DEPARTMENT OF DESIGN AND CONSTRUCTION
CITY AND COUNTY OF HONOLULU

SPECIFICATIONS AND LEGAL DOCUMENTS FOR

NEAL BLAISDELL CENTER CONCERT HALL COOLING TOWER REPLACEMENT

777 Ward Avenue
Honolulu, Hawaii 96814

TAX MAP KEY: 2-3-008:001

PROJECT NO.: V-25-21-C

Prepared by:

AMEL Technologies, Inc.
2800 Woodlawn Drive, Suite 251
Honolulu, Hawaii 96822

Prepared for:
Mechanical & Electrical Division
Department of Design & Construction

Approved:

Director
Department of Design and Construction

Date: 12/10/2021

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TECHNICAL SPECIFICATIONS

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SPECIAL INSTRUCTIONS TO OFFERORS

DESCRIPTION OF WORK: The project is for the NEAL BLAISDEL CENTER CONCERT HALL COOLING TOWER REPLACEMENT, 777 Ward Avenue, Honolulu, Hawaii 96814. Provide all labor, materials, tools and necessary for the construction of the project including all incidental items necessary to complete the work as shown on the drawings and specified herein.

1. OFFICER-IN-CHARGE: The Officer-in-Charge for this project is the Director of the Department of Design and Construction of the City and County of Honolulu or its designee.

2. OWNER: City and County of Honolulu.

3. SEALED OFFERS: All offers for this project shall be enclosed in a sealed envelope marked:

   RFB-DDC – 1546205
   NEAL BLAISDEL CENTER CONCERT HALL
   COOLING TOWER REPLACEMENT

   777 Ward Avenue
   Honolulu, Hawaii 96814

4. EXAMINATION OF SITE, DRAWINGS, ETC.: Each Offeror shall visit the site of the proposed work and fully acquaint himself with the conditions as they exist so that he may fully understand the facilities, difficulties, and restrictions attending the execution of the work under this contract. Offerors shall also thoroughly examine and be familiar with the drawings and the specifications; and available reference documents. The failure or omission of any Offeror to receive or examine any form, instrument or document, or to visit the site and acquaint himself with conditions there existing shall in no way relieve any Offeror from any obligation with respect to his bid. By submitting a bid, the Offeror agrees that he has examined the site and the Specifications and Drawings, and, where the Specifications require in any part of the work a given result to be produced, that the Specifications and Drawings are adequate and the required result can be produced under the Specifications and Drawings. No claim for any extra work will be allowed because of alleged impossibilities in the production of the results specified or because of inadequate or improper plans and specifications and whenever a result is required, the successful offeror shall furnish any and all extras and make any change needed to produce, to the satisfaction of the Department of Design and Construction the required result. The project limits are as indicated on the drawings and specifications.

   The project site is in a restricted area. A site visit will be held after the pre-bid conference. If the offeror or subcontractor cannot attend the pre-bid conference, a site visit can be scheduled by appointment only. Contact Valentino Dela Cruz, Department of Design and Construction at 808-768-8443 to schedule a site visit.

5. BRAND NAMES, MODEL, MAKE OR METHOD: SUBSTITUTION: This section shall supplement Subsection 2.18 - Request for Substitution of the General Instructions to Offerors as follows: “The Contractor will be required to submit six (6) sets of all materials and/or equipment substitution requests.”

6. PROJECT SIGN: The Contractor shall install a project sign in accordance with Section 5.2.2 (j) of the General Conditions. Cost for the sign shall be included in the contract prices for the various contract pay items.

7. THE HAWAII ADMINISTRATIVE RULES: The Hawaii Administrative Rules, Title 3, Department of Accounting and General Services, hereinafter referred to as “HAR”, is by reference incorporated herein and made a part of these contract documents. The HAR is available for inspection at the Division of Purchasing, Department of Budget and Fiscal Services, City and County of Honolulu. The HAR is available at the State Department of Accounting and General Services or http://www.spo.hawaii.gov/.

8. PERFORMANCE SCHEDULE FOR ORDERING MATERIALS: To expedite the completion of the project, the Contractor shall submit all shop drawings and product specifications and data catalogue cuts for review and acceptance within fifteen (15) consecutive days after the acceptance by the City of the Final Construction Documents.

   The Contractor shall submit ten (10) copies of all shop drawings and product specifications and data catalogue cuts of the various materials and equipment.

   The Contractor shall place orders for the various materials and equipment to the suppliers and manufacturers within fifteen (15) consecutive days after the date of the written review and acceptance of the various shop drawings and product specifications and data catalogue cuts. The Contractor shall submit to the Officer-in-Charge copies of the material and equipment orders to certify the placement of such orders.

9. METHOD OF AWARD: See page 2 of OFFER.

SPECIAL PROVISIONS

SP 1. GENERAL CONDITIONS. The "GENERAL TERMS AND CONDITIONS, CITY AND COUNTY OF HONOLULU" dated February 1, 2015, hereinafter referred to as the "GENERAL CONDITIONS" is incorporated herein by reference only and made a part of these specifications. Copies of the GENERAL CONDITIONS may be obtained from the Division of Purchasing, Department of Budget and Fiscal Services website at www.honolulu.gov/pur. Any provision of the GENERAL CONDITIONS not in conflict with the HAR shall be applicable to this Contract.

SP 2. DIFFERING SITE CONDITIONS FOR CONSTRUCTION PROJECTS.
Delete Section 3.9 of the General Terms and Conditions in its entirety and, In lieu thereof, insert:

"3.9 Differing Site Conditions for Construction Projects. Pursuant to HAR 3-125-11, the following shall apply to the procurement of construction Under this contract:

Differing site conditions – price adjustments,

(A) Notification. The contractor shall promptly, and before such conditions are disturbed, notify the procurement officer of:
  (i) Subsurface or latent physical conditions at the site differing materially from those indicated in this contract; or
  (ii) Unknown physical conditions at the site, of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in this contract.

(B) Adjustment of price or time for performance. After receipt of the notice, the procurement officer shall promptly investigate the site, and if it is found that the conditions do materially so differ and cause an increase in the contractor's cost of, or the time required for, performance of any part of the work under this contract, whether or not changed as a result of the conditions, an according. Any adjustment in contract price made pursuant to this clause shall be determined in accordance with the price adjustment clause of this contract.

(C) Timeliness of claim. No claim of the contractor under this clause shall be allowed unless the contractor has given the notice required in this clause; provided, however, that the time prescribed therefore may be extended by the procurement officer in writing.

(D) No claim after final payment. No claim by the contractor for an Adjustment there under shall be allowed if asserted after final Payment under this contract.

(E) Knowledge. Nothing contained in this clause shall be grounds for an adjustment in compensation if the contractor had actual knowledge of the existence of such conditions prior to the submission of bids. [HAR 3-125-11(1)]"

SP 3. LIQUIDATED DAMAGES. When the Contractor fails to complete the work or any portion of the work within the time or times specified in the Contract or any extension thereof, it is agreed that the Contractor shall pay to the City the amount specified below.

Liquidated damage per calendar day: $100.00

The Contractor hereby agrees to pay the amount as liquidated damages, and not by way of penalty, to the City and further authorizes the City to deduct the amount of the damages from monies due the Contractor under the Contract, computed as previously mentioned. If the monies due the Contractor are insufficient or no monies are due the Contractor, the Contractor shall pay the City the difference or the entire amount, Whichever may be the case, upon demand by the City.

SP 4. BID SCHEDULE OF VALUES DATA. Each Offeror should submit with his Offer in a separate sealed envelope identified on the outside by their name, project title and marked “Bid Schedule of Values Data” a breakdown of their overall bid on the bid schedule of values data sheet provided with the offer. The Offeror need not comply, however, if this data sheet is not included at the end of this section.

This information is required for analytical purposes only and shall have no Bearing upon the determination of the lowest responsive, responsible Offeror. Information will not be divulged to the public, however, the City and County of Honolulu will not be held responsible for information made public that is not submitted in a separately sealed envelope as directed at the time bids are submitted.

SP 5. PAYMENTS AND FINAL PAYMENT. Proof of compliance with HRS 103D-328 and HRS 103D-310 may be through Hawaii Compliance Express (HCE) or by written clearance issued by the Hawaii Department of Taxation, Internal Revenue Service, Hawaii Department of Labor, and Hawaii Department of Commerce and Consumer Affairs.

SP 6. CONTRACTOR PERFORMANCE RECORDS. The City will maintain Records pertaining to the Contractor’s performance on contracts with the City. The Contractor will be required to participate in performance assessment activities in accordance with a performance assessment plan that may be prescribed by the City during the performance of the contract. Contractor performance records may be used to determine a Contractor’s Responsibility, qualifications, and eligibility for the award of future contracts with the City.

SP 7. EXHIBIT L. REPORT OF EQUIPMENT PURCHASED WITH CONSULTANT OR CONSTRUCTION CONTRACTS.

The City will not require the use of Exhibit L: Report of Equipment Purchased with Consultant or Construction Contracts form. As a result,

the following sections of the General Terms and Conditions shall be Modified:

A. Delete Section 4.5, Payments, item (a) in its entirety and replace with The following:

"(a) Payments will be authorized by the Director after completion of Performance or delivery and acceptance by the Director of all materials, goods, and services stipulated in the contract or Purchase Order and after the invoices, in triplicate, are received by the using Agency, Attention: Fiscal Officer. The invoices must list the following Information: contract and confirmation purchase order numbers (if any), item numbers, description of items, quantities, unit prices, and extended totals. Payments will be computed in accordance with any applicable unit prices bid. Payments will be made as soon thereafter as the regular course of business will allow; provided, however, that payments shall be made no later than thirty (30) calendar days following receipt of the statement for goods received and services completed."

B. Delete Section 5.4.6, Payment for Delivered Materials of Equipment, Items (a) and (b) in their entirety and replace with the following:

"(a) No payment for any material or equipment that is affixed, movable or removable, delivered to the site of the work under the contract will be made until said material of equipment is incorporated into the parts of the project required to be constructed under the contract. Payment for the delivered material or equipment shall be included in the monthly progress payment under the appropriate cost item.

(b) Specialized or Special Ordered Materials, Equipment. The Officer-In-Charge may, to the extent provided for in the contract, include in the Monthly estimate for progress payment in the delivered cost of specialized materials, special ordered materials or equipment usable only for the contract. Such inclusion in the monthly estimate will be allowed only if all costs are substantiated by evidence of delivery and payment, and only for such materials or equipment as are specifically described or referred to in the contract as being the subject matter for such inclusion in the monthly estimate for progress payment. Payment to the Contractor shall not terminate the Contractor's responsibility or ownership of such materials or equipment until incorporated in place and accepted by the Officer-in-Charge. The Contractor shall be responsible for the safekeeping of such specialized materials or equipment until incorporated into the work and accepted by the Officer-in-Charge. The amount included for payment under this subsection shall be subject to the retention requirement."

C. Delete Section 5.4.7 Final Payment, items (a)(1) and (a)(2) in their entirety.

D. Delete Exhibit L Report of Equipment Purchased with Construction Contracts, in its entirety.

SP 8. GENERAL INSTRUCTIONS TO OFFERORS DATED 02/09/17 - SOLICITATION ADDENDA. Section 2.19 Solicitation Addenda (b)(2) of the General Instructions to Offerors dated 02/09/17 is deleted in its entirety.

OFFER

_____
Offeror's Name

Director of Budget and Fiscal Services
Department of Budget and Fiscal Services
City and County of Honolulu
Honolulu, Hawaii 96813

The undersigned hereby proposes and agrees, if this Offer is accepted, to furnish and pay for all labor, materials, tools, equipment, and incidental work necessary to construct or install, in place complete, the work called for under and in accordance with the true intent of the Contract Documents for:

NEAL BLAISDELL CENTER CONCERT HALL
COOLING TOWER REPLACEMENT

777 Ward Avenue
Honolulu, Hawaii 96814

TAX MAP KEY: 2-3-008:001

PROJECT NO.: V-25-21-C

on file in the Office of the Division of Purchasing, Department of Budget and Fiscal Services, City and County of Honolulu, and that the undersigned will take in payment therefore, the unit and/or unit sum prices itemized in the following Offer Schedule. It is reemphasized that all items in the Offer Schedule shall be considered as in place complete, in every respect.

Item No.	Estimated Quantity	Description	Total Amount
1.	Lump Sum	Provide replacement cooling towers, including but not limited to limited hazardous material survey, demolition and disposal, electrical, piping, painting, controls, and testing and balancing, commissioning, and associated appurtenances, complete, in place, and in accordance with the drawings and specifications.	$_____

2.	Force Account	Force Account to remove confirmed asbestos containing building material (ACBM) and lead containing paint (LCP) that will be disturbed by construction. The Contractor shall perform all work on a force account basis and shall be compensated in accordance with Section 5.4.9 Force Account of the General Conditions. Unused portion of this Force Account shall remain with the City.	$ 5000.00
		TOTAL SUM (ITEMS NOS. 1 AND 2)	$_____

The undersigned also agrees as follows:

1. That the bid submitted on the various items in this Offer on which a Lump Sum bid is asked, include all materials, equipment, labor, and all other incidental work required for the complete construction and installation of these improvements, in accordance with the plans and specifications.

   That the quantities in any item on a Lump Sum bid in this Offer are approximate only and that payment will be made only for the item in place complete, regardless of amount of materials, equipment and labor necessary to complete the same in a proper and workmanlike manner and in accordance with the plans and specifications. That the quantities shown distributed in the lump sum items are given only for the Offeror's convenience and for the purpose of making monthly estimates. The Offeror shall verify these quantities in any manner he deems necessary or expedient.

2. The award of contract is conditioned upon the amount of funds available for the contract. Award of the contract shall be made to the responsive, responsible Offeror submitting the lowest TOTAL SUM.

3. That the time for completion for the Basic Bid and all approved Alternates shall be within **270 consecutive calendar day**s from the Notice to Proceed and shall include provisions for the following:

   a. Submittals of shop drawings and materials for City review and approval. Submittals shall commence within 15 calendar days from the date of Notice To Proceed (NTP) and procurement of long lead items shall commence immediately after approval of required submittals.

   b. Approval of required permits including grading and building permits, NPDES permit, SMA permit, and any other permitting actions, as required. Approval of the necessary permits for this project is anticipated to take 4 months from the award of the contract. Construction onsite

cannot commence until approval of all necessary permits, unless otherwise directed by the Officer-in Charge.

c. Refer to Paragraph 1.06 Coordination with Department of Enterprises Services, PART 1 General Section 01015 Contractor Use of Premises, Division 1 – General Requirements of these Specifications, for additional information on the project scheduling requirements.

