Gate Valves shall be inclusive of trench excavation (without classification), cast iron valve box, trench backfill, pipe cushion, warning tape, sheathing and dewatering of trench, removal and disposal of adobe, clay, mud, and other unsuitable material from the trench, and removal and disposal of surplus excavation material.

SECTION 302.17 – AIR RELIEF VALVES

Add the following paragraph to the "A. General" subsection:

Air relief valves shall be One-Inch Val-Matic Valve & Manufacturing Corp. Combination Air Valve 201C.2 with screened hood, or approved equal.

Amend the second paragraph of the "B. Payment" subsection to read:

The Unit Price for furnishing and installation of Air Relief Valve shall be full compensation for all labor, materials, tools and equipment for excavation (without classification) and backfill, sheathing and dewatering of trench, installation of copper pipes, fittings, various types of valves, ARV, cinder or crush rock cushion, brick saddle, ARV pipe stand, concrete footing, roofing felt, stainless steel straps, screened hood, paint, testing, and all other incidentals to complete this work.

SECTION 302.18 – SERVICE LATERALS, CONNECTIONS AND PIPES

Add the following paragraphs under "A. General" subsection:

New service laterals shall be terminated with an angle valve in the existing meter boxes to facilitate the reconnection to the water meter.

Where existing meters are located within private properties, the new service lateral will be terminated within the public right-of-way and include a new Type "B" or Type "X" meter box with cast iron cover.

When a new lateral is being installed for an existing Department of Water consumer, the contractor shall furnish and install lateral piping including all fittings and appurtenances between the new meter and the existing consumer piping and perform reconnection work, and include a new meter box and cover.

When an existing lateral is being abandoned, the contractor shall cut and plug the existing lateral at the main. The existing meter box and cover shall be cleaned and transported to the Department's Baseyard in Līhuʻe or Puhi, unless otherwise directed by the Engineer.

Amend the entire "D. Payment" subsection to read:

Payment covered under service laterals and connections and appurtenances shall be as follows: Payment for furnishing and installing various sizes of new service laterals and service connections, regardless of the lengths of the laterals or connections, will be made at the Unit Price per each unit based on the actual number installed and tested.

The Unit Price for furnishing and installing various sizes of new service laterals, service connections, and appurtenances shall be full compensation for all labor, materials, tools, and equipment for all handling, hauling, unloading, placing, testing, and all other incidental necessary to complete the work.

No separate payment for the furnishing and installation of taps into mains, reconnections to existing consumer piping, temporary connections, cut and plug and removal of existing laterals, transferal of meters, pipes, fittings, ball corps, ball stops, angle valves, globe valves, double hub fittings, tapping tees, service saddles, meter boxes and covers, meter splices, brass pipes, caps, PVC conduits, warning tape, polyethylene wrap, plastic lateral for isolation, nor any other appurtenances will be made. Additionally, no separate payment will be for trench excavation (without classification) and backfill, sheathing and dewatering of trench, pipe cushion, nor transporting existing meter boxes and covers to the Department's Baseyard in

Līhuʻe or Puhi. The compensation for this work and items shall be deemed to be included in the Unit Price for New Service Laterals.

SECTION 302.19 – METER BOXES

Amend the entire "B. Payment" subsection to read:

Payment for the furnishing and installation of meter boxes including frames and covers will not be paid for separately but shall be included in the Unit Price for Service Laterals or Air Relief Valve Assemblies.

Payment for the furnishing and installation of Meter Boxes shall be full compensation for all labor, materials, tools and equipment for all handling, hauling, unloading, placing, bricks, concrete, cast iron covers, painting, concrete slabs and all other incidentals necessary to complete the work.

No separate payment for excavation (without classification) and backfill of Meter Boxes will be made; the compensation for such work shall be deemed to be included in the Unit Price for Service Laterals or Air Relief Valve Assemblies.

SECTION 302.20 – FIRE HYDRANTS

Amend the third paragraph of the "B. Payment" subsection into the following paragraphs:

Payment for excavation (without classification), backfill, sheathing and dewatering of trench, and fire hydrant markers will not be paid for separately but shall be included in the Unit Price for the furnishing and installation of Fire Hydrants.

No separate payment for the furnishing and installation of hydrant elbow, hydrant extension, pipe cushion, flat brick support, and all other appurtenances will be made; the compensation for such work shall be deemed to be included in the Unit Price for Fire Hydrants.

SECTION 302.21 – FIRE HYDRANT MARKERS

Amend the first paragraph of the "B. Payment" subsection to read:

Payment for hydrant markers will not be paid for separately but shall be included in the Unit Price for the furnishing and installation of Fire Hydrants.

SECTION 302.22 – CONCRETE BLOCKS, JACKETS, BEAMS, CURB GUARDS FOR FIRE HYDRANTS AND METER BOXES, MANHOLE AND VALVE BOX COLLAR

Amend the entire "B. Payment" subsection to read:

Payment for concrete reaction blocks, thrust beams, thrust blocks and test blocks will be made at the Unit Price per each either by specific proposal line item or as a portion within the furnishing and installation of waterline line item. The Unit Price for concrete reaction blocks, thrust beams, thrust blocks and test blocks shall be full compensation for all labor, materials, tools and equipment for all excavation (without classification), backfill, sheathing, dewatering, concrete, forms, tie wire and chairs, bracings, straps, structural struts, surface finishing, curing,

mixing, hauling, furnishing and placing reinforcing steel, and all other incidental materials and work necessary to construct the concrete reaction block, thrust block or thrust beam, in place complete.

Payment for concrete jackets will be made at the Unit Price per linear feet of concrete jacket installed for the various sizes of pipe, regardless of pipe size either by specific proposal line item or as a portion within the furnishing and installation of waterline line item. The Unit Price for concrete jackets shall be full compensation for all labor, materials, tools and equipment for all excavation (without classification), backfill, sheathing, dewatering, concrete, forms, tie wire and chairs, bracings, straps, surface finishing, curing, mixing, hauling, furnishing and placing reinforcing steel, and all other incidental materials and work necessary to construct the concrete jackets in place complete.

Payment for concrete jackets for smaller utility conduits crossing the project's waterlines shall not be made separately. Costs for furnishing and installation of concrete jackets, including miscellaneous items such as warning tapes, shall be deemed to be included in the Unit Price for furnishing and installation of the various sizes and types of pipes in the Proposal.

SECTION 302.24 – VALVE BOXES

Amend the first paragraph of the "A. General" subsection to read:

Valve boxes for air relief valves, butterfly valves and cleanouts shall be installed in accordance with the Standard Details. Valve boxes for temporary and permanent gate valves shall be furnished and installed in conformance with Standard Detail V11 of the WATER SYSTEM STANDARDS or as defined on the construction drawing for this project. Valve boxes shall be installed 3 feet minimum clear from gutter, curbs, utilities and any structures. For this section, Valve Box specifications for Temporary and Permanent Gate Valves are identical.

Amend the entire "B. Payment" subsection to read:

Payment for the furnishing and installing of valve boxes including cast iron frames and covers and adjusting valve boxes to the required grade will not be paid for separately but shall be included in the Unit Price for Gate Valves or Temporary Gate Valves or Tapping Valves or Cleanout assemblies.

Payment shall be full compensation for all labor, materials, tools and equipment for all excavation (without classification) and backfill, cast iron frames and covers, concrete settlement slab, reinforced concrete collar and leveling slab, standpipe (concrete, cast iron, ductile iron, or welded steel pipe), brick leveling course, crushed rock fill, pipe cushion, painting, general area clean up, and all other incidentals necessary to complete the work.

No separate payment for backfilling around valve boxes with black sand, sand or coral chips and for temporary backfill and additional excavation (without classification) to expose the risers after chlorination will be made; the compensation for such work shall be deemed to be included in the Unit Price for Gate Valves, Temporary Gate Valves, Tapping Valves, or Cleanout assemblies.

SECTION 302.30 – CONNECTIONS, RELOCATIONS & LOWERING OF WATER MAINS AND LATERALS

Amend the first paragraph of the "A. General" subsection to read:

Whenever connections to, disconnections from, relocations to, or lowering of existing mains, service laterals, or hydrant laterals are required, the Contractor shall perform all work necessary for the installation of the new or temporary water facility or abandonment of the existing water facility, as shown on the plans, under the coordination of the Manager or his authorized representative.

Add the following paragraph under "A. General" subsection:

The contractor shall utilize temporary waterlines to provide continuous water service and fire protection to existing consumers, as needed.

For this project, Connections to Existing Water Main involve connecting to various types of pipe. The Contractor shall not saw or cut or damage existing asbestos cement pipe. Asbestos cement pipes, fittings, and appurtenances shall be removed at the nearest coupling. The Contractor shall remove and dispose of asbestos cement pipes, fittings, and appurtenances in accordance with Section 302.31.

Amend the entire "B. Payment" subsection to read:

Payment for Connection to Existing Water Main, Connection to Existing Service Lateral, or Connection to Existing Hydrant Lateral which may include the furnishing and installing of pipes, fittings, fire hydrants, gate valves, tapping sleeves and valves, service saddles, hub clamps and other appurtenant materials, will be included in the Lump Sum Price for Connection to Existing Water Main or in the Unit Price for Connection to Existing Service Lateral, Connection to Existing Hydrant Lateral, or temporary bypasses and disconnects.

The Lump Sum Price or Unit Price shall represent full compensation for furnishing all materials, labor, tools, equipment, and incidentals required for excavation (without classification), backfill, sheathing and dewatering of trench, relocating existing gate valves, connections, relocations, disconnections, removal, or lowering of the existing mains as called for on the plans and in accordance with these specifications and inclusive of all incidentals required to complete the work.

No separate payment for cutting, plugging, relocating existing main, lowering of existing mains, providing temporary water service (if necessary), providing temporary fire protection (if necessary), or abandoning of existing mains will be made; the compensation for such work shall be deemed to be included in the Lump Sum for Connections to Existing Water Main or in the Unit Price for Connection to Existing Service Lateral or Connection to Existing Hydrant Lateral.

No separate payment for installation of bypass lines including cutting, plugging and abandoning existing bypass lines will be made; the compensation for such work shall be deemed to be included in the Lump Sum for Connections to Existing Water Main or in the Unit Price for Service Lateral Connections or Connection to Existing Hydrant Lateral.

SECTION 302.31 – REMOVING OR DEMOLISHING, REINSTALLING OR RETURNING EXISTING PIPES AND APPURTENANCES

Add the following paragraphs under "A. General" subsection:

The contractor shall be responsible for removal and disposal of existing pipes and appurtenances abandoned within the State and County Right-of-Way. Removal and disposal of pipes shall follow all applicable OSHA, HIOSH, State of Hawai‘i and Federal Regulations. Abatement personnel shall oversee removal and disposal, when required. Unless otherwise directed by the Manager, pipes and appurtenances shall become the property of the Contractor and shall be expeditiously removed from the construction site.

Care shall be exercised when removing and disposing of asbestos cement pipe and appurtenances. If the contractor causes the asbestos cement pipe or appurtenance to become friable, he will not be reimbursed for extra costs incurred to handle, containerize, transport, and dispose of the waste. Disposal of asbestos cement pipe and appurtenances shall be at an approved asbestos disposal site and all disposal related costs shall be borne by the contractor. Disposal of all hazardous materials shall be completed within 24 hours of removal from the water system and shall not be stored within the project site beyond the 24 hour period.

Temporary pipes, fittings, valves, cleanouts, valve boxes with frames and covers, and appurtenances that were installed to provide temporary water service and fire protection shall be salvaged, cleaned, and transported to the Department's Baseyard in Līhu‘e or Puhi.

Amend the first paragraph of the "B. Payment" subsection to read:

Payment for the removal, cleaning, and transporting of existing fire hydrants, standpipes, cleanouts, and air relief valves will be made at the Unit Price per each unit, based on the actual number removed and accepted by the Manager. If a specific proposal line item is not provided, the contractor shall incorporate the costs into the unit price of the furnishing and installation of the applicable waterline. The Unit Price includes full compensation for all labor, materials, tools, and equipment for removing, cleaning, plugging existing water mains, providing temporary water service, restoring disturbed area, and transporting salvaged fire hydrants, standpipes, air relief valves, and appurtenances to the Department's Baseyard in Līhu‘e or Puhi.

Add the following paragraphs to the "B. Payment" subsection:

Payment for removal of existing gate and tapping valves will be made at the Unit Price per each unit, based on the actual number removed and accepted by the Manager. If a specific proposal line item is not provided, the contractor shall incorporate the costs into the unit price of the furnishing and installation of the applicable waterline. The Unit Price includes full compensation for all labor, materials, tools, and equipment for removing existing valve box components, removing concrete settlement slab, plugging of existing water mains, installing concrete and dirt backfilling, restoration of disturbed area, and cleaning and transporting the salvaged cast iron frames and covers to the Department's Baseyard in Līhu‘e or Puhi.

Payment for removal of temporary gate valves and valve box components will be made at the Unit Price per each unit, based on the actual number removed and accepted by the Manager. If a specific proposal line item is not provided, the contractor shall incorporate the costs into the unit price of the furnishing and installation of the applicable waterline. The Unit Price includes full compensation for all labor, materials, tools, and equipment for removing the

temporary gate valves and valve box components, removing concrete settlement slab, installing concrete and dirt backfill, restoration of disturbed area, and cleaning and transporting salvaged gate valves and cast iron frames and covers to the Department's Baseyard in Līhuʻe or Puhi.

Payment for the removal of temporary pipes and fittings will be made at the Lump Sum or Unit Price for Removal Temporary Water Main. The Lump Sum or Unit Price includes full compensation for all labor, materials, tools, and equipment for excavating (without classification), sheathing, dewatering, disconnecting and removing the temporary pipe and fittings, backfill and restoration of disturbed area, and cleaning and transporting salvaged pipes and fittings to the Department's Baseyard in Līhuʻe or Puhi.

Payment for the removal and disposal of existing pipes, fittings, and appurtenances within the State and County Right-of-Way will be made at the Lump Sum or Unit Price for Removal of Water Main. The Lump Sum or Unit Price shall be full compensation for all labor, materials, tools and equipment for excavating (without classification), sheathing, dewatering, disconnecting, removing, processing, storing, hauling, and disposing of abandoned pipes and fittings, backfill and restoration of disturbed area, abatement personnel, disposal and inspection fees, cutting and plugging of existing water mains and laterals, and all other incidental materials and work necessary for the complete removal of abandoned pipes, fittings, and appurtenances.

Payment for the removal and disposal of existing pipes and appurtenances not specified above shall be considered incidental and shall not be paid for separately but shall be included in the Unit Price or Lump Sum for the various items in the proposal. Payment shall be full compensation for all labor, materials, tools and equipment for excavating (without classification), sheathing, dewatering, disconnecting, removing, hauling, storing, and disposing of abandoned pipes and fittings, backfilling and restoring disturbed area, disposal and inspection fees, cutting and plugging of existing water mains and laterals, and all other incidental materials and work necessary for the complete removal of abandoned pipes and appurtenances.

SECTION 302.35 – VALVE MARKERS

Amend the entire "B. Payment" subsection to read:

Payment for the furnishing and installation of Valve Markers will not be paid for separately, but shall be included in the Unit Price for the installation of various sized of gate or tapping valves. Payment shall be full compensation for all labor, materials, tools and equipment for all excavation (without classification), backfill, concrete, painting, and all other incidental materials and work necessary to complete the work.

SECTION 302.36 – SLOW CURING ASPHALT PAVEMENT (COLD MIX)

Amend "B. Payment", replace the first paragraph with the following:

Payment for furnishing, placement, maintenance and removal of SLOW CURING ASPHALT (Cold Mix) shall be deemed to be included in the Unit Price for furnishing and installation of the various sizes and types of pipes in the Proposal.

SECTION 302.37 – RESTORING PAVEMENTS, DRIVEWAYS, SIDEWALKS, CURBS, GUTTERS, FENCES, WALLS, AND MISCELLANEOUS

Add the following paragraphs under "A. General" subsection:

Asphalt concrete (A.C.) pavement resurfacing work shall include cold planing a 2-inch thick layer of existing A.C. pavement and resurfacing with a minimum 2-inch thick layer of new A.C. pavement (State Mix IV or V). Cold planing and resurfacing of A.C. pavement shall be in accordance with the Hawai'i Standard Specifications for Road and Bridge Construction, 2005. The contractor shall construct the project per the approved construction drawings details and notes and verify potential AC thicknesses that could be encountered prior to submitting a proposal.

Existing pavement striping disturbed by this project shall be restored using thermoplastic extrusion. Painting is not acceptable. Installation of thermoplastic extrusion shall be in accordance with the Hawai'i Standard Specifications for Road and Bridge Construction, 2005.

Existing reinforced concrete sidewalks, curbs, gutters, ramps, driveways, and swales disturbed by this project shall be restored to State Highways Standards in accordance with the Hawai'i Standard Specifications for Road and Bridge Construction, 2005 and the Highway's Division, Design Branch, Standard Plans, 2008.

Amend the entire "C. Payment" subsection to read:

Unless otherwise specified, payment for restoring fences, mail boxes, walls, landscaping, highway signs, highway markers and reflectors, and thermoplastic pavement striping shall not be measured nor paid for directly but shall be considered incidental to the construction work.

Payment for Restoring A.C. Pavement, inclusive of base and subbase courses, will be made at the Unit Price per square yard based on the minimum quantity required to be replaced on the approved plans, measured on the basis of the area of trenches specified for excavation plus an additional of twelve inches on each side of the trench for restoration within the State Right-of-Way or six inches on each side of the trench for restoration within the County Right-of-Way. The Unit Price shall be full compensation for all labor materials, tools, and equipment, for all handling, removing, placing, maintaining and all other incidental materials and work necessary to complete the Restoring A.C. Pavement work.

Payment for Cold Planing Existing A.C. Pavement and A.C. Pavement Resurfacing will each be made at the Unit Price per square yard based on the minimum quantities required as noted on the approved plans. Each Unit Price shall be full compensation for all labor materials, tools, and equipment, for all handling, removing, placing, maintaining and all other incidental materials and work necessary to complete the Cold Planing of Existing A.C. Pavement and A.C. Pavement Resurfacing work.

Payment for A.C. Pavement resurfacing, will be made at the Unit Price per square yard based on the minimum quantity required to be replaced on the approved plans, measured on the basis of the area of roadway required to be resurfaced within the State Right-of-Way or County Right-of-Way. The Unit Price shall be full compensation for all labor materials, tools, and equipment, for all handling, removing, placing, maintaining and all other incidental materials and work necessary to complete the A.C. Pavement resurfacing work.

Unless otherwise specified, payment for restoration of Reinforced Concrete Sidewalk, Curbs, and Ramps, Reinforced Concrete Driveway, AC Driveways and Reinforced Concrete Swale shall not be measured nor paid for directly but shall be considered incidental to the construction work. If specified as a Unit Price, the Unit Price shall be full compensation for all labor materials, tools, and equipment, for all handling, removing, placing, finishing, maintaining, installation of forms, steel or weld wire fabric reinforcement, base course, and all other incidental materials and work necessary to complete the restoration of Reinforced Concrete Sidewalk, Curbs, and Ramps, Reinforced Concrete Driveway, AC Driveway and Reinforced Concrete Swale work.

Add the Following Section:

SECTION 302.40 – BRACING OF UTILITY POLES

When excavating close to utility poles, when specified on the plans, or when directed by the Manager, the Contractor shall brace the utility pole if the utility pole is owned by Hawaiian Telcom or pay for bracing if the utility pole is owned by Kaua‘i Island Utility Cooperative (KIUC). In addition to "Bracing of Utility Poles", the utility agency(s) may require the contractor to stabilize the ground adjacent to the pole(s). "Bracing of Utility Poles" and stabilizing the ground adjacent to the utility pole(s) includes all labor, materials, tools, and equipment necessary to install braces for existing utility poles, stabilize the ground adjacent to the utility poles, and for their removal when bracing and/or stabilizing are no longer necessary. Payment for bracing of utility poles or reimbursement for utility poles braced by KIUC or stabilizing the ground adjacent to the utility poles will not be made directly but shall be included in the Unit Price for the various items in the proposal.

Add the Following Section:

SECTION 302.41 – TRAFFIC CONTROL

Unless provided a specific line item in the proposal, Payment for traffic control work will not be made directly but shall be included in the Unit Price for the various items in the proposal.

SECTION 302.42 – REMOVING AND SALVAGING/DISPOSING OF MATERIALS

Payment for removal and salvage or disposal of materials (fire hydrants, standpipes, valve boxes, etc.) and for the restoration of the area shall not be made directly; costs for these items of work shall be included in the unit price offer for the various items in the proposal.

Add the Following Section:

SECTION 302.43 – EROSION CONTROL / BMP

Payment for all erosion control / BMP measures shown on the drawings will not be made directly but shall be included in the Unit Price for waterline installation.

1.1.03 DEPARTMENT OF PUBLIC WORKS, COUNTY OF KAUA‘I STANDARD SPECIFICATIONS: Whenever reference is made within these Special Provisions or the contract plans to the DPW Standard Specifications, the specifications referred to is the

From:
Date:

Subject: (Subject of Facsimile)
Job No. / Job Name

1.4 FAILURE TO COMPLETE ON TIME AND LIQUIDATED DAMAGES: The Contractor shall complete the work within the number of calendar days specified in the contract. The specified number of calendar days shall commence from the date designated in the Notice to Proceed.

Completion of the work within the required time is important since delay in the prosecution of the work will inconvenience the public, obstruct traffic and interfere with business.

If the Contractor fails to complete the work on or before the final completion date specified in the contract, damages will be sustained by the Department of Water, County of Kaua‘i. Since the amount of damage, exclusive of the actual cost of engineering, inspection and superintendence, including necessary traveling expenses, is difficult, if not impossible to definitely ascertain and prove, the amount of such damages are fixed in advance at the sum of One Thousand Dollars ($1,000.00) for each and every calendar day which the Contractor has delayed in the completion of the contract; and the Contractor shall pay that amount as liquidated damages and not by way of penalty, and in case the same are not paid, the Department may deduct the amount thereof from any monies due or that may become due to the Contractor under the contract.

1.5 MEASUREMENTS: Figured dimensions and drawings take precedence over measurements by scale. The Contractor must verify all measurements at the site and be responsible for the accuracy of the same.

1.6 PROJECT RECORD DOCUMENTS:

1.6.01 SECTION INCLUDES: Overview of maintenance of documents, recording requirements, and submittal of Project Record Documents.

1.6.02 MAINTENANCE OF DOCUMENTS:

A. Maintain a record copy of the following Project Record Documents on-site and record actual revisions to the work:

(1) Contract Drawings.
(2) Specifications.
(3) Amendments.
(4) Change orders and other modifications to the Contract.
(5) Reviewed submittals.
(6) Permits. (Road, Building, Noise, NPDES, etc.)
(7) Specified installer/tradesman certificates.
(8) Update Revisions to BMP plans as required by NPDES permit(s).
(9) Other Project Record Documents as indicated in specific Specification sections.

B. Store Project Record Documents apart from other documents. Provide separate files, racks, and secure storage for Project Record Documents.

C. Record information concurrent with construction progress.

D. Label and file Project Record Documents in accordance with these Specifications. Label each document "PROJECT RECORD" in neat, large, printed letters.

E. Maintain Project Record Documents in a clean, dry and legible condition.

F. Keep Project Record Documents available for inspection.

1.6.03 RECORDING REQUIREMENTS:

A. Use an erasable red pencil (not ink or indelible pencil) to clearly record information or changes on the Drawings by graphic line and note as required. Use an erasable yellow pencil to clearly mark for verification all major components shown as constructed.

B. Use different colors for overlapping changes if required for clarification.

C. Record information concurrently with construction progress. Do not conceal any work until required information is recorded. Date all entries reflecting change.

D. Legibly mark each item on the Drawings to record actual construction, including:

(1) Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.

(2) Field changes of dimension and detail.

(3) Changes made by Contract amendments and modifications.

(4) Details not on original Drawings.

(5) References to related shop drawings.

E. Specifications: Legibly mark each item to record actual construction, including the following:

(1) Manufacturer's name and product model and number.

(2) Product substitutions or alternates utilized, as approved by DOW.

(3) Changes made by amendment and contract modifications.

F. As-Built Drawings: The contractor shall provide and keep up-to-date a complete set of as-built prints for this project which shall be corrected regularly, showing every change from the original contract drawing set, including all addenda, change orders job decisions, etc. The as-built prints shall be used only as a record set and shall be kept on the job site available for the Department's review.

C. If substitution of any brand other than the one specifically named requires changes to work detailed or specified under other headings, then the Contractor assumes all responsibility for this work.

D. Substitution request must be received by said date in Section 1.9 "Substitute Materials" (Section 1-Administration, Page 20).

1.8 STORAGE, WORK ZONE, CONSTRUCTION ACCESS: Department of Water shall not assume the responsibility to approve proposed storage areas, work zones, construction traffic pattern in and out of the project site. The Contractor shall be responsible for all additional NPDES permits, as well as, all updates to approved BMPs per NPDES permit approval requirements.

1.9 PRESERVATION OF PROPERTY: Due care shall be exercised to avoid injury to existing roadway improvements or facilities, utility facilities, adjacent property and roadside trees, shrubs and other plants that are not to be removed.

Roadside trees, shrubs and other plants that are not to be removed, and pole lines, fences, walls, signs, markers and monuments, buildings and structures, manholes and handholes, conduits, pipelines under or above ground, drain and sewer and water lines, all roadway facilities and any other improvements or facilities within or adjacent to the project shall be protected from injury or damage and if ordered by the Department of Water, the Contractor shall provide and install suitable safeguards, approved by the Department of Water, to protect such objects from injury or damage. If such objects are injured or damaged by reason of the Contractor's operations, they shall be replaced or restored at the Contractor's expense. The facilities shall be replaced or restored to a condition as good as when the Contractor entered upon the work, or as good as required by specifications accompanying the contract. The Department of Water may require the Contractor to make or cause to be made such temporary repairs borne by the Contractor and may be deducted from any moneys due or to become due to the Contractor under this contract. The fact that any underground facility is not shown upon the plans shall not relieve the Contractor of his or her responsibility. It shall be the Contractor's responsibility to ascertain the existence of any underground improvements or facilities which may be subject to damage by reason of this operation.

Full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in protecting or repairing property shall be considered as included in the prices paid for the various contract items of work and no additional compensation will be allowed.

1.10 EXTRA WORK: No work of any kind in connection with the work covered by these specifications and plans shall be considered as extra work, or entitles the Contractor to extra compensation, except when the work has been ordered in writing by the Department of Water, and specifically referred to as EXTRA WORK and the amount of compensation stated in the change order.

1.11 BUILDING LAWS: The Contractor shall comply with the local laws, ordinances, rules and regulations bearing on the work and he must obtain and pay for all permits, licenses, certificates and give all notices required thereby.

1.12 DELIVERY OF MATERIALS AT SITE: Have all materials delivered at the site in such quantities as will ensure the uninterrupted progress of the work and the least obstruction of the premises and the adjoining property.

1.13 DEFECTIVE MATERIALS: When requested, furnish, without charge, samples of all materials

entering into the work. All materials not conforming to the requirements of these specifications shall be considered as defective and all such materials, whether in place or not, shall be rejected.

1.14 CLEAN UP: On the completion of each day's work during this construction project, the Contractor shall remove from the site all debris, tools and excess material resulting from his or his subcontractor's the work and leave the work and any affected surroundings area broom clean.

1.15 ENVIRONMENTAL PROTECTION: The Contractor shall comply with the requirements for pollution control in performing all construction activities as set forth in the General Provisions.

1.16 PROJECT SIGN: The Contractor shall furnish, erect, maintain and remove one (1) project sign. The project signboard shall be 3/4 inch thick "AC" exterior grade fir plywood, 4 feet in height and 8 feet long. Sign shall be painted with one prime coat and two finish coats. The sign layout detail and sign and post details shall be submitted to the Department for approval. The project sign shall be erected at the site designated by the Department of Water within seven (7) calendar days after approval of the sign layout. The Contractor shall apply and pay for all permits and fees required for the placement of the sign. The sign layout shall include the Department of Water's logo (graphic to be provided by the Department of Water) and the following information:

MCC, CHLORINATION FACILITIES – KILAUEA WELLS NO. 1 AND NO. 2
JOB NO. 16-04 WP2020 #WKK-03
DEPARTMENT OF WATER

1.17 SUBMITTALS:

1.17.01 SECTION INCLUDES: Overview of transmittal of submittals, submittals requirements, definition of submittal for review and definition of submittal for closeout.

1.17.02 RELATED SECTIONS: Section 1.6 Project Record Documents.

1.17.03 TRANSMITTAL OF SUBMITTALS:

A. General: Transmit submittals, number of copies as indicated in subsequent articles, to the following address:

Kaua'i Department of Water
Attn: Contract Administrator
4398 Pua Loke Street
Līhu'e, Kaua'i, Hawai'i 96766

B. Submittals for Review: Transmit one (1) copy to the Department of Water for review. The Department will retain electronic set and return one (1) reviewed set. Should the contractor require more returned, he shall provide the additional sets at his or her cost. Where more copies are called for in any section of these Special Provisions, the Contractor shall be required to submit said number of prints for approval.

Whenever possible, submittals/transmittals shall also be submitted electronically.

C. Submittals for Closeout:

4) Indexed Tabs: Internally subdivide the binder contents with permanent page dividers, logically organized, with tab titling clearly printed under reinforced laminated plastic tabs.

b. Adobe PDF Electronic Copy: Provide a facsimile of the hardcopy O&M Manual in Adobe PDF Electronic Format on compact disk(s).

c. Electronic Data: Provide electronic files on compact disk(s) or jump drive of any material created electronically by Integrator, in file format in which document was created, that is, Microsoft Word, AutoCAD, etc., including but not limited to:

1) Drawing Files.

2) Installation Instructions.

3) Software Documentation.

4) Operating and Maintenance Instructions.

d. Odd Sized Material: Where O&M information does not lend itself to incorporation into 8½"x11" format, such as the material listed, below, provide it separate from the O&M Manuals. However, clearly label each item, and provide reference in the O&M Manual to the material that is provided separate from the O&M Manuals.

1) Edge-glued books or manuals without 3-hole punched binding.

2) Material of a size other than 8½"x11".

3) Compact disks in jewel cases.

(2) Contents:

a. Table of Contents: Prepare a Table of Contents, for each volume, with each product or system description identified, and include with each volume of manual. Type on 24-pound white paper.

b. Directory: Provide names, addresses, and telephone number of Prime Contractor, Integrator, Installation Contractor, other subcontractors, and major equipment suppliers. Clearly identify contact for warranty support.

c. General: Provide operations and maintenance data for equipment described in the individual sections of the Specification. Prepare and include additional data when the need for such data becomes apparent during training.

d. Description of System and Component Parts:

1) System block and interconnection diagrams.

2) Control diagrams by controls vendor and as-installed control drawing by Contractor.

3) As-installed wiring diagrams, that is, ladder diagrams, point to point diagrams, loop diagrams, circuit directories of panel boards, and similar items.

4) Manufacturer's printed installation, operating, and maintenance instructions for the exact item of equipment supplied.

5) Catalog data containing information required for service, future additions or substitutions.

6) Function, normal operating characteristics, and limiting conditions.

7) Performance curves, engineering data and tests.

8) Complete nomenclature and commercial number of replaceable parts.

e. System Operating Procedures:

1) Description of sequence of operation by control manufacturer.

2) Routine and normal operating instructions.

3) Sequences required.

4) Special operating instructions.

f. System and Equipment Maintenance Procedures:

1) Routine operations.

2) Guide to "trouble-shooting"

3) Disassembly, repair and reassembly.

4) Alignment, adjusting and checking.

g. Maintenance instructions for special finishes, including recommended cleaning methods and materials and special precautions identifying detrimental agents.

h. Spare Parts List: List of manufacturer's spare parts provided with the job, manufacturer's current prices for spare parts, and recommended quantities to be maintained in storage.

B. Project Record Documents: Provide Project Record Documents as required.

C. Spare Parts / Maintenance Materials:

(1) Provide products, spare parts, maintenance and extra materials in quantities specified in individual specification sections prior to Final Acceptance.

(2) Deliver to Project site and place in location as directed by the Department of Water. Contractor shall obtain receipt.

D. Test Reports: Results of specified test requirements. Provide Table of Contents of test results and incorporate into Operation and Maintenance Manuals described above.

E. Warranty Certificates:

(1) For each item required by specific sections of this specification, provide a notarized warranty certificate.

(2) Execute and assemble documents from subcontractors, suppliers, and manufacturer.

(3) For each item of copyrighted software provide under this contract, provide a software license certificate naming the Department of Water as the licensee and stating the number of licenses provided.

(4) Provide Table of Contents of software licenses and incorporate into Operation and Maintenance Manuals described above.

1.18 CONTRACTOR'S OPERATIONS: The Contractor must employ, insofar as possible, such methods and means of carrying out his work so as not to cause any interruption or interference to the Department of Water's or the landowner's operations. Where the Contractor's operations would result in interruptions which would hamper the operations, the Contractor shall coordinate his schedule of work with the Department of Water or the landowner, accordingly.

In the event that the Contractor obtains permission from the landowner for use of any area or resources outside of the designated lot(s), County Right-of-Way, State Highway's Right-of-Way, and/or designated easement(s), the Contractor shall meet the requirements of Division 300, Section 301.15 – USE AND/OR DAMAGE TO PRIVATE PROPERTY (PROPERTY OWNED OTHER THAN BY THE CONTRACTOR) of the Water System Standards, 2002.

END OF SECTION

SECTION SP-2 – ENVIRONMENTAL POLLUTION CONTROL

2.1 GENERAL: This section covers the requirements of environmental pollution control during construction activities. The Contractor shall be responsible for conformance to Title 11, Chapter 60 of the Public Health Regulations, Department of Health, State of Hawai‘i.

2.2 GUIDELINES AND CRITERIA:

A. EROSION AND SEDIMENT CONTROL:

(1) Soil Protection and drainage facilities shall be completed as early as practicable. Sections of bare earth and the length of their exposure to erosion shall be minimized by proper scheduling and limiting the work areas.

(2) Surface drainage from cuts and fills within the construction limits and from borrow and waste disposal areas shall, if turbidity producing materials are present, be held in suitable sedimentation ponds or shall be graded to control erosion within acceptable limits.

B. LANDSCAPE PRESERVATION AND PROTECTION:

(1) Construction activities shall be confined to the work areas defined by the plans and specifications. Care shall be exercised to preserve the natural landscape.

(2) All scars made on trees by equipment, construction operations, or by removal of limbs larger than one inch in diameter shall be coated as soon as possible with an approved tree wound dressing.

(3) All items having any apparent historical or archaeological interest which are discovered in the course of any construction activities shall be carefully preserved.

C. DUST CONTROL: Dust which could damage crops or dwellings or cause nuisance to persons shall be abated and control measures shall be performed. The Contractor shall be held liable for any damage resulting from dust originating from his operations.

D. WASTE DISPOSAL:

(1) Care shall be exercised to ensure that disposal of wastes from construction operations do not create pollution problems.

(2) Disposal of any materials, wastes, effluent, trash, garbage, oil, grease, chemicals, etc., shall meet all regulatory requirements and be subject to the approval of the Manager.

(3) Waste Waters: Construction operations shall be conducted so as to prevent discharge or accidental spillage of pollutants, solid waste, debris, and other objectionable wastes in surface waters and underground water sources.

(4) Disposal of waste materials including drill cuttings, well cleaning, development and pump testing waste waters, etc. shall meet all regulatory requirements and be subject to the approval of the Manager.

E. NOISE CONTROL: The operating schedule of large horsepower heavy equipment shall be planned to have the least impact upon nearby residents. Night operations shall only be conducted with the prior approval of the Manager and shall be curtailed or stopped when a disturbance is created.

2.3 MEASUREMENT AND PAYMENT: The cost for any pollution control activity specified above or deemed necessary by the Manager will not be measured nor paid for directly but will be considered as incidental to and included in the total sum Offer.

END OF SECTION

SECTION SP-3 – DUCTILE IRON PIPE AND PVC (C-900) PIPE

DUCTILE IRON:

3.01 GENERAL: The Contractor shall furnish and install Ductile Iron (DI) pipe in accordance with "Water System Standards, State of Hawai'i, dated 2002". DI pipe shall meet the requirements of Section 202.01. Fittings for DI pipe shall be ductile iron mechanical joint fittings meeting the requirements of Section 202.01.A – Fittings, unless specifically stated otherwise in the plans. Installation shall be in accordance with the Water System Standards.

3.02 SUBMITTALS: The Contractor shall submit manufacturer's data on DI pipe, joints, fittings and geotextile fabric certifying that the product provided meets the specified item.

Prior to excavation the Contractor shall provide submittal that certifies that the pipe cushion material meets requirements below. Onsite sand must be tested by a licensed geotechnical engineer and test results submitted to the Department of Water Engineer for approval.

3.03 TRENCH EXCAVATION AND BACKFILL: Trench excavation and backfill shall meet the requirements of "Water System Standards" Sections 302 Water Mains and Appurtenances; Section 302.02 – Trench Excavation; Section 302.03 Trench Backfill; Section 302.04 Sheathing; Section 302.05 Dewatering; Section 302.06 Adobe or Clay; Section 302.07 Mud Removal and Crushed Rock Stabilization; Section 302.09 Excavation for Manholes; Section 302.10 Excavation for Thrust Blocks, Beams and Test Blocks; Section 302.11 Surplus Excavation; and Section 302.14 Plastic Pipe.

Pipe Cushion Material shall meet the requirements of "Water System Standards" Section 209.02 Pipe Cushion. Pipe cushion material shall be free from hard lumps, debris, salt, hazardous substances above its corresponding regulatory action level, and other deleterious substances.

When groundwater is encountered, pipe cushion material shall be wrapped in a non-woven geotextile fabric as specified in Section 212.05 – Geotextile Fabrics. However if groundwater is encountered within the State Highway's Right-of-Way, pipe cushion material shall conform to ASTM C 33, size number 67, and shall be completely encapsulated with geotextile conforming to Subsection 716.03 – Geotextiles for Underdrain Applications as stated in the "Standard Specifications for Road and Bridge Construction, State of Hawai'i, dated 2005".

3.04 INSTALLATION: Ductile iron pipe installation shall meet the requirements of Water System Standards Section 302 – Water Mains and Appurtenances, additionally for pipe installation within the State Highway's Right-of-Way, pipe installation shall also adhere to the requirements of "Standard Specifications for Road and Bridge Construction, State of Hawai'i, dated 2005", Section 624 – Water System and Section 703.21 – Trench Backfill Material.

Contractor shall retain the services of a licensed Geotechnical engineer to monitor the quality of pipe cushion material, installation and compaction of the pipe cushion and trench backfill. Department of Water will require periodic sieve testing of the pipe cushion material during the course of construction. Results of the Geotechnical engineer's tests shall be provided to the Department of Water within seven (7) calendar days of sampling. Contractor shall be responsible for all associated costs for the licensed Geotechnical engineer, sieve analysis and testing.

PVC (C-900) PIPE:

3.05 GENERAL: The Contractor shall furnish and install Plastic pipe in accordance with "Water System Standards, State of Hawai'i, dated 2002". PVC pipe shall meet the requirements of Section 204.01. Fittings for PVC pipe shall be mechanical joint fittings meeting the requirements of Section 204.01.D – Fittings, unless specifically stated otherwise in the plans. Installation shall be in accordance with the Water System Standards.

3.06 SUBMITTALS: The Contractor shall submit manufacturer's data on PVC pipe, joints, fittings and geotextile fabric certifying that the product provided meets the specified item.

Prior to excavation the Contractor shall provide submittal that certifies that the pipe cushion material meets requirements below. Onsite sand must be tested by a licensed geotechnical engineer and test results submitted to the Department of Water Engineer for approval.

3.07 TRENCH EXCAVATION AND BACKFILL: Trench excavation and backfill shall meet the requirements of "Water System Standards" Sections 302 Water Mains and Appurtenances; Section 302.02 – Trench Excavation; Section 302.03 Trench Backfill; Section 302.04 Sheathing; Section 302.05 Dewatering; Section 302.06 Adobe or Clay; Section 302.07 Mud Removal and Crushed Rock Stabilization; Section 302.09 Excavation for Manholes; Section 302.10 Excavation for Thrust Blocks, Beams and Test Blocks; Section 302.11 Surplus Excavation; and Section 302.14 Plastic Pipe.

Pipe Cushion Material shall meet the requirements of "Water System Standards" Section 209.02 Pipe Cushion. Pipe cushion material shall be free from hard lumps, debris, salt, hazardous substances above its corresponding regulatory action level, and other deleterious substances.

When groundwater is encountered, pipe cushion material shall be wrapped in a non-woven geotextile fabric as specified in Section 212.05 – Geotextile Fabrics. However if groundwater is encountered within the State Highway's Right-of-Way, pipe cushion material shall conform to ASTM C 33, size number 67, and shall be completely encapsulated with geotextile conforming to Subsection 716.03 – Geotextiles for Underdrain Applications as stated in the "Standard Specifications for Road and Bridge Construction, State of Hawai'i, dated 2005".

3.08 INSTALLATION: Plastic pipe installation shall meet the requirements of Water System Standards Section 302 – Water Mains and Appurtenances, additionally for pipe installation within the State Highway's Right-of-Way, pipe installation shall also adhere to the requirements of "Standard Specifications for Road and Bridge Construction, State of Hawai'i, dated 2005", Section 624 – Water System and Section 703.21 – Trench Backfill Material.

Contractor shall retain the services of a licensed Geotechnical engineer to monitor the quality of pipe cushion material, installation and compaction of the pipe cushion and trench backfill. Department of Water will require periodic sieve testing of the pipe cushion material during the course of construction. Results of the Geotechnical engineer's tests shall be provided to the Department of Water within seven (7) calendar days of sampling. Contractor shall be responsible for all associated costs for the licensed Geotechnical engineer, sieve analysis and testing.

END OF SECTION

SECTION SP-4 – NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

4.01 HYDROTESTING EFFLUENT DISCHARGE:

A. GENERAL PROVISIONS: This item of work shall include the furnishing of all labor, materials, tools, and equipment necessary for construction water disposal.

B. REGULATIONS:

(1) The Contractor shall be familiar with and meet the latest requirements of all applicable National Pollutant Discharge Elimination System (NPDES), State Department of Health (DOH), and State Department of Transportation (DOT) ordinances, rules, regulations and permits. Effluent discharge into State receiving waters shall not be made without approved permits. Discharge activities shall include, but shall not be limited to, effluent associated with pipeline hydrotesting/chlorination operations.

(2) The Contractor shall obtain all permits and licenses, pay all charges, fees, and taxes, give all notices and comply with all laws, ordinances, rules and regulations bearing on the conduct of the work as drawn and specified in the contract documents.

C. PROCEDURES:

(1) The DOW has not applied for and was granted a Notice of General Permit Coverage (NGPC) to discharge hydrotesting effluent associated with the construction activities from the project. The Contractor shall review the project and compile all documents required to complete the Notice of Intent (NOI), Form F (NOI-F), if contractor deems necessary. The necessary information to complete the NOI-F must be filed at least 30 days prior to the start of any construction activities.

(2) The Contractor is expected to comply with the conditions set forth in the permit. Any modifications or amendments to the permit by the Contractor shall be done at the Contractor's expense and no time extension will be granted. The DOW shall approve all modifications or amendments.

(3) The Contractor shall make no claims for compensation due to delays or requirements imposed in obtaining an approved NPDES permit. Notice to Proceed will not be delayed due to Contractor's inability to attain an approved NPDES permit.

(4) As required for the discharge of effluent, the Contractor shall also secure all other applicable State and County discharge and connection permits and pay all applicable fees. The Contractor shall fulfill all conditions of the NPDES Permit and all other permits when issued. A copy of all approved permits, when issued, shall be provided to the DOW for information only.

(5) The Contractor shall be responsible for monitoring, collecting samples, and having samples analyzed by a qualified laboratory and submit the analysis report to DOH. All costs shall be borne by the Contractor.

(6) If the DOH is not completely satisfied with the Contractor's BMP Plan or the discharge quality, the Contractor shall do corrective work at his/her own expense.

(7) Upon completion of the project, the Contractor shall submit the Notice of Cessation (CWB-NOC) form to the DOH and a copy of the submitted form to the DOW for information only.

D. COMPLETION OF DISCHARGE ACTIVITIES: At the conclusion of the discharge operations, the Contractor shall furnish the DOW with a signed affidavit indicating the date, location, volume, and treatment, if any, of all discharges. The location of storm drains, bodies of water, sewer manholes, and dry gulches shall be shown in relation to the discharge location.

E. VIOLATIONS: Violation citations for non-compliance shall be the responsibility of the Contractor. The Contractor shall pay all fines and hold harmless the Department of Water.

4.02 STORM WATER DISCHARGE:

A. GENERAL DESCRIPTION: This item of work shall include the furnishing of all labor, materials, tools, and equipment necessary for compliance with State of Hawai‘i Department of Health regulations for discharges composed of storm water runoff associated with construction activity.

B. REGULATIONS:

(1) The Contractor shall be familiar with and meet the latest requirements of all applicable National Pollutant Discharge Elimination System (NPDES), State Department of Health (DOH), State Department of Transportation (DOT), and the Kaua‘i County Department of Public Works (DPW) law, ordinances, rules, regulations and permits.

(2) The Contractor shall obtain all permits and licenses, pay all charges, fees, and taxes, give all notices and comply with all laws, ordinances, rules and regulations bearing on the conduct of the work as drawn and specified in the contract documents.

C. DETERMINATION: This project will not require the preparation of a construction site Best Management Practices (BMP) plan under the DOH NPDES regulations. The project affects a total land area less than the maximum disturbance area allowed for exemption from NPDES requirements. If the Contractor’s work/staging area extends beyond the project work area, increasing the total disturbed land area beyond the maximum disturbance area allowed for exemption from NPDES requirements, the Contractor shall apply for and obtain an NPDES General Permit, Authorizing Discharges of Storm Water Associated with Construction Activity.

Note: Although storm water discharge NPDES is not required, the Contractor is still required to have construction site Best Management Practices (BMP) in place for the duration of the project.

D. PROCEDURES:

(1) The DOW has not applied for a Notice of General Permit Coverage (NGPC) to discharge stormwater associated with the construction activities from the project. The Contractor shall review the project and compile all documents required to complete

the Notice of Intent (NOI), Form C (NOI-C), if contractor deems necessary. The necessary information to complete the NOI-C must be filed at least 30 days prior to the start of any construction activities.

(2) The Contractor is expected to comply with the conditions set forth in the permit. Any modifications or amendments to the permit by the Contractor shall be done at the Contractor's expense and no time extension will be granted. The Department of Water shall approve all modifications or amendments.

(3) The Contractor shall make no claims for compensation due to delays or requirements imposed in obtaining an approved NPDES permit. Notice to Proceed will not be delayed due to Contractor's inability to attain an approved NPDES permit.

(4) As required for the discharge of effluent, the Contractor shall also secure all other applicable State and County discharge and connection permits and pay all applicable fees. The Contractor shall fulfill all conditions of the Notice of General Permit Coverage and all other permits when issued. A copy of all approved permits, when issued, shall be provided to the Department of Water for information only.

(5) The Contractor shall be responsible for monitoring, collecting samples, and having samples analyzed by a qualified laboratory and submit the analysis report to DOH. All costs shall be borne by the Contractor.

(6) If the DOH is not completely satisfied with the Contractor's BMP plan or the discharge quality, the Contractor shall perform corrective work at their own expense.

(7) Upon completion of the project, the Contractor shall submit the Notice of Cessation (CWB-NOC) form to the DOH and a copy of the submitted form to the DOW for information only.

E. Violations: Violation citations for non-compliance shall be the responsibility of the Contractor. The Contractor shall pay all fines and hold harmless the Department of Water.

4.03 MEASUREMENT AND PAYMENT: Payment for the work described herein shall not be made directly but shall be considered incidental to the various items of the Proposal and no additional compensation shall be made.

END OF SECTION

(3) Nonbuilding structures: All self-supporting structures that carry gravity loads and that may also be required to resist the effects of wind, snow, impact, temperature and seismic loads. Nonbuilding structures include, but are not limited to, pipe racks, storage racks, stacks, tanks, vessels and structural towers that support tanks and vessels.

5.1.02 QUALITY ASSURANCE:

A. QUALITY CONTROL BY DOW: Special Inspection of nonstructural components and nonbuilding structures, and their anchorages shall be performed by the Special Inspector under contract with the DOW and in conformance with IBC Chapter 17. Special Inspector(s) and laboratory shall be acceptable to the DOW in their sole discretion. Special Inspection is in addition to, but not replacing, other inspections and quality control requirements herein. Where sampling and testing required herein conforms to Special Inspection standards, such sampling and testing need not be duplicated.

B. REFERENCES:

(1) Where a referenced document contains references to other standards, those documents are included as references under this section as if referenced directly.

(2) Unless otherwise specified, references to documents shall mean the documents in effect at the time of Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization, or if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, regardless of whether the document has been superseded by a version with a later date, discontinued, or replaced. When conflicting requirements occur, the most stringent requirements will govern the design.

Reference	Title
AAMA	American Architectural Manufacturer's Association
ACI 318	Building Code Requirements for Structural Concrete
ACI 350	Code Requirements for Environmental Engineering Concrete Structures
AISC 341	Seismic Provisions for Structural Steel Buildings
ACI 360	Specification for Structural Steel Buildings
ASCE 7	Minimum Design Loads for Buildings and Other Structures
ASTM C635	Standard Specification for the Manufacture, Performance and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings
ASTM C636	Standard Practice for Installation for Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings
AWS D1.1	Structural Welding Code – Steel

Reference	Title
AWS D1.2	Structural Welding Code - Aluminum
AWS D1.2	Structural Welding Code – Stainless Steel
IBC	International Building Code with local amendments
NFPA-13	Standard for the Installation of Sprinkler Systems
OSHA	U.S. Dept. of Labor, Occupational Safety and Health Administration
HIOSH	Hawaii Occupational Safety and Health Standards, Rules and Regulations
SMACNA	Seismic Restraint Manual Guidelines for Mechanical Systems

5.1.03 SUBMITTALS:

A. For structural elements of nonstructural components and nonbuilding structures required to be designed per this specification section, drawings and design calculations shall be stamped by a Hawaii licensed professional engineer qualified to perform structural engineering.

B. Submit drawings and calculations no less than twenty (20) working days in advance of the installation of any component to be anchored to the structure or installation of any structural member to which the component will be attached.

C. The following submittals shall be provided:

(1) List of all nonstructural components and nonbuilding structures requiring wind and seismic design and anchorage.

(2) Shop drawings showing details of complete wind and seismic bracing and anchorage attachment assemblies including connection hardware, and embedment into concrete.

(3) Shop drawings showing plans, elevations, sections and details of equipment support structures and nonbuilding structures, including anchor bolts, structural members, platforms, stairs, ladders, and related attachments.

(4) Identify all interface points with supporting structures or foundations, as well as the size, location, and grip of all required attachments and anchor bolts. Clearly indicate who will be providing each type of attachment/anchor bolt. Equipment vendor shall design anchor bolts, including embedment into concrete, and submit stamped calculations.

(5) Calculations for all supports, bracing, and attachments shall clearly indicate the design criteria applied in the design calculations. Concrete embedment calculations shall be coordinated with thickness and strength of concrete members. Submit a tabulation of the magnitude of unfactored (service level) equipment loads at each support point, broken down by type of loading (dead, live, wind, seismic, operating equipment loads, etc.). Indicate impact factors applied to these loads in the design calculations.

(6) Manufacturer's certificates of compliance with the seismic force requirements of this section.

5.1.04 DESIGN CODES:

A. The following standard codes have application at this site for:

Buildings/Structures:	International Building Code 2006 and ASCE 7-05
Reinforced concrete:	ACI 318-05
Structural steel:	AISC 360-05 and AISC 341-05
Welding:	AWS Welding Codes, Latest Edition
Occupational health and safety requirements:	U.S. Dept. of Labor, Occupational Safety and Health Administration (OSHA)

B. When conflicting requirements occur, the most stringent requirements will govern the design.

5.1.05 DESIGN LOADS:

A. GENERAL: All nonstructural components and nonbuilding structures shall be designed for the loads shown on the Structural General Notes Drawing as well as the following:

B. IMPACT LOADS:

(1) Impact loads shall be considered in the design of support systems.

(2) The following impact load factors shall be used unless recommendations of the equipment manufacturer will cause a more severe load case.

Rotating machinery:	20% of moving load
Reciprocating machinery:	50% of moving load
Hangers supporting floors and platforms:	33% of live and dead load

C. TEMPERATURE: The effects of temperature shall be included in design where nonstructural components and nonbuilding structures are exposed to differential climatic conditions.

5.1.06 LOAD COMBINATIONS: All nonstructural components and nonbuilding structures shall be designed to withstand the load combinations as specified in the governing building code. Where the exclusion of live load or impact load would cause a more severe load condition for the member under investigation, then the load shall be ignored when evaluating that member.

5.1.07 FOUNDATIONS: Consult project drawings for allowable soil bearing recommendations at location of structure.

5.1.08 DEFLECTIONS: Maximum beam deflections as a fraction of span for walkways and platforms shall be L/240 for total load and L/360 for live load. Maximum total load deflection for equipment supports shall be L/450.

5.1.09 PRODUCTS: Materials shall be in conformance with information shown on the drawings and in other technical specification sections. See individual component and equipment specifications for additional requirements.

5.1.10 EXECUTION:

A. Attachments and braces shall be made in such a manner that the component force is transferred to the lateral force-resisting system of the structure. Attachment requirements and size and number of braces shall be based on the calculations submitted by the Contractor.

B. All anchorage of equipment is specified to be made by cast-in anchor bolts in concrete elements unless specifically noted otherwise on the drawings or other specification Sections. Contractor shall be responsible for any remedial work or strengthening of concrete elements because of superimposed seismic loading if anchor bolts are improperly installed or omitted due to lack of submittal review or improper placement for any reason, at no additional cost to the DOW.

C. Anchor bolts shall be provided and installed by the Contractor in accordance with Section SP-5.6. Size of anchor bolts and embedment of anchor bolts shall be based on the calculations submitted by the Contractor.

D. Details of and calculations for all anchorages shall be submitted and accepted in accordance with paragraph 5.1.03 prior to placement of concrete or erection of other structural supporting members. Submittals received after structural supports are in place will be rejected if proposed anchorage method would create an overstressed condition of the supporting member. The Contractor shall be responsible for revisions to the anchorages and/or strengthening of the structural support so that there is no overstressed condition at no additional cost to the DOW.

5.1.11 MEASUREMENT AND PAYMENT: Payment for the furnishing and installing of material, equipment, incidentals and all work included in this Section shall be made at the unit price item or the lump sum item indicated in the Proposal, whichever is specified, and shall be full compensation for all work in connection therewith, complete and finished in accordance with the drawings and specifications.

END OF SECTION

SECTION SP 5.2 – CONCRETE WORK

5.2.01 DESCRIPTION: The work covered by this section includes providing all labor, materials, tools and equipment necessary for completing this item of work as specified in DIVISION 300-CONSTRUCTION, SECTION 303.03 CONCRETE WORK of the Water System Standards, dated 2002, and as modified or supplemented hereinafter.

5.2.02 SUBMITTALS: The following shall be submitted a minimum of twenty (20) working days prior to start of work under this section. Delays to the project due to inadequate submittals shall not be cause for additional payment.

A. DESIGN DATA: Concrete Mix Design for each class of concrete

B. Manufacturer's catalog data for the following items shall include printed instructions for admixtures, sealants, bonding agents, and epoxy-resin adhesive binders:

(1) Concrete Aggregates

(2) Portland Cement

(3) Joint Materials

(4) Concrete Curing Materials

C. TEST REPORTS:

(1) Compressive Strength

(2) Slump

5.2.03 MATERIALS:

A. CEMENT: All Portland cement shall conform to "Standard Specification for Portland Cement" (ASTM C150) for Type II, low alkali, containing less than 0.60 percent alkalis. The Contractor shall submit a certificate of a test with each lot of cement proposed for use on the project.

B. CONCRETE AGGREGATES: Fine aggregate shall be hard, dense, durable particles of either sand or crushed stone regularly graded from coarse to fine. Gradation shall conform to ASTM C33, except percent passing by weight of number 100 sieve is modified to 2-12 percent.

C. POZZOLAN:

(1) Pozzolan shall be Class F fly ash conforming to ASTM C618. Class C fly ash is not allowed. Pozzolan supplied during the life of the project shall have been formed at the same single source.

(2) The pozzolan color shall not substantially alter the resulting concrete from the normal gray color and appearance.

(3) Use pozzolan materials that are of the same brand and type and from the same plant of manufacture as the materials used in the concrete represented by the submitted field test records or used in the trial mixtures.

D. FORMWORK: Forms for all concrete surfaces exposed to view shall be APA High Density Overlay (HDO) Plyform Class I Exterior 48" X 96" X 3/4" minimum thickness. Forms for other concrete surfaces shall be APA Douglas Fir B-B Plyform Class I Exterior 48" X 96" X 3/4-inch minimum thickness.

E. Form ties shall be commercially fabricated for use in form construction and shall be constructed so that ends or end fasteners can be removed without causing spalling at surfaces of the concrete. Diameter on ends shall be 3/4 inch minimum to 1 inch maximum. Embedded portion of ties shall be not less than 1 1/2 inch from face of concrete after ends have been removed.

5.2.04 PROPORTIONING OF CONCRETE:

A. Concrete shall be normal weight concrete composed of cement, pozzolan, admixtures, aggregates, and water; proportioned and mixed to produce a workable, strong, dense, and impermeable concrete. It is acceptable to substitute interground Portland-pozzolan cement conforming to ASTM C595, containing the specified amount of pozzolan in lieu of Portland cement and pozzolan. Water-cementitious material (w/cm) ratio is based on the combined contents of cement and pozzolan.

B. Provide concrete mix designs in accordance with the following guidelines:

Concrete class	ASTM coarse aggregate size	Maximum water-cementitious materials (w/cm) ratio	Minimum cementitious materials content (pounds/CY)	Pozzolan, percent by weight of cementitious materials	Air content (percent)	Minimum[a] 28-day compressive strength, psi	Slump range (inches)
B	57 or 67	0.45	560	15-20[c]	Not required	3000	3-5
C	57 or 67	0.40	560	15-20	Not required	4500	3-5
D	8	0.42	600	15-20[c]	Not required	4000	3-5
E[b]	57	--	-	15-20[c]	Not required	2000	4-8

[a] Compressive strength shall be determined at the end of 28 days based on test cylinders made and tested in accordance with ASTM C39.
[b] Concrete encasement for electrical conduit shall contain 3 pounds of red oxide per sack of cement.
[c] Pozzolan use optional for this class of concrete.

C. Concrete shall be provided by class for the corresponding use listed as follows:

Type of use	Class of concrete
Non-structural concrete (temporary working slabs, sidewalks, curbs, gutters, pavers, thrust blocks, manhole channels, pipe bedding, pipe encasement etc.) and fill concrete where noted on the design drawings	B
Typical cast-in-place structural concrete	C
Topping concrete	D
Electrical conduit encasement (duct banks) and concrete fill	E

5.2.05 EXECUTION:

A. PROTECTING AND CURING:

(1) Do not use curing compound on concrete surfaces to be coated, waterproofed, moisture-proofed, tiled, roofed, or where other coverings are to be bonded. In these cases, use water curing unless the curing compound is first removed or is compatible with the final finish covering.

(2) Maintain concrete surface temperature between 50 degrees F and 80 degrees F for at least 5 days. Cure concrete in hot weather (above 80 degrees F) in accordance with ACI 305.1.

B. SURFACE FINISHES:

(1) Slab Finish:

a. The finishes specified herein include surface finishes, treatments and toppings for floors and slabs. Do not use dry cement on new concrete surfaces to absorb excess moisture. Round edges to a radius of 1/2 inch.

b. Slope floors to drain uniformly within a room or space. Unless otherwise specified, slope shall be a minimum of 1/8 inch per foot toward nearest drain. Restrict use of floor drains with only locally depressed slabs to locations specifically noted.

c. Immediately after final finish is applied, the surface shall be cured and protected as specified in Protecting and Curing paragraph above.

d. Where finish is not specified, floor slabs shall receive a Steel Trowel Finish.

(2) Float Finish:

a. Perform floating with a hand or power-driven float in accordance with ACI 301. Begin floating when the bleed water sheen has disappeared and the surface has

stiffened sufficiently. Float as required to meet tolerance requirements of ACI 117 for a conventional surface.

b. Floating shall close cracks and checks plus compact and smooth the surface. Refloat the slab to a uniform texture.

c. Apply float finish to surfaces of channels, tank bottom slabs, tops of footings, and surfaces to receive insulation or roofing.

(3) Steel Trowel Finish:

a. Float the concrete surface as indicated above and then trowel in accordance with ACI 301.

b. Provide Steel Trowel Finish on floors and walking surfaces unless specified otherwise.

5.2.06 MEASUREMENT AND PAYMENT: Payment for the furnishing and installing of material, equipment, incidentals and all work included in this Section shall be made at the unit price item or the lump sum item indicated in the Proposal, whichever is specified, and shall be full compensation for all work in connection therewith, complete and finished in accordance with the drawings and specifications.

END OF SECTION

SECTION SP-5.3 – UNIT MASONRY

5.3.01 DESCRIPTION: The work covered by this section includes providing all labor, materials, tools and equipment necessary for completing masonry work consisting of reinforced concrete masonry construction. Masonry work shall be constructed from concrete masonry units in combination with reinforcing, mortar, and grout as specified in DIVISION 300 – CONSTRUCTION, SECTION 303.13 Unit Masonry of the Water System Standards, dated 2002, and as modified or supplemented hereinafter.

5.3.02 SUBMITTALS: The following shall be submitted a minimum of twenty (20) working days prior to start of work under this section. Delays to the project due to inadequate submittals shall not be cause for additional payment.

A. CERTIFICATES:

(1) Masonry unit certificates showing compliance to the specifications shall be submitted for each type of masonry unit.

(2) Reinforcing certificates showing compliance to the specifications shall be submitted for reinforcing steel, including reinforcing steel wire and joint reinforcing

B. Manufacturer's catalog data for the following items. Clearly mark the data to indicate which type, size, or item the Contractor intends to provide. Data shall show conformance to specified requirements and Contractor's proposed usage details:

(1) Masonry accessory

(2) Premixed mortar

(3) Masonry cement

(4) Grout admixtures

(5) Flashing

C. TEST REPORTS: Prism test results

D. SHOP DRAWINGS:

(1) Reinforcing Steel: Detail bending and placement of masonry reinforcing bars. Comply with ACI SP-66.

(2) Masonry Units: Details of all types of CMU units including, but not limited to corners, jamb units, lintels and bond beams.

(3) Details of anchors, adjustable wall ties, positioning devices, and other accessories.

5.3.03 MATERIALS:

A. Hollow concrete masonry units. At both load-bearing and non-load-bearing walls shall conform to ASTM C90, 115 pcf medium weight, with concrete masonry unit compressive

strength as required to result in a concrete masonry compressive strength (f'm) of 2,000 psi

B. Cement. Portland cement conforming to the current ASTM C150, Type II, low alkali containing less than 0.60 percent alkalis.

C. Mortar Admixture. Admixture specified DIVISION 300- CONSTRUCTION, SECTION 303.13 Unit Masonry of the Water System Standard shall be added to the mortar mix in accordance with manufacturer's specifications provided that the admixture does not adversely affect bonding or compressive strength.

D. Masonry Cement. Do not use masonry cement.

E. Mortar shall be freshly prepared and mixed in accordance with ASTM C270 to obtain type mortar specified. Where colored mortars are required, pigments may be added at the site or provided as part of prepackaged mortar mix.

F. Grout aggregates shall conform to ASTM C404

5.3.04 EXECUTION:

A. Workmanship:

(1) At corners of load bearing walls, provide a true masonry bond (true corner blocks finished on both face and end) in each course.

(2) Use running bond throughout.

(3) All cells shall be filled solidly with grout in lifts not exceeding eight feet.

(4) Position and hold reinforcing before placing grout by tying or by using bar positioners at maximum 8-foot intervals. Use a vibrator to consolidate the grout. Minimum clear distance between masonry and vertical reinforcement shall be 1/2 inch. Reinforcement shall be doweled out to the minimum lap dimensions of 32 diameters as shown on design drawings.

(5) At grout pours exceeding 5 feet 4 inches, provide cleanout inspection ports in bottom course at all vertical reinforcing bars.

5.3.05 MEASUREMENT AND PAYMENT: Payment for the furnishing and installing of material, equipment, incidentals and all work included in this Section shall be made at the unit price item or the lump sum item indicated in the Proposal, whichever is specified, and shall be full compensation for all work in connection therewith, complete and finished in accordance with the drawings and specifications.

END OF SECTION

SECTION SP-5.4 – REINFORCING STEEL

5.4.01 DESCRIPTION: The work covered by this section includes providing all labor, materials, tools and equipment necessary for completing this item of work as specified in DIVISION 300 – CONSTRUCTION, SECTION 303.04 REINFORCING STEEL of the Water System Standards, dated 2002, and as modified or supplemented hereinafter.

5.4.02 SUBMITTALS: The following shall be submitted a minimum of twenty (20) working days prior to start of work under this section. Delays to the project due to inadequate submittals shall not be cause for additional payment.

A. SHOP DRAWINGS: Reinforcing steel shop drawings showing reinforcing steel bar quantities, sizes, spacing, dimensions, configurations, locations, mark numbers, lap splice lengths and locations, concrete cover and reinforcing steel supports.

B. TEST REPORTS: Material certificates to verify all reinforcing conforms to ASTM A615, Grade 60

5.4.03 MATERIALS:

A. BAR SUPPORTS:

(1) Manufactured concrete block supports with embedded tie wires (wire dobies). Do not use brick, broken concrete masonry units, spalls, rocks, construction debris, or similar material for supporting reinforcing steel.

(2) Bar supports coming into contact with forms shall be CRSI Class 1 plastic protected or Class 2 stainless steel protected.

(3) Stainless steel or plastic protected plain steel supports shall be provided for other work.

5.4.04 PLACING: Reinforcing steel bars shall be supported and fastened together to prevent displacement by construction loads or concrete placement. For concrete placed on ground, furnish concrete block supports or metal bar supports with non-metallic bottom plates. For concrete placed against forms furnish plastic or plastic-coated metal chairs, runners, bolsters, spacers and hangers for the reinforcing steel bar support. Only tips in contact with the forms require a plastic coating.

5.4.05 SPLICING: Where splices are required use Class B splice lengths as noted on the Drawings.

5.4.06 MEASUREMENT AND PAYMENT: Payment for the furnishing and installing of material, equipment, incidentals and all work included in this Section shall be made at the unit price item or the lump sum item indicated in the Proposal, whichever is specified, and shall be full compensation for all work in connection therewith, complete and finished in accordance with the drawings and specifications.

END OF SECTION

SECTION SP-5.5 – GROUT

5.5.01 DESCRIPTION: The work covered by this section includes providing all labor, materials, tools and equipment necessary for grout used for structural support bases, equipment bases, crack repair, surface repair and uses other than masonry. Grout for masonry is specified in Section SP-5.3.

5.5.02 SUBMITTALS: The following shall be submitted a minimum of twenty (20) working days prior to start of work under this section. Delays to the project due to inadequate submittals shall not be cause for additional payment.

A. Complete product literature and installation instructions for the following: Cementitious non-shrink grout, epoxy grout, adhesive for dowel and anchor setting, and concrete repair mortar products to be used on the project.

B. Current ICC Evaluation Report for adhesives used for dowel and anchor setting.

C. Installer certification in accordance with ACI/CRSI Adhesive Anchor Installer Certification Program for installers of horizontal or upwardly inclined adhesive anchors.

5.5.03 MATERIALS:

A. Cementitious nonshrink nonmetallic aggregate grout shall be Five Star Products, Inc. Five Star Grout, Master Builders Masterflow 928, Burke Company Non-Ferrous, Non-Shrink Grout, Hi-Flow Grout by Euclid Chemical Company, or approved substitute.

B. Epoxy grout for equipment mounting shall be a non-cementitious, resin based, multi-component formulation. Epoxy grout shall be flowable, with shrinkage minimized to achieve minimum 98% effective bearing area. Epoxy grout shall be Masterflow 648 CP Plus by Masterbuilders; Sikadur 42 by Sika Corporation; E3-G by Euclid Chemical Company; or approved substitute.

C. ADHESIVE FOR DOWEL AND ANCHOR SETTING:

(1) Adhesive for setting dowels and anchoring connection/base plate bolts shall be an injectable two-component epoxy adhesive. Adhesive shall be approved for the intended use per the product ICC Report.

(2) Adhesive shall be HIT-RE 500V3 by Hilti or approved substitute for anchoring into concrete (equivalent product must have ICC approval for use in cracked concrete in areas with high seismic risk).

(3) Adhesive shall be HIT-HY 70 with HIT-SC sleeve (sleeve for use if masonry wall is ungrouted) by Hilti or approved substitute for anchoring into concrete masonry walls (equivalent product must have ICC approval for use in areas with high seismic risk).

D. CONCRETE REPAIR MORTAR:

(1) Horizontal Applications: Horizontal repair mortars shall be MasterEmaco S 466CI by BASF, SikaTop 111 Plus by Sika Corp, or approved substitute.

(2) Vertical and Overhead Applications: Vertical and overhead repair mortars shall be SikaTop 123 Plus by Sika Corp, MasterEmaco 1500HCR Vertical Overhead by BASF or approved substitute.

5.5.04 EXECUTION:

A. CEMENTITIOUS NONSHRINK GROUT:

(1) Nonshrink, cementitious, nonmetallic aggregate grout shall be used for column base plates, structural bearing plates, and all locations where the general term "non-shrink grout" is indicated on the Drawings. Use of this grout to support the bearing surfaces of machinery shall as detailed on the Drawings for specific locations or pieces of equipment. If guidance is not provided in locations noted above, use of non-shrink grout for equipment mounting shall be limited to equipment less than 25 horsepower or 750 pounds. Grout shall be placed and cured in accordance with manufacturer's instructions.

(2) Nonshrink cementitious grout shall not be used as a surface patch or topping. Nonshrink cementitious grout must be used in confined applications only.

B. EPOXY GROUT FOR EQUIPMENT MOUNTING: Prepare concrete surfaces of equipment pads as indicated in details on the Drawings and as required by the epoxy grout manufacturer. Epoxy grout for equipment mounting shall be placed and cured in accordance with details on the Drawings and in conformance with manufacturer's recommendations.

C. CONCRETE REPAIR MORTAR:

(1) Concrete repair materials and procedures shall be submitted for review to the DOW and shall be accepted prior to commencement of the repair work.

(2) Follow all manufacturers' instructions, including those for minimum and maximum application thickness, surface preparation and curing. Add aggregate as required per manufacturer's recommendations. Any deviations from the manufacturer's instructions shall be submitted for review to the DOW and shall be accepted prior to commencement of the work.

(3) Where mortar will be in direct contact with sewage or sewage gases, the aggregate shall contain no coral sand.

5.5.05 MEASUREMENT AND PAYMENT: Payment for the furnishing and installing of material, equipment, incidentals and all work included in this Section shall be made at the unit price item or the lump sum item indicated in the Proposal, whichever is specified, and shall be full compensation for all work in connection therewith, complete and finished in accordance with the drawings and specifications.

END OF SECTION

SECTION SP-5.6 – ANCHORS

5.6.01 DESCRIPTION: The work covered by this section includes providing all labor, materials, tools and equipment necessary for bolts and all-thread rods used to attach structural elements and equipment to concrete and concrete masonry. Included are cast-in-place and post-installed anchors (adhesive systems and wedge type expansion anchors), nuts and washers.

5.6.02 SUBMITTALS: The following shall be submitted a minimum of twenty (20) working days prior to start of work under this section. Delays to the project due to inadequate submittals shall not be cause for additional payment.

A. Anchor bolt placement plans.

B. Anchor rod, nut and washer material information, including material certifications.

C. Where required by other sections of the Contract Documents, design calculations and details showing the required diameter, length, embedment, edge distance, confinement, anchor reinforcement, anchor bolt sleeves and other conditions, stamped and signed by a currently licensed State of Hawaii Professional Engineer. Calculations shall comply with the provisions of ACI 318 Appendix D.

D. PRODUCT DATA:

(1) ICC Evaluation Service Reports for post-installed adhesive type anchors and expansion (wedge type) anchors when allowed.

(2) Data indicating load capacities.

(3) Chemical resistance.

(4) Temperature limitations.

(5) Installation instructions:

5.6.03 MATERIALS:

A. Anchor bolt materials shall be as specified in Table A.

Table A. Anchor Bolt Materials

Material	Specification
Anchor Bolts	Stainless Steel ASTM A193, Grade B8M Class 1, AISI 316 or ASTM A320, Grade B8M Class 1, AISI 316
Threaded Rods	Stainless Steel ASTM F593 Group 2 Type 316 SS CW

Material	Specification
Nuts and Washers	Stainless Steel ASTM A194 Heavy Hex Nuts and Washers, Type 316 ASTM F594 Heavy Hex Nuts at Adhesive Anchors, Type 316
Concrete Expansion Anchors	Stainless Steel HILTI “KWIK BOLT TZ”, or equal
Concrete Adhesive Anchoring System	HILTI HIT-RE 500 V3, or equal, with Type 316 Stainless Steel threaded rods
Masonry Expansion Anchors	Stainless Steel HILTI "KWIK BOLT 3", or equal
Masonry Adhesive Anchoring System	Hilti "HIT-HY 70", Simpson “SET”, or approved equal, with Type 316 Stainless Steel threaded rods

B. STAINLESS STEEL NUT COATINGS:

(1) Stainless steel nuts shall be provided with Tripac 2000 Blue coating, or approved substitute.

(2) Prepare nut surface by chemically cleaning, abrasive blasting, priming and baking in accordance with Manufacturer’s recommendations.

(3) Apply multiple coats of No. 1424 fluoropolymer coating and bake in accordance with Manufacturer’s recommendations.

5.6.04 EXECUTION:

A. Anchor bolts for equipment frames and foundations shall be designed for seismic and wind forces calculated from design criteria provided on Structural General Notes drawing.

B. Grouting of anchor bolts with nonshrink or epoxy grouts, where specified, shall be in accordance with Section SP-5.5.

C. CAST-IN-PLACE ANCHOR BOLTS:

(1) Anchor bolts to be embedded in concrete shall be placed accurately and held in correct position while the concrete is placed. The surfaces of metalwork in contact with concrete shall be thoroughly cleaned.

(2) After anchor bolts have been embedded, their threads shall be protected by grease and the nuts run on.

(3) Provide heavy hex headed type unless shown otherwise on the Drawings.

(4) Provide 3/4-inch minimum diameter with sufficient length for 10-inch embedment unless noted otherwise in the Contract Documents or accepted equipment anchor submittals.

(5) Grout pads shall not be included in embedment length.

D. ADHESIVE ANCHORS:

(1) Anchor diameter and grade of steel shall be per contract documents or per equipment manufacturer specifications. Anchor shall be threaded or deformed full length of embedment and shall be free of rust, scale, grease, and oils.

(2) All installation recommendations by the anchor system manufacturer shall be followed carefully, including maximum hole diameter embedment.

(3) Holes shall have rough surfaces created by using a hammer drill and carbide bit (core drilled holes are not allowed).

(4) Holes shall be blown clean with oil-free compressed air and be free of dust or standing water prior to installation. Follow additional requirements of the adhesive manufacturer.

(5) Anchor shall be left undisturbed and unloaded for full adhesive curing period.

(6) Concrete temperature (not air temperature) shall be compatible with curing requirements of adhesives per adhesive manufacturer. Anchors shall not be placed in concrete below 25 degrees F.

(7) Reinforcing steel in masonry shall not be damaged.

5.6.05 MEASUREMENT AND PAYMENT: Payment for the furnishing and installing of material, equipment, incidentals and all work included in this Section shall be made at the unit price item or the lump sum item indicated in the Proposal, whichever is specified, and shall be full compensation for all work in connection therewith, complete and finished in accordance with the drawings and specifications.

END OF SECTION

SECTION SP-6.1 – LOUVERS

6.1.01 SUMMARY:

A. Furnish and install louvers, bird screens, structural supports and attachment brackets as shown on the drawings, as specified, and as needed for a complete and proper installation.

B. The louvers to be furnished include the following:

(1) Drainable fixed extruded louvers as necessary.

(2) Insect Screen on interior of louver frame.

(3) Louvers to be rated for wind load of 130 PSF.

6.1.02 REFERENCES:

A. Air Movement and Control Association (AMCA) International, Inc.

(1) AMCA Standard 500-L-99 Laboratory Methods of Testing Louvers for Rating

(2) AMCA Publication 501 Application Manual for Louvers

B. The Aluminum Association Incorporated

(1) Aluminum Standards and Data

(2) Specifications and Guidelines for Aluminum Structures

C. American Society of Civil Engineers

(1) Minimum Design Loads for Buildings and Other Structures

D. American Society for Testing and Materials (ASTM)

(1) ASTM B209

(2) ASTM B211

(3) ASTM B221

(4) ASTM E90-90

E. Architectural Aluminum Manufacturers Association (AAMA)

(1) AAMA 800 Voluntary Specifications and Test Methods for Sealants

(2) AAMA 605.2 Voluntary Specification for High Performance Organic Coatings on Aluminum Extrusions and Panels

(3) AAMA TIR Metal Curtain Wall Fasteners

(4) AAMA 2605-98 Superior Performing Organic Coatings on Aluminum Extrusions and Panels

F. Canadian Standards Association

(1) CAN3-S157-M83 Strength Design in Aluminum

(2) S136 94 Cold Formed Steel Structural Members

6.1.03 SUBMITTALS:

A. PRODUCT DATA:

(1) Air flow and water entrainment performance test results.

(2) Material types and thickness.

B. SHOP DRAWINGS:

(1) Include elevations, sections and specific details for each louver.

(2) Show anchorage details and connections for all component parts.

(3) Include signed and sealed structural calculations.

C. SAMPLES: Submit for approval at least twenty (20) working days prior to ordering.

D. COLOR CHIPS: Submit for approval at least twenty (20) working days prior to ordering.

6.1.04 QUALITY ASSURANCE:

A. SINGLE SUBCONTRACT RESPONSIBILITY: Subcontract the work to a single firm that has had not less than six years' experience in the design and manufacturing of work similar to that shown and required.

B. PERFORMANCE REQUIREMENTS: Provide AMCA and Building Services Research and Information Association (BSRIA) test data as required to confirm that the louvers have the specified air and water performance characteristics.

C. ACOUSTICAL PERFORMANCE: Where applicable, submit test reports to confirm that the louvers meet the specified STC and Noise Reduction requirements.