NOTE: The construction performance period must provide consideration of the above. Offeror will be responsible for any labor escalation and material escalation during the construction performance period provided that the NTP is issued within the 90 calendar day period after execution of the contract.

4. Construction sign shall be provided by the Offeror in accordance with Section 5.2.2 (j) of the General Conditions. Cost for the sign shall be incidental to the various items of the Offer.

5. That if this Offer shall be accepted and the undersigned shall fail to or neglect to contract as aforesaid, and to furnish the required bond to the City within ten (10) days from the date of receiving from the City, the contract prepared and ready for execution, the City may determine that the Offeror has abandoned the contract, and thereupon, forfeiture of the security accompanying his Offeror shall operate and the same shall become the property of the City.

The Undersigned also agrees that if he is awarded this contract, he will enter into and execute the same and that he will furnish bonds in the amount as required by the General Instructions to Offerors.

The Undersigned certifies that he is licensed to undertake this project pursuant to Chapter 444, HRS, as amended, relating to licensing of contractors.

The apparent successful Offeror will be required to submit tax clearances from the State Department of Taxation and the Internal Revenue Service prior to award. The tax clearance certificate must be an original certified by the Department of Taxation.

The Undersigned also agrees that the Director of Budget and Fiscal Services reserves the right to reject any or all bids and to waive any defect therein.

Enclosed herewith is

Surety bond	)	
Legal tender	)	
Certificate of deposit, share certificate,	)	(circle one)
Cashier's check, treasurer's check	)	
Teller's check, official check	)	
Certified check	)	

for the sum of _____

_____DOLLARS ($_____), being not less than five percent of the amount bid.

Respectfully submitted,

_____
Name of Offeror

By _____
Authorized Signature

_____
Print or Type Name and Title of Above

Dated: _____

Address of Contractor _____

_____

Telephone Number: _____

Email Address: _____

In accordance with Hawaii Revised Statutes (HRS) Section 103D-302, all offers 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 contract for construction, and the nature and scope of work to be performed by each joint contractor or subcontractor. "Subcontractor" is defined in Hawaii Administrative Rules (HAR) § 3-120-2. Offers that do not comply with this requirement may be evaluated in accordance with HRS Section 103D-302(b).

It is the sole responsibility of the Offeror to review the requirements of this project and determine the appropriate contractor's licenses that are required to complete the project. The Offeror acknowledges that as a general contractor ('A' or 'B' license), the Offeror is prohibited from undertaking any work solely or as part of a larger project which would require the Offeror to act as a specialty contractor('C' license) in any area in which the Offeror has no specialty contractor's license. The Offeror must have the appropriate specialty license either obtained on its own, or obtained automatically under HAR § 16-77-32.

In determining work that is to be performed by joint contractors or subcontractors, Offerors shall be familiar with among other things HRS Chapter 444, relating to licensing of contractors and the Hawaii Administrative Rules, Title 16, Department of Commerce and Consumer Affairs, Chapter 77, Contractors.

Contractors that are suspended or debarred by the State of Hawaii, State Procurement Office under HRS Chapter 103D, cannot be considered for award during the suspension or debarment.

Contractors or subcontractors that are suspended by the State of Hawaii, Department of Labor and Industrial Relations under HRS Chapter 104 are prohibited from performing any work on any State or County public works construction project.

When more than one (1) joint contractor or subcontractor is listed for a category of work, the Offeror shall identify the scope of work each will perform. Joint contactors or subcontractors shall also be listed for work to be completed under additives or alternates.

All work not within the scope of work of the listed joint contractor(s) or subcontractor(s), shall be performed by the Offeror.

Include the name of each person or firm to be engaged by the Offeror as joint contractor or subcontractor in the performance of the contract in the following table. Write in the complete name of the Joint Contractor or Subcontractor, the Contractor License Number (if applicable), and the Nature and Scope to be performed by each.

COMPLETE NAME OF JOINT CONTRACTOR OR SUBCONTRACTOR	CONTRACTOR LICENSE NUMBER	SPECIFIC DESCRIPTION OF THE NATURE AND SCOPE OF WORK

HAWAII PRODUCTS PREFERENCE

In accordance with Section 103D-1002 of the Hawaii Revised Statutes, and Section 3-124 of the Hawaii Administrative Rules, the Hawaii products preference is applicable to this solicitation. Hawaii products, if identified in the schedule below, may be available to use in the work noted in this solicitation.

Where a bid or proposal contains both Hawaii and non-Hawaii products, then for the purpose of selecting the lowest bid or purchase price only, the price or bid offered for a Hawaii product item shall be decreased by subtracting ten percent for class I Hawaii product items bid or offered, or fifteen percent for class II Hawaii product items bid or offered. The price or bid for the Hawaii product shall be f.o.b., jobsite, unloaded, including applicable general excise tax and use tax. The Hawaii product cost shall not include installation costs. The lowest total bid or proposal, taking the preference into consideration, shall be awarded the contract unless the bid or offer provides additional award criteria. The contract amount of any contract awarded, however, shall be the amount of the bid or price offered, exclusive of the preferences.

All offerors desiring to claim a Hawaii product preference shall designate on the list below, the Hawaii product being offered by completing the quantity, unit measure, unit price and total price for each individual product to be supplied as a Hawaii product. Products not pre-approved shall not be considered. Hawaii Products not meeting the requirements of the specifications shall not be considered.

After the bid opening, Offerors selecting the Hawaii Product Preference may be required to submit additional information on the cost basis of their selected Hawaii Product Preference items. The additional information will be used to verify the cost of the Hawaii product, including the computations for the estimated quantities, manufacturer's or supplier's quotations, and delivered material cost free on board (FOB) at the jobsite, unloaded.

HAWAII PRODUCTS LIST

SCHEDULE OF ACCEPTABLE HAWAII PRODUCT AND DESIGNATION OF HAWAII PRODUCT TO BE USED								
Pre-Approved Hawaii Product Description	Class (I or II)	Manufacturer Vendor	Qty	Unit Measure	Unit Price	Total Price Offered to City* (a)	% (b)	Credit (a) x (b)

* F.O.B. jobsite, unloaded, including applicable general excise tax and use tax. The Hawaii product price shall not include installation costs.

It is further understood by the offeror that in the event of any change that materially alters the offeror's ability to supply Hawaii products, the offeror shall immediately notify the Officer-in-Charge in writing and the parties shall enter into discussions for the purpose of revising the contract or terminating the contract for convenience.

ACKNOWLEDGMENT OF LIQUIDATED DAMAGES PROVISION

PROJECT NAME AND NUMBER: _____

This is to certify that the undersigned understands and agrees to the provisions for Liquidated Damages, Section 3.16 of the General Terms and Conditions, City and County of Honolulu, and that submittal of our bid constitutes acceptance of the provisions and the amount of liquidated damages may be assessed per calendar day as specified in the Special Provisions.

_____
Name of Offeror

_____
Signature and Title

Date: _____

(Failure to submit this form with the bid may be cause for rejection.)

CERTIFICATION OF COMPLIANCE
WITH HRS 396-18, SAFETY AND HEALTH PROGRAMS
FOR CONTRACTOR BIDDING ON CITY JOBS

PROJECT NAME AND NUMBER: _____

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

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

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

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

(3) The details of:
- (a) The mechanism for employee involvement in job hazard analysis;
- (b) Hazard identification, including periodic inspections and hazard correction and control;
- (c) Accident and "near-miss" investigations; and
- (d) Evaluation 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 shall be considered willful noncompliance and be sufficient grounds to disqualify the award and terminate the contract.

_____
Name of Contractor

_____
Signature and Title

Date:_____

CERTIFICATE OF ACCEPTANCE
OF SOLICITATION REQUIREMENTS

It is understood and agreed that the undersigned acknowledges the following:

1. The Offeror has read this solicitation document including any addenda, in its entirety;

2. The Offeror understands and agrees to furnish, deliver, and perform the requirements of the solicitation in strict compliance with the solicitation document as amended, including any specifications, plans, and scope of work descriptions, without any exceptions, if awarded a contract;

3. The Offeror understands and agrees that no substitution or alternate brands may be furnished without the **written approval** of the City;

4. The Offeror understands that the Contractor shall resolve any noncompliance with the requirements of the awarded contract at the Contractor's own expense;

5. The Offeror will make all modifications or customizations to the brand and model being offered as necessary to meet all specifications, at no additional cost. Offeror guarantees that all modifications or customizations done to meet specifications shall not affect the quality of operation of the product; and

6. The Offeror understands that **FAILURE TO MEET CONTRACT REQUIREMENTS WILL CONSTITUTE A BREACH OF CONTRACT THAT MAY RESULT IN SUSPENSION OR DEBARMENT, AND THE EXERCISE OF RIGHTS AND REMEDIES AS PROVIDED BY LAW.** Contract requirements include any specifications, plans, and scope of work descriptions;

7. The undersigned is an authorized representative of the Offeror and can legally obligate the Offeror thereto.

Offeror: _____

Signature: _____

Print Name: _____

Title: _____

Date: _____

Phone: _____

SURETY BID BOND

Bond No. _____

KNOW TO ALL BY THESE PRESENTS:

That we, _____,
(Full name or legal title of Offeror)

as Offeror, hereinafter called Principal, and _____

_____
(Name of bonding company)

as Surety, hereinafter called Surety, a corporation authorized to transact business as a Surety in the State of Hawaii, are held and firmly bound unto the **CITY AND COUNTY OF HONOLULU**, as Owner, hereinafter called Owner, in the penal sum of _____ DOLLARS ($_____), lawful money of the United States of America, for the payment of which sum well and truly to be made, the said Principal and the said Surety bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS:

The Principal has submitted an offer for _____

_____

_____
(Project number, if available, and description)

NOW, THEREFORE:

The condition of this obligation is such that if the Owner shall reject said offer, or in the alternate, accept the offer of the Principal and the Principal shall enter into a Contract with the Owner in accordance with the terms of such offer, and give such bond or bonds as may be specified in the solicitation or Contract Documents with good and sufficient surety for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof as specified in the solicitation then this obligation shall be null and void, otherwise to remain in full force and effect.

Signed this _____ day of _____, 20____.

_____
(Principal)

By_____
Its

_____
(Surety)

By_____
Its Attorney-in-Fact

CONTRACT NO. CT-DDC-xxxxxxx

SOLICITION NO. RFB-DDC-XXXXXX

This AGREEMENT, made and entered into on_____ (Date), by and between the CITY AND COUNTY OF HONOLULU, a municipal corporation existing under and by virtue of the laws of the State of Hawaii, whose principal place of business is 530 SOUTH KING STREET, HONOLULU, HAWAII 96813, hereafter called the "CITY" and, whose principal place of business is CONTRACTOR'S ADDRESS, hereinafter referred to as the "CONTRACTOR."

WITNESSETH THAT:

WHEREAS, the CITY desires to engage the CONTRACTOR to perform work for the <NAME OF PROJECT>;

WHEREAS, a solicitation for bids and the selection of the CONTRACTOR were made in accordance with section 103D-302, Hawaii Revised Statutes (HRS) and the related Hawaii Administrative Rules (HAR). The CONTRACTOR has been identified as the lowest responsible and responsive Offeror, whose offer meets the requirements and criteria set forth in the invitation; and

WHEREAS, the CONTRACTOR is willing and able to provide the services set forth in this AGREEMENT;

NOW, THEREFORE, the CITY and the CONTRACTOR, in consideration of the foregoing and of the mutual promises hereinafter set forth, the sufficiency and adequacy of which are hereby acknowledged, and intending to be legally bound, hereby mutually agree as follows:

1. This Contract and the following documents, appendices, and exhibits collectively form the "AGREEMENT" or "Contract Documents", all of which are attached hereto and incorporated herein:

This Contract

Solicitation No. RFB-DDC-XXXXXX

CONTRACTOR'S OFFER

The Contract Documents as listed hereinabove are in order of controlling preference should there be any conflict in terms; provided, however, that portions in the CONTRACTOR's Offer that exceed specification requirements in the solicitation document will become the new minimum Contract requirements.

2. The CONTRACTOR shall furnish all services, labor, goods, materials, supplies, equipment and other incidentals reasonable necessary for the successful completion of the work contemplated under this AGREEMENT (Work).

3. The CITY agrees to pay the CONTRACTOR for the satisfactory performance and completion of the Work in accordance with the payments schedule and provisions, all as set forth in the AGREEMENT. The total amount of this AGREEMENT shall not exceed XXX DOLLARS AND XX CENTS ($X.XX), which is the maximum payable under this AGREEMENT and inclusive of all taxes. The CONTRACTOR shall not pass through any increases in taxes to the CITY.

4. The term of the Agreement shall be the duration as provided in Solicitation No. RFB-DDC-XXXXXX.

5. The CONTRACTOR will prosecute said work in an efficient manner so as entirely to complete and perform said work within the time set forth in Solicitation No. RFB-DDC-XXXXXX.

IN WITNESS WHEREOF, this AGREEMENT is executed herein by the duly authorized officer or agent of the CITY and the CONRACTOR.

CITY AND COUNTY OF HONOLULU	<CONTRACTOR NAME>
BY:	BY:
PRINTED NAME:	PRINTED NAME:
TITLE: Director, Department of Budget and Fiscal Services	TITLE:
DATE:	DATE:

APPROVED AS TO FORM AND LEGALITY

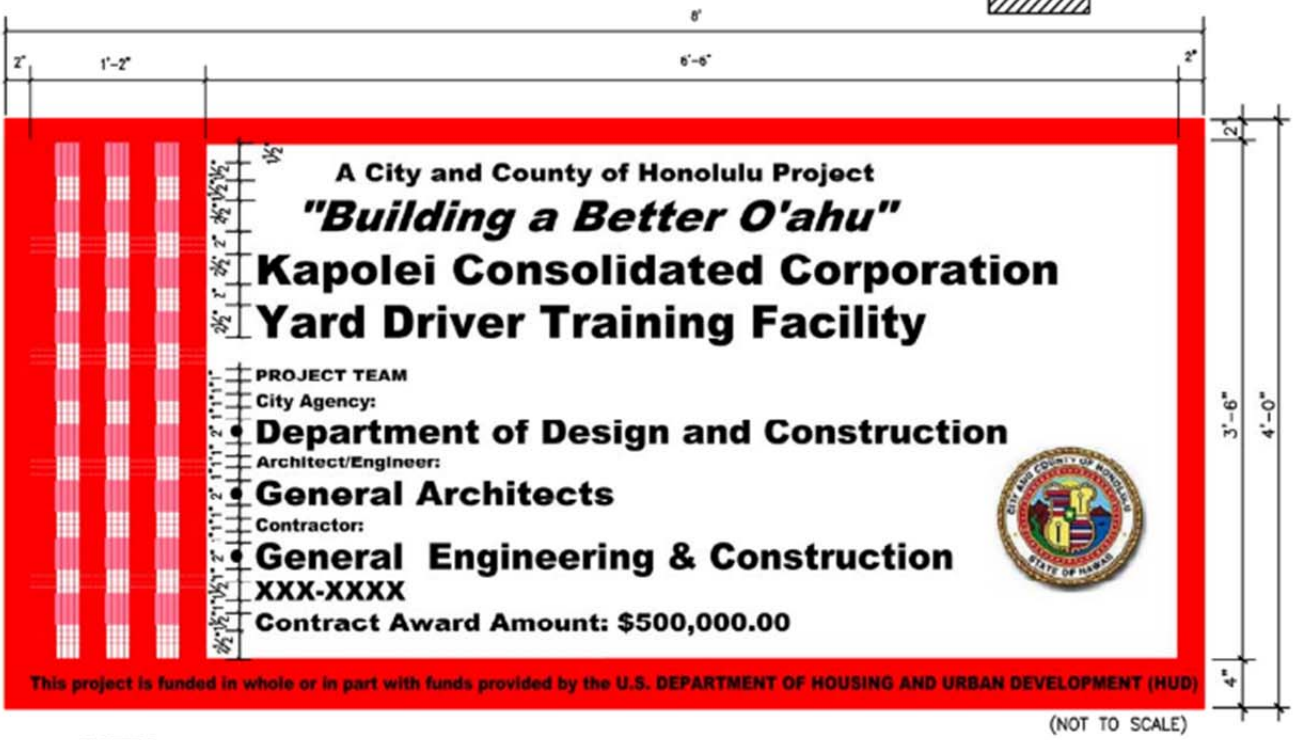
_____

Deputy Corporation Counsel
City and County of Honolulu

CONSTRUCTION SIGN BOARD

Revised September 26, 2016

PANTONE 185C



(NOT TO SCALE)

NOTES:

1. Use 48"x96" 3mm E–Panel or equivalent 2mm aluminum sheets, both sides laminated to a solid black polyethylene core
2. UV print sign directly to on E–panel.
3. Insert appropriate names and agencies only.
4. City and County Seal shall be integrated into sign and printed directly to sign.
5. Color:
   Background Color: White
   Border and Palaka Color Red Pantone 185
6. Letter Height are as Indicated.
7. Lettering Style: Arial Black
8. Lettering shall be black.
9. Phone number listing on construction sign shall be Contractor's phone number.
10. Include text at bottom of sign "This project funded in whole or in part with funds provided by the U.S. Department of Housing and Urban Development(HUD)" only when project has funding from HUD.

WORK REQUIRED: Fabricate and erect in place a complete construction sign board as shown by the above drawing.
A 1–1/2" scale example of proposed sign board with proper size, spacing and format as shown above should be submitted to the Officer–in–charge.

ERECTION: Sign shall be erected at location, as directed by Officer–in–Charge, adequately braced a the the rear side only. It shall be maintained in good condition throughout the progress of work.
When , in the opinion of the Officer–in–Charge. there is a need to relocate the projects sign because of progress of work, or for other reasons, the relocation shall be done as directed without cost to the City.

COMPLETION: Upon completion of project, the sign shall be removed by the Contractor and disposed of as directed by the Officer–in–Charge without cost to the City.

GENERAL INSTRUCTIONS TO OFFERORS

CITY AND COUNTY OF HONOLULU

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CHAPTER 1.0: GENERAL

1.1 Introduction.

These General Instructions to Offerors ("Instructions") state the City's policies relating to Request for Competitive Sealed Bids (RFB), Request for Competitive Sealed Proposals (RFP), and Request for Quotation (RFQ) solicitations.

Before submitting an offer, the Offeror shall be responsible for reading and examining the solicitation documents, these Instructions and all applicable requirements by law. Submission of an offer shall be deemed verification of such reading and examination. No Offeror shall in any way be relieved of any obligation with respect to its offer or the contract due to its failure or neglect to, familiarize itself with, and understand the work requirements, the Solicitation Documents, or existing conditions. No claim for additional compensation to the Offeror shall be allowed based on lack of knowledge or misunderstanding.

1.2 Application.

Any solicitation referencing these General instructions is subject to the Hawaii Revised Statutes ("HRS") §103D and the Hawaii Administrative Rules ("HAR") Title 3. In the case of inconsistencies, the HRS or HAR shall govern over the solicitation's provisions. Provisions from the HRS and HAR are presented for convenience only and may not be complete. Should the solicitation's provisions conflict with these General Instructions, the solicitation's provisions shall govern. Unless otherwise specified, these instructions are not intended to be incorporated into awarded contracts.

1.3 Definitions.

The terms used in this General Instructions to Offerors shall have the same meanings as defined in the City's General Terms and Conditions.

CHAPTER 2.0: SOLICITATION

2.1 Order of Precedence.

Whenever separate Scope of Work, City-provided Offer pages, Special Provisions, Exhibits, requirements, specifications or plans are referred to or attached hereto, they shall be considered a part of this solicitation document as if contained herein. Should any of the scope of work, City-provided offer pages special provisions, requirements, specifications or plans conflict with these Instructions to Offerors, they shall govern. The most recent addenda shall govern over all other previously issued addenda and other solicitation documents.

2.2 Attachments.

In the Vendor Self Service (VSS) eProcurement system, all attachments are incorporated and by reference made a part of the solicitation.

2.3 City's Estimates.

Any estimate provided by the City is for the convenience of the Offeror only and the City does not represent or warrant its accuracy. An Offeror should conduct its own review and analysis.

2.4 Pre-bid or Pre-proposal Conference.

Pre-bid or pre-proposal conference (pre-offer conference), if held, shall be announced in the solicitation document, or in an addendum. Unless specified otherwise in the solicitation, pre-offer conferences shall be non-mandatory. Nothing stated at the pre-offer conference shall change the solicitation unless a change is made by written addendum.

2.5 Examination of Site.

When applicable, the Offeror shall examine carefully the site of the proposed work before submitting an offer. The submission of an offer shall be considered as a warranty that the Offeror has made such examination and is satisfied with the conditions to be encountered in performing the work.

(a) Surface and subsurface conditions.

Where subsurface conditions are known to the City in respect to foundation or other design, the Offeror may inspect the records of the City and examine any sample that may be available. Where such information is shown in the plans, said information represents only the statement by the City as to the character of material which has been actually encountered by the City and is included only for the convenience of the Offeror. The City makes no representations as to the conditions which will actually be encountered by the Offeror.

Any subsurface information or hydrographic survey data furnished are for the Offeror's convenience only. The information and data furnished are the product of the Officer-in-Charge's interpretation of the facts gathered in investigations made at the specific locations indicated to aid in the design of the project, and the City assumes no responsibility whatsoever in respect to the sufficiency or accuracy of borings or of the log of test borings or other preliminary investigations, or of the interpretation thereof, and there is no guaranty, either expressed or implied, that the conditions indicated are representative of those existing throughout the work. In addition, no assurance is given that conditions found at the time of the

subsurface explorations, will be the conditions that prevail at the time of construction. The Offeror shall be solely responsible for all assumptions, deductions, or conclusions the Offeror may make or derive from the subsurface information or data furnished.

Making information concerning subsurface conditions available to Offerors is not to be construed in any way as a waiver of the Offeror's responsibility to examine the solicitation document and site. The Offeror must satisfy itself through its own investigations as to conditions to be encountered.

(b) Utilities, underground.

All underground water, gas, oil, telephone, electric, storm drain, sewer, and other pipes or conduits, shown on the plans, are only approximate in their locations. The Offeror shall make a personal investigation and inspection of the records and drawings possessed by owners of the utilities. The Offeror shall make satisfactory arrangements with the owners of the utilities for the relocation, maintenance and protection of existing utilities.

(c) Materials and equipment.

The City does not assume any responsibility for the availability of any materials or equipment required under this contract. Unless otherwise specified in the solicitation, the Offeror shall be considered as having taken into account when submitting an offer, the availability of materials or equipment required under the contract, except as provided for in applicable sections of the City's general conditions.

2.6 Price Items.

(a) Unless otherwise specified in the solicitation, prices offered shall be based on f.o.b. place of destination and shall include all applicable taxes, freight, delivery, handling and related charges. In the Vendor Self Service (VSS) eProcurement system, when a "Contract Amount" is requested, the Offeror shall enter the line item's lump sum price for the specified goods, services, or construction.

(b) Unless otherwise specified in the solicitation document, Offerors must provide a price for all items listed in the solicitation.

(c) When additive/deductive alternates are provided for in the solicitation, Offerors should enter a price for each and every item listed setting forth the amount to be added to or deducted from the Offeror's total basic price should such additive/deductive alternate be incorporated into the contract. Failure to enter a price for each and every item may result in the Offeror's offer not being considered for award, provided that if award is based on

the item or items on which offers have been submitted, the Offeror's offer may be considered for award.

(d) In case of discrepancy between prices written in words and those written in figures, the price written in words shall govern. Regarding pricing submitted in the Vendor Self Service (VSS) eProcurement system, the price submitted in the system shall govern. Notwithstanding the above, a unit price shall govern over an extended price.

(e) Offers in which prices are unbalanced, which contain omissions, erasures, alterations, or additions not called for, or irregularities of any kind shall be cause for rejection of an offer.

(f) Any illegible or otherwise unrecognizable price shall be cause for rejection of an offer.

2.7 Applicable Taxes.

Unless otherwise specified in the solicitation, the Offeror shall include in its unit price and be responsible for paying all taxes, which shall be applicable to the goods, services, or construction or the furnishing and sale thereof. Offerors are directed to contact the Department of Taxation of the State of Hawaii for assistance regarding the applicability of taxes.

2.8 Wages, Hours and Working Conditions.

(a) Services projects

When the offer is in excess of $25,000 for Services projects and a certification form is made a part of the solicitation, the form shall be completed, signed by the Offeror, and submitted with the Offeror's offer. Failure to submit the required certification may be grounds for disqualification of the Offeror's offer.

The certification form shall be used to certify that, if awarded the contract, the Offeror will comply with HRS §103-55, relating to Wages, hours and working conditions of employees of Contractor supplying services.

The certification form further certifies that the services to be performed will be performed under the following conditions:

(1) Wages. The services to be rendered shall be performed by employees paid at wages or salaries not less than the wages paid to public officers and employees for similar work.
(2) Compliance with Labor Laws. Contractor shall be responsible for and comply with all applicable labor laws of the Federal and State governments, including worker's compensation, unemployment compensation, payment of wages and safety standards.

(b) Construction projects

Offerors are advised of the applicability of HRS §104, "Wages and Hours of Employees on Public Works," projects and the City's applicable General Terms & Conditions, unless otherwise stated in the solicitation. Offerors shall incorporate compliance with all the provisions of HRS §104 and the City's applicable General Terms and Conditions into their offer.

(c) Vendor Self Service (VSS) eProcurement System

By submitting a bid in VSS, you are hereby accepting and acknowledging your compliance with the requirements of Section 2.8 and are not required to submit the certification form.

2.9 Insurance and Indemnification.

Offeror shall include in its price all costs to provide insurance and comply with the indemnification provisions as specified in the solicitation. Insurance and indemnification shall be required for all construction projects.

2.10 Performance and Payment Bonds.

Offeror shall include in its price, all costs to meet the bond requirements of a project.

(a) Goods or Services projects

Contract performance and payment bonds shall only be required for Goods or Services projects when specified in the solicitation.

(b) Construction projects

Contract performance and payment bonds shall be required for all Construction projects greater than $50,000.00 and shall be one hundred percent of the contract amount.

2.11 Bid Security.

When required, Offerors shall provide, at no cost to the City, an offer security. If an offer security is required and an Offeror fails to accompany its offer with an offer security, the offer shall be deemed non-responsive, except as provided in HAR §3-122-223 (d). For solicitations posted on the Vendor Self Services (VSS) eProcurement system, bid security, when required, shall be attached to the offerors electronic bid. The original bid bond shall be provided to the project buyer within five working days from the notification of intent to award. If the offeror fails to comply with this requirement, the offer may be rejected as non-responsive.

(a) Goods or Services. A bid security shall only be required when specified in the solicitation.

(b) Construction. A bid security shall NOT be required for Construction projects procured under HRS 103D-305 (RFQ solicitations). Bid security shall be required for all Construction projects procured under HRS 103D-302 and HRS 103D-303 that are ≥$25,000.00.

(c) Bid Security Amount. Bid security amount shall be equal to at least five percent of the Offeror's total bid amount.

(d) An acceptable bid security shall be limited to:
  (1) Surety bond in the form attached to the solicitation and underwritten by a company licensed to issue bonds in this State. Failure to utilize the City's surety bond forms shall not relieve the Offeror from liability or responsibility if it is discovered that the form utilized is not compliant with the HAR.
  (2) Legal tender; or
  (3) A certificate of deposit; credit union share certificate; or cashier's, treasurer's, teller's, or official check drawn by, or a certified check accepted by a bank, a savings institution, or credit union insured by the Federal Deposit Insurance Corporation or the National Credit Union Administration, and payable at sight or unconditionally assigned to the Director of The Department of Budget and Fiscal Services, City and County of Honolulu.
    i) These instruments may be utilized only to a maximum of $250,000.00.
    ii) If the required security amount totals over $250,000.00, more than one instrument not exceeding $250,000.00 each and issued by different financial institutions shall be accepted.

2.12 Brand Names, Model, Make or Method.

Where the solicitation document specifies one or more manufacturer's brand names or makes of materials, devices, equipment or system; it is indicating a quality, style, appearance, or performance, or method of construction. The Offeror shall base its offer on one of the specified brands, makes, or method, or on an alternate brand, make, or method which has expressly been found to be equal or better by the City in the solicitation or by written addendum to the solicitation.

If any item, make and model or part number listed in the solicitation is discontinued or made obsolete by the manufacturer, it is the offerors responsibility to provide the specified make and model number or offer an equal substitution for the item. Offeror shall follow the procedures set forth in 2.18 "Request for Substitution."