D. STRUCTURAL REQUIREMENTS: Design all materials to withstand wind loads as

required by the applicable building code. Maximum allowable deflection for the louver structural members to be l/180 or 0.75 inch, whichever is less. Maximum allowable deflection for the louver blades to be l/120 or 0.50 inch across the weak axis, whichever is less.

E. PROFESSIONAL ENGINEER REQUIREMENTS: Drawings and structural calculations to be signed and sealed by a professional engineer licensed to practice in the state of Hawai‘i.

F. WARRANTY: Provide written warranty to the DOW that all products will be free of defective materials or workmanship for a period of one year from date of installation.

6.1.05 DELIVERY, STORAGE AND HANDLING:

A. DELIVERY: At the time of delivery all materials shall be visually inspected for damage. Any damaged boxes, crates, louver sections, etc. shall be noted on the receiving ticket and immediately reported to the shipping company and the material manufacturer.

B. STORAGE:

(1) Material may be stored flat, on end or on its side.

(2) Material may be stored either indoors or outdoors.

(3) If stored outdoors the material must be raised sufficiently off the ground to prevent it from being flooded.

(4) If stored outdoors the material must be covered with a weather-proof flame-resistant sheeting or tarpaulin.

C. HANDLING:

(1) Material shall be handled in accordance with sound material handling practices and in such a way as to minimize racking.

(2) Louver sections may be hoisted by attaching straps to the jambs and lifting the section while it is in a vertical position.

(3) Louver sections should only be lifted and carried by the jambs. Heads, sills and blades are not to be used for lifting or hoisting louver sections.

6.1.06 MANUFACTURERS:

A. The louvers and related materials herein specified and indicated on the drawings shall be as manufactured by:

Construction Specialties, Inc.
49 Meeker Avenue,

Cranford, New Jersey 07016
Telephone: 800-631-7379

Construction Specialties, LTD.
895 Lakefront Promenade,
Mississauga, Ontario L5E 2C2
Telephone: 888-895-8955

Dayton by W.W. Grainger, Inc.
Honolulu Branch #561
2833 Paa Street
Honolulu, HI 96819-4406
Telephone: 800-472-4643

Ruskin™
3900 Dr. Greaves Rd.
Kansas City, MO 64030
Telephone: 816-761-7676

B. Products equal to the above materials may be offered providing that the manufacturer and materials are pre-approved at least twenty (20) working days before the bid date. Equivalence shall be demonstrated by submission of complete data to the DOW including drawings and descriptions of products, fabrication details, product samples where applicable or requested and installation procedures. List of substitute material together with qualifying data shall be submitted for approval at least ten days before bid opening. Any variations shall be specifically identified and justified for substitution. Incomplete submittals will be rejected.

6.1.07 MATERIALS:

A. Aluminum Extrusions: ASTM B211, Alloy 6063-T5, 6063-T6 or 6061-T6.

B. Aluminum Sheet: ASTM B3209, Alloy 1100, 3003 or 5005.

6.1.08 FABRICATION, GENERAL:

A. Provide C/S louver models, bird screens, structural supports and accessories as specified and/or shown on the drawings. Materials, sizes, depths, arrangements and material thickness to be as indicated or as required for optimal performance with respect to strength; durability; and uniform appearance.

B. Louvers to be mechanically assembled using stainless steel or aluminum fasteners.

C. Include supports, anchorage, and accessories required for complete assembly.

6.1.09 LOUVER MODELS:

A. C/S 4” (101.6mm) Deep High Performance Drainable Fixed Extruded Mullion Louver Model A4097

(1) Material: Heads, sills, jambs and mullions to be one-piece structural aluminum members with integral caulking slot and retaining beads. Mullions shall be sliding interlock with internal drains. Blades to be one-piece aluminum extrusions with gutter(s) designed to catch and direct water to jamb and mullion drains. Closed cell PVC compression gaskets shall be provided between bottom of mullion or jamb and top of sill to insure leak tight connections. Material thickness to be as follows: Heads, sills, jambs and mullions: 0.081" (2.06mm). Fixed blades 0.081" (2.06mm).

(2) AMCA Performance: A 4' x 4' unit shall conform to the following and be licensed to bear the AMCA seal:

Free Area 8.07 sq. ft. (0.750 sq. m.)
Free area velocity at the point of beginning water penetration 1040 FPM (317.0 m/min)

Intake Pressure drop at the point of beginning water penetration 0.20 in. H2O (5.08 mm) Exhaust pressure drop at 1000 fpm free area velocity (305 m/min) 0.18 in. H2O (4.67 mm)

6.1.10 <u>FINISHES</u>:

A. GENERAL: Comply with National Association of Architectural Metal Manufacturers (NAAMM) "Metal Finishes Manual" for finish designations and application recommendations, except as otherwise indicated. Apply finishes in factory. Protect finishes on exposed surfaces prior to shipment. Remove scratches and blemishes from exposed surfaces that will be visible after completing finishing process. Provide color as indicated or, if not otherwise indicated, as selected by architect.

B. THREE COAT PEARLESCENT FLUOROCARBON COATING:

(1) Louvers to be finished with a minimum 1.4 mil (0.035mm) thick full strength 70% resin, 3 coat Fluoropolymer system.

(2) All aluminum shall be thoroughly cleaned, etched and given a chromated conversion pretreatment before application of the Kynar/Hylar coating. The coating shall consist of a primer, a high metallic color coat and a clear PVF2 topcoat. It shall receive a bake cycle of 17 minutes at 4500F. All finishing procedures shall be one continuous operation in the plant of the manufacturer.

(3) Manufacturer to furnish an extended 20 year limited warranty for the Kynar/Hylar coating. This limited warranty shall begin on the date of material shipment.

OR

C. CLEAR ANODIZE:

appearance of the assembly.

F. Do not erect warped, bowed, deformed or otherwise damaged or defaced members. Remove and replace any members damaged in the erection process as directed.

G. Set units level, plumb and true to line, with uniform joints.

6.1.14 PROTECTION: Protect installed materials to prevent damage by other trades. Use materials that may be easily removed without leaving residue or permanent stains.

6.1.15 ADJUSTING AND CLEANING:

A. Immediately clean exposed surfaces of the louvers to remove fingerprints and dirt accumulation during the installation process. Do not let soiling remain until the final cleaning.

B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to the material finishes. Thoroughly rinse surfaces and dry.

C. TOUCH-UP: Restore louvers and accessory components damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by the Architect, remove damaged materials and replace with new materials.

(1) Touch up minor abrasions in finishes with a compatible air-dried coating that matches the color and gloss of the factory applied coating.

6.1.16 MEASUREMENT AND PAYMENT: Payment for the furnishing and installing of material, equipment, incidentals and all work included in this Section shall be made at the unit price item or the lump sum item indicated in the Proposal, whichever is specified, and shall be full compensation for all work in connection therewith, complete and finished in accordance with the drawings and specifications.

END OF SECTION

SECTION SP-6.2 – COILING DOORS

6.2.01 SUMMARY: Furnish and install two (2) coiling doors and all appurtenances as shown on the drawings, as specified, and per manufacturer's specifications.

6.2.02 REFERENCES: American Society for Testing and Materials (ASTM) A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galv-annealed) by the Hot-Dip Process.

6.2.03 SUBMITTALS:

A. PRODUCT DATA: Manufacturer's data sheets on each product to be used, including:

(1) Preparation instructions and recommendations.

(2) Storage and handling requirements and recommendations.

(3) Installation methods.

B. SHOP DRAWINGS: Provide drawings indicating track details, head and jamb conditions, spring shafts, anchorage, accessories, finish colors, patterns and textures, operator mounts and other related information.

C. REGULATORY REQUIREMENTS AND APPROVALS: Provide shop drawings in compliance with local Authority Having Jurisdiction (AHJ).

D. CERTIFICATIONS: Submit manufacturer's certificate that products meet or exceed specified requirements.

E. Submit installer qualifications.

F. SELECTION SAMPLES: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

G. VERIFICATION SAMPLES: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.

6.2.04 QUALITY ASSURANCE: Installer Qualifications: Utilize an installer having demonstrated experience on projects of similar size and complexity, and trained and authorized by the door manufacturer to perform the work of this section.

6.2.05 DELIVERY, STORAGE, AND HANDLING: Store products in manufacturer's unopened packaging until ready for installation. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

6.2.06 PROJECT CONDITIONS: Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

6.2.07 MANUFACTURERS: Raynor, or approved equal. Requests for substitutions will be considered in accordance with provisions of Section SP 1.7.

6.2.08 COILING AND ROLLING DOORS:

A. DuraCoil Basic as manufactured by Raynor Garage Doors or approved equal.

B. OPERATION: Provide doors designed for electric motor operation with the option for manual operation as back-up.

C. DRIVE ORIENTATION: Orient the drive from the following side when facing the side of the door that has the counterbalance or hood exposed:
Right-hand.

D. STRUCTURAL PERFORMANCE REQUIREMENTS: Wind Loads: Uniform pressure of 26 psf.

E. CURTAIN MATERIAL: Flat interlocking steel slats, 24-gauge (0.023-inch minimum steel thickness), roll-formed from commercial quality hot-dipped galvanized (G-60) steel in compliance with ASTM A-653.

F. MOUNTING: To face of wall on each side of door opening.

G. COLOR AND FINISH: One finish coat of polyester paint applied over one coat of white epoxy primer. Provide color options.

H. ENDLOCKS: Zinc-plated stamped steel fastened with two zinc-plate steel rivets.

I. BOTTOM BAR AND SEAL: Two roll-formed galvanized steel angles, minimum 1-1/2 inches by 1-1/2 inches by 1/8 inch (38.1 mm x 38.1 mm x 3.2 mm) with single-contact type bottom astragal.

J. COUNTERBALANCE SYSTEM:

(1) Headplates: 10-gauge galvanized steel plate, attached to wall angle of guide assembly with ½-inch (12.7 mm) diameter class 5 case hardened bolts. Inside of drive bracket fitted with sealed ball bearing.

(2) Barrel: Minimum 4-1/2 inches (114.3 mm) O.D. and 0.120-inch (3.1 mm) wall thickness structural steel pipe. Deflection of pipe under full load shall not exceed 0.03 inch (0.8 mm) per foot of span.

(3) Torsion Spring: Oil-tempered counterbalance with helical torsion springs, grease packed and mounted on a continuous steel torsion shaft.

K. ENCLOSURES:

(1) Round Hood: 24-gauge steel, finish-painted to match curtain.

(2) Weight Counterbalance Cover: 24-gauge steel, finish-painted to match curtain.

(3) Hood Baffle: Provide EPDM rubber seal to inhibit air infiltration through hood cavity.

(4) Headplate Cover: 24-gauge steel, finish to match curtain.

(5) Weather Seal: Guide brush seal.

L. LOCKING BAR FOR MOTOR OPERATED DOORS: Provide interlock switch with locking bar.

M. CYLINDER LOCK FOR MOTOR OPERATED DOORS: Provide interlock switch with cylinder lock.

6.2.09 EXAMINATION:

A. Do not begin installation until substrates have been properly prepared. Verify that site conditions are acceptable for installation of doors, operators, controls and accessories.

B. Ensure that openings are square, flush and plumb. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

6.2.10 PREPARATION: Clean surfaces thoroughly prior to installation. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

6.2.11 INSTALLATION: Install door, track and operating equipment complete with all necessary accessories and hardware according to shop drawings, manufacturer's instructions. Lubricate bearings and sliding parts, assure weather tight fit around door perimeter and adjust doors for proper operation, balance, clearance and similar requirements.

6.2.12 PROTECTION:

A. Clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance. Remove and legally dispose of construction debris from project site.

B. Remove temporary coverings and protection of adjacent work areas. Repair or replace installed products damaged prior to or during installation.

C. Protect installed products until completion of project.

D. Touch-up, repair or replace damaged products before Substantial Completion.

6.2.13 FIELD QUALITY CONTROL: Provide manufacturer's field service, consisting of product installation and use recommendations, and a minimum of one (1) field site visit to observe and ensure product installation is done in accordance with manufacturer's recommendations.

6.2.14 MEASUREMENT AND PAYMENT: Payment for the furnishing and installing of material, equipment, incidentals and all work included in this Section shall be made at the unit price item

or the lump sum item indicated in the Proposal, whichever is specified, and shall be full compensation for all work in connection therewith, complete and finished in accordance with the drawings and specifications.

END OF SECTION

SECTION SP-6.3 – METAL DOORS & FRAMES

6.3.01 SECTION INCLUDES:

A. Rolled steel door frames, welded construction, for exterior door openings.

B. Flush, hollow steel doors.

6.3.02 RELATED SECTIONS:

A. Section 6.4 – Finish Hardware.

B. Section 6.7 – Painting: Field painting of steel doors and frames.

6.3.03 SUBMITTALS:

A. SHOP DRAWINGS:

(1) Submit shop drawings and schedules for doors and frames.

(2) Indicate frame configuration, anchor types and spacing, location of cutouts for hardware, reinforcement, and finish.

(3) Indicate door elevations, internal reinforcement and closure method.

(4) Coordinate submittal with Section SP-6.4

(5) Finish Hardware and Door Hardware Schedule.

6.3.04 QUALITY ASSURANCE:

A. INDUSTRY STANDARDS: Steel doors and frames, and their installation, shall conform to the following requirements of the Steel Door Institute:

(1) ANSI/SDI-100 - Standard Steel Doors and Frames.

(2) ANSI/SDI-1-5 - Recommended Erection Instructions for Steel Frames.

6.3.05 MATERIALS:

A. SHEET STEEL FOR DOORS AND FRAMES: Prime quality cold rolled, annealed, stretcher leveled steel, conforming to Commercial Standard CS 242 or CS 211, with bonderized finish.

B. HOT-ROLLED STEEL SHEETS AND STRIP: Commercial quality carbon steel, pickled and oiled, complying with ASTM A569 and ASTM A568.

C. COLD-ROLLED STEEL SHEETS: Commercial quality carbon steel, complying with ASTM A366 and ASTM A568.

D. GALVANIZED STEEL SHEETS: Zinc-coated carbon steel sheets of commercial quality, complying with ASTM A526, or drawing quality, ASTM A642, hot dipped galvanized in accordance with ASTM A526, with G60 or G90 coating designation, mill phosphatized.

6.3.06 ROLLED STEEL FRAMES, WELDED CONSTRUCTION:

A. ROLLED STEEL (HOLLOW METAL) FRAMES: Full-formed sheet steel, concealed fastenings, welded construction, SDI 100 or equivalent custom fabricated frames conforming to referenced NAAMM standards.

B. SHAPES: As scheduled and indicated on Drawings.

C. STEEL: Galvanized steel, 16-gauge typically, ASTM A526, Coating Designation G60.

D. REINFORCEMENTS: Provide in accordance with SDI 107.

E. CUTOUTS: Provide factory-prepared cutouts from hardware instructions and templates. Refer to Section SP-8.11 - Finish Hardware. Prepare cutouts with fully drilled and tapped fittings.

F. ANCHORS: Provide in accordance with SDI 105.

6.3.07 HARDWARE PREPARATION:

A. HARDWARE PREPARATION, GENERAL: Conform to SDI 107, SDI 109 and ANSI A115.1 through A115.14.

B. REINFORCEMENT: SDI 100, Table IV.

C. HARDWARE LOCATIONS: SDI 100.

D. LOCK STRIKES: Set out for proper clearance for silencers, weather stripping and sound seals.

E. PREPARATION FOR CONTACTS FOR SECURITY ALARM SYSTEM: At doors identified by DOW to have alarm contacts, factory prepare door frames provide to suit alarm contact.

6.3.08 INSTALLATION:

A. WELDED STEEL FRAMES INSTALLATION:

(1) Install frames in conformance to ANSI/SDI-100 and ANSI/SDI-105. Comply with requirements for fire- rated assembly.

(2) Install frame solid in the wall, plumb and square, with proper opening width and height.

(3) Fasten clip angles to floor construction and brace frames so as to retain their position and clearance during construction of adjacent Work.

(4) Install anchors for stud partitions on hinge jamb immediately above each hinge reinforcing plate and below the top hinge reinforcement (minimum 4 per jamb) and locate anchors directly opposite on the strike jamb.

B. DOORS INSTALLATION, GENERAL: Comply with manufacturer's instructions and recommendations and to ANSI/SDI-100 and ANSI/SDI-1-5. Hang doors and adjust for proper clearances and operation. Refer to drawing set for hardware requirements.

C. REPAIRS:

(1) Make repairs only if permitted by DOW. Otherwise, replace damaged components with new.

(2) Fill surface depressions with metallic paste filler in compliance with manufacturer's recommendations, allow to thoroughly cure, sand flush, and smooth for an invisible appearance with adjacent metal surfaces.

(3) Sand smooth all rusted areas.

(4) Apply touch-up paint using air drying primer compatible with shop-applied finish.

6.3.09 ADJUSTING:

A. OPERATION: Rehang or replace doors which do not swing or operate freely.

(1) Non-rated doors: Doors without closers shall hang straight and still; hardware shall operate smoothly.

B. CHECKING AND ADJUSTING: Check and readjust operations of all door and hardware immediately prior to Substantial Completion Review.

C. REMEDIAL WORK: Immediately remove and replace, at no change in Contract Time or Contract Sum, all damaged, misaligned and warped doors.

6.3.10 CLEANING AND PROTECTION:

A. PRIME COAT TOUCH-UP: Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touch-up of compatible air-drying primer.

B. PROTECTION: Protect installed doors and frames from damage. Remove protection for Substantial Completion review.

C. FINAL ADJUSTMENTS: Check and readjust operating hardware items, leaving steel doors and frames undamaged and in complete and proper operating condition.

D. CLEANING: Clean doors and frames of surface contaminants detrimental to bonding of field applied finishes.

6.3.11 MEASUREMENT AND PAYMENT: Payment for the furnishing and installing of material,

equipment, incidentals and all work included in this Section shall be made at the unit price item or the lump sum item indicated in the Proposal, whichever is specified, and shall be full compensation for all work in connection therewith, complete and finished in accordance with the drawings and specifications.

END OF SECTION

SECTION SP-6.4 – FINISH HARDWARE

6.4.01 DESCRIPTION:

A. The work covered under this section shall include the furnishing of all labor, materials, tools and equipment necessary for completing this item of work as specified in DIVISION 300 – CONSTRUCTION, SECTION 303.24 FINISH HARDWARE of the Water System Standards, dated 2002 and as modified or supplemented hereinafter.

B. Furnish and deliver to the building site, all finishing hardware required for all doors, etc., complete as indicated on the drawings and as specified herein.

C. It is the intent of these specifications to cover in general the class and character of all finish hardware required.

D. The hardware list specified hereinafter has been made for the convenience of the Contractor and covers in general the necessary hardware for doors, casework, etc., but all other doors, etc., shown on the plan and not covered by the general characterization shall be fitted with appropriate hardware of the same standards as the hardware described throughout these specifications. Contractor shall furnish hardware schedule as hereinafter specified.

E. Equivalent products of other manufacturers will be considered in accordance with the "or approved equal" provision. Equivalence shall be demonstrated by submission of complete data to the DOW including drawings and descriptions of products, fabrication details, product samples where applicable or requested and installation procedures. List of substitute material together with qualifying data shall be submitted for approval at least ten days before bid opening. Any variations shall be specifically identified and justified for substitution. Incomplete submittals will be rejected.

6.4.02 SUBMITTALS:

A. SCHEDULE: Furnish one hard copy and one electronic copy of the schedule of hardware in compliance with specifications and drawings. List each opening and hardware to be applied. State keying, material, finish and manufacturer's number for each item. Required types are listed. Verify keying system used by DOW as well as keying hierarchy. Verify number of keys and hierarchy level required.

B. MANUFACTURER'S DATA: Submit manufacturer's descriptive literature along with schedule for information only.

6.4.03 DELIVERY:

A. Examine the plans, specifications, and details in order to check all items so they will be suitable and of perfect fit and delivered where and when required. Certify schedule for same or bring to the attention of the architect prior to ordering materials.

B. All hardware for the particular door shall be delivered at the site, packed separately with all trimmings, screws, etc., and properly labeled and numbered so that they can be checked with the included hardware list.

C. Upon delivery of the finishing hardware to the job site by the hardware supplier, the General Contractor shall have a responsible person check in the material at the place for storage. The hardware shall be protected from damage at all times, both prior to and after installation.

6.4.04 REPRESENTATIVE: Provide services of a competent hardware specialist who is familiar with installation and operation of all finishing hardware items furnished. Representative shall be available for jobsite inspections and consultation as directed by the architect.

6.4.05 QUALITY ASSURANCE: Hardware supplier shall be a Hawai‘i company specializing in architectural finish hardware for a period of not less than three (3) years. Supplier shall maintain local inventory of all products furnished for this project. Certify all submittals for quality assurance.

6.4.06 MATERIALS:

A. All hardware shall be of the best quality in construction, design and finish, and free from any defects. Any defective pieces shall be replaced by the Contractor at his own expense.

B. Hardware shall be of the manufacture, type, weight, function and quality as shown by factory number.

C. HINGES: Regular bearing and ball bearing types as indicated.

D. FINISH: All hardware items shall be furnished in the finish as indicated in the Hardware Groups. Contractor will replace at his own expense all items which have defects or blemishes.

E. HARDWARE SCHEDULE:

(1) Furnish the following hardware groups as indicated below or required for a complete and proper installation. Approved equals to provided manufacturers are acceptable.

MANUFACTURER LIST

Category	Vendor Name	MFG
HINGE	H.B. IVES	IVE
ASTRAGAL	PEMKO	PEM
PANIC HARDWARE	VON DUPRIN	VON
SFIC RIM HOUSING	SCHLAGE	SCH
SFIC CYLINDER	CYBERLOCK	CL
SURFACE CLOSER	LCN CLOSERS	LCN
FLOOR STOP	H.B. IVES	IVE
SEALS	PEMKO	PEM
DOOR SWEEP	PEMKO	PEM
THRESHOLD	PEMKO	PEM

HW GROUP – 001.1
DOOR 01

Qty	Description	Catalog Number	Finish	Mfr
3 EA	HW HINGE	5BB1HW 4.5 X 4.5 NRP	630	PEM
1 EA	PANIC HARDWARE	98-L-06	630AM	VON
1 EA	SFIC RIM HOUSING	80-129	626	SCH
1 EA	SFIC CYLINDER	CL-SF03	626	CL
1 EA	SURFACE CLOSER	1461 SCUSH SRI	689	LCN
1 SET	SEALS	S88D	DKB	PEM
1 EA	DOOR SWEEP	3452AV	AL	PEM
1 EA	THRESHOLD	271A	AL	PEF

F. FASTENINGS:

(1) Furnish necessary screws, bolts, and other fastenings for proper application of hardware. Fastenings shall be of suitable size and type of securing hardware for heavy use. Fastenings must harmonize with the hardware as to material and finish.

(2) Furnish necessary expansion shields, toggle bolts, machine or wood screws or other suitable approved anchoring devices where hardware is to be installed on concrete, masonry or other type of backing.

6.4.07 TEMPLATES: Templates as may be required to be furnished the Contractor within seven days after receipt of an order and approved hardware schedule.

6.4.08 TOOLS AND INSTRUCTIONS: All tools and maintenance or installation instruction packed with the closers and locksets shall be given to the DOW when the project is complete.

6.4.09 INSTALLATION:

A. As specified in Section 303.24 Finish Hardware of the Water System Standards.

B. Hardware Supplier's Inspection: Before final inspection of the work under this contract and acceptance of the project by the DOW, the supplier of hardware and other items specified in this Section shall visit the site and carefully inspect all parts for conformance to this specification, adequacy for intended use, proper functioning, appearance, finish and successful operation, assuming joint responsibility with the General Contractor.

6.4.10 MEASUREMENT AND PAYMENT: Payment for the furnishing and installing of material, equipment, incidentals and all work included in this Section shall be made at the unit price item or the lump sum item indicated in the Proposal, whichever is specified, and shall be full compensation for all work in connection therewith, complete and finished in accordance with the drawings and specifications.

END OF SECTION

SECTION SP-6.5 – SEALANTS

6.5.01 DESCRIPTION: The work covered under this section shall include the furnishing of all labor, materials, tools and equipment necessary for completing this item of work as specified in DIVISION 300 – CONSTRUCTION, SECTION 303.21 CAULKING of the Water System Standards, dated 2002 and as modified or supplemented hereinafter.

6.5.02 MATERIALS: Polysulfide caulking and miscellaneous materials as specified in DIVISION 300 – CONSTRUCTION, SECTION 303.21 CAULKING of the Water System Standards.

6.5.03 INSTALLATION: As specified in DIVISION 300 – CONSTRUCTION, SECTION 303.21 CAULKING of the Water System Standards.

6.5.04 MEASUREMENT AND PAYMENT: Payment for the furnishing and installing of material, equipment, incidentals and all work included in this Section shall be made at the unit price item or the lump sum item indicated in the Proposal, whichever is specified, and shall be full compensation for all work in connection therewith, complete and finished in accordance with the drawings and specifications.

END OF SECTION

SECTION SP-6.6 - FLUID APPLIED ELASTOMERIC ROOFING

6.6.01 GENERAL CONDITIONS:

A. SECTION INCLUDES: Fluid applied flexible acrylic or silicone waterproofing system over concrete. This work shall include the preparation of the roof deck, application of the roof system, and clean up.

B. DESCRIPTION OF FLUID APPLIED ROOFING SYSTEM: The fluid applied roofing system must consist of a reinforced elastomeric system specifically designed for use on a roof. The system must have been approved by FMRC (Factory Mutual Research Corporation) according to Standard 4470 for Class 1 Roof Constructions which includes- Spread of Flame Fire, Windstorm Pressure, Windstorm Pull, Hail Damage, Resistance to Foot Traffic, and Susceptibility to Leakage Classifications.

C. SUBSTRATE APPROVAL: All warranted jobs over any substrate must have substrate approval prior to job start up. Manufacturer may require an approved recovery board with roof breathers over certain concrete type decks. Please consult your local Technical Representative for assistance and approval.

D. RELATED WORK: The Contractor shall review all sections of these specifications to determine items of work that will interface with the application of this roofing system. Coordination and execution of related sections shall be the responsibility of the Contractor.

E. REFERENCES: SP-6 specification sections contain references to the following documents. They are a part of these Sections as specified and modified. In case of conflict between the requirements of these Sections and those of the listed documents, the requirements of these Sections shall prevail.

Reference	Title
ASTM B117	Test Method of Salt Spray (Fog) Testing
ASTM G-29	Test Methods for Algae Resistance
ASTM E-108	Test Method for Fire Test of Roof Coverings.
ASTM D-1653	Water Vapor Transmission of Materials
ASTM G26	Practice for Operating Light-and Water-Exposure-Apparatus (Xenon Arc Type) for Exposure of Nonmetallic Materials.
ASTM D-412	Ultimate Tensile Strength at Break
ASTM D-6083	Standard Specification for Liquid Applied Acrylic Coatings used in roofing.
ASTM C1549	Standard test method for determination of solar reflectance near ambient temperature using a portable solar reflectometer.
ASTM C1371	Standard test method for determination of emittance of materials near roof temperature using portable emissometers

Reference	Title
FM 4470	Standard for Class 1 Spread of Flame Fire, Windstorm Pressure, Windstorm Pull, Hail Damage, Resistance to Foot Traffic, and Susceptibility to Leakage Classification.

F. SUBMITTALS:

(1) Product Data: Provide manufacturer's technical literature on products that make up the roofing system. This shall include, but is not limited to, coatings, reinforcing fabrics, fasteners, etc.

(2) Manufacturer's Installation Instructions: Submit all data sheets available from the manufacturer on the installation of the roofing system applicable to the work.

(3) Manufacturer's Certificate: Certify that Products meet or exceed specified requirements.

G. QUALIFICATIONS: Applicator Qualifications - The applicator of the roofing material specified herein shall be Manufacturer approved applicator. Proof of this qualification shall be provided in written form from the manufacturer of the roofing system.

H. QUALITY CONTROL:

(1) Codes and Standards: The contractor shall make him/herself thoroughly familiar with all codes, regulations, and standards governing the specified work. Any contradiction between the manufacturer's requirements and these specifications shall be brought to the attention of the manufacturer and the specifier.

(2) Deviations: There shall not be any deviations from these specifications unless the deviation is submitted in writing to the specifier. The request for deviation must have a letter from the roofing manufacturer's technical department approving the details of the deviation.

I. DELIVERY, STORAGE, AND HANDLING: Deliver materials to site in manufacturer's unopened and undamaged containers bearing the following information:

(1) Name of manufacturer.

(2) Name of contents and products code.

(3) Net volume of contents.

(4) Lot or batch number.

(5) VOC content

(6) Storage temperature limits.

(7) Shelf life expiration date.

(8) Mixing instructions and proportions of contents.

(9) Safety information and instructions - Store and protect materials from damage and weather in accordance with manufacturer's instructions. Keep out of direct sunlight.

J. WARRANTY: Provide ten-year manufacturer's Product Warranty or a ten-year manufacturer's Labor & Material warranty.

6.6.02 PRODUCTS:

A. MANUFACTURERS:

(1) APO

(2) Hawaiian Sunguard

(3) Hydro-Stop

(4) RoofMate

(5) White Lava

(6) GacoSil Silicone

(7) Hawaiian Sunguard Silicone

(8) Gaco Roof

(9) Tropical Silicone

(10) United Coatings UniSil

(11) Approved Equal

B. MEMBRANE COMPOUND MATERIAL:

(1) Waterproofing Material: Premium Coat three stage, fabric reinforced, flexible acrylic coating, fluid applied in successive stages to form one continuous, seamless, watertight membrane; 40 mil (.04 inches / 1.016 millimeters) minimum cured total system thickness; comprised of the following:

a. Foundation and Saturation Coats: Base Coat (highly flexible water based 100% pure acrylic polymer resin coatings).

b. Fabric: Polyester, non-woven, stitch-bonded, and heat-set fabric.

c. Finish Coat: Finish Coat (ultraviolet light resistant, blend of highly flexible water based 100% pure acrylic polymer resin coating); color as selected from manufacturer's standard colors. White or highly reflective shades will not be accepted.

PROPERTY	TEST	RESULT
OTC (Ozone Transport Commission)		Compliant
CRRC (Cool Roof Rating Council)		Approved
Energy Star (Dept. of Energy) (White or Cotton Finish Coat Only)		Approved

C. ACCESSORIES:

(1) Manufacturer's Cleaning agent for the proper cleaning of existing surfaces and coatings. Promotes adhesion of primers and coatings and has specific functional ingredients for degreasing removing soils and biological residues.

(2) Surface Primer: Hydro-Stop Barrier Guard cementitious waterproofing sealer for concrete.

(3) Cant Strips: Recommended composition materials are EPS (Expanded Polystyrene), Barrier Guard® & Hydro Fiber Mix, and wood (Non-Pressure Treated). Cant strips are to be installed at all internal corners, around curbs, and at all 90-degree angles specified by Hydro-Stop.

(4) Moisture Breathers: Install moisture breathers as recommended by Hydro-Stop Technical Personnel.

(5) Hydro-Fiber: Bulking material used in conjunction with Foundation Coat or Barrier Guard slurry (as specified by Hydro-Stop Technical Representative) to fill cracks, voids, or low depressions on various substrates.

(6) Stable Rust Primer: water based surfactant-free primer used in direct metal applications to stabilize and protect metal surfaces.

(7) pH Blocking Primer: Sure bond Primer as manufactured by Hydro-Stop used for blocking pH migration on concrete and lightweight concrete decks.

(8) Traffic Topping: Hydro-Stop Traffic Coat acrylic based coating designed for light traffic areas.

(9) Surface Sealer: ACRYSHEEN is a water-based epoxy, penetrating sealer designed to produce a clear, semi-gloss surface sheen and provide dirt resistance and weather protection.

6.6.03 INSTALLATION:

A. EXAMINATION:

(1) Verify substrate surfaces are durable, free of dampness, loose particles, cracks, pits, projections, or foreign matter detrimental to adhesion or application of waterproofing system.

(2) Verify that substrate surfaces are smooth and not detrimental to full contact bond of waterproofing materials.

(3) Verify items that penetrate surfaces to receive waterproofing are securely installed.

(4) Verify that substrate areas are adequately supported and firmly fastened in place.

(5) Verify that the concrete deck has a minimum slope of.25 inch/foot (2.083 cm/meter)

(6) Verify that roof does not have ponding water areas.

(7) Verify that all attached vertical walls are properly waterproofed.

B. PREPARATION:

(1) Protect adjacent surfaces not designated to receive waterproofing.

(2) As a minimum, clean and prepare surfaces to receive waterproofing by removing all loose and flaking particles, grease and laitance with the use of a stiff bristle push broom and or washing with cleaner as per manufacturer's instructions. Care should be taken not to inject water into the substrate during washing. In some cases, additional drying time may be required after the cleaning process. Please consult your Manufacturer's Representative for additional advice on cleaning various roofing substrates. Make all necessary repairs to existing substrate.

(3) Seal cracks and joints with sealant materials using depth to width ratio as recommended by sealant manufacturer.

(4) Coordinate work with that of other trades to ensure that components, which are to be incorporated into waterproofing system, are available, do not cause deviations from these specifications requiring approval and prevent delays or interruptions as the work progresses. Verify existing conditions in advance.

(5) Install cant strips at internal corners and metal drip edge on outside perimeter as needed.

C. APPLICATION:

(1) Surface primer-mix slurry in accordance with manufacturer's instructions and apply two coats over masonry surface at a minimum coverage rate of 150 ft2/ gal (3.57 m2/liter). Allow to dry between coats.

a. Apply a single coat of primer to entire substrate at a coverage rate of 200 ft2/gal.

b. Base Coat & Fabric Components-Consist of one coat of base coat applied to the substrate, reinforcing fabric (sizes vary) laid into the wet base coat, and finally a second coat of base coat saturating the fabric from above. Care should be given to ensure that adjacent runs of fabric are overlapped a minimum of 4 inches (10.16 cm). Base coats are applied at a total rate of 25-40 ft2/gal (.594-.951 m2/liter) depending on substrate. Base coat should only be applied with the use of

manufacturer approved roof brushes. Rolling and spraying of the base coat are absolutely forbidden. Fabric to be cut by scissors only, all terminations are to be clean cut, straight and level.

(2) Roof Perimeter-Using 12-inch (30.48 centimeters) fabric and the base components (described above), waterproof entire roof perimeter. Continue waterproofing up vertical surfaces and onto deck a minimum of 6 inches (15.24 centimeters) in each direction.

(3) Roof Penetrations-Using 12-inch (30.48 centimeters) fabric and the base components (described above) seal items projecting through waterproofing material watertight. Waterproof up penetrations a minimum of 6 inches (15.24 centimeters).

(4) Roof Field-Using 40-inch (1.016 m) fabric and the base components (as described above) seal the entire roof field. Overlap adjacent runs of fabric 4 inches (10.16 cm) minimum.

(5) Finish Coat Component-Apply 2 coats of finish coat at a combined total rate of 70 ft2/gal (1.664 m2/liter) over entire roof area. Minimum milage requirements are 11.5 mils (.0115 inches / .292 millimeters) wet and 6.1 mils (.0061 inches / .155 millimeters) dry per coat. Allow to dry between coats. Total finish coat dry thickness should be a minimum of 12.2 mils (.0122 inches / .31 millimeters).

(6) Completed Finish Coat System-System must be installed to a minimum 40 mil (.04 inches / 1.016 millimeters) total cured thickness.

D. PROTECTION OF FINISHED WORK: Use cleaner as per manufacturer instructions to clean roofing system when needed. Please consult your manufacturer Technical Sales Representative for recommendations for maintaining the roofing system. Monitor finished system for 7 days, sweeping off birdbaths to allow for full cure.

E. CLEANING: Immediately clean unscheduled surfaces receiving waterproofing in accordance with manufacturer's instructions.

F. MAINTENANCE: Use cleaner per manufacturer instructions to clean coating system when needed. Please consult your manufacturer for recommendations for maintaining the roofing system.

6.6.04 MEASUREMENT AND PAYMENT: Payment for the furnishing and installing of material, equipment, incidentals and all work included in this Section shall be made at the unit price item or the lump sum item indicated in the Proposal, whichever is specified, and shall be full compensation for all work in connection therewith, complete and finished in accordance with the drawings and specifications.

END OF SECTION

SECTION SP-6.7 – PAINTING

6.7.01 DESCRIPTION:

A. This item of work shall include the furnishing of all labor, materials, tools, and equipment necessary for completing exterior and interior painting including all piping above the floor line and as specified in DIVISION 300 – CONSTRUCTION, SECTION 303.27 PAINTING of the Water System Standards, dated 2002, as amended hereinafter, and as applicable to this project. Items to be painted shall include all new work and all existing work as indicated.

B. Items to be painted shall include, but not necessarily be limited to the following:

(1) Interior surfaces of the control building walls, soffits

(2) Interior door and frame.

(3) Exterior door and frame.

(4) Metal louver.

(5) Metal angle frames.

(6) Metal screen.

(7) Junction boxes and miscellaneous metal surfaces.

(8) Copper piping (indoors).

(9) Deepwell pump motor and discharge base (outdoors)

(10) Deepwell discharge pipe, fittings, valves, and vent (outdoors)

(11) Existing outdoor piping, fittings, valves, and appurtenances

6.7.02 SUBMITTALS:

Submit one (1) hard copy and electronic set of the following to the DOW representative for approval. No ordering of materials shall be done prior to approval.

A. CERTIFICATIONS: Asbestos-free, lead-free, zinc chromate-free, strontium-chromate-free, cadmium free, and mercury free, cadmium free paint certificates shall be submitted to the DOW representative.

B. MANUFACTURER'S PRODUCT DATA SHEETS: Manufacturer's Product Data Sheets for the primers, paints, coatings, solvents, sealing and patching materials, sealants and caulking, and other materials being used shall be submitted. Data sheets shall indicate thinning and mixing instructions, required film thickness (mil) and application instructions.

C. MANUFACTURER'S MATERIAL SAFETY DATA SHEETS: Manufacturer's Material Safety Data Sheets for coatings, solvents, and other hazardous materials shall be submitted to the DOW representative.

D. PAINT SCHEDULE: Submit painting schedule of paint application for all surfaces as per Section SP-6.7.08, for approval by the DOW prior to application.

6.7.03 SPECIAL REQUIREMENTS

A. CODES: The Contractor shall comply with the State OSHL (Occupational Safety and Health Law) and all pollution control regulations of the State Department of Health.

B. PROTECTION:

(1) Persons:

a. The Contractor shall take all necessary precautions to protect public pedestrians and DOW employees.

b. The Contractor shall provide, erect and maintain safety barricades around scaffolds, hoists and wherever Contractor's operations create hazardous conditions in order to properly protect the public and tenants.

(2) Completed Work: The Contractor shall provide all necessary protection for wet paint surfaces.

(3) Protective Covering: The Contractor shall provide and install protective covering over equipment, floor and other areas that are not scheduled for treatment. Protective covering shall be clean sanitary drop cloth or plastic sheets. Paint applied to surfaces not scheduled for treatment shall be completely removed and surfaces shall be returned to original condition.

(4) Safeguarding of Property: The Contractor shall take whatever steps may be necessary to safeguard his work and also the property of the DOW during the execution of this Contract. He shall be responsible for and make good on any and all damages and for losses to work or property caused by his or his employee' s negligence.

(5) Fire Safety: The Contractor shall direct his employees not to smoke in the vicinity and exercise precautions against fire at all times. Waste rags, plastic (polyester sheets), empty cans, etc. shall be removed from the site at the end of each day.