2.13 Supplemental Requirements for Construction Projects.

(a) Estimated Quantities

Unless otherwise specified, all quantities appearing in solicitation document for construction projects are approximate and are prepared for the comparison of offers only. The City does not, expressly or by implication, warrant that the actual quantities will correspond therewith. Offeror shall include in its prices offered, the entire cost of the performance of the contract, and it is understood and agreed that there is included in each lump sum or unit priced item, the entire cost of any and all items incidental to the performance of the work covered by such lump sum or unit priced item. When an Offeror is in doubt as to the proper item to which the anticipated cost of any item is to be allocated, the Offeror shall request clarification from the City, or shall include such cost in the lump sum or unit price offer for the item deemed most appropriate. Failure of the Offeror to request clarification shall bind the Offeror to complete such work at the prices submitted.

(1) Unit priced items: For unit priced items, payment to the Contractor will be made only for the actual quantities of work performed and accepted or of materials furnished and accepted in accordance with the solicitation document and subject to applicable sections of the City's General Terms and Conditions.

(2) Lump sum items: The quantities in any item for a lump sum offer item are approximate only and payment will be made only for the item in place complete, regardless of the amount of material, equipment, and labor necessary to complete the same in a proper and professional manner and in accordance with the contract documents. The Offeror shall verify these quantities in any manner deemed necessary or expedient.

(b) Joint Contractor; Subcontractor Listing

For RFB solicitations, offeror shall comply with HRS §103D-302, relating to the listing of joint contractors or subcontractors.

Specialty work. Joint contractors and subcontractors may perform only the specialty work for which they are listed. When additive/deductive alternates are made a part of the offer, Offeror shall indicate, if applicable, the additive/deductive alternate and the basic work to be performed by each joint contractor or subcontractor.

A listing that is incomplete, ambiguous, or erroneous may be cause for rejection of an offer. Offers which are not in compliance may be accepted if the City concludes that acceptance is in the best interest of the public and the value of the work to be performed by the joint contractor or subcontractor is equal to or less than one percent of the total sum offer amount.

A subcontractor listing is not required for procurements made in accordance with HRS 103D-305 (RFQ solicitations).

(c) Allowances

Any allowance amount specified in the solicitation shall be considered an estimate of the amount required and shall be included in the Offeror's total sum offer. Offerors shall refer to the applicable sections of the City's General Terms and Conditions regarding Allowances for more information.

(d) Mobilization

Offerors shall refer to the applicable sections of the City's General Terms and Conditions regarding mobilization for more information.

(e) Employment of State Residents on Construction Projects.

Unless otherwise stated in the solicitation, offerors are advised of the applicability of HRS §103B, Employment of State Residents on Construction Procurement Contracts. HRS §103B requires the awarded Contractor to ensure that Hawaii Residents compose not less that eighty percent (80%) of the workforce employed to perform the contract. This requirement shall apply to subcontracts of $50,000.00 or more in connection with any construction contract procured under HRS §103D.

(f) Safety and Health Certification

Pursuant to HRS 396-18, all bids and proposals in excess of $100,000 for state construction jobs as defined in section 103D-104 shall include a signed certification from the offeror that a written safety and health plan for the job will be available and implemented by the notice to proceed date of the project. Pursuant to HRS 489E, Uniform Electronic Transactions Act, submittal of an electronic bid in excess of $100,000 shall be deemed to be this signed certification.

2.14 General Terms & Conditions.

The City's General Terms and Conditions shall be either incorporated by reference or by attachment to the solicitation. Offers submitted with any alterations to the City's General Terms and Conditions so made by the Offeror without approval by the City may be sufficient cause for rejection of the offer.

2.15 Source Selection for Federal Grants.

The City may solicit a Request for interest for the sourcing of federal grants pursuant to the requirements of HAR §3-122-16.31.

2.16 Multi-Step Competitive Sealed Bidding.

The City may solicit offers using the multi-step competitive sealed bidding method of source selection pursuant to HAR §3-122, Subchapter 6.5.

Solicitations using this method use two phases:

(a) Phase One

Phase One is conducted in accordance with HAR §3-122, Subchapter 6, with the exception of rules relating to the priced offer. Offerors submit unpriced technical proposals to be evaluated on criteria specified in the solicitation. The City may conduct discussions to clarify the unpriced technical proposals. If the priced offer is specified to be submitted in Phase One, they shall be submitted in a separately sealed envelope and will only be considered in Phase Two from offerors whose unpriced technical proposals are determined to be acceptable in Phase One.

(b) Phase Two

Phase Two is conducted in accordance with HAR §3-122, Subchapter 5, except as set forth in HAR §3-122, Subchapter 6.5. Offerors whose unpriced technical proposals are determined to be acceptable will have their sealed price offers opened (if required to be submitted in Phase One) or be requested to submit a sealed priced offer.

2.17 Request for Clarification.

If a prospective Offeror believes that any of the matters in, or related to, the solicitation are not sufficiently described or explained in the solicitation, or that any discrepancy exists between different parts of the solicitation, or that the full intent of the solicitation is not clear, then the Offeror shall submit a written request for clarification no later than the deadline stated in the solicitation document. The City is not obligated to respond to any request received after the deadline. In the Vendor Self Service (VSS) eProcurement system, the City will not respond to inquiries posted on the VSS Bulletin Board or Q&A list page of the solicitation.

Written request for clarifications shall be e-mailed to bfspurchasing@honolulu.gov or mailed hardcopy to:

City and County of Honolulu
Budget and Fiscal Services
Purchasing Administrator
530 South King Street, Room 115
Honolulu, Hawaii 96813

2.18 Request for Substitution.

Alternate brands, makes, methods and/or packaging may be qualified through the submittal of a written request for substitution for review and approval. An alternate brand, make, or method approved for one procurement or project is not to be considered as approved for any other procurement or project. Offeror shall submit a written request for substitution no later than the deadline stated in the solicitation document. Requests received after the deadline will be denied.

(a) Goods or Services projects.

The written request for substitution must state all features of the proposed substitution that differ from the brand, model, make, method, and/or packaging specified in the solicitation. The written request shall also include sufficient evidence to enable the City to evaluate each feature.

Written request for substitution shall be e-mailed to bfspurchasing@honolulu.gov, or mailed hardcopy to:

City and County of Honolulu
Budget and Fiscal Services
Purchasing Administrator
530 South King Street, Room 115
Honolulu, Hawaii 96813

(b) Construction Projects

The written request must be clearly marked SUBSTITUTION REQUEST on the envelope. Unless otherwise stated in the solicitation, six copies of the request must be submitted together with three sets of technical brochures which shall either be marked or be accompanied by three copies of a statement of variances. The statement of variances must list all features of the proposed substitution which differ from the solicitation, and must further certify that the substitute has no other variant features. The brochures must include sufficient evidence to enable the City to evaluate each feature listed as a variance. Should an unlisted variance be discovered after installation or delivery of the item, the Contractor shall immediately replace the item with the specified item at no cost to the City and without any extension to the contract completion time.

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

SECTION	ITEM	SPECIFIED	SUBSTITUTE	VARIANCE

(For a sample request form refer to General Terms and Conditions Exhibit P.)

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

Substitution requests not complying with the above requirements may be rejected.

Any Offeror whose offer is based on a substitute item which has been approved by the City shall include in its price offer the additional cost required for all modifications in the contract and the cost of all additional diagrams and drawings required to accommodate the substitute item. The modifications referred to include the changes in design that may be required.

Written request for substitution shall be submitted by person, or mailed hardcopy to:

City and County of Honolulu
Budget and Fiscal Services
Purchasing Administrator
530 South King Street, Room 115
Honolulu, Hawaii 96813

(c) Approval and Rejection of Request for Substitution

All requests for substitution submitted prior to the deadline will be responded to.

(1) Approval of Request for substitution.
The City will publish all products approved for substitution via addendum.

(2) Rejection of a Request for substitution.
The City will provide offerors who submit a request for substitution that is rejected a letter detailing the rejection and/or post the rejection in an addendum.

2.19 Solicitation Addenda.

(a) Written Addendum

Oral interpretations or clarifications or changes or approved substitutions will be without legal effect. Only interpretations or clarifications or changes or approved substitutions provided by formal written addendum to the solicitation shall be binding.

(b) Notification of Addenda

(1) In the Vendor Self Service (VSS) eProcurement system, when an addendum is issued, email notifications will be sent to all offerors registered under the solicitation's specified commodity class.
(2) For all other RFB solicitations, notifications of addenda will be issued to all prospective Offerors that downloaded the solicitation document from the City.
(3) For RFPs, if the addendum is issued after the receipt of proposals, notifications will be sent to those Offerors who submitted proposals or who are "priority listed."

(c) Modification to Price Items

It shall be the responsibility of the Offeror to modify or withdraw its offer based on compliance with addenda.

2.20 Cancellation of Solicitation.

A solicitation may be canceled in whole or in part and at any time per HAR §3-122-96.

CHAPTER 3.0: PREFERENCES

This chapter may not apply to Federally funded procurements.

3.1 Applicability of Preferences.

The Apprenticeship preference may apply to solicitations in accordance with HRS §103-55.6.

All other preferences shall only apply to a solicitation when:

(a) An offer form or certificate for the preference is included in the solicitation document; and

(b) The solicitation indicates the applicability of the preference in the solicitation's offer pages, special instructions or special provisions.

3.2 Evaluation of Preferences.

(a) The evaluation of preferences shall be in accordance with HRS §103D Part X and HAR §3-124.

(b) Evaluation procedure and contract award. Solicitations allowing more than one preference shall be evaluated and awarded in accordance with HAR §3-124-25.

(c) Preferences shall be for evaluation purposes only. The award contract amount shall be the amount of the offer, exclusive of any preference.

CHAPTER 4.0: OFFER

4.1 Preparation of Offers.

(a) All offers shall comply with the following:

(1) Shall not include samples or descriptive literature unless expressly requested. Any unsolicited samples, descriptive literature, or attachments will not be examined or tested, and will not be deemed to vary any of the provisions of the solicitation.
(2) All costs to prepare and submit an offer shall be at the Offeror's expense. The City will not reimburse any offer costs or any best and final offer costs incurred by any Offeror, any prospective Offeror, or any other person.
(3) An offer shall be submitted by an individual, member, officer, or agent of the Offeror legally qualified and authorized to do so.
(4) Time is of the essence and the time for delivery is a part of the response and must be adhered to. Time, stated in the number of days, shall mean "calendar" days, and shall include weekends and holidays.

(b) Offers for solicitations that were posted in the Vendor Self Service (VSS) eProcurement system shall comply with HRS §489E. The Offeror's submission of an electronic offer confirms that the Offeror:

(1) Intends to be bound by the offer.
(2) Agrees to all terms, conditions, and provisions of the solicitation.
(3) In accepting the electronic terms, the offer is deemed equal to a signed certification.

(c) Offers for all other solicitations shall comply with the following:

(1) Shall be prepared using the solicitation documents provided by the City.
(2) Shall be prepared in ink or typewritten. Errors may be erased or crossed out, and corrections typewritten or printed in ink but must be initialed in ink by the person or persons signing the offer.
(3) Shall be signed in ink by the individual if offering as a sole proprietor, by one or more members of a partnership, by one or more members or officers of each entity in a joint venture, by one or more officers of a corporation, or by an agent of the Offeror legally qualified and acceptable to the City.

(d) Pursuant to HAR §3-122-21(4)(B), space is provided in solicitations for: brand name, model number and/or packaging. Offerors who leave these fields blank (physically and electronically) certify, by submitting their offer, that they are providing as specified. An offeror who inputs a brand name, model number, and/or packaging that is not pre-approved or approved during the solicitation may have their bid rejected as non-responsive. This paragraph shall not apply to service solicitations.

4.2 Certificate of Acceptance of Solicitation Requirements.

The Certificate of Acceptance of Solicitation Requirements when made a part of the solicitation shall be completed, signed by the Offeror, and submitted with the Offeror's offer. Failure to submit the required certification may be grounds for disqualification of the Offeror's offer.

The Offeror shall sign the Certificate of Acceptance of Solicitation Requirements to acknowledge that the Goods, Services, or Construction provided by the Offeror are in compliance with the Scope of Work specified in the solicitation. Deviations from the specified Scope of Work shall only be allowed by the approval of the City unless otherwise specified in the solicitation.

By submitting a bid in Vendor Self Service (VSS) eProcurement system, you are hereby accepting and acknowledging your acceptance of solicitation requirements and are not required to submit the certification form.

4.3 Certificate of Cost or Pricing Data.

When an offer in response to a Request for Competitive Sealed Proposal (RFP) solicitation is in excess of $100,000.00, the Offeror shall certify that the offer's cost or pricing data is accurate, complete, and current. Failure to submit the required certification may be grounds for rejection of the offer.

4.4 Proprietary or Confidential.

Offeror shall clearly label any proprietary information as confidential. Any information labeled as confidential will remain confidential to the extent provided by law. Offers submitted to the City shall become the property of the City.

4.5 Offer Submission.

(a) Offers for solicitations that were posted in the Vendor Self Service (VSS) eProcurement system: The offeror shall submit its offer electronically within the VSS system. Unless otherwise specified, the City shall only consider offers submitted in the VSS system for award. Offerors shall be responsible for registration and successful response submittal in VSS.

(b) Offers for all other solicitations: If the solicitation specifically requires hard copy offers, the offer should be sealed in an envelope. The solicitation

number, Offeror's name and address, and closing date of the solicitation should be printed on the outside of the envelope. The offer envelope must be time stamped and deposited at the Division of Purchasing.

4.6 Modification or Withdrawal of Offers.

An offer may be modified or withdrawn prior to the solicitation's close date and time.

CHAPTER 5.0: OPENING OF BIDS AND REGISTRATION OF PROPOSALS

5.1 Public bid opening of RFB and RFQ solicitations.

(a) Opening for RFB and RFQ solicitations that were posted in the Vendor Self Service (VSS) eProcurement system: After the solicitation's close date and time has passed, a bid tabulation will be available on the solicitation's detail page in VSS.

(b) Opening for all other RFB solicitations: The opening of offers shall be by a representative of the City, at the date and time stated in the solicitation, in the presence of all Offerors who attend. The opened offers shall be available for public inspection at the time of offer opening except to the extent that the Offeror designates trade secrets or other proprietary data to be confidential. Offerors shall ensure that material so designated as confidential shall be readily separable from the offer in order to facilitate public inspection of the non-confidential portion of the offer. Prices and makes and model or catalogue numbers of items offered, deliveries, and terms of payment shall be publicly available at the time of offer opening regardless of any designation to the contrary.

5.2 Opening of RFP Solicitations.

After the RFP submittal due date, proposals shall not be publicly opened. Proposals shall be open to public inspection after the notice of award has been posted.