C. STORAGE AREA FOR MATERIALS: No paint material, empty cans and paint brushes and rollers may be stored in buildings, but shall be stored in separate storage facilities away from the buildings.

6.7.04 MATERIALS

A. LEAD PROHIBITION: All paint shall be lead-free.

B. MERCURY PROHIBITION: All paint shall be mercury-free.

C. CHROMATE PROHIBITION: All paint shall be free of zinc-chromate and/or strontium-chromate.

D. CADMIUM PROHIBITION: All paint shall be cadmium-free.

E. All materials shall be delivered to the job site in undamaged original containers bearing the manufacturer's label and shall be stored in such a manner as to prevent damage. All rejected materials shall be removed from the job site immediately.

F. Thinning of paint shall be done using material recommended by the manufacturer. Mix proprietary products according to manufacturer's printed specifications. Compound thinner, mineral oil, kerosene, refined linseed oil, or gasoline shall not be used for thinning.

G. Except for metal primers, all paint shall contain maximum amount of mildewcide per gallon of paint permitted by the mildewcide manufacturer without adversely affecting the quality of the paint.

H. The supplier shall submit a signed certificate indicating the amounts of mildewcide added by both the paint manufacturer and the paint supplier. Mercurial fungicide shall not be used.

6.7.05 SURFACE PREPARATION

A. MILDEW REMOVAL: Remove all mildew and sterilize the surface to be coated using one of the following methods:

Apply a treatment solution composed of the following ingredients and in the noted pro portions to the affected surface using a sponge or low-pressure sprayer:

2/3 cup TSP (Trisodium Phosphate)
1 quart household bleach
3 quarts warm water

Note: Household bleach shall not be mixed with ammonia or any detergents or cleaners containing ammonia as this will create a poisonous gas.

Scrub the surface as necessary to completely remove the mildew.

or,

Apply a commercial mildew treatment solution such as Purex, Jomax Remover or equal in strict accordance with the manufacturer's recommendations and instructions.

Following treatment, the surface shall be cleaned with potable water and allowed to thoroughly dry before coating work.

B. FERROUS METAL AND GALVANIZED METAL TO BE REPAINTED:

(1) Remove from surface to be repainted all foreign matter such as tape, gum.

(2) Remove all rust to bare metal. Remove all loose, blistered, scaled, crazed, chalky finish to an existing tight and firm finish.

(3) Where existing finish remains clean, tight and firm, prepare surface with liquid sandpaper.

(4) Immediately, spot prime, with specified primer, areas where bare metal is exposed.

(5) Completely wipe or wash all surfaces with mineral spirits or other appropriate solution as required to remove any accumulated film of wax, oil, grease, smoke, dust, dirt, chalky or other foreign matter which would impair bond of, or bleed through new finish.

C. CONCRETE TO BE REPAINTED:

(1) Remove from surfaces to be repainted all foreign matter such as nails, screws, staples, tape and gum.

(2) Remove all loose, blistered, scaled, crazed or chalky finish to an existing tight and firm finish.

(3) Where the existing finish remains tight and firm, prepare the surface by lightly sanding. Where the paint has been removed, sand the edges of scarred areas to a smooth feathered edge.

(4) Wash all surfaces with a solution of T.S.P. (trisodium-phosphate) and water or other appropriate solution to remove any accumulated film of wax, oil, grease, smoke, dust, dirt, chalking or other foreign matter which would impair the bond of, or bleed through the new paint finish. After washing, rinse the surface with potable water and allow to thoroughly dry.

(5) Fill holes, cracks, open joints and other imperfections with appropriate compound and allow to set.

(6) Spot prime areas where bare concrete or fill material is exposed with the specified primer and feather out onto adjacent paint.

6.7.06 <u>PAINT APPLICATION:</u>

A. GENERAL:

(1) All work shall be done in a workmanlike manner by skilled and experienced mechanics and shall conform to the best painting practices.

(2) All materials shall be applied in accordance with the manufacturer's specifications and the finished surfaces shall be free from runs, sags, drops, ridges, waves, laps, streaks, brush marks and variations in color, texture and finish (glossy or dull). The coverage shall be complete and each coat shall be so applied as to produce a film of

uniform thickness. No paint, varnish or enamel shall be applied until the preceding coat is thoroughly dry and approved.

(3) No exterior painting of unprotected surfaces shall be done in rainy, damp weather. Coats shall be applied only to surfaces that are thoroughly dry.

B. APPLICATION: Shall be by brush or roller only.

C. Application of a coat of paint shall constitute the Painting Contractor's acceptance of the surface and the responsibility for it.

6.7.07 MISCELLANEOUS:

A. INSTALLATION OF REMOVED ITEMS: After completion of final paint coat, removed items shall be reinstalled.

B. CLEAN-UP:

(1) During the progress of the work, all debris, empty crates, waste, drippings, etc. shall be removed by the Contractor and the grounds about the areas to be painted shall be left clean and orderly at the end of each work day.

(2) Upon completion of the work, staging, scaffolding, containers and all other debris shall be removed from the site. All paint splashed or spilled upon adjacent surfaces not requiring treatment (hardware, fixture, floors) shall be removed and the entire job left clean and acceptable.

6.7.08 PAINT SCHEDULE: In addition to the schedule listed in DIVISION 300 - CONSTRUCTION, SECTION 303.27 PAINTING the following schedule supplements surfaces.

A. Any existing painted surfaces not specifically noted in the finish schedule shall be finished to match adjoining work.

B. Paint schedule is based on the products of manufacturers approved by the DOW. Provide all other paints required for all other surfaces as approved by the DOW.

C. The painting schedule shall apply to previously painted surfaces.

D. At the option of the DOW representative, paint sheens may be revised at no additional cost to the DOW.

E. Obtain approval of all paint schedule from the DOW representative prior to ordering any paint.

F. PAINT SCHEDULE FOR EXISTING SURFACES:

(1) See Water System Standard, DIVISION 300 - CONSTRUCTION, SECTION 303.27 PAINTING and DIVISION 400 - APPROVED MATERIAL LIST AND STANDARD DETAILS, SECTION 402 APPROVED MATERIAL LIST, V PAINTS AND COATINGS, or as directed by DOW.

I. TEST PRESSURE: The hydrostatic, air, or gas pressure used to determine system compliance.

J. TAKE DOWN COUPLING: Pipe couplings that facilitate disassembly of piping systems without damage or demolition of piping system components.

K. EXPOSED: All area exposures other than buried, submerged, or encased/embedded.

L. CORROSIVE PROCESS AREA: Areas where the atmosphere contains enough corrosive substances to necessitate the use of non-corrosive materials. All incidental materials used in a corrosive process area shall be of 316 stainless steel for plate and 304 stainless steel for fasteners unless noted otherwise.

7.1.03 REFERENCES:

A. SP-7.1 specification sections contain references to the following documents. They are a part of these Sections as specified and modified. In case of conflict between the requirements of these Sections and those of the listed documents, the requirements of these Sections shall prevail.

Reference	Title
ANSI B31.3	Process Piping
ASME B1.1	Unified Inch Screw Threads
ASME Section IX	Boiler and Pressure Vessel Code; Welding and Brazing Requirements

7.1.04 MATERIALS AND WORKMANSHIP:

A. Materials and equipment shall be new and free from defects and shall be listed for the purpose for which they are to be used by an independent testing laboratory. Three such organizations are Underwriters Laboratories (UL), American National Standards Institute (ANSI), and American Society of Mechanical Engineers (ASME). Those items listed by Underwriters' Laboratories shall bear the "UL" label of approval. Independent testing laboratory shall be acceptable to the inspection authority having jurisdiction.

B. Brand names, manufacturer's names, and catalog numbers indicate standard of design and quality required. Substitute materials may be used if qualified by written permission from the DOW. List of substitute material together with qualifying data shall be submitted per the RFP.

C. Qualifying data shall include catalog cuts, shop drawings, and/or specifications to show equality with materials specified herewith.

D. Comply with local ordinances and regulations of the County of Kaua'i. Workmanship subject to approval of the DOW who shall be afforded every opportunity to determine skill and competency. Concealed work may be reopened at random during formal inspection by the DOW.

wireways and insulated cable holders mounted on unistrut in handholes. Cables shall be tied to the cable holders in these locations.

Power conductors feeding 480V or higher rated equipment shall be identified by colored phase tape at both ends.

Raceway fill limitations shall be as defined by NEC and the following:

a. Lighting and receptacle circuits may be in the same conduit in accordance with de-rating requirements of the NEC. Lighting and receptacle circuits shall not be in conduits with power or control conductors. Signal conductors shall be in separate conduits from power conductors. Motor feeder circuits shall be in separate conduits.

b. Power conductors derived from uninterruptible power supply systems shall not be installed in raceways with conductors of other systems. Install in separate raceways.

c. Splices and terminations are subject to inspection by DOW prior to and after insulating.

d. Motor terminations at 460-volt motors shall be made by bolt-connecting the lugged connectors.

e. In-line splices and tees, where approved by DOW, shall be made with tubular compression connectors and insulated as specified for motor terminations. Splices and tees in underground handholes or pull boxes shall be insulated using Scotch-cast epoxy resin or Raychem splicing kits.

f. Terminations at solenoid valves, 120 volt motors, and other devices furnished with pigtail leads shall be made using self-insulating tubular compression connectors within the termination box.

(3) Signal Cable:

Provide terminal blocks at instrument cable junctions within dedicated terminal boxes provided by the installer. Signal circuits shall be run without splices between instruments, terminal boxes, or panels.

Circuits shall not be made using conductors from different pairs.

Shields are not acceptable as a signal path, except for circuits operating at radio frequencies utilizing coaxial cables. Common ground return conductors for two or more circuits are not acceptable.

Shields shall be bonded to the signal ground bus at the control panel only and isolated from ground at the field instrument or analyzer and at other locations. Shields or drain wires for spare circuits shall not be grounded at either end of the cable run. Terminals shall be provided for running signal leads and shield drain wires through junction boxes.

Spare circuits and the shield drain wire shall be terminated on terminal blocks at both ends of the cable run and be electrically continuous through terminal boxes.

Where instrument cable splicing is required, provide an instrument stand with terminal box mounted approximately 3 feet high for instrument cable splices with the circuits and individual conductors provided with label as specified in this Section.

Cable for security and telephone systems shall be installed and terminated in compliance with the manufacturer's recommendations.

F. SPLICING:

(1) Wires shall be formed neatly in enclosures and boxes.

(2) Splices made according to NEC. Conductors #10 and smaller twisted and dip soldered. Conductors #8 through #4/0 spliced with solderless clamp or compression (indent) connectors.

(3) Splices reinsulated according to wire manufacturer's instructions. Splice insulation shall be 150 percent in thickness of original wire insulation and of the same electrical and mechanical characteristics. Insulating type (600V use) shall be neoprene, Okoprene by Okonite Company or approved equal. Jacketing and insulating tape shall be high density cold setting polyethylene adhesive tape, Scotch Super 33+ by 3M Company or approved equal.

G. WIRE MARKERS:

Each conductor shall be identified at each terminal to which it is connected. Conductors size No. 8 AWG or smaller shall have identification sleeves. Conductors shall be identified in accordance with paragraph SP-8.1.09.E. The letters and numbers that identify each wire shall be machine printed on sleeves with permanent black ink.

The figures shall be 1/8-inch high. Sleeves shall be yellow or white tubing, sized to fit the conductor insulation. The sleeves shall be shrunk to fit the conductor with hot air after installation.

They shall be TMS Thermofit Marker System by Raychem Co., sleeve style wire marking system by W. H. Brady Co., or approved equal. Adhesive strips are not acceptable.

Conductors No. 6 AWG and larger shall use slotted tags, each secured to the cable with two nylon tie-wraps. Tags shall be white plastic with conductor identification number permanently embossed.

Power conductors feeding 480V or higher rated equipment shall be identified in accordance with paragraph SP-8.1.09.E.2.

H. RACEWAY MARKERS:

Raceway markers shall be 22 gauge minimum thickness, solid Type 316 stainless steel tags with raceway number laser engraved 3/16-inch minimum height characters. Tags

shall be attached to the raceway with Type 316 stainless steel wire. Raceway markers shall be as manufactured by Impact Inc., or approved equal.

I. NAMEPLATES:

(1) Exposed:

Nameplates shall be made from laminated phenolic plastic. The nominal size of the nameplates shall be 3/4 inches high by 2 inches wide. Nameplates shall have black backgrounds with 3/16-inch white letters. If abbreviations are required because of space limitations, abbreviations shall be submitted to DOW prior to manufacture.

Nameplates shall be fastened using self-tapping Type 316 stainless steel screws. The use of adhesives will not be permitted on the outside of enclosures.

(2) Interior:

Nameplates located inside equipment enclosures shall be machine embossed metal tags.

J. PANELBOARDS:

The Contractor shall type in the circuit description on the circuit directory as shown on the final record drawings or panelboard schedule.

Provide "Circuit Directory and Circuit Identification" in accordance with NEC 408.4. Each circuit shall be of sufficient detail to allow each circuit to be distinguished from other circuits. Circuit identification shall include load location and provide equipment or instrument Tag Number and Tag Description, where shown on the drawings.

K. DRY-TYPE TRANSFORMERS (600 VOLTS AND LESS):

(1) Bond/ground transformers per the drawings.

(2) Install transformers on walls or floors at locations shown on the Drawings. Install floor mounted transformers on raised concrete bases. Provide sufficient access and working space for ready and safe operation and maintenance.

(3) Mount transformers so that vibrations are not transmitted to the structural parts of the building or to other equipment. Make connections to transformers with flexible conduit.

(4) Adjust tap settings to provide proper voltage at panelboards.

(5) Ground transformer in conformance with the National Electrical Code.

L. ELECTRIC MOTORS:

(1) Grounding and Bonding

Verify the circuit ground cable (green) is identified and connected to the grounding lug in the motor terminal box.

M. MOTOR CONTROL CENTER:

The motor control center shall be erected in accordance with the recommendations of the manufacturer and with the details specified herein.

Field wiring shall meet the requirements of this Section. Cables larger than No. 6 AWG which hang from their vertical connections shall be supported within 2 feet of the connection.

The solid-state overload relay and soft starter settings shall be implemented by the Contractor with the settings selected based on the actual full load amperes of the motor connected to the starter and the requirements of the motor-driven equipment. Refer to the manufacturer's literature for setting the protection parameters.

Circuit breakers shall be adjusted by the Contractor to the lowest setting not causing false tripping or as otherwise determined by the coordination study.

Install motor control center level and plumb and bolted to concrete housekeeping pad per the manufacturer's installation instructions.

For motor control centers that are to be installed into existing electrical rooms, provide shipping splits as required to allow installation through existing doors and passages to the final mounting locations.

N. TERMINAL BLOCKS:

(1) Power and Control:

Unless otherwise specified, terminal blocks shall be panhead strap screw type. Terminals shall be provided with integral marking strips which shall be permanently identified with the connecting wire numbers as shown on the drawings.

Terminal blocks for P-circuits (power 120-600 volts) shall be rated not less than the conductor current rating and shall not be rated less than 600 volts AC. Terminal blocks for C-circuits (control and/or 120 volts or less power) shall be rated not less than 20 amperes and shall not be rated less than 600 volts AC.

(2) Signal and Instrumentation:

Terminal blocks for S- and J-circuits (signal and instrumentation) shall be rated not less than 20 amperes at 300 volts AC. Terminals shall be tin-plated. Signal and instrumentation terminal blocks shall be cage-clamp spring type, Wago Corporation, Phoenix Contact, or approved equal.

O. INDICATING LAMP COLORS:

Unless otherwise noted, the following color code and inscriptions shall be followed for service legends and lens colors of all indicating lights:

Function	Inscription	Color
Open	Open	Red
Closed	Closed	Green
Fail	Fail	Amber
Warning Alarm	******	Amber
Auto	Auto	Yellow
Manual	Manual	White
Local	Local	White
Remote	Remote	Blue
Control Power On	Control Power	White
Run	Run	Red
Ready	Ready	Green
Stopped	Stopped	Green
Supervisory	On Supervisory	White

P. PUSHBUTTON COLORS:

Unless otherwise noted, the following color code and inscriptions shall be followed for all pushbuttons:

Function	Inscription	Color
Reset	Reset	Red
Emergency Stop	E-Stop	Red
All Others	As Required	Black

Q. CONTROL STATIONS, AND SAFETY DISCONNECT SWITCHES:

Control stations, contactors and safety disconnect switches shall be mounted 48 inches above the floor, ground, or slab to center of device.

R. EQUIPMENT FINISH:

Unless otherwise specified, electrical and instrumentation equipment and materials shall be coated by the equipment manufacturer as specified below.

(1) Finish: Electrical equipment shall be treated with zinc phosphate, bonderized or otherwise given a rust-preventive treatment. Equipment shall be primed, coated with enamel, and baked. Minimum dry film thickness shall be 3 mils.

Before final acceptance, the Contractor shall touch up scratches on equipment with identical color coating. Finish shall be smooth, free of runs, and match existing finish. Prior to touching up scratches, Contractor shall fill them with an appropriate filler material approved by DOW

(2) Color: Exterior color of electrical equipment shall be FS 26463 (ANSI/NSF 61) light gray. Interior shall be painted FS 27880 white. Nonmetallic electrical enclosures and equipment shall be the equipment manufacturer's standard grey color.

Exterior color of instrumentation panels and cabinets mounted indoors shall be FS 26463 light gray; unless otherwise specified, exterior color for cabinets mounted outdoors shall be FS 27722, white. Cabinet interiors shall be FS 27880, white.

S. TESTING:

(1) General:

Prior to energizing the electrical circuits, the following tests shall be performed. Unless otherwise specified, a 1,000 volt megohmmeter shall be used for insulation resistance measurements. This testing shall be done for new conductors and existing conductors that are physically re-installed in raceways or trays.

The test measurements shall be recorded on the specified forms and provided in accordance with submittal requirements specified in this Section.

DOW reserves the right to witness testing activities. The Contractor shall notify DOW not less than 48 hours prior to the commencement of any testing activity.

(2) Insulation Resistance Measurements:

a. General: Insulation resistance measurements shall be made on conductors and energized parts of electrical equipment. Minimum acceptable values of insulation resistance shall be in accordance with the applicable ICEA, NEMA, or ANSI standards for the equipment or material being tested, unless otherwise specified. The ambient temperature at which insulation resistance is measured shall be recorded on the test form. Insulation resistance measurements shall be recorded in a format similar to Form SP-7-A, contained in Section SP-8.1. Insulation with resistance of less than 10 megohms is not acceptable.

b. Conductor and Cable Tests: The phase-to-ground insulation resistance shall be measured for all circuits 120 volts and above, except lighting and receptacle circuits. Measurements may be made with motors and other equipment connected, except that solid state equipment shall be disconnected unless the equipment is normally tested by the manufacturer at voltages in excess of 1000 volts DC.

c. Motor Tests: The Installed Motor Test Form, SP-7-B, contained in Section SP-8.1, shall be completed for each motor after installation. All motors shall have their insulation resistance measured before they are connected. Motors 60 HP and larger shall also be tested in accordance with Section SP-8.1.10.H.7. Insulation resistance values less than 10 megohms are not acceptable.

(3) Prefunctional Checkout:

Prior to functional testing, all protective devices shall be adjusted and made operative. Prior to energization of equipment, the Contractor shall perform a functional checkout of the control circuit. Checkout shall consist of energizing each control circuit and operating each control, alarm or malfunction device, and each interlock in turn to verify that the specified action occurs. The Contractor shall provide a description of the proposed functional test procedures prior to the performance of functional checkout.

The Contractor shall verify that motors are connected to rotate in the correct direction. Verification may be accomplished by momentarily energizing the motor, provided the Contractor confirms that neither the motor nor the driven equipment will be damaged by reverse operation.

T. ELECTRICAL EQUIPMENT LABELING:

Electrical equipment shall have field marked signs and labeling to warn qualified persons of the potential electric arc flash hazards per NEC Article 110.16 Flash Protection.

Electrical equipment shall have NFPA 70E labels installed stating the results of the Arc Flash analysis specified in SP-7.8 Arc Flash Hazard Analysis and Short Circuit/Coordination Study.

Electrical distribution equipment and utilization equipment shall be field labeled to identify the power source and the load as specified. Refer to NEC Article 110.22 for Identification of Disconnecting Means installation criteria. Specific information is required such as the equipment tag number and equipment description of both the power source and the load equipment.

U. FINISHING:

(1) Structural and architectural elements cut or drilled for installation of electrical system or otherwise affected by work shall be patched, repaired, and restored to the satisfaction of DOW at no additional cost to DOW. Drilling, cutting, patching, repairing, and restoring subject to approval and satisfaction of DOW.

(2) Attachment of electrical equipment to wood by wood screws. Attachment to concrete by embedded or expansion inserts and bolts. Powder charge driven fasteners shall be used <u>only</u> with the <u>approval</u> of DOW. Close all unused knockouts on boxes or enclosures with metal cap.

(3) Wipe clean all exposed raceways and enclosures with rag and solvent. Raceways shall be painted in accordance with this Section. Factory finished enclosures that have been damaged during installation shall be retouched to match the original finish. Panelboards shall be identified by stenciling with paint on back of doors the voltage and designation. Voltage ratings stenciled on the front of disconnect switches and junction boxes where wires are terminated for connection to equipment that are not part of this contract.

(4) Blockouts in concrete and masonry walls for raceways and cables shall be sealed following final testing. Cables passing through such blockouts shall be spread evenly to limit heat build-up.

8.1.10 EQUIPMENT AND FUNCTIONAL TESTING REQUIREMENTS

Functional testing of electrical equipment shall be coordinated with DOW. Testing shall be conducted over a period of not less than seven (7) days to verify correct operation. If any equipment should fail to operate properly within this 7-day period, the Contractor shall correct the installation, and the 7-day test period shall restart (equipment must operate continuously without issue or failure for not less than 7 days). Seven-day functional testing requirement shall apply to all electrical equipment at time of commissioning, including temporary systems.

Electrical tests shall be conducted per the requirements specified in the NETA Acceptance Testing Specifications (NETA ATS), current edition, as described and/or modified within this Section. Testing shall be conducted by a NETA qualified testing agency or major equipment vendor (Siemens, GE, Eaton, Square D or approved equal) as described in the NETA Acceptance Testing Specifications except as noted elsewhere within this Section. Where the testing agency is referred to in this specification, it shall be in reference to this NETA qualified testing firm.

Testing specified within this Section shall include all electrical equipment specified in SP-8, all electrical rotating equipment, and any power distribution electrical apparatus specified under other specification sections in this Contract. Where testing in accordance with this Section is required, the required tests, including correction of defects and retesting, shall be completed prior to energization of material, equipment, or systems.

A. SUBMITTALS:

Submittal requirements for equipment and functional testing specified in Section SP-8.3.

B. TESTING EQUIPMENT AND MATERIALS:

Test instruments shall be calibrated to references traceable to the National Institute of Standards and Testing and shall have a current sticker showing date of calibration per manufacturer's specifications, deviation from standard, name of calibration laboratory and technician, and date of recalibration.

C. DIVISION OF RESPONSIBILITY:

Contractor responsibilities for providing information required by the testing agency that are listed in NETA ATS are as follows:

(1) The Contractor shall provide an approved copy of the short-circuit analysis, coordination study, arc flash report, and protective device setting report that are specified in SP-7.8.

(2) The Contractor shall provide the required equipment instruction manuals requested by the testing agency.

(3) The Contractor shall provide a copy of the list of equipment that will be tested under this Contract.

(4) The Contractor shall be responsible for providing suitable power for testing as required by the testing agency.

(5) The Contractor shall be responsible for coordinating the scheduling of testing with the testing agency and shall be responsible for ensuring that equipment is prepared as required for testing by the testing agency.

(6) The Contractor shall be responsible for providing the site-specific hazard and safety training called for in NETA ATS.

(7) Testing agency responsibilities shall be as listed in NETA ATS.

(8) The Contractor shall provide a set of up-to-date Contract Documents for the testing agency.

D. SAFETY, TEST EQUIPMENT CALIBRATION, AND REPORTS:

Conform to the safety requirements specified in NETA ATS.

Test equipment shall be calibrated to the requirements specified in NETA ATS.

Test reports shall include all of the requirements listed in NETA ATS. Equipment Identification shall include the equipment name and number per the project standards.

E. THERMOGRAPHIC SURVEYS:

In the following specified testing for bolted connections, a choice is generally given for testing via thermographic means or millivolt drop testing or torque tightening verification. In such cases, either the millivolt drop test or torque tightening verification shall be conducted in addition to the thermographic scan. Thermographic scan testing shall be completed near the end of construction or during the commissioning phase of the project. At a minimum the new equipment must be subject to normal load conditions when the thermographic scan takes place.

F. OPTIONAL TESTS:

Testing requirements referenced in these specifications include all of the NETA ATS applicable test requirements for the equipment type. Tests identified as optional in the NETA ATS documents are required only where specifically called for in these specifications.

G. TEST REPORTS:

(1) Provide test reports in conformance with the NETA specifications for test reports and utilize the test forms in this Section as the basis for developing the test forms for this project.

(2) Use the project full equipment name and equipment number for equipment identification.

(3) Provide a copy of the final test report in electronic Microsoft Office Word format on CD ROM. Images in the report may be in JPEG or Adobe Acrobat PDF format.

H. TESTING:

(1) Low Voltage Dry Type Transformers:

Perform all testing as specified in the NETA ATS Low Voltage, Small, Dry Transformer testing requirements.

(2) Low Voltage Cable, 600V Maximum:

a. Low voltage cable testing shall include all low voltage power and control circuits operating at 120V or higher except for circuits that feed lights or receptacles.

b. Perform testing per NETA ATS requirements for low voltage conductors.

(3) Molded Case Circuit Breakers:

Test molded case circuit breakers in motor control centers and 480V distribution panels to the requirements called for in the NETA specifications for testing molded case circuit breakers.

a. Primary current injection testing will be required only for main and tie breakers and for feeder breakers or motor circuit protectors rated 100A or more.

b. Test ground fault features per NETA ATS ground fault testing requirements.

(4) Instrument Transformers:

Test per NETA ATS requirements for instrument transformers.

(5) Metering:

a. Test metering devices per NETA ATS requirements.

(6) Grounding Systems:

a. Test grounding per NETA ATS requirements.

b. Fall of potential testing shall be conducted for each building grounding system.

c. The Contractor shall test each grounding connection to determine the ground resistance. The grounding test shall be IEEE Standard 81. A plot of ground resistance readings for each isolated ground rod or ground mat shall be provided to DOW on 8-1/2 x 11-inch size graph paper. The current reference rod shall be driven at least 100 feet from the ground rod or grid under test. The measurements shall be made at 10-foot intervals beginning 25 feet from the test electrode and

ending 75 feet from it, in direct line between the ground rod or center of grid and the current reference electrode.

d. A grounding system that shows greater than 2 ohm resistance for the flat portion of the plotted data shall be considered inadequately grounded. The Contractor shall add additional parallel connected ground rods and/or deeper driven rods until the ground resistance measurements meet the 2 ohm requirement. Ground rods required over those specified will be paid for as extra work. Use of salts, water, or compounds to attain the specified ground resistance is not acceptable.

(7) Electric Motors:

a. Insulation resistance testing shall be performed for new motors 50 horsepower and larger and any variable frequency drive powered motors. Tests for acceptability will be made using a 1,000V megohm meter (megger). Interpretations of test results for minimum acceptable values of insulation resistance will be made in accordance with IEEE No. 43. All deficiencies shall be corrected by the Contractor at no cost to DOW.

b. All motors operating at 480V or higher shall be tested per NETA ATS specifications for rotating machinery testing.

c. Verify that motors are connected to rotate in the correct direction with the load disconnected. Verification may be accomplished by momentarily energizing the motor, provided the Contractor confirms that neither the motor nor the driven equipment will be damaged by reverse operation.

d. Motor running current shall be measured on each phase with the motor operating under load. Current imbalance shall be less than 5 percent difference between phases.

(8) Low Voltage Motor Starters:

a. Test low voltage motor starters per NETA ATS specifications.

b. Verify that the solid-state overload settings are correct per the motor nameplate data.

c. Discrete remote control features shall be tested to the extent that they can be tested from the terminals of equipment provided in the motor control centers.

(9) Motor Control Centers:

Test motor control centers per NETA ATS specifications, motor control centers, and the related sections for components.

(10) Low Voltage Switchboards:

Test low voltage switchboards per NETA ATS specifications, low voltage switchboards, and the related sections for components.

(11) Capacitors:

Test power factor capacitors per NETA ATS specifications.

I. FUNCTIONAL TESTING:

(1) Electrical function testing may be performed by qualified electricians (not required to be done by an independent test agency) or by the independent testing agency specified under this Section.

(2) Submit a description of the functional test procedure prior to the performance of the functional checkout.

(3) Perform the functional test per NETA ATS specifications for function tests and the requirements of this paragraph prior to energization of the equipment.

(4) Application specific electrical functional performance testing of equipment is described in the individual equipment specifications.

J. LOOP WIRING AND INSULATION RESISTANCE TESTING:

(1) Electrical power and signal cable ring-out and resistance testing. Conducted in accordance with Section SP-8.1. Wiring tests shall not be conducted until cables have been properly terminated, tagged and inspected.

a. Power and Control: Per Section SP-8.1.

b. Signal: Test form SP-8-E.

8.1.11 RECORD DOCUMENTS:

Record documents refer to those documents maintained and annotated by the Contractor during construction, and include all Contract Drawings marked up with any RFI and submittal changes along with original submittal drawings.

8.1.12 MEASUREMENT AND PAYMENT:

A. COMPENSATION: No separate payments will be made for the work covered by this section of these specifications. All costs in connection with furnishing and installing of the various items in accordance with standard practice, the details shown on the drawings and in accordance with these specifications, shall be included in the lump sum price of which the item is a part.

B. KAUA‘I ISLAND UTILITY COOPERATIVE (KIUC) COSTS:

The Contractor shall pay for all KIUC installation costs associated with this project.

KIUC work at Kīlauea Wells shall include but not be limited to:

(1) Disconnection of existing secondary cables

(2) Termination of new secondary cables

(3) De-energization and re-energization of the existing transformer

(4) Installation of new KIUC meter and instrument transformers, including all associated wiring and connections.

(5) Removal of the existing KIUC meter.

(6) Assistance with modifications to the existing transformer pad for additional conduits to be installed for the new service, including lifting the transformer, if required.

SP-8-A. WIRE AND CABLE RESISTANCE TEST DATA FORM:

Wire or Cable No.:_____ Temperature, ºF _____

Location of Test	Insulation resistance, megohms
1.	
2.	
3.	
4.	
5.	
6.	
7	

.

CERTIFIED _____ Date _____
Contractor's Representative

WITNESSED _____ Date _____
DOW's Representative

SP-8-B. INSTALLED MOTOR TEST FORM:

Motor Equipment Number _____ Date of Test _____

Equipment Driven _____

MCC Location _____

				Ambient temp	ºF
Resistance:					
Insulation resistance phase-to-ground megohms:					
Phase A		Phase B		Phase C	
Current at Full Load:					
Phase		Current, amps			
Phase		Current, amps			
Phase		Current, amps			
Thermal Overload Device:	Manufacturer/catalog #		Amperes		
Circuit breaker (MCP) setting:					

Motor Nameplate Markings:

Mfr		Mfr Model		Frame		HP	
Volts		Phase		RPM		Service factor**	
Amps		Freq		Ambient temp rating			ºC
Time rating				Design letter**			
	(NEMA 1-10.35)				(NEMA MG-1.16)		
Code letter				Insulation class			

**Required for 3-phase squirrel cage induction motors only.

CERTIFIED _____ Date _____
Contractor's Representative

WITNESSED _____ Date _____
DOW's Representative

SP-8-C. DRY TRANSFORMER TEST DATA FORM:

(Note: Use Data Form for dry type transformers with voltage rating of 600 Vac or less and sizes to 167 kVA single phase and 500 kVA three phase. Use NETA Test Forms and Test Procedures for higher voltages and larger transformers.)

Equipment Tag No.: _____ Temperature Rating: _____

Description/Location: _____ Feeder size/Source: _____

Primary Voltage: _____ Secondary Voltage: _____ Winding Connection: _____

A. VISUAL INSPECTION

Transformer Inspection	Pass	Fail	Note
1. Nameplate data as specified			
2. Mechanical condition			
a. Free of dents and scratches			
b. Anchored properly			
c. Shipping brackets removed			
d. Spacing from wall per nameplate			
3. Grounding *			
a. Equipment grounding			
b. System grounding			

B. INSULATION-RESISTANCE TESTS: Perform tests with calibrated megohmmeter. Apply 1000 Vdc test voltage for 60 seconds and record readings in megohms at 30-seconds and 60-seconds intervals.

Test Group	Resistance between		30-second reading	60-second reading	Absorption Ratio Index 60-sec. / 30-sec.
Primary Winding to ground	A	GRD			
	B	GRD			
	C	GRD			
Secondary Winding to ground with * N-G Bond removed	a	GRD			
	b	GRD			
	c	GRD			
Primary Winding to Secondary Winding	A	a			
	B	b			
	C	c			

Submit resistance readings to DOW immediately after the tests that are less than the manufacturer's recommended value or less than 10-megohms. Record the Absorption Ratio Index values for future reference. Ratio must be 1.0 or greater, with infinity (∞) equal to 1.0.

CERTIFIED (Contractor's Representative): _____ Date _____

WITNESSED (DOW's Representative):_____ Date:_____

SP-8-D. MOTOR CONTROL CENTER/MOTOR CONTROLLER SWITCHBOARD TEST FORM:

Equipment No. _____ Ambient room temperature _____

Location _____

A. MECHANICAL CHECK:

All bolted connections either bus to bus or cable to bus shall be torqued to the manufacturer's recommendations.

B. ELECTRICAL TESTS:

(1) Measure insulation resistance of each bus section phase to phase and phase to ground for 1 minute using a megohmmeter at 1000 volts.

Test results (megohms)			
Phase		Phase	
A-GRD		A-B	
B-GRD		B-C	
C-GRD		C-A	

(2) Set the circuit breaker in the starter unit to comply with the requirements of NEC, Article 430-52 and Table 430-152.

(3) Motor overload heater elements shall be sized and installed based on the actual nameplate full load amperes of the motor connected to the starter.

CERTIFIED _____ Date _____
Contractor's Representative

WITNESSED _____ Date _____
DOW's Representative

SP-8-E. LOOP WIRING AND INSULATION RESISTANCE TEST DATA FORM:
Loop No.: _____
List all wiring associated with a loop in table below. Make applicable measurements as indicated after disconnecting wiring.

Wire No.	Panel Tie	Field TB	Continuity Resistance [a]		Insulation Resistance[b]			
			Cond./ Cond.	Cond./ Shield	Shield/ Gnd.	Shield/ Cond.	Cond./ Gnd.	Shield/ Shield
A			--	(A/SH)				
B			(A/B)	--				
C			(A/C)	--				
D			(A/D)	--				
etc.								

NOTES:

a. Continuity Test. Connect ohmmeter leads between wires A and B and jumper opposite ends together. Record resistance in table. Repeat procedure between A and C, A and D, etc. Any deviation of ±2 ohms between any reading and the average of a particular run indicates a poor conductor, and corrective action shall be taken before continuing with the loop test.

b. Insulation Test. Connect one end of a 500-volt megger to the panel ground bus and the other sequentially to each completely disconnected wire and shield. Test the insulation resistance and record each reading.

CERTIFIED _____ Date _____
Contractor's Representative

WITNESSED _____ Date _____
DOW's Representative

END OF SECTION

SECTION SP-8.2 SCOPE OF WORK

Provide all articles, materials, equipment, operations, and services herein or on drawings, including all labor, materials, taxes, fees, insurance, and incidentals required to ensure completion.

8.2.01 TEST COMPLETE INSTALLATION: Installation shall be complete in every detail as specified and ready for use. Any item supplied by the Contractor developing defects within one year of final acceptance by DOW shall be replaced by such materials, apparatus, or parts to make such defective portion of the complete system conform to the true intent and meaning of these Drawings and Specifications, at no cost to DOW.

8.2.02 WORK SHALL INCLUDE:

A. Remove existing primary and secondary motor control centers from the existing well pump control building.

B. Remove existing power factor correction capacitors and disconnects for each well pump.

C. Remove existing interior and exterior light fixtures at the well pump control building, including associated conduits, wiring, and light switches. Remove existing general-use receptacles and air compressor receptacle in the well pump control building and associated conduits and wiring.

D. Remove existing door security switches and associated junction boxes, conduits, and wiring at the well pump control building.

E. Remove existing 4-20mA signal wiring for the well level transmitters W10 and W20 and well flow transmitters W12 and W22 from the transmitters back to RTU 82. Remove associated exposed conduits within the control building. Existing exterior conduits back to the RTU shall remain.

F. Field-verify sizes, contents, and routing of existing conduits between the control building and RTU 82 prior to demolition work. Provide existing as-built information to DOW and verify circuits required to be maintained.

G. Remove existing disconnect switch at each well pump. Remove existing control junction boxes, flexible conduit, and wiring associated with solenoid valves and instruments, except pressure and flow transmitters, at each well pump. Remove existing conduit stub-ups back past the underground elbow at each pump area.

H. Remove existing electrical service conductors from the KIUC transformer.

I. Provide temporary electrical equipment, including motor control center, to maintain operation of two well pumps, two chlorine booster pumps, and existing miscellaneous control building 120V loads. Provide panelboard PNL-A in the control building to serve building 120V loads. Provide all temporary conduit and wiring to supply existing electrical equipment from the temporary MCC.

J. Modify existing service panelboard/manual transfer switch to tap existing bus and provide a temporary feeder to the temporary MCC, including all conduit and wiring.

K. Provide temporary SCADA RTU connections, including conduit, wiring, and terminal cabinets, where required, to maintain communication of all existing I/O points for control of the well pumps, control of the chlorination system, monitoring of process variables, site security, and other remote control and monitoring functions.

L. Decommission and remove temporary equipment when no longer required. Salvage and provide equipment to DOW.

M. Furnish and install all new electrical equipment at the new generator shelter building, including KIUC pullbox and metering equipment, service panelboard, generator terminal cabinet, 208/120V panel PNL-B, lighting, receptacles, door intrusion switches, all associated conduit and wiring, and all other appurtenances and incidentals.

N. Install new electric service ductbank, including underground concrete-encased conduit and wiring, from the existing KIUC transformer to the KIUC pullbox and metering equipment at the new generator shelter. Install new electric service conduit and wiring from the KIUC metering equipment to the service panelboard.

O. Install all new electrical ductbank, including underground concrete-encased conduit and wiring, from the new generator shelter to the existing well pump control building. Ductbank shall include both power and controls/signal conduits and wiring.

P. Furnish and install new motor control center within the existing well pump control building. Motor control center shall include one reduced-voltage solid state motor starter for each well pump, one full-voltage non-reversing motor starter for each chlorine booster pump, power monitoring equipment, and feed to panelboard PNL-A for supplying site 120V loads.

Q. Provide new SCADA termination cabinet to terminate and relay I/O points from the well pump control building to the existing SCADA RTU cabinet. Provide all associated conduit, boxes, and wiring.

R. Provide new 4-20mA signal wiring from existing well level transmitters and well discharge flow transmitters to RTU 82. Provide new conduits for signal wiring within the control building and tie in to existing exterior conduits back to RTU 82.

S. Provide new door security switches and associated conduits, junction boxes, and wiring at the well pump control building.

T. Provide all new lighting at the well pump control building, including conduits, wiring, and switches. Provide new receptacles for general use and for the existing air compressor, including new conduits and wiring.