If the RFP required submitting physical proposals they shall be opened in the presence of two or more procurement officials.

5.3 Late Offers and Late Modifications.

The City shall not accept offers and modifications after the solicitation close time and date.

5.4 Time for Acceptance of Offer.

Unless otherwise stated in the solicitation, an offer may be withdrawn only if the City fails to award the contract within:

(a) For City-funded projects or projects funded in whole or in part by the federal government; within sixty (60) days of the deadline for offers;

(b) For projects funded in whole or in part by the State, within one hundred fifty (150) days of the deadline for offers; and

(c) For improvement district projects, within three hundred (300) days of the deadline for offers.

CHAPTER 6.0: EVALUATION OF OFFERS

6.1 Waiver of Informalities.

The City may waive or accept minor informalities, mistakes or other defects in accordance with HAR §3-122-31.

6.2 Multiple or Alternate Offers.

Unless specifically provided for in the solicitation, multiple or alternate offers by the same offeror shall not be accepted and all such offers shall be rejected.

An offeror shall be considered to have submitted more than one offer if such offeror submits more than one offer under the same Taxpayer Identification Number (FEIN or SSN), same name, or through agents, or through joint ventures, partnerships or corporations in which such person has more than a twenty five percent interest in each of them, or through any combination thereof.

6.3 Conditioned Offers.

Offers that are conditioned may be deemed nonresponsive and rejected.

6.4 Limiting Acceptance to Entire Offer.

An Offeror may not limit acceptance to the entire offer, unless allowed by the solicitation:

(a) If the acceptance of an offer is so limited by the Offeror but not allowed, the offer will be determined to be not acceptable and rejected.

(b) If the acceptance of an offer is so limited by the Offeror and allowed, the purchasing agency shall not reject part of the offer and award on the remainder.

6.5 Anti-competitive Practices.

If there is any evidence indicating that two or more Offerors are in collusion to restrict competition or have otherwise engaged in anti-competitive practices relating to the procurement, the offers of all such Offerors shall be rejected and such evidence may be a cause for their suspension or debarment.

6.6 Suspended or Debarred List.

No contract will be awarded to any Offeror suspended or debarred by the Federal, State or City.

6.7 Unauthorized Communications

Except as otherwise authorized in the solicitation, offerors shall not communicate with the Contracting Officer, any member of an Evaluation Team or Selection Committee appointed by the Contracting Officer, or any other City officer, employee or agent directly serving the procurement activity.

6.8 Rejection of Offers.

The City reserves the right to reject any or all offers when in the City's opinion; such rejection will be in the best interest of the City. Offers may be rejected for the following reasons:

(a) Offeror lacks sufficient experience to perform the work contemplated;

(b) Offeror does not possess proper license, if required to cover the type of work contemplated, at the time of the offer submittal due date, unless otherwise specified in this solicitation;

(c) Offeror who has uncompleted work on contracts in force, or a record of unsatisfactory work performance or delays on completed contracts or on contracts in force which, in the judgment of the City, might hinder or prevent the prompt completion of additional work if awarded;

(d) Offeror who has complaints filed for abusive or threatening language or behavior during previous contracts toward any City Officer-in-Charge or his/her representative;

(e) Offeror who has had a previous contract terminated for default by the City;

(f) Offeror who has failed to comply or is delaying compliance with the requirements for final inspection or final payment of the City's General Terms and Conditions for any contract in force;

(g) Offeror is determined to be non-responsible;

(h) Offeror fails to pay, or satisfactorily settle, all bills overdue for labor and material on former City contracts prior to the offer submittal due date;

(i) The Offeror assisted in developing or preparing the specifications or work statements.

(j) The offer does not conform in all material respects to the requirements of the solicitation.

(k) The proposed price is clearly unreasonable.

6.9 Cost Analysis Data

The City reserves the right to request cost data. Pursuant to HAR §3-122-35, this cost data will be used to determine if an offer is fair and reasonable. Information provided by the Offeror shall remain confidential and proprietary in accordance with HRS §92F-13(3).

CHAPTER 7.0: DISCUSSION & BEST AND FINAL OFFER

This chapter shall apply only to Request for Competitive Sealed Proposals (RFP) solicitations.

7.1 Priority Listed Offers.

The City may establish a Priority List consisting of at least three (3) Offerors. Those Offerors who are selected for the priority list are referred to as the "Priority-Listed Offerors (PLO)." The City will not publicly identify the PLO firms prior to the public posting of the notice of award.

When soliciting using a Design Build RFP, the three responsible, most qualified offerors shall be short-listed as PLO and notice will be given to all offerors as to which offerors are short-listed.

If the City issues addenda after the PLO firms are determined, the City will issue the addenda only to the PLO firms.

7.2 Discussions.

Discussions will be limited to only Priority-Listed Offerors (PLO). PLOs shall be accorded fair and equal treatment with respect to any opportunity for discussions and revisions of offers; however, offers may be selected without such discussion.

New proposals or amendments to the existing solicitation that, in the City's sole judgment, significantly change the nature of the procurement will not be permitted. Should the City believe it is in its best interest to go forward with a

significant change, then the solicitation may be cancelled and a new solicitation may be issued.

Non-Disclosure of offer contents. The contents of any offer shall not be disclosed so as to be available to competing Offerors during the discussion process.

7.3 Best and Final Offer (BAFO).

The City reserves the right to issue a request for Best and Final Offers (BAFOs). However the City is under no obligation to do so. The City may make its selection and Award based on the initial offers submitted.

If BAFOs are requested, the City shall inform the PLO firms and allow/request revised offers, including correction of any weaknesses, minor irregularities, errors, and/or deficiencies identified by the City. Adequate time shall be provided to PLO firms to revise their offers. Upon receipt of the BAFOs, the City will repeat the evaluation process. The evaluation process will consider the revised information, re-evaluate, and revise scores as appropriate.

CHAPTER 8.0: AWARD

8.1 RFB and RFQ Solicitations.

(a) Additive or Deductive Alternates

In the event additive or deductive alternates are included in the solicitation, the lowest offer will be determined after adding to or deducting from the total basic price, the alternate or alternates considered for award. Alternates, if any are awarded, shall be awarded in the order listed in the offer. Award of alternates shall be dependent upon the availability of funds.

(b) Low Tie Bids

In the case low tie bids from responsible and responsive Offerors are received, award may be made by the drawing of lots.

8.2 Exceeding Available Funds.

In the event all offers exceed available funds and where time or economic considerations preclude re-solicitation of a reduced scope of work, the City may negotiate an adjustment of the offer price, including changes in the solicitation requirements, with the lowest priced responsive and responsible Offeror, to bring the offer within the amount of available funds.

8.3 Verification of Responsibility of Offeror.

Prior to the award of the contract, the successful Offeror shall be registered as "Compliant" on the State of Hawaii Compliance Express System (http://vendors.ehawaii.gov) or submit the required tax clearances from the State Department of Taxation and Internal Revenue Service, the Certificate of Compliance with the State Department of Labor and Industrial Relations, and the Certificate of Good Standing with the Department of Commerce and Consumer Affairs Business Registration Division. The City may reject the offer if the Offeror fails to provide proof of compliance within the time permitted by the City. Offeror shall meet all licensing requirements of the solicitation.

8.4 Execution of Contract.

Upon notification of award, the successful Offeror shall obtain the contract from the Division of Purchasing, Department of Budget and Fiscal Services, for execution. The contract document shall be returned within ten days from the date of notification of the award, or within such time as the City may allow.

Failure to enter into the contract and to furnish satisfactory security, when required, may be cause for cancellation of the Offeror's award and forfeiture of the Offeror's offer security, if any, as liquidated damages and not as a penalty.

The contract documents are to be completed and executed by the Offeror in the following manner:

(a) Notarization

Signatures appearing on the contract forms and bond forms (if applicable) must be notarized by a notary public.

(b) Authorization

The City may require, in the case of a corporation, a corporate resolution authorizing the person(s) signing to execute the contract and bond. The City may require, in the case of a joint venture or partnership, a power of attorney authorizing the person(s) signing to execute the contract and bond. The surety, if applicable, may also be required to attach its corporate resolution or power of attorney authorizing the person(s) signing to execute the bond.

(c) Performance and Payment Bonds

Performance and payment bonds, if required, shall be delivered at the same time the contract is executed. Performance and payment bonds shall be in conformance with HAR §3-122-221, §3-122-222 and §3-122-227.

(d) Evidence of Insurance Coverages

If insurance coverages are required by the solicitation, evidence of insurance coverages shall be delivered at the same time the contract is executed.

8.5 Awards of Less than $100,000 and $250,000.

On any individual award totaling less than $100,000 for Goods or Services and less than $250,000 for construction, the City reserves the right to award the contract by Purchase Order. The purchase order shall be performed in accordance with the terms set forth in the solicitation.

8.6 Cancellation of Award.

The City reserves the right to cancel the award of any contract any time before the City signs the contract.

CHAPTER 9.0: DEBRIEFING, PROTEST, SUSPENSION AND DEBARMENT

9.1 Debriefing.

Debriefing shall apply only to Request for Competitive Sealed Proposal (RFP) solicitations. A written request for a debriefing shall be made within three (3) working days after the posting of the award.

9.2 Authority to Resolve Protested Solicitations and Awards.

The City shall resolve complaints and protest of awards in accordance with HAR §3-126-1 and HRS §103D-701.

9.3 Authority to Debar or Suspend.

The City may debar or suspend an Offeror for cause from consideration for award of contracts in accordance with the provisions of HRS §103D-702, and HAR §3-126-2.

9.4 Solicitation or Award in Violation of Law.

If a solicitation or award is found to be in violation of law, it shall be resolved in accordance with HAR §3-126-4.

DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01005 - SUMMARY OF WORK

PART 1 - GENERAL

1.01 GENERAL PROVISIONS

A. The General Instructions to Offerors (2/9/17), the General Conditions, and Special Provisions preceding these specifications shall govern this section of the work.

1.02 PROJECT DESCRIPTION

A. The project consists of replacing two existing cooling towers at the Neal Blaisdell Center Concert Hall, as shown on the Contract Documents prepared by AMEL Technologies, Inc.

1.03 PERFORMANCE SCHEDULE

A. Upon the approval and acceptance of the performance schedule, it shall not be altered without written authorization from the Officer-in-Charge. Approval must be obtained and issued one week prior to the proposed work. Any and all approved changes shall be issued as a convenience to the Contractor and shall not constitute an entitlement to an additional cost impact claim to be submitted by the Contractor.

END OF SECTION

SECTION 01010 - PROJECT GENERAL REQUIREMENTS

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. The General Instruction to Offerors (2/9/17), the General Conditions, and Special Provisions preceding these specifications shall govern this section of the work.

1.02 APPLICABLE REGULATIONS

A. The Contractor shall comply with all local laws, ordinances, rules and regulations pertaining to such work and must obtain and pay for required permits, license and certificates and publish and post all notices required thereby.

1.03 DESCRIPTION OF WORK

A. These specifications are divided for convenience into titled divisions and sections as set forth in the TABLE OF CONTENTS preceding these specifications and shall not be considered an accurate or complete segregation of the several units of labor and materials. No responsibility, direct or implied, is assumed by the City and County for omissions or duplications of the subject matter. The Contractor shall be held responsible for the complete work whenever or wherever the parts are described in one or more trade heads. Any mention in these sections or indication on the drawings of articles, materials, operations, or methods required that the Contractor furnish each item so mentioned or indicated, of the kind, type, or design and quality of each item so mentioned or indicated on the drawings, and that the Contractor furnish all labor, materials, equipment, incidentals, and supervision necessary to complete the work in accordance with the drawings and the true meaning and intent of these specifications, even though such mention of articles, materials, operations, methods, quality, qualifications, or conditions is not expressed in complete sentences.

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

C. Schedule of work included in these specifications sections are given for convenience and shall not be considered as a comprehensive list of items necessary to complete the work of any section.

D. The Contractor shall employ the usual standard practice of coordinating the work covered in each section with the work of other sections. The necessary information and the items, accessories, anchors, connections, patterns, templates, etc., shall be delivered when required, in order to prevent any delay in the progress and completion of the work.

1.04 PLANS AND SPECIFICATIONS

A. These specifications are intended to cover all labor, materials, and standards of workmanship employed in the work indicated on the plans and called for in

the specifications or reasonably implied therein. The plans and specifications complement one another. Any part of the work mentioned in one and not represented in the other shall be done the same as if it had been mentioned or represented in both.

B. The Contractor shall not alter the drawings and specifications. In the event of any error or discrepancies, the Contractor shall immediately notify the Officer-in-Charge for clarification and instructions.

C. All figured dimensions take precedence over scaled measurements. No important dimension shall be determined by scale.

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

E. Phrase "or equal" shall mean "or equal acceptance to the Officer-in-Charge."

1.05 AS-BUILT DRAWINGS

A. The Contractor shall keep job site copies of the drawings and shall mark on one set, kept expressly for this purpose, all changes made or site conditions which differ from the contract set. Contractor shall stamp and sign each sheet of the complete set of contract drawings indicating it represent as-built condition. Contractor shall also submit an as-built specification set indicating specific products used and stamp and sign the cover sheet indicating as-built conditions.

1.06 OFFICER-IN-CHARGE REVIEW AND ACCEPTANCE

A. Officer-in-Charge review and acceptance of all submittals and conditions shall be based on the information submitted and the visible condition observed. Acceptance shall be for general intent of the contract. Ultimate performance of the work or product to meet the contract requirements shall be the Contractor's responsibility.

1.07 EXISTING UTILITIES

A. Location of existing utilities and facilities shown are approximate only and are not guaranteed. The Contractor shall verify, in the field, the location of all existing utilities. The Contractor shall be fully responsible for any and all damages, injuries, deaths, expense, etc., to property, personnel and the public resulting from accidents to or from existing facilities and/or utilities.

B. Should existing utilities not shown on the plans be encountered in the field during the operation, the Contractor shall promptly notify the Officer-in-Charge for instructions. Failure to do so will make the Contractor liable for any and all damages arising from his operations. Upon the instructions of the Officer-in-Charge, the Contractor may be required to relocate or adjust the existing utilities. The Contractor shall not be compensated extra for any additional material required because of differences in location of existing utilities in the plan and in the field.

1.08 STORAGE OF MATERIALS. EQUIPMENT AND FABRICATING AREAS

A. Storage of materials, equipment and fabricating areas will be permitted at the project site to the extent allowed by Section 01015 Contractor Use of Premises.

1.09 RESTORATION OF EXISTING AREAS

A. All existing areas disturbed or damaged due to construction or ingress and egress to the site shall be repaired to match the existing. Restoration and maintenance of all affected areas shall be the Contractor's responsibility, including areas beyond construction limits. Lawn areas shall be re-cultivated, top soiled and then re-grassed. Other damaged areas shall be repaired with the same kind and type of material.

B. All restoration work shall conform to the applicable provisions of the DPR Standard Specifications for Landscaping, herein attached and the respective sections of the Standard Specifications of the Department of Public Works referred to herein. All costs for the restoration work shall not be paid for directly but shall be considered incidental to the various items of the work.

1.10 PRECONSTRUCTION PHOTOGRAPHS

A. The Contractor shall submit photographs (one hard copy and two electronic copies on CD-ROMs) of areas where work will be done to document existing conditions prior to starting construction. The submittal shall include a list of photographs describing its locations.

1.11 REFERENCE STANDARDS:

A. All work shall be done in accordance to the most current standards listed in the Special Provisions, Detailed Specifications, DPR Standard Specifications (attached), and below as amended and/or amplified herein:

ASA	American Standard Association.
ASTM	American Society of Testing and Materials.
AISC	American Institute of Steel Construction.
ACI	American Concrete Institute.
ADA	Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities.
GC	General Conditions of Construction Contracts of the City and County of Honolulu (7/99)
IBC	International Building Code.
O.I.C	The Director of the Department of Design and Construction or a representative of the Director acting within the scope of the duties and authority assigned and delegated to him as such representative.

DDC-CI Department of Design and Construction, Construction Inspector.

END OF SECTION

SECTION 01015 - CONTRACTOR USE OF PREMISES

PART 1 - GENERAL

1.01 SPECIAL NOTICE

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

B. The Contractor must be familiar with the project site and familiarize themselves with existing conditions and the amount and kind of work to be performed relating to methods of construction and labor under which the work will be performed.

C. Contractor shall call the Mechanical & Electrical Division of the Department of Design and Construction, telephone number 768-8431, and give five (5) days notice before starting any work.

D. Contractor shall not establish on-site presence until permission has been granted by the Officer-in-Charge.

1.02 PROTECTION OF PROPERTY

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

B. In relation to execution of this contract, the General Contractor shall be responsible for known existing structures and improvements, both above and underground, including within and adjoining the working area, and shall provide adequate protection, either by barricades, covering or by temporary removal. Any known existing structures or improvements damaged during construction shall be repaired or replaced with materials, workmanship, fixtures or equipment of the same kind, quality and size as required by drawings and specifications. Any materials or equipment temporarily removed and damaged shall be re-erected and installed in an approved manner.

1.03 MATERIAL STORAGE AND FABRICATING AREAS

A. On-site storage of materials and equipment that are required for this project will be allowed. The size and location of the storage area will be dependent on the space available at the time of construction.

B. On-site fabrication of equipment will not be allowed.

1.04 PARKING

A. Parking will be available for a limited number of company vehicles (vehicles labeled with the company name). Company vehicles will be allowed only during periods when the Contractor is active on-site.

1.05 SANITARY FACILITIES

A. Toilet facilities will not be available for use. The Contractor shall provide temporary toilet facilities.

1.06 COORDINATION WITH DEPARTMENT OF ENTERPRISE SERVICES (DES)

A. The Contractor's operations to perform work shall be coordinated with the operations and events of the DES. To allow DES to coordinate events and activities, the Contractor shall prepare and submit a construction schedule for approval by DES at least twenty (20) working days before the start of any work at the project site.

B. During scheduled events, the Contractor may be prohibited from working at the project site. A time extension will be provided for the day(s) that the Contractor is not allowed to work.

PART 2 – PRODUCTS (NONE)

PART 3 - EXECUTION (NONE)

END OF SECTION

SECTION 01060 – REGULATORY REQUIREMENTS

PART 1 - GENERAL

1.01 LICENSED OFFERORS:

A. All prospective offerors must hold a current “B” contractor’s licenses from the State of Hawaii. No bid will be accepted from any unlicensed offeror.

PART 2 - PRODUCTS (NONE)

PART 3 - EXECUTION (NONE)

END OF SECTION

SECTION 01300 – SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.01 GENERAL PROVISIONS

A. The General Instructions to Offerors (2/9/17), the General Conditions, and Special Provisions preceding these specifications shall govern this section of the work.

1.02 SUBSTITUTION OF MATERIALS AND EQUIPMENT

A. Substitutions requests shall be in accordance with Section 2.12 Brand names, models; substitutions of the General Instructions to Offerors (2/9/17) and submitted with a make or method in the format as shown on the attached sample.

1.03 SUBMITTALS

A. The following listing of required submittals is provided for the Contractor's convenience. The Contractor shall review the technical sections of this specification, prepare and submit a comprehensive listing of required submittals.

B. Shop Drawings shall be required for:
   1. Section 07560 – Fluid Applied Roofing
   2. Section 15400 – Mechanical Piping
   3. Section 15640 – FRP Induced Draft Cooling Towers
   4. Section 15950 – Direct Digital Controls

C. Color Samples for color selection shall be required for:
   1. Section 09900 - Painting

D. Other required submittals shall include
   1. Product List, Product Data, Manufacturer's Instructions, Guarantee, Operation and Maintenance Manual, and As-Built Drawings: Section 15050 – Basic Mechanical Materials and Methods.

   2. Product Data and Manufacturer's Instructions: Section 15640 – FRP Induced Draft Cooling Towers.

   3. Product Data, Manufacturer's Instructions, and Quality Control Reports: Section 16100 – Electrical Work

E. Submittal Identification
   1. To avoid rejection and to expedite each submittal, the General Contractor shall have a rubber stamp made up in the following format.

NBC CONCERT HALL
COOLING TOWER REPLACEMENT
HONOLULU, HAWAII

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

SUBMITTAL#_____
SPEC SECT# AND NAME_____
SUBCONTRACTOR NAME_____
SUPPLIER NAME_____
MANUFACTURER NAME_____

_____
GENERAL CONTRACTOR'S NAME

CERTIFIED BY _____
(Contractor's Signature)

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

3. Submittal Format: Unless otherwise indicated in the applicable specification sections, the Contractor shall present the submittal items with a letter in the format shown on the attached sample and according to the following:
   a. Certificate of Compliance: The original and three (3) copies of the signed manufacturer's certificate indicating compliance to the provisions of the specifications. The Certificate of Compliance shall be on 8 1/2" x 11" sheet.

   b. Product Data: Ten (10) copies of product data, such as manufacturer's data, catalog cuts that indicate conformance to the provisions of the specifications regarding materials, appearance and finishes. Product data shall conform to an 8-1/2" x 11" format.

   c. Shop Drawings: One (1) reproducible and six (6) prints of drawings indicating how specific portions of the work are to be fabricated or installed by the Contractor, that are either confirmation of conditions detailed in the construction documents, clarification, planned conditions not readily indicated in the Construction Documents, that

maintain the design intent. Shop drawings shall be cross referenced to corresponding items in construction documents. As much as possible, shop drawings should conform to an 8-1/2" x 11" format (i.e. capable of being folded to 8-1/2" x 11" for filing), but in no case shall exceed 24" x 36" size sheets.

d. Guarantee: The original and ten (10) copies of a written guarantee, signed as directed in the applicable specification section, for the scope of work and duration indicated in the applicable specification section. Unless otherwise indicated in the applicable specification section, guarantee periods shall be for one (1) year, and start at the time of acceptance by the City and County. Guarantees shall conform to an 8-1/2" x 11" format.

e. Test Reports: Ten (10) copies of test reports for any material used in this contract shall be submitted when specified or required by the Officer-in-Charge.

f. Maintenance Data and Operating Instructions: Ten (10) copies of maintenance data and operating instructions shall be submitted at the conclusion of the equipment installation. The manual shall include instructions for operating, maintenance, repair, recommended inspection points and periods for inspection in a practical, complete, and comprehensive manner. The information shall be arranged in a logical, orderly sequence, including a general description of the equipment and significant technical characteristics. Tests, adjustment, and calibration information shall include illustrations, diagrams, and step-by-step procedures.

1.04 AS-BUILT DRAWINGS

A. The Contractor shall maintain at the job site two (2) sets of full-size contract drawings, marking them in red to show all variations between the construction actually provided and that indicated or specified in the contract documents, including buried or concealed construction.

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

C. The representation of such change shall conform to standard drafting practice and shall include such supplementary notes, legends, and details as necessary to clearly portray the as-built construction. If drawings are prepared on Computer Aided Drafting (CAD) system, the file shall be provided to the City and County on CD.

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

AS-BUILT DRAWINGS

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

_____
CONTRACTOR'S NAME

_____
Signature Date

E. Monthly and final payments to the Contractor shall be subject to prior approval of these drawings. On completion of the work, both sets of marked-up drawings shall be delivered to the Officer-in-Charge, and shall be subject to the approval of the Officer-in-Charge before acceptance.

1.05 COMPLETION FOLDER

A. Substantial Completion: When Contractor considers the Work, or designated portion thereof, is substantially complete, submit written notice, with list of items to be completed or corrected.

B. Officer-in-Charge will make an inspection to verify the status of completion with reasonable promptness.

C. Should Officer-in-Charge determine that the Work is not substantially complete; Contractor shall remedy deficiencies and submit a second written notice or substantial completion.

D. Final Inspection: When Contractor considers the Work is complete, submit a written certification that equipment and systems have been tested in the presence of the Officer-in-Charge and are operational, and Work is completed and ready for final inspection.

E. Officer-in-Charge will make an inspection to verify the status of completion with reasonable promptness.

F. When the Officer-in-Charge finds that the Work is acceptable under the Contract Documents, Officer-in-Charge will request the Contractor to make closeout submittals.
   1. Evidence of compliance with requirements of governing authorities.

2. Project Record Document.
   a. Project Personnel - A listing of the Contractor's personnel and position.

   b. Subcontractor/Vendor - A listing of the subcontractors and vendors and work description.

   c. Emergency Notification- A listing of persons to call for emergency.

3. Warranties and Bonds: Execute and assemble documents from subcontractors, suppliers, and manufacturers.
   a. Provide duplicate notarized copies.

   b. Contractor's name, address, and telephone number.

   c. Warranty period (start and end dates; day/month/year).

   d. Warranty contact's name, address, and telephone number.

   e. Provide Table of Contents and assemble in three D side ring binder with durable plastic cover.

4. Evidence of Payment and Release of Liens: To requirements of General and Supplementary Conditions.

5. Certificate of Insurance for Products and Completed Operations.

G. Submit the final Application for Payment in accordance with procedures and requirements stated in the conditions of the Contract. Final Payment Request shall have copies of State Tax Clearance Certificate attached.

REQUEST FOR SUBSTITUTION – SAMPLE

DATE:_____

PURCHASING ADMINISTRATOR
DEPARTMENT OF BUDGET & FISCAL SERVICES
CITY AND COUNTY OF HONOLULU
530 SOUTH KING STREET, ROOM 115
HONOLULU, HI 96813

Dear Director:

SUBJECT: REQUEST FOR SUBSTITUTION

PROJECT TITLE: _____

_____

We hereby submit for substitution ten (10) sets of technical brochure and statement of variances for your review and approval for the item(s) shown below.

SECTION/ ITEM	SPECIFIED BRAND	SUBSTITUTION OR ALTERNATE BRAND	VARIANTS/ FEATURES

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

_____
SIGNATURE

NOTE: 1. Please use own letterhead
2. Submit one (1) original and two (2) copies
3. If no variant feature indicate "None"
4. Submit ten (10) sets of descriptive literature, technical brochures and/or plans after bid opening (if allowed)

Sample Request for Substitution

(SHOP DRAWING/MATERIAL SUBMITTAL - SAMPLE)

DATE:_____

DIRECTOR
DEPARTMENT OF DESIGN AND CONSTRUCTION
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET, 11th FLOOR
HONOLULU, HI 96813

Dear Director:

SUBJECT: _____

_____

We herewith submit for your approval the following item(s) for the subject project:

NO. OF COPIES	ITEM	SUPPLIER OR SUBCONTRACTOR

Your early review and approval of the above item(s) will be greatly appreciated.

_____
SIGNATURE

NOTE: 1. Please use own letterhead
2. Submit original and two (2) copies letter

END OF SECTION

SECTION 01450- SERVICE OF MANUFACTURER'S REPRESENTATIVE

PART 1 – GENERAL

1.01 GENERAL PROVISIONS

A. The General Instructions to Offerors (2/9/17), the General Conditions, and Special Provisions preceding these specifications shall govern this section of the work.

1.02 SCOPE

A. The services of Manufacturer's Representative shall be required for the products as called for in other sections of these specifications.

1.03 RELATED WORK

A. Individual requirements are described in pertinent other sections of these specifications.

1.04 QUALITY ASSURANCE

A. The Manufacturer's Representative shall be competent, thoroughly trained and experienced in the work and shall be completely familiar with the product or equipment, the specified requirements and the methods needed for the proper performance of the product or equipment.

1.05 SUBMITTALS

A. Qualifications: Submit, if requested by the Officer-in-Charge, the qualifications and experience of the Manufacturer's Representative.

B. Report**:** Submit a written report by the Manufacturer's Representative attesting that the product or equipment was installed in accordance with the Manufacturer's instructions and that the City's personnel have been properly instructed in its operation and/or maintenance.

1.06 GENERAL REQUIREMENTS

A. Obtain the Manufacturer's Representative Service and be responsible for the Manufacturer's Representative.

PART 2 - PRODUCTS (NONE)

PART 3- EXECUTION

3.01 SERVICES OF MANUFACTURER'S REPRESENTATIVE

A. The Manufacturer’s Representative shall be present as often as he deems necessary to assure the proper performance of the product or equipment.

B. The service for the product or equipment shall include but not be limited to:
   1. Inspection: Examine the areas and conditions under which the product or equipment is to be installed and report to the Contractor any unsatisfactory conditions for corrections by Contractor.

2. Preparation: Check for defects and completeness of product, equipment and parts.

3. Tests: Test any condition which may affect the performance of the product or equipment.

4. Installation: Render assistance to the Contractor as required and ensure that manufacturer's installation instructions are being understood and followed.

5. Equipment Start-up: Inspect the installation, test the equipment and adjust as required.

6. Instruction to Personnel: Instruct the operating personnel in the aspects of safety, operation and maintenance.

7. Operations and Maintenance Manual: Demonstrate the contents of the operations and maintenance manual if required to be submitted under SECTION 01300- SUBMITTAL PROCEDURES.