U. Provide all conduit, wiring, and terminations to serve miscellaneous control building 120V loads (currently fed from Panel "P") from panel PNL-A.

V. Provide two new non-fused disconnect switches and all conduit, wiring, and terminations to maintain control and power to the existing chlorination system, including both chlorine booster pumps and metering pumps.

W. Provide building grounding systems at both the generator shelter and the well pump control building. Provide a grounding system for the temporary MCC tied to the well pump control building grounding system.

X. Provide new equipment at each well pump, including new outdoor-rated stainless steel fused disconnect switch, controls junction box, equipment supports, conduits, and wiring.

Y. Where required, obtain approvals and coordinate all work with KIUC.

Z. Establish work sequencing, obtain DOW approval, and perform work accordingly to maintain DOW's minimum operational requirements for the station.

8.2.03 ELECTRICAL SEQUENCING CONSTRAINTS:

A. GENERAL COMMENTS: The contract documents, including the Electrical Work Sequence on Drawing E-006, describe individual work activities and their associated constraints that the Contractor shall include in planning and scheduling the Contract Work in accordance with the given milestones. The Contractor shall submit his own construction schedule and work sequencing plan detailing the order in which activities are to be performed. This shall include shutdown requirements and outage durations for review and approval by the DOW. The proposed construction schedule and sequence that activities follow shall ensure that the frequency and duration of planned outages are minimized. General criteria are as follows:

(1) The DOW shall be notified in writing at least fourteen (14) calendar days in advance of any planned outages.

(2) Work sequences/cutovers shall be done during DOW approved work hours on Monday through Thursday.

(3) Complete station outages shall be limited to no more than 8 hours. The contractor shall restore operation of the station to the satisfaction of DOW at the end of each working day prior to leaving the site.

(4) A minimum of one well pump and associated chlorination system shall be operational for the entire duration of construction, except during scheduled complete station outages. Normal operation of the station throughout construction shall maintain both well pumps and associated chlorination system in service via existing, temporary, or new motor control equipment.

(5) Prior to energizing electrical equipment, testing shall be performed in accordance with manufacturer recommendations and the specifications.

8.2.04 OPERATIONAL TESTING:

A. Following the final installation phase, the Contractor shall conduct operational tests to demonstrate that the installed equipment operates according to the plans and specifications. The DOW shall be notified at least seven (7) calendar days in advance of the tests so that the DOW or his designated representative can be present to witness the

testing. All conditions of operation of the following installations as applicable shall be tested.

(1) The motor control center and the pump motor starters and control equipment.

(2) Surge protective devices.

(3) Telemetering and supervisory control equipment.

(4) Valve control and auxiliary equipment.

(5) Meters, monitors, indicators, and displays.

(6) Any built-to-order equipment.

B. The Contractor shall be responsible for coordinating these tests with the General Contractor and any other subcontractor or supplier required to be present during the tests. The Contractor shall furnish all necessary measuring or recording equipment for the tests. If there are any failures during the test, the Contractor shall make such repairs or replacements as required at no cost to DOW and shall reinitiate the test.

8.2.05 OTHER WORK INCLUDED:

A. Concrete, forming, excavation, backfilling and painting provided by respective sections of this contract.

B. Equipment utilizing electricity shall be provided by respective sections of this contract. Installation of equipment complete with power wiring and electric controls and interlock wiring shall be part of Electrical Work.

8.2.06 MEASUREMENT AND PAYMENT: No separate payments will be made for the work covered by this section of these specifications. All costs in connection with furnishing and installation of the various items in accordance with standard practice, the details shown on the drawings and in accordance with these specifications shall be included in the Lump Sum Price of which the item is a part.

END OF SECTION

SECTION SP-8.3 – SUBMITTALS

Each submittal covered under SP-8 shall be thoroughly reviewed by the Contractor responsible for SP-8 work. The Contractor shall provide review comments attached to the submittal identifying compliance or non-compliance with the SP-8 specifications. The Contractor shall be responsible to verify that submittals meet specified requirements. Submittals shall be partitioned by specification section.

Submittal information for SP-8 submittals including but not limited to catalog cuts and other such formatted materials shall be assembled in a three-ring binder(s) for hardcopy submittals. All electronic submittals shall be submitted through DOW's PM Web System. Each SP-8 Section requiring a submittal shall be separated by section tabs or bookmarks. Multiple submittals for a single SP-8 Section is unacceptable. Hardcopy and electronic submittals shall contain a cover sheet, indexed by Sections. Sections shall contain an index sheet with equipment listed and cross-referenced to the appropriate specification paragraph.

Submittals shall be made for approval and resubmitted until approval is received for the following:

8.3.01 COPIES OF SP-8 SPECIFICATION SECTIONS:

A copy of all SP-8 specification sections, with addendum updates included, and all referenced and applicable sections, with addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements. Check marks (✓) shall denote full compliance with a paragraph as a whole. If deviations from the specifications are indicated, and therefore requested by the Contractor, each deviation shall be underlined and denoted by a number in the margin to the right of the identified paragraph, referenced to a detailed written explanation of the reasons for requesting the deviation. The DOW shall be the final authority for determining acceptability of requested deviations. The remaining portions of the paragraph not underlined will signify compliance on the part of the Contractor with the specifications. Failure to include a copy of the marked-up specification sections, along with justification(s) for any requested deviations to the specification requirements, with the submittal shall be sufficient cause for rejection of the entire submittal with no further consideration.

8.3.02 CATALOG CUTS:

A. Submit for approval one (1) hard copy and one (1) electronic copy of the catalog cuts of the following equipment:

(1) Junction Boxes

(2) Pullboxes

(3) Conduits, including PVC coated GRS

(4) Conductors and Cables

(5) Panelboards

(6) Disconnect Switches

(7) Cabinets

(8) Motor Control Center

(9) Generator Connection Cabinet

(10) Surge Protective Devices

(11) Power Monitors

(12) Reduced Voltage Solid State Starters (Soft Starters)

(13) Power Factor Correction Capacitors, Capacitor Circuit Breakers, and Capacitor Contactors

(14) Control Devices and Instrumentation

(15) Light Fixtures and Lighting Control Devices

(16) Metering Equipment

(17) Any Built-to-Order Equipment

B. Catalog information for SP-8 submittals shall be manufacturer's catalog descriptive literature with identifying arrows pointing to the specific equipment, devices, and materials to be supplied for the individual specification sections. Catalog information shall include technical specifications and application information, including NEMA and electrical ratings, range, weight, accuracy, etc. Catalog cuts shall be edited to show only the items, model numbers, and information which apply.

8.3.03 EQUIPMENT AND MATERIAL SPECIFIC REQUIREMENTS:

A. RACEWAYS, BOXES, AND SUPPORTS:

(1) Design details and materials for fire stopping.

B. PANELBOARDS:

(1) Manufacturer's certification that bus bracing can withstand the specified short circuit condition.

(2) Quantity and rating of circuit breakers provided with each panelboard.

(3) Panel ratings, bus ampacities, schedule of branch breakers provided, and ground and neutral configuration.

(4) Information required to support the short circuit and coordination and arc flash study specified in Section SP-8.8.

C. DRY-TYPE TRANSFORMERS (600 VOLTS AND LESS):

(1) Information required to support the short circuit and coordination and arc flash study specified in Section SP-8.8.

D. MOTOR CONTROL CENTER:

(1) Elementary connection and interconnection diagrams for each starter unit and an interconnection diagram for the entire MCC, in accordance with NFPA 79 and/or NEMA ICS 18 Part 1 standards.

(2) Time current curves for all protection devices.

(3) List of starters and feeder tap compartments indicating the size and type of circuit protection.

(4) Interrupting, withstand, and continuous current rating of:

a. Bus bars

b. Feeder tap units

c. Starter units

d. Main incoming units

(5) Soft starter wiring schematics complete with wire numbers

(6) Manufacturer's certification and calculations that the equipment complies with the seismic requirements of Section SP-8.6.

(7) Information required to support the short circuit and coordination and arc flash study specified in Section SP-8.8.

(8) Results of factory tests as specified within this Section.

(9) Nameplate schedule.

(10) Dimensioned drawings showing conduit access locations.

(11) Front view elevation with starter and component schedule.

8.3.04 SHOP DRAWINGS:

A. Prior to fabrication, the Contractor shall submit for written approval of DOW one (1) hard copy and one (1) electronic set of complete material and installation drawings, control and connection wiring diagrams, installation details, internal and external layout drawings showing all components and dimensions, nameplate legend with engraving and sizes, and manufacturer's wiring diagrams for any built-to-order equipment and panels, including the MCCs and generator connection cabinet.

B. Where the Contractor is required to provide information on drawings as part of the specified work, such drawings shall be prepared in AutoCAD 2011 format (.dwg) and shall be provided on DVDs or in electronic format and on 22 inches x 34 inches bond paper complete with borders and title blocks clearly identifying project name, equipment, and the scope of the drawing. Drawing quality and size of presentation shall be such as to permit 50 percent reduction (11 inches x 17 inches) of such drawings for insertion in operation and maintenance manuals. 11 inches x 17 inches size drawings may be provided in lieu of 22 inches x 34 inches if approved by DOW. Contractor shall provide hardcopy plots of all drawing files submitted.

8.3.05 ELECTRICAL INSTALLATION DRAWINGS: At least twenty (20) working days prior to any testing, the Contractor shall submit one (1) complete hard copy and one (1) electronic set of approved electrical installation drawings to DOW. The installation drawings shall include manufacturer's wiring diagrams for any built-to-order equipment.

8.3.06 PRE-TEST CHECKLIST:

A. The following information shall be provided prior to commencing electrical and instrumentation equipment and functional testing:

(1) Proposed testing procedures including proposed test report forms and listing of equipment that will be tested.

(2) Test report including documentation for all tests performed. Utilize test forms referenced in Section SP-8.1.

(3) Execution plan including schedule.

(4) Name and qualifications of the independent testing firm that will be performing the testing work. Submitted information shall confirm that qualifications are to NETA ATS requirements.

B. Prior to the startup or testing of the pumps, the Contractor shall submit a checklist of all field adjustable pump control devices. The list shall include but not be limited to the actual settings of all time delay relays and the solid-state starter ramp-up and ramp-down timing.

8.3.07 PRODUCT DATA:

The following information and product data specified under individual specification sections shall be provided once equipment and materials submitted have received favorable review dispositions:

A. Applicable operation and maintenance information on an item-by-item basis. Operation and maintenance information shall be provided at the time of equipment, device, or material site delivery, or at a certain stage of project completion as required by DOW, whichever is earlier. Full-size drawings shall be reduced to 11 inches x 17 inches.

(1) All vendor supplied operations and maintenance manuals must be written in English.

(2) All vendor supplied operations and maintenance manuals must be submitted in an electronic file format on a Microsoft Windows compatible CD-ROM or DVD-ROM.

(3) Three (3) identical hardcopies of each vendor-supplied operations and maintenance manual must be submitted.

(4) All submitted CD-ROMs or DVD-ROMs must have a professional quality label that includes, at a minimum, a descriptive title, the name of the vendor or supplier, and a date of creation.

(5) O&M information shall contain the names, addresses, and telephone numbers of the manufacturer, the nearest representative of the manufacturer, and the nearest supplier of the manufacturer's equipment and parts.

B. Test results for motors and electrical systems on the forms specified in Section SP-8.1. A file of the original test results shall be maintained by the Contractor. Prior to acceptance of work, the resulting file shall be provided to DOW.

C. Description of functional checkout procedures specified under Section SP-8.1, shall be provided 14 days prior to performing functional checkout tests.

D. Record documents specified in Section SP-8.1.

E. Equipment and Material Specific Requirements:

(1) Grounding System: Ground resistance readings specified in Section SP-8.1.

(2) Dry-Type Transformers (600 Volts and Less)

a. Manufacturer’s verification that the unit has been built and tested in accordance with the specified ANSI standards.

b. Manufacturer’s verification of the sound levels, if different from the specified NEMA ST20 standards.

(3) Lighting Fixtures

a. IES lighting design files for use in lighting design software.

b. Manufacturers’ warranties as specified in Section SP-8.10.

(4) Motor Control Center

a. Results of field tests as specified within Section SP-8.1.

b. Manufacturer's certification that the following items are capable of interrupting and/or withstanding the specified short circuit condition:

1) Bus bar bracing

2) Feeder tap units

3) Starter units

c. Dimensions and weights.

8.3.08 AS-BUILT DRAWINGS:

A. Upon completion of the final inspection and testing, the Contractor shall provide one (1) hard copy and one (1) electronic set of as-built installation drawings and manufacturer's wiring diagrams for any built-to-order equipment to DOW.

B. Record drawings shall be updated to include all field labelled terminal numbers and conductor tags to match actual equipment supplied and installed.

8.3.09 MEASUREMENT AND PAYMENT: No separate payments will be made for the work covered by this section of these specifications. All costs in connection with furnishing and installation of the various items in accordance with standard practice, the details shown on the drawings, and these specifications shall be included in the lump sum price of which the item is a part.

END OF SECTION

SECTION SP-8.4 – EXTERIOR WORK

Materials, equipment, and construction methods specified in other paragraphs of the specifications for Electrical Work shall apply to the exterior work.

8.4.01 EXTERIOR WIRING SYSTEMS:

A. The table below specifies the type of raceway required for each location and application.

Location	Application/Condition	RACESPEC
Outdoor	Exposed	GRS
Outdoor	Exposed transition from below grade or slab, minimum 6" above finish grade or slab	PRS
Concealed	Power and signal circuits embedded in concrete structure	PVC4
Underground	Power and signal circuits encased in concrete duct bank	PVC4
Outdoor	Exposed (only where specifically required to be PVC)	PVC8

B. GALVANIZED RIGID STEEL CONDUITS (GRS): Conduit shall be rigid steel, hot-dip galvanized after fabrication inside and out, round bore with smooth finished surfaces, ANSI and UL compliant. 3/4-inch minimum diameter unless otherwise specified. Conduit unions shall be made with threaded fittings; compression couplings are not acceptable. Prime and paint all new exposed conduits in accordance with manufacturer's instructions and SP-8.1. Acceptable manufacturers shall be Allied Tube and Conduit Corp., Wheatland Tube Co., or approved equal.

C. POLYVINYL CHLORIDE (PVC) CONDUIT: PVC conduit shall be round bore, smooth inside finish, electrical type. For normal duty, commercial grade Schedule 40 (PVC4) shall be provided. For installation in areas exposed to damage, or as specified above, commercial grade Schedule 80 PVC (PVC8) shall be provided. PVC conduit shall be NEMA TC2, UL 651 compliant. Fittings shall be PVC solvent weld type and joints shall be made with standard PVC couplings. Minimum size: 3/4-inch exposed; 1-inch embedded or encased.

PVC conduit entering fiberglass boxes or cabinets shall be secured by threaded bushings on the interior of the box and shall be terminated with a threaded male terminal adapter having a neoprene O ring.

All PVC conduit installed outdoors and exposed shall be painted gray in accordance with SP-8.1 for protection from sun exposure.

D. PVC-COATED RIGID STEEL CONDUIT AND FITTINGS (PRS): Conduit system, including fittings and mounting appurtenances, shall be hot dip galvanized inside and out with clear coated urethane over hot galvanized threads, with polyvinylchloride (PVC) jacket and red urethane interior coating. Conduit shall be round bore, smooth inside finish, electrical type, and for use with approved threaded fittings. The PVC jacket shall

be bonded to the galvanized steel and shall have a minimum thickness of 40 mils exterior coating and 20 mils interior coating. Robroy "Plasti-bond REDH20T" conduit system or approval equal, NEMA RN1.

E. EXTERIOR UNDERGROUND CABLES AND WIRES: Exterior cables and wires shall be as specified in Section SP-8.5. Insulation and sheath conforming respectively to ASTM 0 1352-60 and ASTM 9 752-60. Splices shall be made with compression connector on the conductor and by insulating and waterproofing, suitable for continuous submersion in water and pass ANSI C119.1.

8.4.02 TRENCH EXCAVATION:

A. Trench width and depths shall be sufficient to accommodate proper installation of boxes and ductlines. Excavate trenches along straight lines from structure to structure before ducts are laid or structure constructed so the elevation can be adjusted, if necessary, to avoid unseen obstructions.

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

C. Bottom of trench shall be flat and smooth.

D. Provide sheathing and bracing as required to support sides of excavations from cave-ins.

E. Provide drainage and pumps as required to keep trenches dry.

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

G. Any existing underground piping or conduit that is encountered shall be properly shored and protected from damage. Any damage to existing utilities resulting from the Contractor's operations shall be repaired at the Contractor's expense.

H. The contractor shall tone the entire route of any new trenching or excavation, and report any unforeseen obstructions to DOW. Damage to any existing underground utility or structure, as a result of the contractor's failure to tone, shall be the responsibility of the contractor, who will repair and restore any damages to the satisfaction of DOW, at no additional cost to DOW.

8.4.03 BACKFILL:

A. Ducts and box installations shall be approved by respective utility company inspector prior to backfilling. All excavations for boxes in excess of the required depths shall be filled with crushed lava rock to the required depth.

B. Backfilling shall be to finished grades and Contractor shall restore areas disturbed by operations to original condition to the satisfaction of DOW. Replace sod which has been removed, as soon as possible after backfilling is completed.

C. Backfill material shall be provided in accordance with Section SP-9.

D. Backfill material shall be placed in maximum of 8-inch layers in loose thickness before compacting. Backfill shall be thoroughly compacted with hand or mechanical tampers to 95 percent of ASTM D1557 maximum dry density. Jetting or flooding of backfill will NOT be permitted. In no case shall tamping be accomplished by using the wheels or tracks of a vehicle.

8.4.04 INSTALLATION OF CONDUIT AND DUCT BANK:

A. Ducts shall be installed promptly after excavation in order to keep the trenches open as short a time as possible.

(1) Saw cut, ream and taper ducts and conduits with manufacturers' approved tool.

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

(3) Provide spacers to maintain proper separation between ducts. Maintain minimum 1-foot separation between signal conduits and power/controls conduits.

(4) Run conduits and duct banks in straight lines, except where change of directions are necessary, and conduits and duct banks shall have a continuous downward slope of three (3) inches in each 100 feet away from buildings and toward underground structures. Changes of direction shall not exceed 4 degrees per length of conduit or duct. Radii and turns shall be made with appropriate duct bends and sweeps.

Provide manufactured plastic conduit spacers anchored to prevent movement during the concrete pour. Manufacture: Carlon, PW Pipe, Underground Devices, or approved equal.

(5) Underground conduit bend radius shall be not less than 2 feet minimum at vertical risers and shall be not less than 3 feet elsewhere.

(6) Allow and provide for two offsets per conduit and raceway for each 100 linear feet to account for unexpected field conditions including for excavation and backfill limited to three feet of extra width and/or depth. Include these specified provisions in the bid price.

(7) Terminate ducts in end-bells where ductlines enter manholes, handholes, walls, and boxes.

(8) Apply thin coat of sealing compound on ducts and conduits at couplings and bells.

(9) Securely anchor duct banks prior to pouring concrete encasement to prevent ducts from floating.

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

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

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

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

(10) Ducts shall be clean and free from debris and rubbish. After each day's work, provide temporary conduit plugs at the end of conduit banks to prevent entry of dirt, rubbish, debris, or concrete.

(11) After duct bank has been completed, unless indicated otherwise, pass a test mandrel through the entire length of each duct or conduit to test for burrs and obstructions and after which a brush with stiff bristles shall be pulled through to make certain that no particles of earth, sand or gravel have been left in the line. Mandrel shall be 14 inches long and shall have diameter of 1/2-inch less than inside diameter of duct. If burrs or obstructions are encountered, that section shall be replaced at no additional cost to DOW. Dewater any handhole prior to providing conductors.

(12) Unless indicated otherwise, pull cord shall be installed in each conduit. Pull cord is specified in this Section.

(13) Underground conduits and conduit banks shall maintain 2 feet earth cover unless otherwise shown. Earth cover for power duct banks that have feeders exceeding 400 amps capacity shall be installed with earth cover maintaining the 2 feet of cover throughout the length of the duct bank to the maximum extent physically possible. Where duct banks require more depth for lengths exceeding 10 feet, the situation shall be brought to the attention of DOW for review.

(14) Underground conduit banks through building walls shall be cast-in-place or installed with concrete into boxouts with water stops on all sides of the boxout. Water stops shall be as specified in the Cast-in-Place Concrete section. Extend the horizontal reinforcement from the duct bank into the boxout terminating with J-hook bends.

(15) Where reinforced concrete duct banks enter the side of a building, manhole, or handhole and the reinforcement cannot be brought into a window and be terminated, then drill the structure and embed the reinforcement in epoxy to minimum of 3 inches depth.

(16) Provide PVC threaded adapter with female threads where PVC conduit is joined to steel conduit. Procedure:

a. Before assembly: Double coat steel conduit with Red-Robroy, Green-Permacote, Blue-Ocal or approved equal.

G. REINFORCING STEEL:

(1) Clean reinforcing steel of mill or rust scale and form to required dimensions.

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

H. Concrete encasement on exposed outdoor conduit risers shall continue to 3 inches above grade, with top crowned and edges chamfered.

8.4.06 UNDERGROUND MARKING TAPE

Underground detectable marking tape shall be for early warning protection of digging around direct buried cables, conduits, and concrete duct banks. Tape shall be OSHA approved.

Marking tape example: Low density polyethylene plastic, nominally 6 inches wide and 4 mil thickness with metallic lined tape with red polyethylene film on top and clear polyethylene film on the bottom. Tape shall be imprinted with a warning continuously along the length similar to: "CAUTION - STOP DIGGING - BURIED ELECTRIC LINE BELOW."

Tape Products: Brady "Identoline"; Services and Materials "Buried Underground Tape"; Somerset (Thomas & Betts) "Protect-A-Line"; or approved equal.

8.4.07 HANDHOLES AND PULLBOXES

A. Handholes and pullboxes shall be installed approximately where shown on the drawings. The exact location of each handhole or pullbox shall be determined after careful consideration has been given to the location of other utilities, grades, and pavement.

Handholes shall be precast concrete with checker plate, galvanized, traffic covers designed for H 20 loading. Handholes shall be provided with open bottoms. Handholes shall be constructed of 3000 psi reinforced concrete. Handhole cover shall be engraved "ELECTRICAL" or "SIGNAL" as applicable.

Dimensions shall be as specified on the drawings. Handhole walls shall be provided with raceway boxouts sized to accommodate the penetrating underground duct banks. Handholes shall be provided with angled riser sections to allow the handhole cover to be installed flush with finished grade.

Unless otherwise specified, handhole and pullbox installation shall be as follows:

(1) Handholes and pullboxes shall be set on a minimum of 12 inches of crushed rock on top of undisturbed or compacted earth.

(2) Handholes shall be set plumb so that water shall drain to the sump. Where installed in roadways, handhole lids shall be set to match grade of roadway. Use of slope riser section for the handholes may be required.

(3) Metallic hardware inside handholes shall be bonded to the ground plate or ground bus using bolted connections, bonding jumpers and grounding bushings.

B. IDENTIFICATION TAGS:

Each set of cables #6 AWG and larger in handholes and pullboxes shall be identified by a non-corrosive metal tag. Letters shall be minimum 1/4-inch high identifying the cable as to use and voltage. Tags shall be wrapped around the cables and taped. Power tags shall be red.

For cables smaller than #6 AWG, provide Wire Markers as specified in Section SP-8.1.

C. CABLE SUPPORTS:

Provide heavy-duty, non-metal cable racks for support of conductors. Racks shall be UL listed glass-reinforced nylon consisting of slotted wall brackets for support arms designed for a minimum of a 400-pound load. Each support bracket shall from the top to the bottom and the arms shall be adjustable and installed on 24-inch centers. Use 1/2-inch stainless steel bolts, hardware, inserts, and fasteners. Cables supports, clamps or racks shall be provided to support the cable at minimum 2-foot intervals. Concrete inserts shall be embedded on 24-inch centers in walls and ceiling.

Cable Support Products or approved equal:

(1) Underground Devices Incorporated Type RA arms with CR36 support brackets.

(2) Unistrut Power-Rack F20N-STA33 Stanchions with F20N-ARM14 Arms.

8.4.08 GROUND BUS: Provide a ground bus in concrete manholes, handholes, and electrical pullboxes with dimension of 3-foot width x 3-foot length x 3-foot depth and larger. Provide a NEMA threaded 4-hole grounding plate for connecting two to four 1-hole ground connectors that enter the enclosure from two to four duct banks. Products: Burndy, T&B, or approved equal.

8.4.09 CONNECTIONS TO EXISTING CONCRETE PADS: Where connections to existing concrete pads are indicated, break an opening in the pad out to the dimensions required and preserve steel in pad. Cut the steel and bend out to tie into the reinforcing of the duct line envelope. Chip out the opening in the pad to form a key for the duct bank envelope.

8.4.10 CABLES: Cables shall be thoroughly lubricated with soapstone before drawn into ducts.

8.4.11 ELECTRICAL SEALANT: Electrical sealant putty shall be non-hardening, non-oxidizing, non-corrosive, non-poisonous, and non-injurious to human skin with service temperature range of 30 to 200 degrees Fahrenheit. Product shall be used to seal against the entrance of water.

8.4.12 PULLING LINE: Pulling line shall be polyethylene type, mildew and rot resistant with minimum of 200-pound tensile strength and minimum 1/4-inch diameter. Install in all "future" raceways. Manufacture: Greenlee, Ideal, or approved equal.

8.4.13 MEASUREMENT AND PAYMENT: Payment for the furnishing and installing of material, equipment, incidentals and all work included in this Section shall be made at the unit price item or the lump sum item indicated in the Proposal, whichever is specified, and shall be full compensation for all work in connection therewith, complete and finished in accordance with the drawings and specifications.

END OF SECTION

SECTION SP-8.5 – DEVICES AND EQUIPMENT

All devices, materials, and equipment specified herein shall be manufactured and installed in accordance with the appropriate articles in the (National Electrical Code) NEC except as noted. Equipment and materials shall be new and free from defects. All materials and equipment of the same or a similar type shall be of the same manufacturer throughout the work. Standard production materials shall be used wherever possible.

8.5.01 WIRING MATERIALS

A. The table below specifies the type of raceway required for each location and application.

Location	Application/Condition	RACESPEC
Indoor noncorrosive	Exposed	GRS
Indoor corrosive	Exposed	PVC8
Nonhazardous	Final connection to equipment and light fixtures	LFS
Architecturally finished areas	Concealed in framed walls and ceiling spaces (lighting and receptacle circuits only)	EMT
Architecturally finished areas	Final connection to light fixtures	FLEX

B. GALVANIZED RIGID STEEL CONDUITS (GRS):

Conduit shall be rigid steel, hot-dip galvanized after fabrication inside and out, round bore with smooth finished surfaces, ANSI and UL compliant. 3/4-inch minimum diameter unless otherwise specified. Conduit unions shall be made with threaded fittings; compression couplings are not acceptable. Prime and paint all new exposed conduits. Acceptable manufacturers shall be Allied Tube and Conduit Corp., Wheatland Tube Co., or approved equal.

(1) Unscheduled Raceway:

With the exception of lighting, telephone, and receptacle circuits, the type and size of raceway shall be as specified in the table above or on the Drawings.

Unscheduled lighting and receptacle raceways shall be sized by the Contractor in accordance with the NEC. Minimum size shall be 3/4-inch for exposed and 1-inch for embedded raceway.

C. The number and size of communication raceways shall be as required for the particular equipment provided subject to the minimum sizes specified herein. POLYVINYL CHLORIDE (PVC) CONDUIT:

PVC conduit shall be round bore, smooth inside finish, electrical type. For normal duty, commercial grade Schedule 40 (PVC4) shall be provided. For installation in areas exposed to damage, or as specified above, commercial grade Schedule 80 PVC (PVC8) shall be provided. PVC conduit shall be NEMA TC2, UL 651 compliant. Fittings shall

be PVC solvent weld type and joints shall be made with standard PVC couplings. Minimum size: 3/4-inch exposed; 1-inch embedded or encased.

PVC conduit entering fiberglass boxes or cabinets shall be secured by threaded bushings on the interior of the box and shall be terminated with a threaded male terminal adapter having a neoprene O ring.

D. LIQUIDTIGHT FLEXIBLE CONDUITS (LFS):

Conduit shall be liquidtight flexible steel constructed from spiral-wound steel strip with successive convolutions securely interlocked and jacketed with liquidtight plastic cover, UL 360 compliant. Minimum size shall be 3/4-inch unless otherwise specified. For use with threaded fittings. Provide O-ring seals at conduit and box connections. Provide forty-five and ninety-degree fittings where applicable. Prime and paint all new exposed conduits. Length of flexible liquidtight conduit shall not exceed 15 times the trade diameter of the conduit and not exceed 36 inches in length. Use conductive thread compound. Acceptable manufacturers shall be Sealtite by Anamet Electrical, Inc. or approved equal.

E. ELECTRICAL METALLIC TUBING (EMT):

Conduit shall be electrical metallic tubing with electro-galvanized steel finish, ANSI and UL compliant. Minimum size shall be 3/4-inch unless otherwise specified. For use with compression type fittings. Provide electro-galvanized sheet steel boxes where necessary, NEMA 1 stamped or form-bent with screw covers.

F. FLEXIBLE CONDUITS (FLEX):

Conduit shall be flexible steel constructed from spiral-wound galvanized steel strip with successive convolutions securely interlocked, UL 1 compliant. Minimum size shall be 3/4-inch unless otherwise specified. For use with compression type fittings and EMT type conduit. Provide with an internal ground wire. Provide forty-five and ninety-degree fittings where applicable. Prime and paint all new exposed conduits. Length of flexible liquidtight conduit shall not exceed 15 times the trade diameter of the conduit and not exceed 36 inches in length.

G. ENCLOSURES AND CABINETS:

Enclosures and cabinets for panelboards, breakers, and switches shall be National Electrical Manufacturers Association (NEMA) type, fabricated from galvanized steel, prime painted and enamel finished according to NEMA specifications. Special purpose cabinets shall be formed without knockouts.

H. BOXES, GUTTERS, AND TERMINAL CABINETS:

(1) General: Provide Type 316L (low carbon) or Type 316 stainless products where stainless steel is specified. Enclosure constructed of mild sheet steel shall be hot-dipped galvanized after fabrication. Hinges shall be continuous type and for NEMA 4X cabinet hinges shall be stainless steel. Boxes or enclosures installed outdoors shall

be provided with breather/drain fittings constructed of Type 316 stainless steel and with a NEMA rating matching the rating of the box or enclosure.
The table below specifies the electrical enclosure material and rating for the location and application.

Location	Electrical Enclosure Material and NEMA Rating
Indoor: Control Building	NEMA 1, Mild Steel
Outdoor: All Areas	NEMA 4X, **Stainless Steel (Type 316)**

(2) Pullboxes and Wire Gutters:

Indoor boxes and enclosures in non-corrosive or non-process areas larger than FD boxes shall be constructed of sheet steel and galvanized after fabrication. Outdoor boxes and enclosures shall be provided with neoprene gaskets on the hinged doors or removable covers. Box and gutter sizes, metal thickness, and grounding shall comply with the National Electrical Code. Bolt-on junction box covers 3 feet square or larger, or heavier than 25 pounds, shall have a rigid handle. Covers larger than 3 x 4 feet shall be split.

(3) Terminal Cabinets:

Terminal cabinets shall be provided with adjustable terminal strip mounting, back-panels for equipment mounting, print pockets in the doors, continuous door hinges, and three-point lockable latches. Terminal cabinets located outdoors and in corrosive areas shall be with stainless steel door hinge, three-point latch, and filtered ventilation, if required. Terminal blocks shall conform to Section SP-8.1.

I. OUTLET AND SMALL JUNCTION BOXES:

Concealed boxes shall be pressed from NEC code gauge steel, galvanized 4-inch square x 1-1/2-inch deep minimum or as specified on drawings.

(1) Unless indicated otherwise, exposed boxes and weather exposed recessed boxes shall be cast aluminum, prime painted, enamel finished, threaded hubs for conduit connection.

(2) Extension or raised rings for pressed boxes pressed from NEC code gauge steel and galvanized. Use as required at device outlets and make box opening flush with finished surface.

J. WIRES AND CABLES:

(1) Scheduled Conductors and Cables:

Where conductors and cables are identified on the drawings, they shall be provided in accordance with the table below:

Cable/ Raceway Identifier	Description	Cable Type	Special Provisions Section
P	Power	XHHW-2	8.5.01 J (4)
C	Control	XHHW-2	8.5.01 J (4)
S	Signal	#16 twisted shielded pair	8.5.01 J (5)
D	Data (Ethernet)	CAT-6	8.5.01 J (6)

(2) Unscheduled Conductors and Cables:

Where not specified on the Drawings, conductors and cables shall be sized in accordance with the National Electrical Code for the particular equipment served with the minimum size as specified herein.

Unscheduled conductor with insulation shall be type XHHW-2, as specified in Power and Control Conductors and Cable, 600 Volt, SP-8.5.01 J (4), below.

(3) Color Coding:

a. Control Conductors:

Single-conductor control conductors shall have the following colors for the indicated voltage:

Control Conductor	120V
Control (AC)	Red
Neutral	White
Ground	Green
Power (DC)	Blue
Control (DC)	Violet

b. Power Conductors:

Power conductors shall have the following colors for the indicated voltage:

Power Conductor	480V	208/120V
Phase A	Brown	Black
Phase B	Orange	Red
Phase C	Yellow	Blue
Ground	Green	Green
Neutral	Gray	White

Cables may be black with colored 3/4-inch vinyl plastic tape applied at each cable termination. Tape shall be wrapped with 25 percent overlay to provide 3 inches minimum coverage.

c. Signal Conductors:

Signal cable conductors shall be color coded black and white for pairs or black, white, and red for triads. Each conductor and each group of conductors shall be numbered.

(4) Power and Control Conductors and Cable, 600 Volt:

Cables shall be copper conductor, insulation type XHHW-2. Conductors shall be 600V rated, 90-degrees C, cross-linked polyethylene in accordance with ICEA S-66-524. Minimum size shall be #12 AWG for power, control, and lighting circuits.

Conductors shall be bare annealed copper; stranded in accordance with ASTM B8. Acceptable products shall be Okonite X-Olene, Southwire, or approved equal.

(5) Signal Cables:

Factory cable between manufactured instrument system components shall be provided in compliance with the instrument manufacturer's recommendations.

Signal cable shall be provided for instrument signal transmission. Single instrument cable shall be single twisted, shielded pairs, 16 AWG, with overall shield instrumentation cable. UL listed, Cable Tray and 600V rated. Bare annealed copper; Class-B stranded per ASTM B-8.

Insulation shall be 15 mil, Flame-retardant Okoseal (PVC) with 4 mil nylon, 75-degree C temperature rated, UL 1277. Color Code per ICEA Method-1: Pairs- Black and White. Twisted on a 2-inch lay.

Shield shall be 100 percent, 1.35 mil aluminum/polyester or Mylar tape with 7-strand tinned copper drain wire. Overall shield shall be 2.35 mil aluminum-Mylar tape with 7-strand tinned copper drain wire. Jacket shall be flame-retardant, moisture and sunlight resistant 45 mil Polyvinyl Chloride (PVC).

Acceptable products shall be Okonite, Okoseal-N type SP-OS (Shielded Pairs with Overall Shield); Cooper Industries-Belden; General Cable; or approved equal.

(6) Data Communication Cable:

Data Communication cable shall be Category 6 (250MHz); Fast Ethernet 100Base-T; 4-pair, F/UTP-Foil Shielded, 22AWG solid bare copper conductors, FEP insulation, polyester separator, overall foil shield and low smoke polyvinyl chloride outer jacket, Belden or approved equal.

K. SPLICING AND TERMINATING MATERIALS:

Connectors shall be tool applied compression type of correct size and UL listed for the specific application. Connectors shall be tin-plated high conductivity copper. Wire nuts for a splice are prohibited.

Signal and control conductors shall be connected to terminal blocks and field devices and instruments shall be terminated with conductor terminals as specified in Section SP-8.1.

Connectors for wire sizes No. 8 AWG and larger shall be compression tool installed one-hole lugs up to size No. 3/0 AWG, and two-hole or four-hole lugs for size No. 4/0 and larger. Mechanical clamp, dimple, screw-type connectors are not acceptable. In-line splices and taps shall be used only by written consent of DOW or where specifically allowed in these Specifications or on the Drawings.

Power conductor splices shall be compression type, made with a compression tool die approved for the purpose, as made by Thomas and Betts Corp., or approved equal. Splices shall be covered with electrical products designed for the application, insulated, and covered with a heat-shrinkable sleeve or boot, as specified elsewhere.

Motor connection kits shall consist of heat-shrinkable, polymeric insulating material over the connection area and high dielectric strength mastic to seal the ends against ingress of moisture and contamination. Motor connections may use the Tyco Electronics removable boot product line.

Motor connection kits shall accommodate a range of cable sizes for both in-line and stub-type configurations. Connection kits shall be independent of cable manufacturer's tolerances.

L. RACEWAY SUPPORTS:

(1) Conduit Supports:

Framing channel with end caps and straps shall be provided to support groups of conduit. Individual conduit supports shall be one-hole pipe straps used with clamp backs and nesting backs where required. Material shall be Type 316 stainless steel.

Conduit supports for PVC coated rigid steel and PVC conduit systems shall be one-hole PVC coated rigid steel clamps or oversized Type 316 stainless steel clamps.

(2) Ceiling Hangers:

Ceiling hangers shall be adjustable steel rod hangers and fittings. Provide J-Type conduit support for single conduit. Straps or hangers of plumber's perforated tape are not acceptable. Unless otherwise shown, hanger rods shall meet ASTM A193 and be sized as 3/8-inch up to 2-inch conduit and shall be 1/2-inch all-thread rod over 2-inch conduit. Material shall be Type 316 stainless steel.

(3) Suspended Raceway Supports and Racks:

Suspended raceway supports shall consist of concrete inserts, steel rod hangers, and jamb nuts supporting framing channel or lay-in pipe hangers as required. Framing channel shall be a minimum of 12-gauge. Material shall be Type 316 stainless steel.

Hanger rods shall be 1/2-inch-diameter all-thread rod and shall meet ASTM A193.

(4) Materials:

The table below specifies the type of raceway supports required for each location and application.

Location	Framing channel	Threaded rod, hardware, and fittings
Indoor, Control Building	Steel, HDG	Steel, HDG
Outdoor, corrosive area (general)	Stainless Steel (Type 316)	Stainless Steel (Type 316)

HDG = Hot Dip Galvanized Finish

M. FIRESTOPS:

Firestops and seals shall be Flamemastic 77, Vimasco No. 1-A, or approved equal, and shall be applied in accordance with manufacturer's recommendations. Products which are affected by water are not acceptable. Use with manufacturer recommended fire stop pillows and putties.

N. CONDUIT THREAD LUBRICANT:

Thread lubricant shall be conductive with anti-seize and anti-corrosion properties, compatible with steel and aluminum conduit materials. Manufacture: T&B Kopr-Shield; Crouse Hinds STL; or approved equal.

8.5.02 WIRING DEVICES

A. GENERAL:

Wiring devices shall be UL approved for the current and voltage specified and shall comply with NEMA WD 1. Devices shall contain provisions for back wiring and side wiring with captive binding screws.

Provide devices colored to conform to manufacturer's or industry standard for special use such as orange for isolated ground receptacles, blue for surge suppression receptacles, and red for emergency power receptacles. Unless shown otherwise on the Drawings, normal use devices shall be brown, except those located in finished areas shall be ivory.