8. Follow-up: Provide follow-up service in case of problems involving product or equipment related to possible product failure, equipment malfunction, incompatibility with other products or conditions, or operation or maintenance problems during guarantee time.

END OF SECTION

SECTION 01524 – CONSTRUCTION WASTE MANAGEMENT

PART 1 – GENERAL

1.01 GENERAL PROVISIONS:

A. The General Terms and Conditions, City and County of Honolulu (not specifically attached), the Special Provisions, and all other applicable documents preceding these specifications shall govern all work specified hereinafter in all DIVISIONS AND SECTIONS.

1.02 WORK DESCRIPTION

A. This section includes administrative and procedural requirements for the following:

1. Salvaging nonhazardous demolition and construction waste.

2. Recycling nonhazardous demolition and construction waste.

3. Disposing of nonhazardous demolition and construction waste.

1.03 DEFINITIONS

A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.

C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the work.

1.04 PERFORMANCE REQUIREMENTS

A. General: Salvage/recycle minimum 50% by weight of total waste generated by the work.

B. Salvage/Recycle Requirements: The requirement of the Officer-in-Charge is to salvage and recycle as much nonhazardous demolition and construction waste as possible including the following materials:

1. Demolition Waste:

    a. Structural and miscellaneous steel

    b. Rough hardware

    c. Roofing

    d. Insulation

    e. Equipment

    f. Piping

    g. Supports and hangers

    h. Electrical and HVAC waste

        1) Mechanical equipment

        2) Refrigerants

        3) Electrical conduit

        4) Copper wiring

        5) Electrical devices

        6) Switchgear and panel boards

        7) Transformers

2. Construction Waste:

    a. Metals

    b. Roofing

    c. Piping

    d. Electrical conduit

    e. Packaging: Regardless of salvage/recycle goal indicated above, salvage or recycle 100% of the following uncontaminated packaging materials:

        1) Paper

2) Cardboard

3) Boxes

4) Plastic sheet and film

5) Polystyrene packaging

6) Wood crates

7) Plastic pails

1.05 SUBMITTALS

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

B. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit 3 copies of report. Include separate reports for demolition and construction waste. Include the following information:

1. Material category

2. Generation point of waste

3. Total quantity of waste in tons

4. Quantity of waste salvaged, both estimated and actual in tons

5. Quantity of waste recycled, both estimated and actual in tons

6. Total quantity of waste recovered (salvaged plus recycled) in tons

7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste

C. Waste Reduction Calculations: Before request for Substantial Completion, submit 3 copies of calculated end-of-project rates for salvage, recycling, and disposal as a percentage of total waste generated by the work.

D. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.

E. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.

F. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

G. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

H. Statement of Refrigerant Recovery: Signed by Refrigerant Recovery Technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to Environmental Protection Agency (EPA) regulations. Include name and address of Technician and date refrigerant was recovered.

1.06 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.

B. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION

3.01 SALVAGING DEMOLITION WASTE

A. Salvaged Items for Reuse in the Work:

1. Clean salvaged items.

2. Pack or crate items after cleaning. Identify contents of containers.

3. Store items in a secure area until installation.

4. Protect items from damage during transport and storage.

5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.

B. Salvaged Items for Sale and Donation: Sale not permitted on project site. Labor for loading donated items is acceptable to local trade practices; union labor if applicable.

C. Salvaged Items for the City Use:

1. Clean salvaged items.

2. Pack or crate items after cleaning. Identify contents of containers.

3. Store items in a secure area until delivery to the City Office.

4. Transport items to the City storage area off-site.

5. Protect items from damage during transport and storage.

3.02 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

A. General: Recycle paper and beverage containers used by on-site workers.

B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to the City.

C. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at project site to the maximum extent practical.

1. Provide containers or bins for controlling recyclable waste until they are removed from project site. Include list of acceptable and unacceptable materials at each container and bin. Inspect containers and bins for contamination and remove contaminated materials if found.

2. Store components off the ground and protect from the weather.

3. Remove recyclable waste off the City property and transport to recycling receiver or processor. Plan on removing recyclables from project premises within days.

3.03 RECYCLING DEMOLITION WASTE

A. Metals: Separate metals by type.

1. Structural steel: Stack members according to size, type of member, and length.

2. Remove and dispose of bolts, nuts, washers, and other rough hardware.

B. Asphalt Shingle Roofing: Separate organic and glass-fiber asphalt shingles and felts. Remove and dispose of nails, staples, and accessories.

C. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.

D. Piping: Reduce piping to straight lengths and store by type and size. Separates supports, hangers, valves, sprinklers, and other components by type and size.

E. Lighting Fixtures: Separate lamps by type and protect from breakage.

F. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panel boards, circuit breakers, and other devices by type.

G. Conduit: Reduce conduit to straight lengths and store by type and size.

3.04 RECYCLING CONSTRUCTION WASTE

A. Packaging:

1. Cardboard and boxes: Break down packaging into flat sheets. Bundle and store in a dry location.

2. Polystyrene packaging: Separate and bag materials.

3. Pallets: As much as possible, require deliveries using pallets to remove pallets from project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.

4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

B. Metals: Separate metals by type.

1. Structural steel: Stack members according to size, type of member, and length.

2. Remove and dispose of bolts, nuts, washers, and other rough hardware.

C. Asphalt Shingle Roofing: Separate organic and glass-fiber asphalt shingles and felts. Remove and dispose of nails, staples, and accessories.

3.05 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from project site daily and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.

2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Burning of waste materials shall not be permitted.

C. Disposal: Transport waste materials off the City property and legally dispose of them.

END OF SECTION

SECTION 01525 - SAFETY REQUIREMENTS

PART 1 - GENERAL

1.01 GENERAL PROVISIONS:

A. The General Instructions to Offerors (2/9/17), the General Conditions, and Special Provisions preceding these specifications shall govern this section of the work.

1.02 REFERENCES

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

1. ANSI A10.14- Construction and Demolition Operations- Requirements for Safety Belts, Harnesses, Lanyards and Lifelines for Construction and Demolition Use

2. ANSI Z359.1 - Safety Requirements for Personal Fall Arrest Systems

3. The Hawaii Occupational Safety and Health Law, Chapter 396-18, Hawaii Revised Statutes, effective May 16, 1972, as amended

4. NFPA 10- Portable Fire Extinguishers

5. NFPA 70 - National Electrical Code

6. NFPA 241- Safeguarding Construction, Alteration, and Demolition Operations

1.03 DEFINITIONS

A. Recordable Occupational Injuries or Illnesses: Any occupational injuries or illnesses which result in serious injuries lost workday cases, non-fatal cases or significant mishaps.

B. Serious Injuries: Fatalities, regardless of the time between the injury and death, or the length of the illness; hospitalization of three or more employees and property damage in excess of $200,000.

C. Lost Workday Cases: Injuries other than fatalities that result in lost workdays.

D. Non-Fatal Cases: Cases without lost workdays which result in transfer to another job or termination of employment, or require medical treatment (other than first aid) or involve property damage in excess of $10,000 but less than $200,000 or involve: loss of consciousness or restriction of work or motion. This category also includes any diagnosed occupational illnesses which are reported to the employer but are not classified as fatalities or lost workday cases.

E. Significant Contractor Mishap: Any Contractor mishap which involves falls of 4 feet or more, electrical mishaps, crane mishaps, trenching/entrapment mishaps, hazardous material/hazardous waste mishaps, equipment mishaps, and fire mishaps which result in a lost time injury, or property damage of $10,000 or more, but less than $200,000; or when fire department or emergency medical treatment (EMT) assistance is required.

F. Medical Treatment: Treatment administered by a physician or by registered professional personnel under the standing orders of a physician. Medical treatment does not include first aid treatment even though provided by a physician or registered professional personnel.

G. First Aid: Any one-time treatment, and any follow-up visit for the purpose of observation, of minor scratches, cuts, burns, splinters, and so forth, which do not ordinarily require medical care. Such one-time treatment, and follow-up visit for the purpose of observation, is considered first aid even though provided by a physician or registered professional personnel.

H. Lost Workdays: The number of days (consecutive or not) after, but not including, the day of injury or illness during which the employee would have worked but could not do so; that is, could not perform all or any part of his normal assignment during all or any part of the workday or shift, because of the occupational injury or illness.

1.04 SUBMITTALS

A. Submit under provisions of Section 01300 – SUBMITTAL PROCEDURES.

B. Site Specific Accident Prevention Plan.

C. Health and Safety Plan.

1.05 ACCIDENT PREVENTION PLAN (APP)

A. Submit site specific accident prevention plan for review and approval at least 15 calendar days prior to start of work at the jobsite. Conform to requirements of Federal, State and local safety and health laws and regulations. Work cannot proceed until the APP has been reviewed and found acceptable by the Officer-in- Charge. The Activity Hazard Analysis (AHA) and other required plans shall be approved by the on-site Officer-in-Charge prior to starting that phase of the work. The approved AHA shall be reviewed and documented on site by the Contractor. The APP shall be site specific and shall include:
   1. All elements: Minimum Basic Outline for Preparation of Accident Prevention Plan.

   2. Name and safety related qualifications of superintendent. Superintendent shall demonstrate the ability to manage the on-site Contractor safety program through appropriate management controls and maintain a log of safety inspections performed. The superintendent shall be able to identify hazards and shall have the direct responsibility for expending resources necessary to correct the hazards. The superintendent shall maintain applicable safety reference material on the jobsite.

3. Emergency action plan to include a map denoting the route to the nearest emergency care facility with emergency phone numbers which will be displayed in clear view for on-site employees.

4. The Hawaii Occupational Safety and Health Law, Chapter 396-18, Hawaii Revised Statutes, effective May 16, 1972, as amended, is applicable and made a part of the Contract. The Contractor shall carefully read and strictly comply with its requirements.

B. Activity Hazard Analysis (AHA): AHA shall be prepared for each major phase of work and submitted to Officer-in-Charge a minimum of 15 calendar days prior to the start of that phase. AHA shall be posted on a conspicuous location at job site readily available for all personnel to review. As a minimum, AHA shall define activity being performed, sequence of work, specific hazards anticipated, control measures to eliminate or reduce each hazard to acceptable levels, training requirements for all involved, and the competent person in charge of that phase of work.

PART 2 – PRODUCTS (NONE)

PART 3 - EXECUTION

3.01 FIRE PROTECTION

A. Compliance: NFPA 241, and City and County of Honolulu fire regulations.

3.02 SAFETY INSPECTIONS

A. The Contractor shall conduct daily safety inspections and document the results on forms provided by the Contractor.

3.03 WEEKLY SAFETY MEETING

A. Attach safety meeting minutes to the Contractor's daily report. Documentation shall include the contract name with a list of topics discussed and names of attendees.

3.04 DRUG PREVENTION PROGRAM

A. Conduct a proactive drug/alcohol use prevention program for all workers, prime and subcontractor, on the site. Assure that no employees use illegal drugs or consume alcohol during work hours; assure no employees under the influence of drugs or alcohol during work hours.

3.05 MULTI-EMPLOYER

A. Prime/general Contractor is the "Controlling Employer" and controlling authority for all work site safety and health of the subcontractors.

3.06 ACCIDENT REPORTING REQUIREMENTS

A. Accountability: The prime Contractor shall identify, in the APP, who shall complete exposure data (hours worked); accident investigations, reports and logs; and immediate notification of accidents to include subcontractors.

B. Accident Scene Preservation: For OSHA serious accidents, the prime Contractor shall ensure the accident site is secured and evidence is protected remaining undisturbed until released by the Officer-in-Charge.

C. Notification: Notify Officer-in-Charge of any accident meeting the definition of OSHA recordable within 4 hours. Information shall include Contractor name; contract title; type of contract; name of activity, installation or location where mishap occurred; date and time of mishap; names of personnel injured; extent of property damage, if any; and brief description of mishap (to include type of construction equipment used.)

D. Additional Requirements: In addition to OSHA reporting requirements, initial notification shall be made of any accident involving significant mishaps.

E. Reporting Requirements: For OSHA recordable accidents, the prime Contractor shall conduct a suitable investigation, complete the forms and provide to the Officer- in-Charge within 5 days of the accident.

F. Monthly Exposure Report: Monthly exposure reporting, to the Officer-in-Charge is required by the 5th of each month. This report is a compilation of man hours worked each month for all on site workers, both prime and subcontractor.

3.07 OSHA CITATIONS VIOLATIONS

A. Provide the Officer-in-Charge with a copy of each OSHA citation, OSHA report and Contractor response. Correct violations/citations promptly and provide written corrective actions to the Officer-in-Charge. The Contractor will pay any penalties promptly.

3.08 SAFETY QUALIFICATIONS:

A. Qualifications for on-site Superintendent or Safety Representative:
   1. Demonstrate the ability to manage the on-site Contractor safety program through appropriate management controls, and maintain a log of safety inspections performed.

   2. Able to identify hazards and have the direct responsibility for expending resources necessary to abate the hazards.

   3. Must have worked on similar types of projects that are equal to or exceed the scope of the project assigned with the same responsibilities.

   4. Must submit training certifications showing the place and dates of any training.

3.09 TEMPORARY WIRING:

A. Provide temporary wiring in accordance with NFPA 10, NFPA 241, and NFPA 70, Article 305-6(b), Assured Equipment Grounding Conductor Program. Program shall include frequent inspection of all equipment and apparatus.

3.10 TEMPORARY BARRICADES:

A. Contractor shall provide for barricading acceptable to the Officer-in-Charge around all work areas to prevent public access.

3.11 FENCING:

A. Fencing shall be provided along the construction site at all open excavations to control access by unauthorized people. Fencing shall be installed to be able to restrain the greater force of at least 200 pounds or 80 mph winds, Exposure C.

3.12 SIGNS:

A. Place warning signs at the construction area perimeter designating the presence of construction hazards requiring unauthorized persons to keep out. Signs shall be placed on all sides of the project, with at least one sign every 300 feet. All points of entry shall have signs designating the construction site as a hard hat area.

3.13 HAZARDOUS NOISE:

A. Provide hazardous noise signs, and hearing protection, wherever equipment and work procedures produce sound-pressure levels greater than 85 dBA steady state or 140 dBA impulse, regardless of the duration of the exposure.

3.14 MATERIAL HANDLING EQUIPMENT:

A. Material handling equipment such as forklifts shall not be modified with work platform attachments for supporting employees unless specifically delineated in the manufacturer's printed operating instructions. Crane supported work platforms shall only be used in extreme conditions if the Contractor proves that using any other access to the work location would provide a greater hazard to the workers. AHA shall address all safeguarding measures. Christmas tree lifting is prohibited.