B. RECEPTACLES AND PLUGS:

(1) General:

Receptacles shall be grounding type.

(2) 120V Receptacles:

a. INDOOR, CLEAN AREAS: Unless shown otherwise on the Drawings or Schedules, receptacles shall be duplex 20 amp, NEMA 5-20R, and shall accept NEMA 5-15P and 5-20P plugs. Where the manufacturer of cord-connected equipment requires an isolated ground, a receptacle with isolated ground shall be provided.

Manufacturers: Hubbell 5362, General Electric 4108-2, or approved equal.

Isolated ground receptacle manufacturers: Hubbell IG-5362, Arrow-Hart IG5362, or approved equal.

b. OUTDOOR, PROCESS OR CORROSIVE AREAS: Receptacle shall be duplex, 20 ampere, NEMA 5-20R, and shall accept NEMA 5-15P and 5-20P plugs. Receptacle and plug shall be corrosion resistant, marine duty with clear polycarbonate cover, weatherproof-while-in-use type.

For outdoor locations or locations near bathrooms, sinks, or other sources of water, receptacles shall be GFCI type.

Manufacturers: Hubbell 53CM62/53CM21, General Electric, or approved equal.

(3) 250V Receptacles:

Receptacles shall be duplex 15 amp, NEMA 6-15R, and shall accept NEMA 6-15P plug caps. Receptacles shall be Hubbell 5662, Arrow Hart 5662, or approved equal. Plug caps shall be Hubbell 5666-C, Arrow-Hart 6866, or approved equal.

C. SWITCHES:

(1) General Purpose (INDOOR, CLEAN AREAS):

General purpose switches shall be quiet AC type, specification grade, back and side wired, and shall be provided in accordance with rated capacities as required or as indicated on Drawings. Switches used for motor control shall be horsepower rated a minimum of 1/2 HP at 15 amps and 1 HP at 20 amps. Switches shall match receptacles in color.

Manufacturers: General Electric, Hubbell, or approved equal, as follows:

	15A, 120-277V		20A, 120-277V	
	G.E. Co.	Hubbell	G.E. Co.	Hubbell
Single:	GE5931	HBL1201	GE5951	HBL1221
Three-way:	GE5933	HBL1203	GE5953	HBL1223
Four-way:	GE5934	HBL1204	GE5954	HBL1224
SPST momentary:	GE5953	--	--	--
Three-position center-off momentary:	GE5935	HBL1556	--	HBL1557

(2) Switches for Outdoor and Corrosive Areas:

Switches shall be 20-ampere presswitch type with weatherproof/ corrosion resistant neoprene plate. Switches shall be mounted in “FS” type copper-free aluminum or PVC mounting boxes.

Manufacturers: Hubbell or Arrow-Hart as follows:

	Hubbell with 17CM50 plate	Arrow-Hart with 2881 plate
Single pole	1281	2991
Double pole	1282	2992
3-way	1283	2993
4-way	1284	2994

D. DEVICE PLATES:

Device plates shall be provided with switches. In non-corrosive indoor areas, receptacle device plates shall be satin finished Type 302 high nickel stainless steel, 18% chrome, 8% nickel with suitable holes for device as manufactured by Crouse-Hinds, Appleton, or approved equal.

Device plates in corrosive or outdoor areas shall be corrosion-resistant/marine-duty type. Device plates for explosion-proof equipment shall be factory provided with the equipment.

Device plates for UPS powered receptacles shall be red.

Device plates shall be provided with engraved laminated phenolic nameplates with 1/8-inch white characters on black background.

Nameplates for switches shall identify panel and circuit number and area served. Nameplates for receptacles shall identify circuit and voltage if other than 120 volts, single phase.

E. CABLE STRAIN RELIEF:

Cable strain relief devices shall be provided where a cable leaves a disconnect box to a field mounted mixer. The strain-relief device shall be a stainless steel wire grip with a 45-degree insulated-throat box connector. The wire grip shall be as manufactured by HUBBLE/ KELLUMS, or approved equal.

F. HARDWARE, SUPPORTS, BACKINGS, ETC.:

All hardware, supports, backings, and other equipment shall be provided. Wood materials, for use in dry locations only, shall be "wolmanized" treated against termite; ferrous materials for use in dry locations only shall be galvanized for corrosion protection; ferrous materials for use in damp or wet locations shall be Type 316 stainless steel; and nonferrous materials shall be brass or bronze.

8.5.03 PROTECTIVE EQUIPMENT:

A. PANELBOARDS:

(1) Panelboard Types:

a. Three-phase, four-wire 208Y/120 or 480Y/277 volt, dead front, circuit breaker type panelboard with current rating of 600-amperes or less.

b. Single-phase, three-wire 120/240 volt, dead front, circuit breaker type panelboards with current rating of 400-amperes or less.

(2) Manufacturers:

DOW believes the following candidate manufacturers are capable of producing equipment and/or products that will satisfy the requirements of this Section. This statement, however, shall not be construed as an endorsement of a particular manufacturer's products, nor shall it be construed that named manufacturers' standard equipment or products will comply with the requirements of this Section. Candidate manufacturers include:

a. EATON / CUTLER-HAMMER:

PRL1a and PRL3a Clipper Power Visor Surge Protective Device series.

b. GENERAL ELECTRIC:

AQ and AD with internal Surge Protective Devices.

c. SIEMENS:

S1, SE, and S3 with internal Surge Protective Devices

d. SQUARE D:

NQOD and NF with internal Surge Protective Devices.

e. Or approved equal.

(3) Arrangement and Construction:

Assembly mounted in MCC. Manufacture and install according to NEC Articles 240 and 408.

The front of the panel shall have concealed trim clamps and hinges. The locks shall be flush with cylinder tumbler-type with spring loaded door pulls. The fronts shall not be removable with doors in the locked position. Panelboard locks shall be keyed alike.

Gutter space shall be provided on all sides of the breaker assembly to neatly connect and arrange incoming wiring.

Panelboard shall be composed of individually mounted circuit breakers designed to be removable without disturbing other breakers.

A directory holder with clear plastic plate and metal frame shall be mounted on the inside of the door.

Panelboard shall come complete with breaker locking mechanisms to facilitate lockout tagout procedures, for all breakers supplied.

(4) Bus:

Bus shall be tin-plated copper and shall have current ratings as shown on the panelboard schedules, sized in accordance with UL 67. Ratings shall be determined by temperature rise test.

The minimum bus size shall be 100 amperes. Panel fault withstand rating shall be not less than the interrupting rating of the lowest-rated circuit breaker in the panel and shall be verified with the results of the short circuit study specified in SP-8.7. Series rating is prohibited.

Panelboards shall be provided with a separate ground bus and, where specified, with a full capacity neutral bus. The neutral bus shall be mounted on insulated stand-offs.

(5) Circuit Breakers:

Circuit breakers shall be molded-case type provided for the current ratings and pole configurations specified on the panelboard schedule. Circuit breakers shall be bolt-on type. Circuit breakers shall be listed in accordance with UL 489 for the service specified. Load terminals of circuit breakers shall be solderless connectors.

Circuit breakers rated 120/208 volt alternating current shall have an interrupting current rating sized according to the results of DOW approved short circuit calculations and protective device coordination study required by SP-8.8, with a minimum of 18,000 amperes symmetrical at 208 volt AC.

Circuit breakers rated 277/480 volt alternating current shall have an interrupting current rating sized according to the results of DOW approved short circuit calculations and protective device coordination study required by SP-8.8, with a minimum of 65,000 amperes symmetrical at 480 volt or as specified on the panelboard schedule.

Provide circuit breakers with special features such as ground fault interrupting (GFI), heating air conditioning and refrigeration (HACR) rating, or locking capability as shown on the Drawings or Schedules.

(6) Finish:

Panelboard cabinet shall be fabricated from hot-dip galvanized steel in accordance with UL 50. Panelboard fronts shall have a gray, baked enamel finish.

(7) Surge Protective Device (SPD):

Provide a metal oxide varistor (MOV) surge protective device (SPD) integral within each panelboard where indicated on the drawings that indicates the status and condition of the SPD. Each SPD shall be bus connected for parallel operation, rated for 208Y/120V, 3-phase, 4-wire systems; and 240/120V, 1-phase, 3-wire systems; and have a minimum surge rating of 120kA per phase. The SPD shall be designed, manufactured and tested in accordance with the latest applicable UL Listed standards (UL 1449, 3rd Edition), UL 1283 and CSA certified per CSA 22.2. Each SPD shall have an audible alarm with silence switch, an alarm indicator light, and indicator lights for line-to- neutral, line-to-ground, and neutral-to-ground monitoring. Ground per NEC and manufacturer's instructions.

(8) Schedules:

Panelboard schedules are shown on the Drawings.

B. INDIVIDUAL CIRCUIT BREAKERS:

Circuit breakers shall be thermal magnetic, molded case type with the ampere rating as specified. Circuit breaker interrupting rating shall be sized according to the results of DOW approved short circuit calculations and protective device coordination study required by SP-7.8, with a minimum of 65,000 amperes symmetrical at 480 volt.

C. SAFETY DISCONNECT SWITCH:

Safety disconnect switches shall be heavy-duty, 30-400 ampere rating, fused or non-fused, as indicated on the drawings, stainless steel operator, safety type rated 600 volts AC.

Provide fusible disconnect switches with ratings as indicated on the drawings. Provide 200kAIC Class R or Class J current limiting fuses as appropriate for the circuit type and the circuit voltage. Provide built-in fuse-pullers.

Enclosures shall be:

(1) NEMA 1 for architecturally finished areas and electrical room.

(2) NEMA 4X Type 316 stainless steel for all other areas.

The operating handle shall be capable of being padlocked in the "off" position. The operator shall be a positive, quick-make, quick-break mechanism. Provide bolt-on hubs. Provide door lock. Provide nameplates with the equipment tag number, equipment description, and power source as indicated on the drawings. Submit nameplate list.

Switches shall be horsepower rated for motors and shall comply with NEMA KS 1. Switches shall be provided with defeatable door interlocks that prevent the door from opening when the operating handle is in the "on" position. Switches shall have line terminal shields.

Manufacturer: Eaton, Square-D, Siemens, General Electric, ABB, or approved equal.

D. NAMEPLATES: Nameplates shall be provided in accordance with the requirements of Section SP-8.1.

8.5.04 CONTROL DEVICES:

A. PUSHBUTTONS:
Pushbuttons shall be flush head, heavy-duty, with NEMA rating to match enclosure type. Operators shall be green for start function, red for stop functions, and black for all other functions. The escutcheon legend shall be as specified on the drawings.

(1) UL Listed.

(2) Dielectric Strength: 1300 Volts for one minute for Logic Reed contacts, 2200 Volts for one minute for other contacts.

(3) 1.2-inch (30.5-mm) mounting hole.

(4) Temperature operating range 14-degree F (–10-degree C) to 131-degree F (55-degree C).

(5) Momentary contact type

(6) When switching circuits are monitored by programmable controllers or other solid-state circuits, furnish hermetically-sealed, logic-reed type contacts rated not less than 0.15 amperes at 150 Vac and 0.06 amperes at 30 Vdc.

(7) When switching circuits are not monitored by programmable controllers or other solid-state circuits, furnish contacts with NEMA Utilization Category rating A600 rated not less than 10 amperes continuous and 6 amperes break at 120 Vac.

Manufacturer: Allen-Bradley 800T/800H series or approved equal.

B. SELECTOR SWITCHES:

Selector switches shall be heavy-duty with NEMA rating to match enclosure type. Selector switches shall have maintained position contacts. Switches shall be provided with contact blocks and number of positions as required performing the specified or indicated operations.

The escutcheon legend shall be as specified on the drawings. Provide:

(1) UL Listed.

(2) Dielectric Strength: 1300 Volts for one minute for Logic Reed contacts, 2200 Volts for one minute for other contacts.

(3) 1.2-inch (30.5-mm) mounting hole.

(4) Temperature operating range 14-degree F (–10-degree C) to 131-degree F (55-degree C).

(5) Standard knob operator (not lever type nor wing lever type)

(6) Number of positions and contact configuration as shown on Drawings.

(7) When switching circuits are monitored by programmable controllers or other solid-state circuits, furnish hermetically-sealed, logic-reed type contacts rated not less than 0.15 amperes at 150 Vac and 0.06 amperes at 30 Vdc.

(8) When switching circuits are not monitored by programmable controllers or other solid-state circuits, furnish contacts with NEMA Utilization Category rating A600 rated not less than 10 amperes continuous and 6 amperes break at 120 Vac.

Manufacturer: Allen-Bradley 800T/800H series or approved equal.

Where shown on the instrumentation drawings field instruments and field analyzers shall have a lock-out style selector switch for locking on or locking off the 120Vac power source. The selector switch shall use a control station in NEMA-12, 4, 4X, or 7 as required by the area classification. Provide O-Z/Gedney Class 441 with two position key-operated maintained contact switch.

C. INDICATING LIGHTS:

Red, amber, green, and blue indicating lights shall be heavy-duty full voltage 120Vac or 24Vdc push-to-test LED type with NEMA rating to match enclosure type for installation in a 1.2-inch (30.5-mm) hole. Furnish with 28 chip high visibility LED. The escutcheon and lens color shall be as shown on Drawings or scheduled.

White indicating lights shall be as above, incandescent type lamp.

Manufacturer:

(1) Allen-Bradley 800H-QRTH10 series or approved equal for 120Vac applications with colors other than white.

(2) Allen-Bradley 800H-QRTH24 series or approved equal for 24Vdc applications with colors other than white.

(3) Allen-Bradley 800H-QRT10 series or approved equal for 120Vac applications with white.

(4) Allen-Bradley 800H-QRT24 series or approved equal for 24Vdc applications with white.

Refer to Section SP-8.1 for indicating light lens colors.

D. CONTROL STATION ENCLOSURES:

(1) Enclosures locations and ratings:

a. Indoors: NEMA 12

b. Outdoors and Corrosive areas: NEMA 4X Type 316 stainless steel

E. CONTROL POWER TRANSFORMERS:

(1) Sized for the panel devices and products.

(2) Dual primary and single secondary fusing.

F. NAMEPLATES: Nameplates shall be provided in accordance with the requirements of Section SP-8.1.

8.5.05 CONTROL RELAYS

A. LOAD-SWITCHING CONTROL RELAYS:

Control relays used for switching loads such as solenoids, actuators, contactors, motor starter coils, remote interlocking, etc. shall be NEMA heavy-duty industrial type.

Contacts shall be 4-pole and be field interchangeable to either normally-open or normally-closed. Relay shall be capable of accepting a 4-pole adder.

AC relays shall have NEMA A600 contact ratings and electrical clearances for 600 volts. DC relays shall have NEMA P300 contact ratings and electrical clearances for 250 volts.

Manufacturer: Allen Bradley Bulletin-700, Square D Class 8501, or approved equal.

B. LOGIC LEVEL SWITCHING CONTROL RELAYS:

Control relays for signal circuits shall be IEC industrial rated with 4-poles minimum that can be field interchangeable to either normally-open or normally-closed.

Manufacturer: Allen Bradley Bulletin-700-CF Series, or approved equal.

C. TIMERS:

(1) Multi-function, micro-controller based, socket mounted timing relay.

(2) Single functions:

a. Delay on Make

b. Delay on Break

c. Recycle (on time first, equal recycle delays)

d. Single shot

e. Interval

f. Trailing edge single shot

g. Inverted single shot

h. Inverted delay on break

i. Accumulative delay on make

j. Re-triggerable single shot

(3) Dual functions:

a. Delay on make/delay on break

b. Delay on make/recycle (on time first, equal recycle delays.)

c. Delay on make/interval

d. Delay on make/single shot

e. Interval/recycle (on time first, equal recycle delays)

f. Delay on break/recycle (on time first, equal recycle delays)

g. Single shot/recycle (on time first, equal recycle delays)

h. Recycle – both times adjustable (on time first)

i. Recycle – both times adjustable (off time first)

j. Interval/delay on make

k. Accumulative delay on make/interval

(4) Time delay range, switch selectable:

a. Single function 0.1 second to 1,705 hours in 8 ranges.

b. Dual function 0.1 second to 3,100 minutes in 8 ranges.

c. Setting accuracy +/- 1 percent or 50 milliseconds, whichever is greater.

d. Repeat accuracy +/- 0.1 percent or 16 milliseconds, whichever is greater.

(5) Output:

a. Two Form-C electromechanical isolated contacts rated 10-amperes resistive at 240Vac

b. Rated 1/3-horsepower at 120 or 240Vac

c. Double-pole double-throw: DPDT.

d. Mechanical life: 10,000,000 operations

e. Electrical life: 1,000,000 operations at full load.

(6) Mounting: Magnal Plug 11-pin socket.

(7) Environment: -4-degree F (-20-degree C) to 149-degree F (65-degree C).

(8) Manufacturer: ABB / SSAC's multifunction type TRDU time delay relay with dip-switch function setting with 12Vdc, 24Vac, 120Vac, 240Vac inputs as required or indicated or approved equal.

D. ALTERNATING RELAY:

(1) Alternate assignment between "Duty" and "Stand-by" at the end of each run cycle.

(2) Double-pole, double-throw output relay rated for 7-amps inductive at 120-volts AC.

Isolation not less than 1,500-volt RMS input to output. Life of 1,000,000 operations at full electrical load.

(3) Switch to select alteration or continuous operation of either load.

(4) Mount in Magnal 11-pin socket.

(5) Operating temperature range of 4-degree F (–20-degree C) to 140-degree F (60-degree C).

(6) Manufacturer: ABB-SSAC type ARP series or approved equal.

E. MOTOR DRIVEN TIMERS - ON-DELAY AND OFF-DELAY:

(1) Time Delay Relay - Upon Energization (TDE) or Upon De-Energization (TDDE): TDE driven by a 120 Vac synchronous motor that starts timing when initiated by an external signal via closing a dry contact. Turn a knob on the front of the dial for time settings. TDE device will reset upon power failure. TDDE device will not reset upon power failure. Special configuration where specified: will not reset upon power failure.

(2) Provide a pilot light visible from the front of the timer to indicate when the timer motor is energized. Provide visual indication by a cycle progress pointer that advances to zero from the setting then back to zero as time progresses.

(3) Provide two of "instantaneous" NEMA Form-C output contacts that actuate when the timing is initiated. Provide two "delayed" NEMA Form-C contacts that actuate when the unit has timed out or de-energized. The timer automatically resets, when the

timing cycle is completed. Contact ratings: 10-ampere at 120 Vac and 5-ampere at 240 Vac.

(4) Permanently mount and setup the timer with the initial settings shown or specified. Timer range with 16 configurations from 5-seconds to 60-hours. Range and timer setpoints shown on drawings.

(5) Timer Manufacturer: Eagle Cycl-Flex Automatic or Manual Reset Timer: HP5 series or HP5E series; Automatic Timing Controls, Series 305D Motor Driven Analog Reset; or approved equal.

F. LATCHING RELAYS:

(1) Manufactured to the specifications for load switching control relays except with dual coils for latch and unlatch positions.

(2) Momentary energization of the latch or unlatch coils shall operate and mechanically hold the contacts in that position until the opposite coil is energized.

(3) Contacts shall be included that preclude energizing both the latch and unlatch coils at the same time.

G. MOTOR TEMPERATURE SWITCH RELAYS:

(1) Instrument Function: Motor high temperature measurement

(2) Signal Input: NC temperature switch integral to motor

(3) Signal Output: DPDT contact outputs rated at 10A @ 250Vac

(4) Supply Voltage: 120Vac

(5) Indicator: Green LED for normal conditions and red LED for fault conditions

(6) Response Times: Operates in 10 ms, releases in 1 second

(7) Temperature Switch Voltage: 12Vdc

(8) Temperature Switch Current: 2 mA max

(9) Additional Requirements: Relay shall retain its state during power failures and shall have connections for an external reset. When temperature switch opens, the relay shall energize and latch on until the temperature switch re-closes and the reset button is pressed.

(10) Manufacturer: ATC Diversified Electronics SPM-120-ADA, or approved equal.

H. NAMEPLATES: Nameplates shall be provided in accordance with the requirements of Section SP-8.1.

8.5.06 MAGNETIC CONTACTORS:

A. LIGHTING CONTACTOR:

Lighting contactors shall be 100 percent rated for ballast and tungsten lighting, resistance and other non-motor loads.

Contactor shall be rated 600Vac, 60-Hertz with the ampere rating and number of poles as indicated on the drawings. Provide a minimum of two poles per NEMA ICS 2-211B for industrial-duty applications.

The following options shall be available and shall be provided as indicated on the drawings:

(1) Auxiliary contacts rated 5 amperes at 600Vac.

(2) Timer or time clock attachment.

(3) Transient suppression module for 120Vac control circuits.

(4) Electrically or mechanically held as specified.

Contactors shall be provided with disconnecting means and overcurrent protection mounted in the same enclosure.

Manufacturer: Allen Bradley Bulletin 500L or 500LP, Square D Class 8903, or approved equal.

8.5.07 ELAPSED TIME INDICATORS

Elapsed time indicators (meter) shall be conventional 3-1/2-inch square case meters designed for flush panel mounting. The meter shall be non-resettable and display elapsed running time of each motor/valve in hours by 6 digit dials. The meters shall be operable on 120 volt, 60 Hertz power.

8.5.08 CURRENT TRANSFORMERS AND TRANSDUCERS

Provide monitoring current transformers with 600Vac insulation and primary ampere rating as indicated with 5-ampere output.

Provide AC current transducer for any one of the phase conductors of the power circuit to be installed through onboard toroid. Provide a loop-powered transducer with input rated from 0 to 50 ampere with 4-20madc analog output scaled for the primary current of the current transformer. Provide zero and span adjustments.

Manufacturer: ABB AC current transducer TCSA Series Loop Powered and mounting accessories, or approved equal.

Provide a DIN rail or back plate mounted AC current transducer that is a loop-powered transducer with input rated from 0 to 5-ampere and with 4-20madc analog output scaled for the primary current of the current transformer.

Manufacturer: ABB AC current transducer DCSA Series Loop Powered and mounting accessories, or approved equal.

Nameplates shall be provided in accordance with the requirements of Section SP-8.1.

8.5.09 TERMINAL STRIPS, BLOCKS, AND DEVICES

A. Power Wiring: Provide back plate mounted terminal strips rated at 600 Vac.

B. Control Wiring: Provide a DIN rail with spring powered contact rated at 300 Vac, 24 ampere with pluggable terminals.

C. Terminal identification standard to the product provided.

D. MANUFACTURER:

(1) Standard: Allen Bradley or approved equal.

(2) Standard: DIN rail: Phoenix Contact or Weidmuller Z-Series.

8.5.10 DRY-TYPE TRANSFORMERS (600 VOLTS AND LESS)

A. MANUFACTURERS:

(1) ABB

(2) General Electric

(3) Eaton Cutler-Hammer

(4) Siemens

(5) Square D

(6) Or approved equal.

B. INSULATION:

Transformers temperature rise based on 40-degree C ambient temperature:

(1) 15 kVA and above: Minimum Class 220 insulation, maximum 115 degree C temperature rise.

(2) Less than 15 kVA: Minimum Class 180 insulation, maximum 115 degree C temperature rise.

C. COILS:

Transformer coils:

(1) Copper.

(2) 15 kVA and above: impregnated with varnish.

(3) 10 kVA and below: encapsulated.

D. WINDING CONFIGURATION:

Transformers shall have electrically isolated primary and secondary windings. Primary and secondary winding configurations shall be as specified or shown. Provisions shall be made to permit separate grounding of the neutral conductor and the enclosure. Single-phase transformers shall be the four-winding type.

E. TRANSFORMER TAPS:

Transformers 15 kVA and above shall be provided with two 2-1/2 percent full capacity taps above normal voltage and four 2-1/2 percent full capacity taps below rated voltage on the primary winding.

F. TERMINAL COMPARTMENTS:

Terminal compartments shall be sized to permit termination of cables specified. Terminal connections shall be made in the bottom third of the enclosure. The terminals shall be copper and sized for the cable specified.

G. ENCLOSURES:

Transformers enclosures:

(1) 15 kVA and smaller: weatherproof, non-ventilated enclosures.

(2) Indoor over 15 kVA: drip-proof, ventilated enclosures.

(3) Outdoor: weatherproof enclosures.

H. MOUNTING:

Transformers 45 kVA and below shall be suitable for mounting within an MCC and/or wall mounting and include mounting brackets and hardware. Transformers over 45 kVA shall be floor mounting type.

I. NAMEPLATES:

Nameplates shall be provided in accordance with the requirements of Section SP-8.1.

J. SOUND LEVELS:

The sound levels shall not exceed the following values:

kVA	dB
0-9	40
10-45	42
50-450	45
225-300	50
500	54

K. NON-LINEAR LOAD K-FACTOR RATED TRANSFORMER:

(1) TYPE: 100 percent non-linear load rated specifically designed to handle non-linear loads with double size neutral for harmonic load.

(2) K FACTOR: K = 13.

L. SHIELDED ISOLATION TRANSFORMER:

Provide self-cooled two-winding type transformer with electrical ratings as shown.

Provide copper or aluminum metal shielding between primary and secondary windings.

Provide electro-static winding shield grounded to the transformer case.

8.5.11 GROUNDING SYSTEM

A. CABLE:

Ground cable shall be annealed bare copper, concentric stranded as specified. If cable sizes are not specified, the minimum sizes shall be as follows:

480V MCC and switchboards	4/0 AWG
Cable tray	4/0 AWG
Duct Banks	4/0 AWG
Lighting panels	4 AWG
Exposed metal	4 AWG
Control panel	

B. GROUND RODS:

Ground rods shall be copper covered steel, 3/4-inch diameter and 10 feet long. Rods shall have threaded type removable caps so that extension rods of same diameter and length may be added where necessary.

C. COMPRESSION CONNECTIONS:

Compression connection system shall be Burndy, Thomas & Betts, or approved equal. Material and tools of different manufacturers shall not be mixed.

Compression connections shall be irreversible compression connectors unless otherwise approved by DOW.

D. BOLTED CONNECTORS:
Bolted connectors shall be Burndy, Thomas and Betts, O.Z. Gedney, or approved equal.

E. BUILDING SYSTEM GROUND BARS:

Ground bars shall be a minimum of 2-inch (width) x 12-inch (length) x 1/4-inch (depth), and shall be solid copper. Assembly shall come complete with insulated wall brackets, mounting hardware and compression terminals. Erico #EGBA14212TES or approved equal.

F. WELDED CONNECTORS:

Exothermic welding products shall be Erico's Cadweld Plus system with a remotely operated battery powered electronic ignition device and moisture resistant weld metal cup for the required mold, or approved equal.

G. EQUIPMENT GROUND PLATE:

Equipment ground plate shall be two-hole copper flush mounted grounding plate, Erico Cadweld, Burndy YGF Series, or approved equal.

8.5.12 <u>KIUC METERING EQUIPMENT:</u>

A. METER SOCKETS:

(1) General:

a. Meter socket shall include provisions for test switch and KIUC seals.

b. Meter socket shall be current transformer rated, ring-type, 13-Jaw, 20A, 480/277V.

c. Meter socket and its installation shall comply with all requirements of KIUC. Confirm exact specifications with KIUC prior to ordering.

d. Provide grounding and bonding per NEC.

e. Enclosure shall be Type 316 stainless steel, NEMA 3R rated.

f. Meter socket shall be manufactured by Milbank, model UCSX3433, or approved equal.

B. CT CABINET:

(1) CT cabinet shall be rated NEMA 3R, constructed of Type 316 stainless steel.

(2) Cabinet dimensions shall be minimum 42-inches wide by 42-inches high by 11-inches deep.

(3) CT cabinet shall have two fixed, solid handles on the cover for lifting.

(4) Cabinet shall have provisions for KIUC seals.

(5) Provide cabinet with horizontal "C" mounting brackets and vertical "Z" mounting brackets to mount KIUC instrument transformers. Install in accordance with KIUC requirements

(6) Provide grounding and bonding per NEC.

(7) CT cabinet and its installation shall comply with all requirements of KIUC. Confirm exact specifications with KIUC prior to ordering.

8.5.13 GENERATOR TERMINAL BOX: Wall-mounted connection/termination cabinet for mobile generator with mechanical set-screw lug landings for three phases and neutral plus ground. Rated minimum 600A, 480V, 35kAIC short circuit withstand, UL listed as a complete assembly to UL 1773 Standard for Termination Boxes. Bus shall be silver-plated copper, sized for 1000A per sq inch ampacity, supported by UL Recognized Component insulators. Enclosure shall be wall-mounted, rated NEMA 3R, constructed of aluminum, with ANSI-61 gray powder-coat finish. Provide lockable latches on front door; cable access panel at bottom of cabinet shall be held captive by front door. Wall-mount cabinet in accordance with manufacturer's anchorage requirements. Generator terminal box shall be Berthold Electric Generator Connection Cabinet or approved equal.

8.5.14 SECURITY DEVICES

A. PERSONNEL DOOR SECURITY CONTACT

a. General:

a. Hermetically sealed magnetic reed switch contact to monitor open/closed position of personnel doors.

b. Surface-mount aluminum housing.

c. Contact shall be fully sealed in epoxy or polyurethane potting compound.

d. 2” to 3” operating gap.

e. Provide with mounting bracket.

f. Minimum 36” of stainless steel armored cable wired to contact.

b. Contact Ratings:

a. Normally open SPST (Form A) contact, 24V DC, minimum 0.1A

c. Manufacturer

a. Interlogix/UTC (GE Sentrol) 2505A, Honeywell 960, or approved equal.

B. OVERHEAD (ROLL-UP) DOOR SECURITY CONTACT

(1) General:

a. Hermetically sealed magnetic reed switch contact to monitor open/closed position of overhead roll-up doors.

b. Contact shall be fully sealed in epoxy or polyurethane potting compound.

c. Minimum 3” operating gap.

d. Provide with mounting bracket(s) for floor and roll-up door mounting.

e. Minimum 36” of stainless steel armored cable wired to contact.

(2) Contact Ratings:

a. Normally open SPST (Form A) contact, 24V DC, minimum 0.1A

(3) Manufacturer

a. Interlogix/UTC (GE Sentrol) 2205A or approved equal.

8.5.15 MISCELLANEOUS DETAILS

A. Complete all panel circuit directories, using typewriter or printer. Verify “room” and “use” designations before typing.

B. Prime and paint all new exposed conduits in accordance with manufacturer’s instructions and SP-8.1.

C. All grounding wire within building run in rigid steel conduit, and where practicable, routed together with circuit conductors.

D. Furnish necessary test equipment and make all tests necessary to check for unspecified grounding, shorts and wrong connections. Correct faulty conditions, if any.

E. Label all panels and service equipment. Identification labeling shall be by competent craftsmen. Letters to be 1 1/2-inch high minimum, black paint. Dynamo labels are not acceptable. Panel label designation: APANEL (Name) 120/208V, 3-phase, 4WSN". Tag all empty conduits in terminal cabinets and boxes giving destination. Use fiber disc tags in bushing.

F. Provide arc flash warning labels on all electrical equipment as required by NEC Article 110.16 and SP-8.8.

8.5.16 MEASUREMENT AND PAYMENT: Payment for the furnishing and installing of material, equipment, incidentals and all work included in this Section shall be made at the unit price item or the lump sum item indicated in the Proposal, whichever is specified, and shall be full compensation for all work in connection therewith, complete and finished in accordance with the drawings and specifications.

END OF SECTION

SECTION SP-8.6 – MOTOR CONTROL CENTERS

8.6.01 GENERAL REQUIREMENTS:

A. The motor control center (MCC) lineup, including main circuit breaker and power monitoring section, low-voltage transformer and panelboard (where required), well pump starter sections, and chlorine booster pump starters shall be manufactured by Siemens, Square D, Eaton, or approved equal.

B. The entire MCC shall be supplied as a complete, engineered assembly by the same manufacturer.

C. The MCC and all components shall be ASSEMBLED, WIRED, and TESTED AT THE FACTORY as a system prior to shipment. All component parts listed in this portion of the specifications shall be UL Listed to UL 845 and shall conform to latest National Electrical Manufacturers Association (NEMA) Standards (NEMA ICS-1), whenever applicable.

D. The entire MCC shall be rated 600 (480) volts, 60 Hertz, 3-phase, 4-wire as specified and shall be suitable for operation at the specified voltages and short circuit capacities. MCC shall be completely factory tested.

8.6.02 STRUCTURE AND CONSTRUCTION:

A. STRUCTURE:

(1) Motor control centers shall be made of No. 14 gauge steel minimum and, unless otherwise shown on the drawings, each section shall be 90 inches high by 20 inches wide by 20 inches deep. The individual unit compartments shall be a minimum of 12 inches high.

(2) Each section shall have 72 inches for stacking starter units into the sections

(3) The compartments shall have pan-type doors with a minimum of two quarter-turn hold-down latches; and neoprene gaskets.

(4) A full height vertical wireway, 4-inch wide minimum, but not less than 30 square inches in cross section, shall be provided for each vertical motor control center section. The wireway shall contain full height removable doors. Horizontal wireways shall be provided top and bottom, extending the length of motor control centers.

(5) Bottom channel sills shall be mounted front and rear of the vertical sections extending the full length of the motor control center lineup. A removable lifting angle shall be mounted on top and shall extend the width of the motor control center lineup.

(6) All switches mounted on front panel of MCC shall be mounted no higher than 70 inches AFF. Emergency stop pushbuttons shall be mounted no higher than 60 inches AFF. Account for 3-1/2-inch concrete housekeeping pad.

(7) Nameplates shall be installed as shown on the drawings.

B. CONSTRUCTION:

(1) Motor control centers located indoors shall have NEMA 1, gasketed enclosures.

(2) Motor control centers located outdoors shall be NEMA 3R rated (door-in-door construction).

(3) Starter units, size 4 and smaller, and feeder tap units less than 225 amperes shall be drawout plug-in construction with hardened, tin-plated copper free-floating stabs, steel spring backups. The door shall have interference tabs which prevent door closure if unit is improperly installed.

(4) Units shall be latched in the position to assure proper bus contact. The unit disconnect device shall be interlocked to prevent removal or reinsertion of a unit when the disconnect is in the "ON" or "TRIPPED" positions.

(5) Fusible switch or circuit breaker disconnect operators shall be capable of accommodating three padlocks for locking in the "OPEN" position.

(6) Hardware for mounting future starter and feeder tap units shall be provided at compartments specified as "FUTURE".

C. SEISMIC BRACING: The Motor Control Centers shall be braced for Seismic Zone 4 as defined by the latest version of the Uniform Building Code.

8.6.03 FINISH AND COLOR: The finish and color shall be in accordance with SP-8.1.

8.6.04 BUS

A. GENERAL:

(1) Bus shall be tin-plated copper with bolted connections between vertical and horizontal bus bars. Access for tightening these connections shall be from the front, without the need for tools on the rear of the connection. Insulated horizontal and vertical bus barriers shall be provided. Barriers shall be fabricated from high-strength, glass-filled polyester resin.

(2) The bus shall be braced to withstand stresses resulting from the maximum short circuit current available. Minimum bracing shall be 65,000 amperes symmetrical. Bus bracing shall be verified with the results of the short circuit and arc flash analysis required by SP-8.7 and approved by DOW.

B. HORIZONTAL BUS: Unless otherwise specified or shown, the main horizontal bus shall be rated a minimum 600 amperes continuous.

C. VERTICAL BUS: Unless otherwise specified or shown, the main vertical bus shall be rated a minimum 300 amperes continuous.

D. GROUND BUS: A 1/4-inch by 2-inch tin plated ground bus shall be provided the full length of the motor control center (except the dedicated control sections). Ground bus shall be located at the bottom of the motor control center. Provide a lug to terminate a bare 4/0 AWG copper ground conductors at each end of the ground bus. Ground bus shall not be continuous between motor control center and switchboard sections.

8.6.05 WIRING:

A. GENERAL:

(1) Motor control centers shall be provided with NEMA ICS 18 Class II, Type B wiring. All starter units shall have terminal blocks for control wiring. Terminal blocks shall be provided for power wiring for starters size 2 and smaller.

(2) Motor control centers shall be provided with all necessary interconnecting wiring and interlocking.

B. POWER WIRE: Power wire shall be copper 90 degrees C insulated, sized to suit load; minimum power wire size shall be No. 12 AWG copper stranded.

C. CONTROL WIRE: Control wire shall be No. 16 AWG stranded copper wire, rated 90 degrees C machine tool wiring (MTW) and UL listed for panel wiring.

D. TERMINATIONS AND CABLE CONNECTIONS:

(1) TERMINALS: Control wiring shall be lugged with ring-tongue or locking spade crimp type terminals made from electrolytic copper, tin-plated.

(2) CABLE CONNECTORS: Cable connectors for use with stranded copper wire, sizes No. 8 AWG to 1000 kCmil shall be UL listed. Dished conical washers shall be used for each bolted connection. Connectors shall be reusable and shall be rated for use with copper conductors. Incoming line and outgoing feeder compartments shall be provided with crimp type lugs, 3M Company, Burndy Company, or approved equal.

E. CONDUCTOR MARKERS: Markers used for identification shall meet the requirements of SP-8.1.

8.6.06 SPATIAL LAYOUT:

A. Motor control center space allocations indicated in these contract documents are based on a typical manufacturer's configuration. It shall be the contractor's and MCC supplier's responsibility to determine the actual space requirements based on the equipment supplied and the performance specified to ensure that the motor control center is supplied with the necessary spatial layout to accomplish the required functions within the available space. The motor control center overall dimensions shall not exceed the available space allocated for installation indicated on the Drawings unless otherwise approved by DOW.

B. For motor control centers that are to be installed into existing electrical rooms, provide shipping splits as required to allow installation through existing doors and passages to the final mounting locations.

d. The meter shall accept current inputs of class 10: (0 to 10) A, 5 Amp Nominal, and class 2 (0 to 2) A, 1A Nominal Secondary.

(4) The meter shall have an accuracy of +/- 0.1% or better for volts and amps, and 0.2% for power and energy functions. The meter shall meet the accuracy requirements of IEC687 (Class 0.2%) and ANSI C12.20 (Class 0.2%).

a. The meter shall provide true RMS measurements of voltage, - phase to neutral and phase-to-phase; and current, per phase and neutral.

b. The meter shall calculate RMS readings, sampling at over 400 samples per cycle on all channels measured readings.

c. The meter shall utilize 24 bit Analog to Digital conversion.

d. The meter shall provide %THD (% of total Harmonic Distortion). Harmonic magnitude recording to the 40th order shall be available for voltage and current harmonics.

(5) The meter shall provide a simultaneous voltage and current waveform recorder.

a. The meter shall be capable of recording 512 samples per cycle for a voltage sag or swell or a current fault event.

b. The meter shall provide pre- and post-event recording capability.

c. The meter shall have a programmable sampling rate for the waveform recorder.

d. The meter shall have an advanced DSP design that allows power quality triggers to be based on a 1 cycle updated RMS.

e. The meter shall allow up to 170 events to be recorded.

f. The meter shall store waveform data in a first-in, first-out circular buffer to ensure that data is always being recorded.

(6) The meter shall include a three-line, bright red, 0.56-inch LED display.

a. The meter shall fit in both DIN 92mm and ANSI C39.1 round cut-outs.

b. The meter must display a % of Load Bar on the front panel to provide an analog feel. The % Load bar shall have not less than 10 segments.

(7) Power meter shall have the capability of being upgraded in the field to add features without being removed. The meter shall be provided with the "V6" upgrade package that includes the following features: multifunction measurement with I/O expansion, 4 megabytes data-logging, harmonic analysis, TLC and CT/PT compensation, limit and control functions, and 512 samples per cycle waveform recorder.

a. The virtual upgrade packs must be able to be implemented without physically removing the installed meter.

b. Meter shall be a traceable revenue meter, and shall contain a utility grade test pulse allowing power providers to verify and confirm that the meter is performing to its rated accuracy.

(8) The meter shall include 2 independent communications ports on the back and face plate, with advanced features.

a. One port shall provide RS485 communication speaking Modbus ASCII, Modbus RTU, or DNP 3.0 protocol through back plate.

b. Baud rates shall be from 9600 baud to 57600 baud.

c. The meter shall provide an optical IrDA port (through faceplate), as the second communication port, which shall allow the unit to be set up and programmed using a PDA or remote laptop without need for a communication cable.

d. The meter shall have Pocket PC based software available for remote programming and integration.

(9) The meter shall provide user configured fixed window or rolling window demand. This shall allow the user to set up the particular utility demand profile.

a. Readings for kW, kVAR, kVA and PF shall be calculated using utility demand features.

b. All other parameters shall offer max and min capability over the user selectable averaging period.

c. Voltage shall provide an instantaneous max and min reading displaying the highest surge and lowest sag seen by the meter.

d. The meter shall provide upgrade rate of 6 cycles for Watts, Var and VA. All other parameters shall be 60 cycles.

(10) The meter shall support power supply of 90 to 265 Volts AC and 100 to 370 Volts DC. Universal AC/DC Supply shall be available and shall have burden of less than 11VA.

(11) The meter shall provide Limits Alarms and Control Capability as follows:

a. Limits can be set for any measured parameter.

b. Up to 16 limits per parameter can be set.

c. Limits shall be based on % of Full Scale settings.

d. Manual Relay Control shall be available through software.

e. Relay set delays and reset delays shall be available.

(12) The meter shall have data-logging capability. Refer to paragraph G. Three Phase Digital Multi-function Power Monitor, subparagraph 7, for upgrade pack to be included. The meter shall have a real-time clock that allows for time stamping of all the data in the meter when log events are created. The meter shall have six logs; the meter shall also have the Waveform Log:

a. The meter shall have three historical logs for trending profiles. Each log shall be capable of being programmed with up to 64 parameters. The user shall have the ability to allocate memory between the three historical logs in order to increase or decrease the memory allotted to each of the logs.

b. The meter shall have a log for Limits Alarms. The Limits log shall provide magnitude and duration of an event, time-stamp, and log value. The log must be capable of recording to 2048 events.

c. The meter shall have a log for System Events. The System Events log shall record the following occurrences with a time-stamp: Demand Resets, Password Requests, System Startup, Energy Resets, Log Resets, Log Reads, and Programmable Settings Changes.

d. The meter shall have a log for I/O changes. The I/O Change log shall provide a time-stamped record of any Relay Outputs and any Input Status changes. The log must be capable of recording up to 2048 events.

e. The meter shall have a log which is capable of recording a waveform both when a user-programmed value goes out of limit and when the value returns to within limit.

(13) The meter shall have I/O expandability through two Option card slots on the back.

a. The cards shall be capable of being installed in the field, without removing the meter from installation.

b. The meter shall auto-detect the presence of any I/O Option cards.

c. The Option Card slots shall accept I/O cards in all of the following formats: 100BaseT Ethernet Communication Card; Four Channel Bi-directional 0-1mA Output Card; Four Channel 4-20mA Output Card; Two Relay Outputs/2 Status Inputs Card; Four Pulse Output/4 Status Inputs Card; Fiber Optic Card.

d. The meter shall be capable of accepting any combination of up to two cards.

e. Provide the meter with the Ethernet Option Card, which shall provide the meter with 100BaseT Ethernet functionality. The Ethernet Option card shall:

1) Allow the meter to speak with 12 simultaneous sockets of Modbus TCP, so that multiple requests for data can be received simultaneously.

2) Allow auto transmit/receive detection for straight or null RJ45 cables.

(14) The meter shall have transformer loss, line loss, and total substation loss compensation.

a. Substation losses shall be programmable for Watts and VARs, and for ferrous and copper losses.

(15) The meter shall have a standard 4-year warranty.

(16) Power meter shall be able to be stored in (4 degree F (-20 degree C) to 158 degree F (70 degree C)). Operating temperature shall be (4 degree F (-20 degree C) to 158 degree F (70 degree C)).

a. NEMA 12 faceplate rating shall be available for the power meter.

(17) Acceptable product is Electro Industries/GaugeTech, Model Shark 200-0-10-V6-D2-INP100S-X-X Meter or approved equal.

D. REDUCED-VOLTAGE SOLID-STATE STARTERS:

(1) Scope of Work:

a. This specification describes the performance, functional specifications and fabrication details for a digital reduced voltage, stepless, solid state motor starter that shall provide a selectable voltage ramp, current limit or torque ramp (all standard) method of soft starting 3-phase AC induction motors.

1) The motor starter shall be self-contained and house the solid-state controller, motor overload protection (Class 10 through Class 30 selectable), an integral bypass contactor and a disconnect means as required on the drawings, in one MCC section.

b. They are for use with National Electrical Manufacturers Association (NEMA) design B, AC motors to reduce the current in-rush as well as mechanical shocks that can result from starting or stopping a motor across the line.

(2) Quality Assurance:

a. Codes and Standards

1) Unit(s) must be manufactured to the codes listed below:

(a) National Electrical Code

2) Unit(s) must be approved and/or certified by, and carry the label(s) of one or more of the following organizations:

(a) Underwriters Laboratories (UL)

(b) Canada Standards Association (CSA) or cUL is acceptable

3) The complete starter units shall be UL listed under UL 845 as part of the MCC.

b. Manufacturer's Qualifications:

1) The manufacturer shall be a certified ISO 9002 facility.

2) All incoming material shall be inspected and/or tested for conformance to quality assurance.

3) Power semiconductors shall be fully tested for proper electrical characteristics (dv/dt, di/dt, etc.).

4) All subassemblies shall be inspected and/or tested for conformance to venders engineering and quality assurance specifications.

5) Printed circuit boards shall be burned in for a minimum of 48 hours at 60°C.

6) The complete unit shall be functionally tested under load before shipment to assure proper operation per specification. Complete test reports shall be available upon request.

(3) Warranty: A one-year warranty shall be provided on materials and workmanship from date of acceptance of the project completion.

(4) Features:

a. Design Specifications

1) Power Ratings

(a) Input: 200 – 460V ±15%, 3 phase 50 / 60Hz (selectable) ± 10%. Unit(s) will operate with any incoming phase sequence.

1. Output: Reduced voltage 3 phase AC derived from phase-angle fired inverse-parallel thyristors, ramped to full voltage.

2. Current Rating(s): Shall be, at a minimum, capable of the motor Full Load Amps for the Horsepower(s) indicated on the drawings, including any Service Factors.

a) Current ratings of starter chassis must be based on manufacturer's data showing they were tested at 50°C. Units with current ratings tested at 40°C will be sufficiently oversized to match this requirement and prospective alternate bidders will provide proof of this over sizing prior to receiving approval to bid.

3. Output Overload Capacity: Shall be as follows, based upon motors indicated on the drawings and specified elsewhere;

   a) For units used on motors where Class 10 overload protection is required, the soft starter shall be callable of delivering 550% of the motor FLA for 10 seconds.

   b) For units used on motors where Class 20 overload is required, the soft starter shall be capable 500% of motor FLA for 20 seconds.

   c) If the motor is capable of Class 30 protection, the soft starter shall be capable of delivering 550% current for 30 seconds.

   d) Continuous duty rating shall be for the motor FLA plus + 15%.

   e) Lighter duty rated starters are not acceptable

4. SCCR (Short Circuit Current Rating) Listing: Combination starter units shall be UL listed to withstand the Available Fault Current of the system as indicated on the drawings or as determined prior to installation. For retrofit applications, both the soft starter and circuit breaker shall be supplied so that the SCCR rating of the combination is capable of withstanding the Available Fault Current. SCCR ratings in combination with the Circuit Breaker shall be published and supplied by the manufacturer with submittals.

5. Control Power: 120VAC, 60Hz provided by a Control Power Transformer with primary and secondary fusing, adequate to operate all associated devices in each starter.

2) Power Current Switching Devices (SCRs):

   (a) PIV RATINGS: Minimum 2.5 times nominal line voltage.

      1. Protection: RC snubber network circuits on each phase assembly and MOV protective devices on the gate circuits.

      2. Efficiency: 98.5% through SCRs, 99.97% when bypass is engaged.

3) Bypass Contactor: All units shall have an integral Bypass Contactor to shunt motor power around the SCRs when at full speed. The soft starter shall include all necessary control circuitry to accomplish this without the need for external timers and engage the Bypass Contactor only when the microprocessor has determined that the motor has reached speed.

   (a) Overload Protection shall be integral and continuous so that it is in the motor circuit at all times, even when the Bypass Contactor is engaged.

(b) Decel Interlocking shall be integral to allow the soft starter to automatically disengage the Bypass Contactor when a Decel command is given.

(c) Units which use external Bypass Contactors will be considered, but shall still meet the all of the above control and protection conditions. They shall also meet the SCCR ratings as required above.

4) Ambient Conditions:

(a) Temperature: As a standard of unit design quality, starter shall be documented to show that the open chassis design has been tested for 0 – 50° C (-32 to 122° F) operation. Enclosed units shall be designed for 0 – 40° C ambient unless indicated elsewhere.

(b) Altitude: 3300 ft (1000 m) without derating, 16,500ft (5000m) maximum.

(c) Humidity: 0 – 95% RH, non-condensing.

b. Product Features:

1) Acceleration Control shall be fully adjustable in programming to match any application. As a minimum, starter shall come complete with the following settings:

(a) Ramp Type: To ensure maximum flexibility in matching any unforeseen load conditions in the field, the starter shall provide all of the following methods of closed loop acceleration ramp control: Voltage Ramp, Current Limit Only (Current Step) or Closed Loop Torque. In addition, the soft starter shall be capable of being programmed to start the motor Across-the-Line for testing purposes. To avoid problems in commissioning once the field application conditions are known, any starter that has limited ramp choices will not be acceptable.

(b) Starting Torque: Initial torque output shall be programmable as either Voltage or Torque output depending on the selected ramp profile, and adjustable between 50-200% of motor Full Load Torque.

(c) Maximum Current Limit: To ensure acceptability to power conditions and reliability of starting under any circumstance that the motor can function in, a Current Limit function shall be available in all starting ramp modes, adjustable between 150 and 550% of the unit rating. Starters which do not provide Current Limit in all starting modes will not be acceptable.

(d) Ramp Time: The time between Initial Torque and Full Output shall adjustable between 1 and 360 seconds.

(e) Kick Start: To provide for starting of difficult loads, the starter shall include a Breakaway Pulse (Kick Start) feature that will apply a high output for a short time on initial start command. The Kick Start voltage level shall be adjustable from 40 – 100% voltage, for 0.1-2 seconds max.

(f) Motor heating function that will maintain motor above dew point when a run signal is not applied. Functions by passing a small amount of DC current through the motor windings on motors which include a thermistor or PTC temperature device.

(g) Slow Speed Jog: For checking rotation at start-up or other testing procedures, the starter shall provide a programmable Slow Speed Jog feature, initiated by the Operator Interface or via input. The Slow Speed Jog output shall be programmable as a percentage of the base motor speed, not exceeding 21%.

1. Slow Speed Reverse: For testing purposes or to provide for special applications as indicated on the drawings, the soft starter shall be capable of rotating the motor in the reverse direction upon command from the operator interface or via inputs. This feature shall be integral to the soft starter or modifications shall be provided to accommodate it.

2) Deceleration Control (Controlled Ramp Down): To facilitate the controlled deceleration of pumps and other loads, Decel Torque Control and/or Pump Control shall be built in and selectable with the following adjustments, all of which are independent of any Acceleration Ramp settings:

(a) Deceleration Ramp Time: adjustable from 0 – 360 seconds to allow gentle controlled deceleration in excess of the natural coast-to-stop time of the load.

(b) Stop Torque Level, adjustable from 10-100% to automatically turn off the starter when the output torque has reached a desired level, i.e. when a check valve has closed.

3) Selectable Ramp Profiles: To accommodate changeable conditions, the starter shall provide 3 separately adjustable ramp profiles, selectable via a dry contact closure. Each ramp will provide all of the above features.

4) Motor and Load Protection shall be integral to the starter assembly. All current referenced protection features shall be automatically calculated from the motor nameplate FLA as entered by the user. All time based protection features shall have retentive memory so that they remain active should the power fail and be restored. Starter shall provide the following functions:

(a) I^2t Thermal Overload shall be provided by the on-board microprocessor control based on inverse time-current trip curves as defined by NEMA trip curve Classes. The trip curves classes shall be programmable from between Class 5 and Class30 and the starter shall be UL listed to provide

each individual class. As the most important protection feature of a starter, the overload protection shall be based on a Motor Thermal Model retained in memory and provide the following features:

1. Retentive Thermal Memory shall be used to ensure that the overload protection does not lose track of motor temperature after the power is lost or shut down. Upon reapplication of power, the microprocessor shall be updated as to the motor thermal state. This feature shall be capable of being over ridden for emergency re-start applications.

2. Manual or Automatic Reset shall be selectable in programming to provide for automatic reset in unattended remote applications.

3. Thermistor Input shall be provided in case the motor or equipment arrives with integral Thermistors to monitor temperature. The Thermistor input shall provide for a motor thermal temperature monitoring that will bias the Motor Thermal Model mentioned above based on actual motor temperature.

   a) The Thermistor monitoring circuit shall detect broken or shorted field devices or wiring.

   b) Units without this feature shall provide external Thermistor Protection Relays if necessary and provide a way for the soft starter to display a Thermistor Trip independently of a Motor Overload trip.

(b) Phase-Loss Protection shall be standard and shut down the starter if current through any leg drops to 20% of the programmed motor FLA or less, independent of line voltage levels.

   1. For purposes of testing with smaller motors, each starter shall be capable of having the motor FLA adjusted down to 20% of the unit Max Amp rating so that this feature will not trip if a load less than 20% of that setting is connected (i.e. 4% of unit max. rating).

(c) Phase Current Imbalance shall be used to bias the Motor Thermal Model so that the tripping curve reflects the additional motor heating caused by the imbalance.

   1. The "Pick-up Point" of this feature shall be programmable or able to be defeated so that nuisance tripping can be avoided.

(d) Ground Fault Protection shall be included which will prevent a start-up if any phase is connected to Ground or trip while running.

(e) Over Current / Shear Pin Protection shall be provided. This Over Current trip shall be adjustable at lower levels than the Thermal Overload

protection for the purpose of protecting mechanical components from undue shock when rapid unexpected load changes occur.

1. Adjustment level shall be from 50% to 150% of the programmed motor FLA

(f) Under Current / Load Loss Protection shall shut down the starter on an adjustable Under Current condition. This shall be programmable as follows:

1. Adjustment level shall be from 19% to 100% of the programmed motor FLA

(g) Multiple motors (2) shall be capable of being accommodated in case the soft starter is temporarily connected to a spare motor where the motor protection parameters differ and the primary motor will be used again. Selection between the motor profiles shall be via the Operator Interface or communications port.

(h) Over and Under Voltage Protection will cause a trip if the voltage dips or surges beyond the unit tolerance limits for both the line voltage and the control voltage, differentiating the trip cause between the two systems on the Operator Interface Display.

5) Starter Protection shall be provided to maintain reliability of both the equipment and the circuit components, with the following features:

(a) Shorted SCR / Welded Contactor Detection shall be standard. This function must automatically prevent the next start when at least one SCR is shorted or the Bypass Contactor is welded.

(b) Starter Overtemp Trip shall be built-in and protect the SCRs from excessive heat build-up in the heat sink. This function shall also detect a broken wire or defective sensor.

6) Conformal coatings shall be factory applied to all circuit boards and circuit board components that allow and/or benefit from such treatments.

7) Control Location shall be programmable to be any of the following choices: Control (Digital) Inputs, Operator Interface / keypad, PC viaserial comm. port., PLC via Profibus or Profinet or Profinet interface or PC via Profibus or Profinet interface. The Operator Interface display shall graphically indicate which control point being used.

(a) When remote control via the Profibus or Profinet interface is being used, the ability to override that control point via digital input will be provided for testing or troubleshooting.

8) Input / Output features shall be as follows:

(a) Four (4) Inputs shall be provided for the control and option selection of the starter as follows. All input and control devices shall be 24VDC control from a built-in power supply, requiring only dry contact closures. All I/O termination points shall incorporate easily removable terminal blocks to facilitate quick change-out or troubleshooting isolation in the field.

1. Input commands shall be programmable for any one of the following functions; Motor Right (Fwd), Motor Left (Rev), Parameter Set 1, 2 or 3, Trip Reset, Quick Stop, Slow Speed, Emergency Restart, and Local Override for allowing local control when using Serial Communications as the control point.

(b) Four (4) Output Relays shall be provided; three outputs shall be Form A (SPST), the fourth shall be Form C (SPDT), all rated for 240VAC, 3 Amps max.

1. Each relay shall be fully programmable for any one of the following functions; PIO Output 1, PIO Output 2, Input Status (1-4), Run up (Accelerating), Operation/bypass, Coasting down, On time motor (Running), Motor-on commanded, DC braking Contactor, Group warning (no trip), Group error (Fault trip), Bus error, Device (starter) error, Power on, Ready to start.

9) Operator Interface panel shall be included which provides simple to use adjustment and status indication on a dead-front shroud of the starter. This panel shall be capable of being remotely mounted up to 10ft (3 meters) away from the starter chassis, such as on the front door of the enclosure.

(a) Adjustments shall be made by keypad with tactile feedback keys for high noise environments. No binary coded dipswitches shall be used for programming. Pass code protection shall be available to prevent unauthorized changes to the programming.

(b) Graphical User Display shall be backlit LCD for long life and visibility in low contrast environments. Display shall have a minimum of 4 lines of alpha-numeric characters, programmable in 4 languages and capable of displaying all digits in displayed parameter so that operators do not need to calculate current values over 999A.

10) Metering functions shall be provided through the Alpha-Numeric Display for indicating the following;

(a) Output Current for each individual phase. Indicating range to be 0.0 – 9999 amps

(b) Voltage: Phase-to-phase and Phase-to-ground voltages shall be available for display

(c) Frequency, for use in generator operation diagnostics.

(d) Motor Thermal Status to indicate heat build-up in the motor. Range shall be 0 – 100% of the motor thermal capacity and count up towards 100% while heating.

(e) Elapsed Time shall indicate the number of hours that the starter has been in a Run condition, maximum 100,000 hours.

(f) Start Counter, indicating the number of Run commands given.

11) Serial Communications shall be provided as follows:

(a) Starter shall have either a RS232 or RS485 digital communication port

(b) Communications protocol shall be Profibus or Profinet.

(c) PC interface and software shall be available either through the local programming port via USB connection, or over the Profibus or Profinet connection (if installed)

12) Historical Data shall be recorded and displayed, plus made available for communication. It shall be retained in non-volatile memory for viewing by service personnel later.

(a) History shall include fault conditions experienced by the starter and peak running details

(5) Mechanical Construction

a. Power Terminations shall be made on factory supplied mechanical lugs of sufficient size to accommodate the required wire for the line and load. Lugs are to be clearly marked as Line (L1, L2, L3) and Load (T1, T2, T3) and with appropriate tightening torque specifications.

b. Control Terminations to the soft start main unit shall be on terminal strips that can be removed easily without the need to special tools.

(6) MOTOR DATA: The soft start shall be designed to operate a NEMA design B motor with a nameplate rating of one standard horsepower size larger than nameplate rating of motor being provided, for cooler operation of the SCRs. Design shall allow for heavy duty operation if available.

(7) Control Options:

a. The soft start's control circuit shall be completely independent of its power circuit and adaptable to 240, 380 or 460 VAC, 50 or 60 Hz. The peripheral soft start control circuitry shall be operated at 120 VAC, 60 Hz from a control power transformer included within the MCC soft start's section.

b. The soft start shall accept control logic either by operator devices (pushbuttons, selector switches, etc.) wired directly to the unit or from external relay logic, including but not limited to the following:

1) Three position H-O-A switch that provides for manual (HAND) start or remote signal (AUTO) start from remote relay contacts.

2) Red RUN pilot light illuminated whenever the soft start is provided with a run command and no fault condition is present.

3) Green STOP pilot light illuminated whenever the soft start is supplied with control power and no run command is present.

4) All operator devices shall be panel door-mounted using supplied 120 VAC control logic. Clearly labeled terminals shall be provided.

(8) Installation:

a. The FLA motor amps shall be input into the starter memory via the keypad.

b. Adjust all circuit breakers, switches, access doors and operating handles for free mechanical and electrical operation as described in manufacturer's instructions.

c. Clean interiors of all enclosed electrical equipment to remove construction debris, dirt and shipping materials.

(9) Software: A software package shall be provided for full programming via a PC running under MS Windows OS, connectable via a USB cable to the soft starter.

(10) Manufacturer: Siemens 3RW44 or approved equal

E. Three Phase Electric Motor Protector shall be a SymCom, Inc. Model No. 777 or approved equal.

(1) Input Voltage:

a. 200 - 480 VAC, 3 phase (Standard)

b. 500-600 VAC, 3 phase (Available).

(2) Frequency: 50 or 60 Hz

(3) Motor Full Load amp Range:

a. 2 - 90 Amps, 3ø (Direct)

b. 91 - 800 Amps, 3ø (External CT's)

(4) Programmable Operating Points:

a. LV - Low Voltage Threshold: 170V (450V*) - HV Setting

b. HV - High Voltage Threshold: LV Setting - 528V (660V*)

c. VUB - Voltage Unbalance Threshold: 2 - 15% or 999\

d. MULT - # of Loops or CT Ratio (XXX:5): 1 - 10 Loops or 100-800

e. OC - Over Current Threshold: (20 - 100A) / MULT

f. UC - Under Current Threshold: (0, 10 - 98A) / MULT

g. CUB - Current Unbalance Threshold: 2 - 25% or 999 OFF)

h. TC - Over Current Trip Class: 5, J5, 10, J10, 15, J15, 20, J20, 30, J30

i. RD1 - Rapid Cycle Timer: 2 - 500 Seconds

j. RD2 - Restart Delay After All Faults Except Under Current (Motor Cool Down Timer: 2 - 500 Minutes

k. RD3 - Restart Delay After Under Current (Dry Well Recovery Timer): 2 - 500 Minutes

l. #RU - Number of Restarts After: 0, 1, 2, 3, 4, A (Automatic)

m. ADDR - RS485 Address: A01 - A99

n. #RF - Number of Restarts After All Faults Except Under Current: 0, 1, oc1, 2, oc2, 3, oc3, 4, oc4, A, ocA

o. UCTD - Under Current Trip Delay: 2 - 60 Seconds

p. GF - Ground Fault Current Threshold: (3 - 20A) / MULT or OFF

(5) Physical Specifications:

a. Low Voltage: 4 seconds

b. Output Contact Rating (Pilot Duty) SPDT: 480 VA @ 240 VAC

c. Transient Protection (Internal): 2500 V for 10 mSeconds

(6) Accuracy:

a. Voltage: +/- 1%

b. Current: +/- 3% (<100 amps direct)

c. Timing: 5% +/- 1 Second

(7) Repeatability:

a. Voltage: +/- 0.5%

b. Current: +/- 1% (<100 amps direct)

(8) Temperature Range: 0 - 70 degrees Celsius

(9) Dimensions: 3.0" H x 5.1" D x 3.6" W

(10) Power Consumption: 10 Watts (Max.)

(11) Weight: 1.2 lbs.

(12) Motor saver shall be provided with the MODBUS Output monitoring port.

F. Three Phase Electric Motor Protector Remote Manager shall be a SymCom, Inc. Model RM-2000 with an RS485MS-2W serial interface for connection to the SymCom, Inc. Model 777-KW Motor Protector, or approved equal.

(1) Control Voltage - 115VAC +/- 10%; 50-60 Hz

(2) Transient Protection (Internal) - 2500 V for 10ms

(3) Power Consumption - 3 Watts (Maximum)

(4) Communication Ports:

a. 1 Port for MS777

1) Setup: Even Parity, 1 Stop Bit

2) Baud Rate: 9600

3) Protocol: Modbus RTU

4) Available Addresses: 01

5) Serial Interface: RS485

b. 1 Port for PC, PLC, etc.

1) Setup: None, Odd, or Even

2) Baud Rate Parity Protocol: 1 or 2 Stop Bits

3) Available Addresses: 300 – 28800

4) Serial Interface: Modbus RTU; A01 - A99; RS485

c. Real-time Clock:

1) Y2K: Compliant

2) Battery Back-up Life: 10 years @ 25 degrees Celsius without external power.

3) Last fault memory: Stores up to 4 faults with time and date stamp, includes voltages and currents at the time of trip.

d. Output Relays:

1) (option 1): Consult Factory for Function of Relays

2) Configuration: Two Independent Electro-Mechanical Form C(SP DT)

3) Contact Material: Silver/Tin Oxide

4) Pilot Duty Rating: 240 VA @ 120 VAC

5) General Purpose Rating: 5 A @ 120 VAC

e. Analog Output (option 2):

1) Types: 0-20 mA, 4-20 mA, 0-5 VDC, 0-10 VDC (specify with order, for others consult factory)

2) Output Signal: KW, PF, Amps, or Volts

3) Maximum Load: (Software Selectable)

(a) 0-20 mA: 500 Ohms max.

(b) 4-20 mA: 500 Ohms max.

(c) 0-10 VDC: 2 kilo Ohms min.

(d) 0-5 VDC: 2 kilo Ohms min.

4) Accuracy: +/- 1% @ 25 degrees Celsius

5) Isolation: 1 kVrms

f. Analog/Digital:

1) Inputs (option 3): Consult Factory

g. Physical Specifications: Remote Manager.

1) Certifications:

(a) UL: UL 508

(b) cUL: cUL 508

(c) CE: Pending

h. Environment:

1) Class of Protection: NEMA 4x (Pending)

2) Ambient Operating Temp.: -20 to 70 degrees Celsius

3) Ambient Storage Temperature: -30 to 70 degrees Celsius

4) Humidity: Up TO 85%, non-condensing

i. Enclosure:

1) Dimensions: 6.1" L x 6.5" W X 1.1" D

2) Weight: 1.2 lbs.

3) Material: Black Polycarbonate

j. Display: Liquid Crystal with extended temp range.

1) Size: 2 rows x 20 characters

2) Lighting: LED Back-Light

k. Keypad: Eight 0.5" stainless steel dome buttons for tactile feedback.

1) Mechanical Life: 50,000 actuations

2) Overlay Material: Polyester

3) UV Exposure without degradation: 2000 Hrs.

l. Terminal: Depluggable terminal block.

G. WELL PUMP CONTROL CIRCUIT SEQUENCE TIMER:

(1) Miniature programmable logic controller sequence timer to control well pump operational cycle timing. Program timing functions to meet the requirements specified on the drawings.

(2) Operable on 120V, 60Hz supply.

(3) Integral graphic display for control and programming.

(4) Sequence timer inputs and outputs shall be expandable via I/O expansion modules. Provide I/O expansion modules as required to perform the functions shown on the drawings.

(5) Manufacturer: Siemens LOGO! 8 series or approved equal.

H. ELAPSED TIME METER: Provide as specified in Section SP-8.5.

I. SELECTOR SWITCHES:

(1) Provide as specified in Section SP-8.5 for all MCC starter cubicle switches.

(2) For the SCADA Cabinet selector switch provide a panel mounted, single pole, 3-position, rotary, cam operated with fixed pistol grip handle. Contact action shall not be dependent upon springs. Contacts shall be 20 ampere, 600 volts, maintaining type. Switch shall meet NEMA 1 requirement for panel mounting. Switch shall be provided with escutcheon plates. Switch shall be General Electric SBM series or approved equal.

J. MECHANICAL TIME CLOCK:

(1) 7-day mechanical timer with programmable schedules for each day. Provide one time clock for each well pump motor starter.

(2) Timer shall include skip-a-day feature, manual override until next on/off cycle, and optional reserve power to maintain timing cycle for 24 hours during power outages.

(3) Enclosure shall be NEMA 1, metal.

(4) Timeclock rated for operation on 120V, 60Hz supply.

(5) Contacts shall be rated 120-277V, 40A.

(6) Mount time clock to face of MCC in accordance with manufacturer instructions and wire to well pump starter control circuit in accordance with the drawings.

(7) Manufacturer: Tork W100L or approved equal.

K. NAMEPLATES: Provide 1/8-inch dilecto or approved equal with beveled edges. Lettering shall be white and of Gorton Normal Double Line design. Height and description as shown on drawings.

L. CONTACTORS: The contactors in the pump motor control circuit shall be NEMA rated, Size 0 minimum with coil surge suppression unit.

M. TIME DELAY RELAYS: Provide as specified in Section SP-8.5.

N. AUXILIARY RELAY: Provide as specified in Section SP-8.5.

O. EMERGENCY STOP – RESET PUSHBUTTON: The emergency stop switch shall be push-pull type, complete with Square D Class 9001 switch or approved equal, with maintained contact attachments, and Type TR red mushroom push button unit. The switch shall be labeled EMERGENCY STOP.

P. INDICATING LIGHTS: Provide as specified in Section SP-8.5.

Q. MOTOR HIGH TEMPERATURE SWITCH RELAY (TSH): Provide as specified in Section SP-8.5.

R. CAPACITORS AND CAPACITOR BREAKERS:

The KVAR rating of the capacitors shall be sized to correct power factor of motor and associated controls to approximately 95%, not to exceed unity, at full load conditions. Capacitors shall be designed and manufactured according to NEMA standards, and rated in continuous KVAR, voltage and frequency for operating within the ambient temperature range of 60 degree F to 90 degree F. They shall be subject to all NEMA standard dielectric tests. They shall be filled with nonflammable high dielectric liquid and be individually fused with current- limiting fuses. Askarel and insulating liquids containing poly-chlorinated biphenyls (PCB's) shall not be provided.

Capacitor circuit breakers shall be thermal-magnetic type and be suitable for capacitor furnished. Breaker rating shall be approximately 150 percent of capacitor rated current or per circuit breaker manufacturer's recommended size.

S. CAPACITOR ISOLATION CONTACTOR: The capacitor isolation contactor shall be NEMA rated and provided to isolate the capacitors from the pump motor feeder circuit during starting of the pump motor. Rating of the isolation contactor shall match or exceed the capacitor circuit breaker rating.

T. DRY-TYPE TRANSFORMERS (600 VOLTS AND LESS): As specified in Section SP-8.5.

U. PANELBOARDS (600 VOLTS AND LESS): As specified in Section SP-8.5.

V. PROTECTIVE DEVICE RATINGS AND SETTINGS: Device ratings and adjustable settings shall be as specified in the short-circuit and coordination study detailed in Section SP-8.7.

W. WIRING:

All MCC wiring shall be color coded or labeled with permanent markers to identify individual circuit/runs.

Provide elementary and connection diagrams for each starter unit and an interconnection diagram for the entire motor controller switchboard.

X. STRIP HEATERS: Provide 500-watt strip heaters with perforated guards at the rear of motor starter cubicles, SCADA cabinet, and instrumentation display board. S trip heaters

shall be powered via the 120V panelboard and controlled by remote thermostat. Thermostat shall be Pentair TWR60 or approved equal.

Y. INSTRUMENT TRANSFORMERS:

(1) General: Instrument transformers shall be molded dry-type in accordance with ANSI C57.13. Transformer volt-ampere rating shall be suitable for carrying the specified load without overheating or exceeding the permissible accuracy for the transformer.

(2) Potential Transformers: Potential transformers shall have an ANSI accuracy class of 0.3. They shall be equipped with current limiting fuses.

(3) Current Transformers: Current transformers shall be furnished with the specified ratios. The accuracies shall conform to ANSI C37.20.

8.6.09 MANUFACTURER'S SERVICES: Provide a factory-trained representative at the site for the specified quantity and duration of the following activities. Specified durations do not include travel time to or from the project site. The factory representative shall anticipate a minimum of 2 separate trips to the project site.

A. Training Sessions: Provide a minimum of 8 hours of classroom field training on the motor controller switchboard installation. Certify completion of training on Form SP-8-H, Section SP-8.6.

B. Start-up and Testing Assistance: Provide a minimum of 8 hours of on-site support for start-up and testing. Complete form SP-8-G, Section SP-8.6.

8.6.10 MEASUREMENT AND PAYMENT: Payment of the furnishing and installing of equipment will be made at the Lump Sum Price Bid of which the item is a part and shall be full compensation for all work in accordance therewith, complete and finished in accordance with the drawings and specifications.

SP-8-G. MANUFACTURER'S INSTALLATION CERTIFICATION FORM:

Contract No: _____ Specification section: _____

Equipment name: _____

Contractor: _____

Manufacturer of equipment item: _____

The undersigned manufacturer of the equipment item described above hereby certifies that he has checked the installation of the equipment and that the equipment, as specified in the project manual, has been provided in accordance with the manufacturer's recommendations, and that the trial operation of the equipment item has been satisfactory.

Comments: _____

_____

_____

_____

_____

_____	_____
Date	Manufacturer
	_____
	Signature of Authorized Representative
_____	_____
Date	Contractor
	_____
	Signature of Authorized Representative

SP-8-H. MANUFACTURER'S INSTRUCTION CERTIFICATION FORM:

Contract No: _____ Specification section: _____

Equipment name: _____

Contractor: _____

Manufacturer of equipment item: _____

The undersigned manufacturer certifies that a service engineer has instructed the wastewater treatment plant operating personnel in the proper maintenance and operation of the equipment designated herein.

Operations Check List (check appropriate spaces)	
Start-up procedure reviewed	
Shutdown procedure reviewed	
Normal operation procedure reviewed	
Others:	
Maintenance Check List (check appropriate spaces)	
Described normal oil changes (frequency)	
Described special tools required	
Described normal items to be reviewed for wear	
Described preventive maintenance instructions	
Described greasing frequency	
Others:	

_____ _____
Date Manufacturer

_____
Signature of Authorized Representative

_____ _____
Date Signature of DOW's Representative

_____ _____
Date Signature of Contractor's Representative

END OF SECTION

SECTION SP-8.7 – ARC FLASH HAZARD ANALYSIS AND SHORT CIRCUIT/ COORDINATION STUDY

8.7.01 DESCRIPTION AND REQUIREMENTS: Materials, equipment, and construction methods specified in other sections of the specifications for Electrical Work shall apply to this section.

A. This section specifies that the Contractor shall subcontract an independent full member NETA Engineering and Study Firm and Testing Firm to prepare and furnish, but not necessarily be limited to, the following:

(1) Short-circuit study (SCS) and a protective device coordination study (PDCS) for all facility new and existing electrical distribution power system equipment.

(2) Arc Flash Hazard Analysis Study (AFA) per the requirements set forth in the current version of NFPA 70E -Standard for Electrical Safety in the Workplace. The arc flash hazard analysis shall be performed according to the IEEE Standard 1584 - 2002, the IEEE Guide for Performing Arc-Flash Calculations.

(3) The scope of the studies shall include all new distribution and power equipment supplied under this contract, temporary distribution and power equipment, and existing equipment, including, but not limited to, the following:

a. Existing utility transformer.

b. Existing equipment fed by the new equipment.

c. Existing equipment feeding new equipment.

(4) Qualifications: The short-circuit, protective device coordination, and arc flash hazard analysis studies shall be performed by the manufacturer of the distribution and power equipment or by an electrical study or testing service that is regularly engaged in power system studies. The Hawai‘i registered professional Electrical Engineer responsible for the studies shall affix the professional licensed electrical stamp (Hawai‘i) and sign the studies.

B. APPLICABLE PUBLICATIONS: The publications listed below and/or listed herein shall form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only. Consider the advisory provisions to be mandatory, as though the word “shall” had been substituted for “should” wherever it appears. Equipment, materials, installation, and workmanship shall be in accordance with the mandatory and advisory provisions of NFPA 70, unless more stringent requirements are specified or indicated.

(1) Institute of Electrical and Electronics Engineers, Inc. (IEEE):

a. IEEE 141 - Recommended Practice for Electric Power Distribution and Coordination of Industrial and Commercial Power Systems.

b. IEEE 242 - Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems.

c. IEEE 399 - Recommended Practice for Industrial and Commercial Power System Analysis.

d. IEEE 241 - Recommended Practice for Electric Power Systems in Commercial Buildings.

e. IEEE 1015 - Recommended Practice for Applying Low-Voltage Circuit Breakers Used in Industrial and Commercial Power Systems.

f. IEEE 1584 - Guide for Performing Arc-Flash Hazard Calculations.

(2) American National Standards Institute (ANSI):

a. ANSI C57.12.00 - Standard General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers.

b. ANSI C37.13 - Standard for Low Voltage AC Power Circuit Breakers Used in Enclosures.

c. ANSI C37.010 - Standard Application Guide for AC High Voltage Circuit Breakers Rated on a Symmetrical Current Basis.

d. ANSI C 37.41 - Standard Design Tests for High Voltage Fuses, Distribution Enclosed Single-Pole Air Switches, Fuse Disconnecting Switches and Accessories.

(3) The National Fire Protection Association (NFPA)

a. NFPA 70 - National Electrical Code, latest edition.

b. NFPA 70E - Standard for Electrical Safety in the Workplace.

(4) National Electrical Testing Association (NETA)

a. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems

C. SUBMITTALS: Submit a complete arc flash hazard analysis and short circuit/coordination study report, as specified herein, in accordance with Section S P - 8.3, E L E C T R I C A L W O R K - SUBMITTALS:

(1) The studies shall be submitted prior to receiving final approval of the new distribution and power equipment shop drawings and/or prior to release of equipment drawings for manufacturing. If formal completion of the study may cause delays in equipment shipments, approval from DOW may be obtained for a preliminary submittal of data to ensure that the selection of device ratings and characteristics will be satisfactory to properly select the distribution and power equipment. The formal study will be provided to verify preliminary findings.

(2) The results of the short-circuit, protective device coordination, and arc flash hazard analysis studies shall be summarized in a final report. Electronic PDF copies of the report shall be provided upon request.

(3) The electronic files of the system model used to perform the study shall be submitted upon completion and acceptance of the study results by DOW.

(4) The product shall be a certified report summarizing the short circuit and coordination study and conclusions or recommendations which may affect the integrity of the electric power distribution system. As a minimum, the report shall include the following sections:

a. Executive Summary including Introduction, Scope of Work and Results/Recommendations.

b. Short-Circuit Methodology Analysis Results and Recommendations.

c. Short-Circuit Device Evaluation Table.

d. Protective Device Coordination Methodology Analysis Results and Recommendations

e. Protective Device Settings Table.

f. Time-Current Coordination Graphs and Recommendations.

g. Arc Flash Hazard Methodology Analysis Results and Recommendations including the details of the incident energy and flash protection boundary calculations, along with Arc Flash boundary distances, working distances, Incident Energy levels and Personal Protection Equipment levels in accordance with the methods outlined in IEEE Standard 1584 and stated hereinafter.

h. Arc Flash Labeling section showing types of labels to be provided. Section will contain descriptive information as well as typical label images.

i. Work shall include the fabrication of signs with the arc flash hazard study results and the installation of the signs on the equipment in accordance with NFPA 70E Table 3-3.9.3 that includes the personnel protective equipment (PPE) risk category, the energy available, and the clothing recommendation.

j. One-line system diagram that shall be computer generated and will clearly identify individual equipment buses, bus numbers used in the short-circuit analysis, cable and bus connections between the equipment, calculated maximum short-circuit current at each bus location, device numbers used in the time-current coordination analysis, and other information pertinent to the computer analysis.

k. The equipment manufacturer's information used to prepare the study.

l. Power Utility Company system information applicable to the project.

m. Short circuit calculations listing short circuit levels at each bus. Provide a sketch of the bus and use both the project term and the bus-code-name to identify the bus, branches, sources, loads. Base the system on the Project One-Line diagram.

n. Coordination study time-current curves including the instrument transformer ratios, model numbers of the protective relays, and the relay settings associated with each breaker.

o. Comparison of short circuit duties of each bus to the interrupting capacity of the equipment protecting that bus.

p. Data used as input to the report that includes cable impedances, source impedances, equipment ratings for the equipment being purchased for the project, etc.

q. Assumptions made during the study.

D. STUDIES: The Contractor shall furnish an Arc Flash Hazard Analysis Study per NFPA 70E -Standard for Electrical Safety in the Workplace, reference Article 130.3 and Annex D, as prepared by the subcontracted Study Firm. This study shall also include a short circuit and coordination study on the electrical power distribution system as specified and as described in Section 6.1 of NETA ATS. The studies shall be performed in accordance with IEEE Standards 141 and 242 and shall utilize the ANSI method of short circuit analysis in accordance with ANSI C37.010.

The studies shall be performed using actual equipment data for both existing and new equipment. For new equipment, the Contractor shall provide copies of final reviewed equipment submittals to the Study Firm upon request.

Any power distribution equipment outages shall be scheduled in advance and coordinated with DOW to limit process outages as required per plant process capacities.

E. DATA:

(1) Contractor shall furnish all data as required for the power system studies. The Study Firm performing the short-circuit, protective device coordination, and arc flash hazard analysis studies shall furnish the Contractor with a listing of required data immediately after award of the contract. The Contractor shall expedite collection of the data to assure completion of the studies as required for final approval of the distribution and power equipment shop drawings and/or prior to the release of the equipment for manufacturing.

(2) Source combination may include present and future motors.

(3) Load data utilized may include existing and proposed loads obtained from Contract Documents.

(4) If applicable, include fault contribution of existing motors in the study. The Contractor shall obtain required existing equipment data, if necessary, to satisfy the study requirements.

F. SHORT-CIRCUIT ANALYSIS:

(1) Transformer design impedances shall be used when test impedances are not available.

(2) Provide the following:

a. Calculation methods and assumptions.

b. Selected base per unit quantities.

c. One-line diagram of the system being evaluated that clearly identifies individual equipment buses, bus numbers used in the short-circuit analysis, cable and bus connections between the equipment, calculated maximum short-circuit current at each bus location and other information pertinent to the computer analysis.

d. The study shall include input circuit data including electric utility system characteristics, source impedance data, conductor lengths, number of conductors per phase, conductor impedance values, insulation types, transformer impedances and X/R ratios, motor contributions, and other circuit information as related to the short-circuit calculations.

e. Tabulations of calculated quantities including short-circuit currents, X/R ratios, equipment short-circuit interrupting or withstand current ratings and notes regarding adequacy or inadequacy of the equipment rating.

f. Results, conclusions, and recommendations. A comprehensive discussion section evaluating the adequacy or inadequacy of the equipment must be provided and include recommendations as appropriate for improvements to the system.

(3) For solidly-grounded systems, provide a bolted line-to-ground fault current study for applicable buses as determined by the Engineer performing the study.

(4) Protective Device Evaluation:

a. Evaluate equipment and protective devices and compare to short circuit ratings.

b. Adequacy of switchgear, motor control centers, and panelboard bus bars to withstand short-circuit stresses.

c. Provide written notification of any circuit protective devices improperly rated for the calculated available fault current.

G. PROTECTIVE DEVICE TIME-CURRENT COORDINATION ANALYSIS:

(1) Protective device coordination time-current curves (TCC)shall be displayed on 5-cycle log-log scale graph paper.

(2) Include on each TCC graph, a complete title with descriptive device names.

(3) Terminate device characteristic curves at a point reflecting maximum symmetrical or asymmetrical fault current to which the device is exposed.

(4) Identify the device associated with each curve by manufacturer type, function, and, if applicable, tap, time delay, and instantaneous settings recommended.

(5) Plot the following characteristics on the TCC graphs, where applicable:

a. Electric utility's overcurrent protective device.

b. Medium voltage equipment overcurrent relays.

c. Medium and low voltage fuses including manufacturer's minimum melt, total clearing, tolerance, and damage bands.

d. Low voltage equipment circuit breaker trip devices, including manufacturer's tolerance bands.

e. Transformer full-load current, magnetizing inrush current, and ANSI through-fault protection curves.

f. Medium voltage conductor damage curves.

g. Ground fault protective devices, as applicable.

h. Pertinent motor starting characteristics and motor damage points, where applicable.

i. The largest feeder circuit breaker in each motor control center and applicable panelboard.

(6) Provide adequate time margins between device characteristics such that selective operation *is* provided, while providing proper protection.

(7) Provide the following:

a. A One-line diagram shall be provided which clearly identifies individual equipment buses, bus numbers, device identification numbers and the maximum available short-circuit current at each bus when known.

b. A sufficient number of log-log plots shall be provided to indicate the degree of system protection and coordination by displaying the time-current characteristics of series connected overcurrent devices and other pertinent system parameters.

c. Computer printouts shall accompany the log-log plots and will contain

descriptions for each of the devices shown, settings of the adjustable devices, and device identification numbers to aid in locating the devices on the log-log plots and the system one-line diagram.

d. The study shall include a separate, tabular printout containing the recommended settings of all adjustable overcurrent protective devices, the equipment designation where the device is located, and the device number corresponding to the device on the system one-line diagram.

e. A discussion section which evaluates the degree of system protection and service continuity with overcurrent devices, along with recommendations as required for addressing system protection or device coordination deficiencies.

f. Provide written notification of any significant deficiencies in protection and/or coordination.Provide recommendations for improvements.

H. ARC FLASH HAZARD ANALYSIS:

(1) The arc flash hazard analysis shall be performed according to the IEEE 1584 equations that are presented in NFPA 70E, Annex D. The arc flash hazard analysis shall be performed in conjunction with the short-circuit analysis and the protective device time-current coordination analysis.

(2) The flash protection boundary and the incident energy shall be calculated at significant locations in the electrical distribution system (switchboards, switchgear, motor control centers, panelboards, busway and splitters) where work could be performed on energized parts.

(3) Working distances shall be based on IEEE 1584. The calculated arc flash protection boundary shall be determined using those working distances.

(4) When appropriate, the short circuit calculations and the clearing times of the phase overcurrent devices will be retrieved from the short-circuit and coordination study model. Ground overcurrent relays should not be taken into consideration when determining the clearing time when performing incident energy calculations.

(5) The short-circuit calculations and the corresponding incident energy calculations for multiple system scenarios must be compared and the greatest incident energy must be uniquely reported for each equipment location in a single table. Calculations must be performed to represent the maximum and minimum contributions of fault current magnitude for normal and emergency operating conditions. The minimum calculation will assume that the utility contribution is at a minimum. Conversely, the maximum calculation will assume a maximum contribution from the utility. Calculations shall take into consideration the parallel operation of synchronous generators with the electric utility, where applicable as well as any stand-by generator applications.

The Arc Flash Hazard Analysis shall be performed utilizing mutually agreed upon facility operational conditions, and the final report shall describe, when applicable, how these conditions differ from worst case bolted fault conditions.

(6) The incident energy calculations must consider the accumulation of energy over time when performing arc flash calculations on buses with multiple sources. Iterative calculations must take into account the changing current contributions, as the sources are interrupted or decremented with time. Fault contribution from motors should be decremented as follows:

Fault contribution from induction motors should not be considered beyond 5 cycles.

(7) For each piece of ANSI rated equipment with an enclosed main device, two calculations shall be made. A calculation shall be made for the main cubicle, sides, or rear; and shall be based on a device located upstream of the equipment to clear the arcing fault. A second calculation shall be made for the front cubicles and shall be based on the equipment's main device to clear the arcing fault. For all other non-ANSI rated equipment, only one calculation shall be required and it shall be based on a device located upstream of the equipment to clear the arcing fault.

(8) When performing incident energy calculations on the line side of a main breaker (as required per above), the line side and load side contributions must be included in the fault calculation.

(9) Miscoordination should be checked amongst all devices within the branch containing the immediate protective device upstream of the calculation location and the calculation should utilize the fastest device to compute the incident energy for the corresponding location.

(10) Arc Flash calculations shall be based on actual overcurrent protective device clearing time. A maximum clearing time of 2 seconds will be used based on IEEE 1584-2002 section 8.1.2. Where it is not physically possible to move outside of the flash protection boundary in less than 2 seconds during an arc flash event, a maximum clearing time based on the specific location shall be utilized.

(11) Provide the following:

a. Results of the Arc-Flash Hazard Analysis shall be submitted in tabular form, and shall include device or bus name, bolted fault and arcing fault current levels, flash protection boundary distances, working distances, personal-protective equipment classes and AFIE (Arc Flash Incident Energy) levels.

b. The Arc-Flash Hazard Analysis shall report incident energy values based on recommended device settings for equipment within the scope of the study.

c. The Arc-Flash Hazard Analysis may include recommendations to reduce

AFIE levels and enhance worker safety.

I. EXECUTION:

(1) Field Adjustment:

a. Contractor shall adjust relay and protective device settings according to the recommended settings table provided by the coordination study.

b. Contractor shall make minor modifications to equipment as required to accomplish conformance with short circuit and protective device coordination studies.

c. Provide written notification of any required major equipment modifications.

(2) Arc Flash Labels:

a. Provide a 4-inch x 4-inch, Brady thermal transfer type label of high adhesion polyester for each work location analyzed.

b. The labels shall be designed according to the following standards:

1) UL969 – Standard for Marking and Labeling Systems.

2) ANSI z535.4 – Product Safety Signs and Labels.

3) NFPA 70 (National Electric Code – Article 110.16.(5) Limited, restricted, and prohibited

c. The label shall include the following information:

1) System Voltage.

2) Flash protection boundary.

3) Personal Protective Equipment Category.

4) Arc Flash Incident energy value (cal/cm^2)

5) Limited, restricted, and prohibited Approach Boundaries.

6) Study report number and issue date.

d. Labels shall be printed by a thermal transfer type printer, with no field markings.

e. Arc flash labels shall be provided for equipment as identified in the study and the respective equipment access areas per the following:

1) Floor Standing Equipment – Labels shall be provided on the front of each

individual section. Equipment requiring rear and/or side access shall have labels provided on each individual section access area. Equipment line-ups containing sections with multiple incident energy and flash protection boundaries shall be labeled as identified in the Arc Flash Analysis table.

2) Wall Mounted Equipment – Labels shall be provided on the front cover or a nearby adjacent surface, depending upon equipment configuration.

3) General Use Safety labels shall be installed on equipment in coordination with the Arc Flash labels.The General Use Safety labels shall warn of general electrical hazards associated with shock, arc flash, and explosions, and instruct workers to turn off power prior to work.

(3) Implementing PDCS Settings and Arc Flash Sign Installation:

a. The Testing Firm shall implement the protective device coordination study settings on new and existing equipment, as required in Section SP-7.1, based on the Study Firm's Protective Device Coordination Report specified herein and accepted by DOW, and submit a final amended report of the Record As-Built electrical equipment protective device settings subsequent to start-up and testing.

b. The Testing Firm shall work with the Contractor and the Study Firm for implementing the Arc Flash Hazard sign installation requirements for electrical equipment as specified in NEC Article 110.16 Flash Protection and NFPA 70E.

8.7.02 MEASUREMENT AND PAYMENT: Payment for the furnishing and installing of material, equipment, incidentals and all work included in this Section shall be made at the unit price item or the lump sum item indicated in the Proposal, whichever is specified, and shall be full compensation for all work in connection therewith, complete and finished in accordance with the drawings and specifications.

END OF SECTION

SECTION SP-8.8 LIGHTING

8.8.01 DESCRIPTION: This section specifies luminaires (lighting fixtures) features and installation and applies to the installation of new indoor and outdoor lighting.

8.8.02 REFERENCES:

A. This section contains references to the following documents. They are a part of this section as specified and modified. Where a referenced document contains references to other standards, those documents are included as references under this section as if referenced directly. In the event of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

B. Unless otherwise specified, references to documents shall mean the documents in effect at the time of Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, regardless of whether the document has been superseded by a version with a later date, discontinued or replaced.

Reference	Title
NFPA 70	National Electrical Code (NEC)

8.8.03 WARRANTY: LED Luminaires and Lamps Warranty. Provide five-year limited warranty.

8.8.04 SUBMITTALS: List of materials and components with arrangement drawings. Refer to Drawings for fixture schedule.

8.8.05 LIGHTING MATERIALS: Lighting materials, including luminaires, lamps, accessories, and hardware, shall conform to the detailed requirements specified on the drawings.

8.8.06 EXTERIOR LUMINAIRES:

A. Complying with UL 1598 and listed for installation in wet locations.

(1) Sheet Metal Components: Corrosion-resistant aluminum with powder-coat finish, unless otherwise indicated. Formed and supported to prevent warping and sagging.

(2) Housings: Housings shall not warp, sag, or deform in use and shall be rigidly formed, weather- and light-tight enclosures. Provide filter/breather for enclosed luminaires.

(3) Doors, Frames, and Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

Removable doors for cleaning or replacing lenses. Designed to disconnect ballast when door opens.

(4) Exposed Hardware Material: Stainless steel.

(5) Plastic Parts: High resistance to yellowing and physical changes due to aging, exposure to heat, and UV radiation.

(6) Lenses and Refractors Gaskets: Provide heat-resistant and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.

8.8.07 LED ELECTRONIC DRIVER: Drivers shall incorporate internal fusing designed to withstand a 2.5kV surge test and shall be Class 1 rated for 120V with an operating temperature of -20 deg F to 140 deg F. Drivers shall have power factor better than 90% and total harmonic distortion less than 20%. Expected lifetime of driver shall be 100,000 hours or greater.

8.8.08 LED LIGHT ENGINES AND OPTICS:

A. LED light engines shall consist of multiple LED arrays mounted to a metal-core circuit board with heat sink to improve thermal management.

B. LED lamps shall utilize acrylic lenses with multiple photometric distributions available.

C. LED lamp color temperatures shall be from 3000K to 5000K.

8.8.09 FIXTURE FINISHES:

A. Manufacturer standard unless scheduled or shown:

(1) Paint Finish: Applied over corrosion-resistant treatment or primer, free of defects.

(2) Metallic Finish: Corrosion resistant.

(3) Color: Dark bronze.

8.8.10 PHOTOELECTRIC RELAYS:

A. PHOTO-CELLS:

(1) Provide UL 773 or UL 773A listed units. Factory-mount units to the luminaires. Where available, provide units from the same manufacturer as the fixture.

(2) Provide time-delay relays that fail in the on-position, factory set to turn light unit on at 1.5 to 3 foot candles (16 to 32 lux) and off at 4.5 to 10 foot candles (48 to 108 lux) with 15-second minimum time delay. Provide directional lens in front of photocell to prevent fixed light sources to cause turnoff.

(3) Provide a cadmium sulfide cell housed in a plug receptacle assembly, three-prong, polarized, locking type. Provide assembly for outdoor mounting and rated for 1800 VA at 120V maximum capacity.

a. Relay with locking-type receptacle shall comply with NEMA C136.10.

b. Adjustable window slide for adjusting on-off set points.

8.8.11 EXECUTION:

A. The location and type of luminaires, associated poles, fixtures, and receptacles are as shown on the drawings.

B. Labels and marks, except the UL label, shall be removed from exposed parts of the fixtures. Fixtures shall be cleaned when the project is ready for acceptance.

C. Raceways, wire, or cable shall be provided in accordance with SP-7. Raceways and wire shall be provided from the fixtures, switches and receptacles to the lighting panel in accordance with the NEC. Underground and outdoor wire splices shall be in accordance with Section SP-7.

D. Fixtures labeled to require conductors with a temperature rating exceeding 75 degrees C shall be spliced to circuit conductors in a separately mounted junction box. Fixture wire shall meet UL and NEC requirements. Fixture shall be connected to junction box using flexible conduit with a temperature rating equal to that of the fixture.

E. Recessed fixtures shall be provided with mounting hardware for the ceiling system specified. A concealed latch and hinge mechanism shall be provided to permit access to the lamps and ballasts and for removal and replacement of the diffuser without removing the fixture from ceiling panels.

F. Fixtures shall be aligned and directed to illuminate an area as specified. Fixtures shall be directly and rigidly mounted on their supporting structures. The conduit system shall not be used to support fixtures.

G. Fixture supports that are welded to steel members shall be treated with rust-resistant primer and finish paint where brackets or supports for lighting fixtures.

H. Provide manufacturer recommended mounting hardware and brackets.

8.8.12 WIRE CONNECTIONS: Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values or use torque values specified in UL 486A and UL 486B.

8.8.13 FIELD QUALITY CONTROL:

A. Inspect each installed fixture for damage then replace damaged fixtures and components. Verify normal operation of each fixture after installation.

B. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation.

Verify normal transfer to battery power source and retransfer to normal.

C. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. Retest to demonstrate compliance with specification requirements where adjustments are made. Replace fixtures with damage or corrosion during warranty period.

8.8.14 MEASUREMENT AND PAYMENT: Payment for the furnishing and installing of material, equipment, incidentals and all work included in this Section shall be made at the unit price item or the lump sum item indicated in the Proposal, whichever is specified, and shall be full compensation for all work in connection therewith, complete and finished in accordance with the drawings and specifications.

END OF SECTION

SECTION SP-9 – CIVIL SITE WORK

9.01 GENERAL:

A. This section covers the requirements for performing site work to include, but is not limited to, erosion and dust control, asphalt concrete pavement demolition and removal, building and trenching excavation and fill, installation of new asphalt concrete pavement and associated concrete headers and curbs, installation of bollards, and site grading and restoration.

B. This item of work shall include the furnishing of all labor, materials, tools and equipment necessary for completing this item of work as specified in DIVISION 300 – *CONSTRUCTION*, SECTION 303.02 *SITEWORK* of the *Water System Standards*, dated 2002 as amended, of the Department of Water, County of Kaua‘i; *Standard Specifications for Road and Bridge Construction*, dated 2005 as amended, of the Department of Transportation, State of Hawai‘i; and *Standard Details for Public Works Construction*, dated September 1984 as amended, of the Department of Public Works, County of Kaua‘i, as amended and as modified or supplemented hereinafter, and as applicable to this Project.

C. The Contractor shall be responsible for coordinating all phases of the project with the DOW.

D. All submittals shall be in accordance with Sections 1.6, 1.17, and the Water Construction Notes.

9.02 FIELD VERIFICATION:

A. It shall be the responsibility of the Contractor to examine the Project site and determine for himself/herself the existing conditions. The existing site condition as of the bid opening date will be accepted as part of the work whether indicated on the Plans and/or described herein or that may vary therefrom.

B. Dimensions and locations used in the composition of the Contract Documents are based on record drawings and are approximate. It is the responsibility of the Contractor to field-verify all dimensions, locations and clearances for new structures, equipment and appurtenances prior to their acquisition.

9.03 EROSION AND SEDIMENT CONTROL:

A. The installation and maintenance of temporary erosion and sediment control measures shall occur in accordance with Ordinance No. 808 of the County of Kaua‘i; the "*Best Management Practices (BMP's) for Sediment and Erosion Control*," Department of Public Works, County of Kaua‘i, 2011 as amended; the "*Storm Water Runoff System Manual*," Department of Public Works, County of Kaua‘i, July 2001 as amended, and the Construction Drawings.

9.04 CLEARING AND GRUBBING:

A. Clearing shall consist of removing all obstructions, including rocks, debris, and vegetation, including brush, roots, stumps, and logs, occurring within the areas to be disturbed.

B. Grubbing shall consist of the removal and disposal of any roots larger than three (3) inches in diameter and matted roots from all areas disturbed by Project work and proposed utility trenches within the approximate trenching limits. Excavate this material together with logs, organic and metallic debris, brush and refuse, and remove to a depth of not less than the finished subgrade elevation indicated on the plans as construction areas under this Contract.

C. All vegetation, debris and other unsuitable materials resulting from clearing and grubbing operations shall be removed and disposed of offsite. Offsite disposal of unsuitable materials shall be in accordance with Federal, State and local regulations and as directed by the DOW. Burning will not be permitted.

D. The Contractor shall take appropriate action to check and prevent the spread of dust and comply with all dust regulations imposed by the State and County of Kaua‘i agencies.

9.05 DEMOLITION AND REMOVAL WORK:

A. The DOW assumes no responsibility for the actual condition of items or portions of structures to be removed.

B. The storage or sale of removed items on site will not be permitted.

C. PROTECTION: Provide barricades, warning signs and lighting, and other forms of protection and maintenance and supervision thereof, or as may be directed as required to protect the users from injury due to selective removal work and to maintain security

(1) Provide interior and exterior shoring, bracing, or support to prevent movement, settlement, or collapse of structure or elements to be removed, and adjacent facilities or work to remain.

(2) Protect from damage existing finish work that is to remain in place and becomes exposed during demolition operations.

D. Promptly repair damages caused to adjacent facilities.

E. Use of explosives or fire will not be permitted.

F. All materials resulting from removal work shall become property of the Contractor and shall be removed from the limits of the project site. Remove rubbish and debris from the jobsite daily, unless otherwise directed; do not allow accumulations inside or outside any buildings. Transport and legally dispose of materials off site. Remove and transport debris and rubbish in a manner that will prevent spillage on streets or adjacent areas. The Contractor shall comply with all applicable government regulations in disposing of said waste material. If hazardous materials are encountered during demolition operations, comply with applicable State, Federal and local regulations, laws, and ordinances concerning removal, handling, and protection against exposure or environmental pollution.

G. Burning of removed materials is not permitted on the project site.

9.06 EARTHWORK

A. Excavation, embankment, subgrade preparation, fill, compaction and grading shall comply with the Ordinances of the County of Kaua'i, as amended, Appendix L - "*Geotechnical Investigation Kilauea Wells Generator Shelter Kauai Department of Water Kilauea, Kauai, Hawaii*," July 2017, prepared by Hirata & Associates, Inc.; and as specified herein. If references or standards conflict, the more stringent standard shall be used unless otherwise determined by DOW.

B. SUBMITTALS FOR FILL MATERIALS:

(1) Submit the name of the proposed testing laboratory together with the qualifications of the person or persons who will be performing on site testing.

(2) Samples of fill materials to be used shall be submitted twenty (20) working days in advance of use. Samples shall consist of 0.5 cubic feet of each type of material, and shall be tagged with the name of the source and pit number where applicable.

(3) Test Results on Imported Materials: Provide copies of laboratory test reports demonstrating that the proposed imported materials meet the specification requirements. Test reports shall be dated no more than ninety (90) days prior to the date of submission. Submit maximum modified proctor densities and the optimum water content for all imported materials.

(4) Laboratory tests along with samples provided by the Contractor certifying:

a. Moisture density relationships.

b. Gradation test reports.

c. Gradation test for non-cohesive materials.

d. Atterberg Limits (Plasticity Index) test results.

(5) Field testing reports.

C. Provide and install shoring, cribbing, and lagging as required to safely preserve the excavations and earth banks from damages resulting from the work.

D. The Contractor shall at all times control the grading around building areas so that the ground is adequately sloped to prevent any water from flowing into building areas and open trench excavations. All excavations shall be kept free from standing water, and the Contractor shall do all pumping and draining that may be necessary to remove water to the extent required in carrying on the work.

E. Caution shall be exercised on all excavation work adjacent to existing trees that are to remain. All exposed fibrous and branch type roots shall be carefully pruned or saw-cut to the extent required for excavation work. Every effort shall be taken to preserve the existing trees and to minimize damage to said trees.

F. The Contractor shall use best management practices to reduce the amount of soil erosion resulting from the grading work.

G. Filling operations shall be performed so as to bring the fill area to the finished grades shown on the Drawings, allowing for topsoil, concrete slab, or site paving and base course.

H. Soft or loose soils that do not readily compact should be excavated and replaced with compacted structural fill at no extra cost to DOW.

I. When moisture content of the fill material is below optimum, water shall be added until the moisture content is optimum to ensure that the proper compaction can be obtained. When the moisture content of the fill material is above optimum, the fill material shall be aerated until the optimum moisture content is obtained.

J. All cut and fill slopes shall be grassed by hydro-mulching or protected from erosion by other approved methods immediately upon their completion.

9.07 EXCAVATION AND FILL MATERIALS:

A. For building slabs-on-grade, the exposed subgrade shall be scarified to a minimum depth of six (6) inches, moisture conditioned to about two (2) percent above optimum moisture and compacted to a minimum 90 percent compaction as determined by ASTM D 1557.

As a precautionary measure, the relatively moist condition of the prepared subgrade shall be maintained prior to placement of fill materials. It is important that the soils not be allowed to dry significantly prior to placement of the overlying fill.

B. Excavations – Excavation into the onsite silty clay can generally be accomplished using conventional excavating equipment. Temporary cuts into the near surface soils shall be stable at slope gradients of 1H:1V or flatter. It will be the Contractor's responsibility to conform to all OSHA safety standards for excavations.

C. The excavation areas that were over-excavated shall be backfilled with suitable fill material conforming to the requirements of these specifications and recompacted to a minimum 90 percent compaction in accordance with ASTM D 1557.

D. Bottoms of excavations shall be compacted before placing fill materials.

E. Onsite Fill Material – The onsite silty clay (if any) will be acceptable for reuse in compacted fills and backfills. All rock fragments larger than 3 inches in maximum dimension should be removed from the onsite clayey silt prior to reuse.

F. Imported Fill Material – Imported fill material or granular structural fill shall be well-graded, non-expansive granular material. The imported fill material shall have a maximum particle size of 3 inches, and between 8 and 20 percent of soil by weight shall pass the #200 sieve. The plasticity index (P.I.) of the portion of the soil passing the #40 sieve shall not be greater than 10. It shall have a minimum CBR value of 15 and a CBR expansion value less than 1.0 percent when tested in accordance with ASTM D 1883. Any imported fill material shall be tested Contractor-hired Soils Engineer and approved by DOW

prior to delivery to the Project site.

G. Select Borrow – Select borrow shall be either onsite fill material or imported fill material that has a minimum CBR of 30.

H. Compaction – Cohesive soils, such as the onsite silty clay, shall be placed in horizontal lifts restricted to eight (8) inches loose thickness and compacted to a minimum 90 percent compaction as determined by ASTM D 1557. Granular fill, such as imported fill material, shall be placed in horizontal lifts restricted to eight (8) inches in loose thickness, but compacted to a minimum 95 percent compaction as determined by ASTM D 1557. For exterior slabs-on-grade, concrete walkways, and asphalt concrete pavement, the base course should be compacted to a minimum 95 percent compaction as determined by ASTM D 1557.

I. Fill placed in areas with slope steeper than 5H:1V should be continually benched as the fill is brought up in lifts.

J. For geotechnical monitoring and testing requirements, see Section SP-10. As a minimum, the Contractor shall perform one (1) field in-place density test per 1,000 square feet, or fraction thereof, of each lift of fill or backfill areas compacted by either hand-operated machines or other than hand-operated machines. Field in-place density shall be determined in accordance with ASTM D 2922. Should test results indicate that compaction is not as specified; the material shall be removed, replaced, and recompacted to meet Specifications at the Contractor's expense.

9.08 TRENCH EXCAVATION:

A. The bottom of trench shall be carried to the specified lines and grades with proper allowance for pipe thickness, concrete encasement, and for cushion as specified in the Plans, and Section SP 8 – ELECTRICAL WORK, of these Specifications.

B. The Contractor shall not proceed with backfill placement in excavated areas until the subgrade has been inspected by the DOW. All pipes and concrete encasement shall have a minimum thickness of cushion material below the barrel of the pipe/conduit as specified in the Plans, and Section SP 8 – ELECTRICAL WORK, of these Specifications. Cushion material shall be placed in the bottom of the trench, leveled and compacted to 90 to 95 percent relative compaction in accordance with ASTM D 1557. Bell holes shall be excavated at each pipe/conduit joint to permit proper inspection and uniform bearing of pipe/conduit on cushion material.

C. After the pipe/conduit has been laid to alignment and grade, unless otherwise specified, additional cushion material shall be placed in layers the full width of the trench and compacted up to the specified level. Cushion shall be placed simultaneously on both sides of the pipe/conduit, keeping the level of backfill the same on each side. The material shall be carefully placed and compacted around the pipe/conduit to ensure that the pipe/conduit barrel is completely supported and that no voids or uncompacted areas are left beneath the pipe/conduit. The Contractor shall use particular care in placing material on the underside of the pipe/conduit to prevent lateral movement during backfilling.

D. The trench shall be backfilled to an elevation which will permit the placement of the specified surface. Other surfaces shall be restored, including compaction, to the condition existing prior to construction.

E. See Section SP-10 for geotechnical monitoring and testing.

9.09 GEOTEXTILE MATERIAL: Soil separation and stabilization geosynthetic fabric shall be a non-woven geotextile, Tencate 170N or approved equal. Submit manufacturer's literature and sample of the geotextile fabric at least two (2) weeks prior to use.

9.10 SURVEY LAYOUT: The Contractor shall employ a Hawai'i-licensed Land Surveyor to determine lines and elevations. The Contractor shall layout lines and grades from existing property lines and benchmarks and shall assume responsibility for their accuracy for use during construction. The Contractor shall preserve and maintain all benchmarks and survey reference points previously established by the DOW. If any benchmarks or survey reference points are disturbed, damaged, or removed due to construction activities, the Contractor is responsible for restoration under the Hawai'i-licensed land surveyor's direction and approval. Copies of field notes, descriptions, and new values of the new benchmark shall be sent do the Department of Public Works and all applicable agencies for review and approval prior to final acceptance of the project.

9.11 ORDINANCES, REGULATIONS: All work shall conform to the following ordinances and regulations:

A. Section 22-7.17 – *Specifications for Grading, Grubbing, and Stockpiling* – Kaua'i County Code, 1987, as amended (Ordinance No. 1016).

B. Public Health Regulations, HAR Title 11, Chapter 54 - *WATER QUALITY STANDARDS*

C. Public Health Regulations, HAR Title 11, Chapter 55 - *WATER POLLUTION CONTROL*

D. Public Health Regulations, HAR Title 11, Chapter 60 - *AIR POLLUTION CONTROL*

E. Public Health Regulations, HAR Title 11, Chapter 46 - *COMMUNITY NOISE CONTROL*

F. Public Health Regulations, NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)

G. *Storm Water Runoff System Manual*, by the Department of Public Works, County of Kauai, dated July 2001

9.12 CONSTRUCTION AREA APPEARANCE:

A. GENERAL: The Contractor shall, throughout the duration of the Project, keep all roadways free from all debris produced from the Project. The Contractor shall keep the Project and surrounding area neat and free from dust nuisance. The DOW may require supplementary measures as necessary. Upon completion of each phase of the Project, the Contractor shall immediately remove all excess material and thoroughly clean the affected area.

B. COMPLETION OF WORK: Upon completion of the work, the Contractor shall remove all equipment, signs and unused materials provided for the work and shall restore the Project site to a neat and clean condition and do all the other required cleaning as specified above and by DOW.

C. NON-COMPLIANCE: Should the Contractor fail to comply with the foregoing provisions, DOW may, with or without notice, cause the cleaning to be done and deduct the cost of such work from any moneys due the Contractor under this contract.

9.13 EXISTING UTILITIES:

A. This section shall supplement Division 200 - Earthwork, of the Hawaii Standard Specifications for Road and Bridge Construction, dated 2005, of the Department of Transportation, Highway Division, State of Hawai‘i, as amended.

B. Prior to commencing excavation, the Contractor shall exercise due diligence in locating and protecting any utilities. The Contractor shall be responsible for and shall pay for all damages to existing utilities whether shown or not shown on the Plans. DOW will not be responsible for damages to the Contractor’s equipment resulting from any conflicts with existing utilities.

C. The Contractor shall be responsible for the protection of existing surface and subsurface utilities and poles within and abutting the Project site, trench excavations, borrow sites and other work areas. Any utilities that the Contractor encounters during the progress of the work, such as, telephone ducts, electric ducts, water lines, sewer lines, electric lines and drainage pipes, whether or not shown on the Plans, shall not be disturbed or damaged unless otherwise instructed in the Plans and Specifications. The Contractor shall notify the DOW and the affected utility company immediately of any damaged or disturbed utility.

D. The Contractor shall be responsible for the relocation of waterlines 2” or less in diameter due to a potential conflict, whether shown or not shown on the Plans.

9.14 ASPHALT CONCRETE PAVEMENT:

A. REFERENCES: All materials, storage, handling, and installation shall be in accordance with the following. If references or standards conflict, the more stringent standard shall be used unless otherwise determined by DOW.

(1) Chapter 303 of the *Water System Standards*, 2002 as amended, County of Kaua‘i

(2) *Standard Specifications for Public Works*, 1986 as amended, County of Kaua‘i

(3) *Standard Specifications for Road and Bridge Construction*, 2005 as amended, of the Hawai‘i State Department of Transportation

B. SUBMITTALS:

(1) Manufacturer’s certificates of conformance for bituminous material and for the job mix formula to the DOW for approval.

(2) Test results (certified degree of compaction, moisture content, gradation tests) of subgrade and aggregates to be used two (2) weeks in advance of use for approval

C. JOB CONDITIONS:

(1) Construct only when temperatures are above minimum specified in *the Standard Specifications for Road and Bridge Construction*, 2005 as amended, Hawai‘i State Department of Transportation.

(2) Do not construct pavement or base when the base surface is wet or contains an excess of moisture which would prevent uniform distribution and the required penetration.

(3) Establish and maintain the required lines and grades for each course during construction operations.

(4) Maintain vehicular and pedestrian traffic during paving operations, as required for other construction activities and in accordance with Drawings.

D. ROAD RESTORATION REQUIREMENTS

(1) The pavement section should consist of two (2) inches of Asphalt Concrete Paving (ACP) over six (6) inches of untreated aggregate base course, over six (6) inches of select borrow aggregate subbase, over six (6) inches of borrow, placed on the compacted subgrade. The six (6) inches of borrow may be replaced with an additional four (4) inches of aggregate subbase if desirable. Prime or tack coat should be applied per the standards and the Drawings.

(2) Relative compaction shall be at least 95 percent as determined by ASTM D1557.

(3) The subgrade should be compacted to at least 95 percent relative compaction for a minimum depth of at least six (6) inches. Soil tests shall be made at the subgrade level and the final pavement structure verified or modified as necessary.

(4) Apply pre-paving herbicide to all new pavement areas in accordance with the manufacturer's recommended procedures and rates. Application shall not be made immediately after heavy rains or when rain is forecasted within the next 48 hours. Perform two herbicide applications at least three days apart.

(5) The finished surface of the pavement shall be true to grade and cross sections, free from depressions and grainy spots, and of uniform texture. It shall not vary more than 1/8 of an inch over 10 feet. Low or defective areas shall be corrected by cutting out the faulty areas and replacing with new materials. Skin patching for correcting low areas will not be permitted.

E. ACCESS ROAD AND RESTORATION

(1) The Contractor is not responsible for maintaining or repairing the access road between the project site and Kūhiō Highway unless damage beyond normal wear and tear occurs as a direct result of Contractor activities or negligence. If damage occurs as a direct result of

Contractor activities or negligence, the road shall be restored as stated below at no cost to DOW.

(2) In the unlikely event that the access road is severely damaged or washed out due to stream flooding or other forces of nature beyond the control of the Contractor or DOW, DOW will negotiate additional contract days and restoration of access with the Contractor.

(3) If road restoration beyond the project limits is required, the Contractor's responsibility shall include, but is not limited to, proper backfill and compaction of excavation, shaping and general restoration of the pavement, restoration of public and private improvements when damaged by construction, restoration of drainage facilities, scarification of existing surfacing, if required, removal of debris and surplus of material, and all other requirements of these Specifications.

(4) New manhole rings and valve boxes and monument cases shall be adjusted as necessary to be flush with the restored surface and shall be done to the satisfaction and current standards of the road Agency having jurisdiction.

(5) Place asphaltic concrete at line and grade to match existing manhole rings, valve boxes, and monument cases, unless noted otherwise on the plans.

(6) The Contractor shall also restore any existing improvements including, but not limited to, culverts, driveways, curbs, walkways, road markings, parking strips, pavement markings, parking areas, signs, or other permanent improvements. Restoration shall be in accordance with the current standards of the road Agency having jurisdiction.

9.15 SITE RESTORATION: The Contractor shall restore any disturbed area within the project site to existing or better conditions. Grassing shall conform with the *Water System Standards*, 2002 as amended, and the County of Kaua'i *Standard Specifications for Public Works Construction*, 1986 as amended. The Contractor shall also restore any existing improvements within Project vicinity that are damaged or disturbed during construction, including but not limited to, drainage swales, ramps and walkways, road markings, signs, or other permanent improvements. Restoration shall be to the satisfaction of DOW.

9.16 MEASUREMENT AND PAYMENT: Payment for the furnishing and installing of material, equipment, incidentals and all work included in this Section shall be made at the unit price item or the lump sum item indicated in the Proposal, whichever is specified, and shall be full compensation for all work in connection therewith, complete and finished in accordance with the drawings and specifications.

END OF SECTION

SECTION SP-10.1 – GEOTECHNICAL MONITORING AND TESTING

10.01 GENERAL: Contractor shall retain the services of a licensed geotechnical engineer to monitor the quality, installation and compaction of all pipe cushion, trench backfill, and structural backfill material per Section SP-9 and all applicable sections of this Request for Proposal and approved Construction Drawings. Department of Water will require periodic sieve testing of the pipe cushion and backfill material during the course of construction as the Chief of Construction Management deems necessary. Results of all Geotechnical engineer's testing (sieve analysis and compaction results) shall be provided to the Department of Water within seven (7) calendar days of sampling and testing.

Contractor shall retain the services of a licensed Geotechnical engineer as stated in the notes of the approved construction drawings to monitor the quality and compaction of material during installation of the building foundation, drainage facilities, all underground utilities, parking lot, driveway, sidewalks, miscellaneous paving of asphalt cement and concrete, and appurtenances as required by the various sections of the associated Request for Proposal documents.

The Geotechnical engineer's representative shall be on-site at ALL times where and when backfill occurs within the project site to assure quality of backfill, proper compaction, and other requirements necessary for the project.

Contractor shall be responsible for all associated costs for the licensed Geotechnical engineer monitoring and testing required by the approved construction drawings, specifications, and other related documents referenced in this Solicitation Document.

10.02 MEASUREMENT AND PAYMENT: Payment for the furnishing and installing of material, equipment, incidentals and all work included in this Section shall be made at the unit price item or the lump sum item indicated in the Proposal, whichever is specified, and shall be full compensation for all work in connection therewith, complete and finished in accordance with the drawings and specifications.

END OF SECTION

SECTION SP-11 – FIELD OFFICE

11.01 GENERAL: A field office is required for this project. It shall be furnished per section 6.3 of the General Provisions for Construction Contracts with the Department of Water. Contractor shall be responsible for all associated costs for the field office.

11.02 MEASUREMENT AND PAYMENT: Unless otherwise specified, payment for field office shall not be measured nor paid for directly but shall be considered incidental to the construction work.

END OF SECTION

APPENDIX L: *"Geotechnical Investigation Kilauea Wells Generator Shelter Kauai Department of Water Kilauea, Kauai, Hawaii"*, prepared by Hirata & Associates, Inc.

(Attached separately)