3.15 ELECTRICAL WORK:

A. All underground electrical spaces shall be certified safe for entry before entering to conduct work. All cable intended to be cut shall be positively identified and de-energized prior to performing each cut. Perform all high voltage cutting remotely. When racking in or live switching of circuit breakers, no additional person other than the switch operator will be allowed in the space during the actual operation. Contractors shall plan so that work near energized parts is minimized to the fullest extent possible. Utilization of electrical outages clear of any energized electrical sources is the preferred method. When working in energized substations, only qualified electrical workers shall be permitted to enter. When work requires Contractor to work near energized circuits as defined by the NFPA 70, high voltage personnel shall use personnel protective equipment that includes as a minimum, electrical hard hat, safety shoes, insulating gloves with leather protective sleeves, Nomex (fire retarding) shirts, coveralls, face shields, and safety glasses. Insulating blankets, hearing protection, and switching suits may be required, depending on the specific job and as delineated in the Contractor AHA.

3.16 TRAFFIC CONTROL DEVICES:

A. The Contractor shall provide, install, and maintain all necessary signs, lights, flares, barricades, markers, cones, and other protective facilities, and shall take all necessary precautions for the protection, convenience, and safety of public traffic. All such protective facilities and precautions to be taken shall conform with the "Administrative Rules of Hawaii Governing the Use of Traffic Control Devices at Work Sites on or Adjacent to Public Streets and Highways", adopted by the Director of Transportation, and the current U.S. Federal Highways Administration "Manual on Uniform Traffic Control Devices, Part VI- Standards and Guides for Traffic Controls for Street and Highway Construction, Maintenance, Utility and Incident Management Operations".

END OF SECTION

SECTION 01533 – BARRICADES

PART 1 - GENERAL

1.01 GENERAL PROVISIONS

A. The General Instructions to Offerors (2/9/17), the General Conditions, and Special Provisions preceding these specifications shall govern this section of the work.

1.02 DESCRIPTION OF WORK

A. Provide barricades as required, and as acceptable to the Officer-in-Charge, to prevent people from entering the project area, and to protect enclosed property.

1.03 GENERAL REQUIREMENTS

A. The Contractor shall take precaution to protect people and property from injury and damage. The Contractor shall augment the barricades as required to delineate the work areas and provide the appropriate signage and hazard lights, as directed by the Officer-in-Charge. Signs shall be neat, enamel painted and fabricated by personnel normally engaged in the sign industry.

B. The Contractor shall be responsible for their own security and protection of their property, including mobilization yard barricades.

C. Barricades, in general, shall be neat, as required for protection and adequately anchored and braced.

D. Security shall be maintained against access onto the work areas at all times except the Contractor shall allow for authorized City and County personnel.

PART 2- PRODUCTS (NONE)

PART 3- EXECUTION (NONE)

END OF SECTION

SECTION 01560 - ENVIRONMENTAL CONTROLS

PART 1 - GENERAL

1.01 GENERAL PROVISIONS

A. The General Instructions to Offerors (2/9/17), the General Conditions, and Special Provisions preceding these specifications shall govern this section of the work.

1.02 ENVIRONMENTAL PROTECTION:

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

1.03 APPLICABLE REGULATIONS

A. In order to provide for abatement and control of environmental pollution arising from the construction activities of the Contractor and his subcontractors in the performance of this contract, the work performed shall comply with the intent of the applicable Federal, State and local laws and regulations concerning environmental pollution control and abatement, including, but not limited to, the following regulations:
   1. State of Hawaii, Department of Health, Administrative Rules, Chapter 55, WATER POLLUTION CONTROL, Chapter 54, WATER QUALITY STANDARDS.

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

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

   4. Other regulations as noted on the drawings.

1.04 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: certified by EPA approved certification program.

B. Regulatory Requirements: Comply with hauling and disposal regulations of authority having jurisdictions.

PART 2- PRODUCTS (NONE)

PART 3 - EXECUTION

3.01 AIR POLLUTION CONTROL

A. Emission: The Contractor shall not be allowed to operate equipment and vehicles that show excessive emissions of exhaust gases until corrective repairs or adjustments are made, as determined by the Officer-in-Charge.

B. Dust: The Contractor, for the duration of the contract, shall maintain all excavations, embankments, haul roads, permanent access roads, plant sites, waste disposal areas, borrow areas, and all other work areas within or without the project limits free from dust which would cause a hazard to the work, or the operations of other contractors, or to persons' property. Contractor shall also control dust occurring from construction activities such as rough grading and grinding/cutting concrete or masonry. Industry-accepted methods of stabilization suitable for the area involved, such as sprinkling or similar methods will be permitted. Chemical or oil treating shall not be used.

C. Burning shall not be permitted.

3.02 WATER POLLUTION CONTROL

A. Wastes: The Contractor shall not deposit at the site or in its vicinity, solid waste or discharge liquid waste, such as fuels, lubricants, bituminous waste, untreated sewage and other pollutants, which may contaminate any surface water or ground water.

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

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

3.04 DISPOSAL: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

END OF SECTION

SECTION 01715 – EXISTING CONDITIONS - ASBESTOS / LEAD / HAZARDOUS MATERIAL SURVEY

PART 1 - GENERAL

1.01 SUMMARY

A. This section includes the requirements for asbestos-containing building materials (ACBM), lead-containing paint (LCP) and / or other Hazardous Materials Surveys and Contractor is to follow on remediation as required.

B. Related Sections are:

1. Section 13281 – REMOVAL AND DISPOSAL OF ASBESTOS-CONTAINING MATERIALS for requirements of controlling hazards involving asbestos containing building materials (ACBM) in the project areas.

2. Section 13282 – LEAD-CONTAINING PAINT CONTROL MEASURES for requirements of work which disturbs LCP which is defined as paint with any lead content.

3. Section 13288 – TESTING/AIR MONITORING for requirements for monitoring and compliance.

1.02 ASBESTOS

A. The structure to be renovated or modified under this contract was constructed in the 2004. A survey for the presence of asbestos-containing building materials (ACBM) using AHERA requirements shall be conducted for areas that will be disturbed by the construction work. If ACBM is detected, Contractor shall remediate as required per Section 13281.

B. If applicable, notify employees, Subcontractors and all other persons engaged on the project of the presence of asbestos in the existing buildings in accordance with the requirements of Chapter 110, Article 12-110-2 (f) (1) (B) of the Occupational Safety and Health Standards, State of Hawaii.

1.03 LEAD CONTAINING PAINT

A. The structure to be renovated or modified under this contract was constructed in 2004. A survey for the presence of lead-containing paint (LCP) shall be conducted for areas that will be disturbed by the construction work.

B. If the contractor finds LCP on work areas that will disturb the surface, the contractor shall inform employees, Subcontractors and all other persons engaged in the project that lead-containing paint (LCP) is present in the existing building(s) and/or at the job site. Follow the requirements of Title 12 (Department of Labor and Industrial

Relations), Subtitle 8 (Division of Occupational Safety and Health), Chapter 12-148 (Lead Exposure in Construction), Hawaii Administrative Rules.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 SURVEY

A. Contractor shall conduct Asbestos and Lead-Containing Paint Assessment Survey of suspected hazardous materials that will be disturbed by the construction work.

3.02 REMEDIATE

A. Contractor shall remediate Asbestos and Lead-Containing Paint that will be disturbed by their work.

END OF SECTION

DIVISION 2 – SITE WORK

SECTION 02055 – SELECTIVE DEMOLITION AND REMOVAL

PART I – GENERAL

1.01 GENERAL REQUIREMENTS: The General Terms and Conditions, City and County of Honolulu, (not specifically attached), the Special Provisions, and all other applicable documents preceding these specifications shall govern all work specified hereinafter in all DIVISIONS AND SECTIONS.

1.02 SUMMARY

Provide all equipment, materials, tools, labor, etc., as required to perform all demolition and removal work, complete, as indicated on the drawings and as specified herein.

1.03 SPECIAL REQUIREMENTS

A. The Contractor shall visit the site, examine the areas and note all existing conditions and extent of work involved for the complete removal and surface preparation work required.

B. The Contractor shall comply with pollution control regulations and safety code.

C. Careful consideration shall be made for the existing finishes and surfaces during all removal and demolition work. Minimize damage to existing surfaces as any damages to existing surfaces shall be restored to pre-damaged condition.

D. The Contractor shall coordinate and schedule all work with the Officer-in-Charge and the Auditorium Events and Services Manager of the Department of Enterprise Services (DES). Contractor is forewarned that work of this section may be limited by the DES operations and events schedule.

PART 2 – PRODUCTS

2.01 MATERIALS

Damaged surfaces or items shall be repaired by the Contractor with materials which are equal or better in quality.

PART 3 – EXECUTION

3.01 GENERAL

A. All work shall be executed in an orderly and careful manner with due consideration for the remaining parts of the building.

B. Existing utility lines, etc, on/or in the building shall be protected from damage. Removal of utilities, etc. where required to facilitate renovation work shall be permitted, however, anything that is removed shall be reinstalled in its original location and condition.

3.02 REMOVAL WORK

A. Completely remove all existing roofing, insulation, etc., to the structural deck as indicated on the drawings and/or specified herein.

B. Items may be removed to implement removal of items noted in this section or elsewhere in these specifications and/or as indicated on the drawings. Such items to be removed and reinstalled shall be carefully removed to avoid damage and securely reinstalled.

C. The Contractor shall coordinate with the Officer-in-Charge for all items to be removed and disposed of for inspection and/or review for possible salvage.

D. All dismantled materials having no salvage value as determined by the Officer-in-Charge shall become the property of the Contractor and shall be completely removed and hauled away from the premises.

3.03 SURFACE PREPARATION WORK

A. The entire area shall be inspected by the Officer-in-Charge before any new work can be started. Should the Contractor start any new work without the Officer-in-Charge's approval, the Officer-in-Charge may have the contractor remove any work started and repair the area at no cost to the City.

B. Contractor shall repair any damages occurring during the progress of the work.

3.04 DRY ROT AND TERMITE DAMAGE

A. Should dry rot and termite damage be discovered during the removal work, it shall be reported to the Officer-in-Charge for inspection and recommendation. Contractor shall, at no cost to the City, refinish/repaint any additional repairs resulting from unreported dry rot or termite damage.

B. All reported additional repair work for dry rot and termite damage areas not indicated on drawings shall be considered additional work and the Contractor shall be compensated in accordance with the GENERAL CONDITIONS.

C. All materials used to replace deteriorated areas shall match the existing material in size, shape and species and shall be treated for termites.

D. Any damage to adjoining and/or other areas caused by the Contractor during the execution of the removal and/or repair work shall not be considered additional work and shall be repaired at the Contractor's expense.

3.05 PATCHWORK

All areas or surfaces damaged as a result of removal work shall be patched to match existing adjacent surfaces and/or areas to the satisfaction of the Officer-in-Charge.

3.06 TEMPORARY BARRICADES

A. The Contractor shall provide, erect, and maintain safety barricades around the project areas during the execution of work under this contract, including work done by other sections. At the discretion and approval of the Officer-in-Charge, alternative means to provide safety around the project area may be acceptable.

B. Barricades shall be constructed from durable materials as approved by the Officer-in-Charge to provide necessary protection and security of the project site.

C. The barricades shall remain until final acceptance of the project, or until the hazardous condition no longer remains and approval is given by the Officer-in-Charge for their removal.

3.07 CLEAN-UP

A. From time to time, as directed by the Officer-in-Charge and at the completion of the removal work, all rubbish, debris, etc., accumulated from this work shall be removed from the site. The area shall be kept neat and clean to the satisfaction of the Officer-in-Charge.

B. After the completion of the repair work and before the final acceptance of the project, the Contractor shall clean all areas of all rubbish, debris, etc. to the satisfaction of the Officer-in-Charge.

END OF SECTION

DIVISION 7 – THERMAL AND MOISTURE PROTECTION

SECTION 07560 – FLUID APPLIED ROOFING SYSTEM

PART 1 - GENERAL

1.01 GENERAL CONDITIONS: The General Instructions to Offerors, the General Terms and Conditions, (not physically attached), and Special Provisions preceding these specifications shall govern this section of the work.

1.02 SUMMARY

Provide an instant-setting, fluid applied roofing system as indicated on the drawings and/or specified herein.

1.03 REFERENCES

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

A. American Society for Testing and Materials (ASTM)

ASTM D412 – Standard Test Method for Rubber Properties in Tension

ASTM D3746 – Impact and Hail Resistance

ASTM D4541 - Adhesion to Cap Sheet

ASTM E96 – Water Vapor Permeability

ASTM E108 – Test Method for Fire Test of Roof Coverings.

ASTM G155 – UV Exposure (Xenon)

FM 4470 - Class A Roof System

B. IBC – International Building Code, 2012 edition

1.04 GENERAL REQUIREMENT

A. System Description:

1. Instant setting fluid applied, roof recover/restoration waterproofing system complete, in place, as shown on the drawings, specified herein, or needed for a complete and proper watertight and warrantable installation.

B. Applicator Qualifications: See 1.05, C.

C. The Contractor shall notify the local authorized representative of the manufacturer whose fluid applied roofing system he proposes to use and shall arrange for the latter to visit the site to inspect the existing roof surfaces receiving the roofing system before

application, at least once during application and at job completion.

1.05 SUBMITTAL

A. Submit in accordance with SECTION 01300 – SUBMITTALS.

B. Shop Drawings: Provide the following details:

1. Conditions of interface with other materials.

2. VTR flashing.

C. Manufacturer's Instruction: Submit manufacturer's installation instructions, and special precautions requirements.

D. Contractor's and Installer's Certification: Submit a signed certificate from the proposed roofing manufacturer showing that the Contractor is an approved installer of the Manufacturer's complete Roofing System and that each member of the installation crew has been trained in the system's proper installation and certified by the Manufacturer's Technical Representative. The names of the certified installers shall be submitted to the O.I.C. and only employees that are certified installers shall be allowed to perform work on this project.

E. Technical Representative Certification: Submit a signed certificate from the Manufacturer designating its Technical Representative for the Project and attesting that this person is both qualified and authorized to act on behalf of the Manufacturer.

F. Certificates: Submit certificates of compliance for materials specified.

G. Product Data: Provide data for material description, physical properties, recommended storage conditions, shelf life, precautions, and joint crack sealants, with temperature range for application of waterproofing membrane.

1.06 PRODUCT HANDLING

A. Delivery of Materials: All materials shall be delivered to the site in the original unbroken manufacturer's wrapping material and containers with the original label thereon intact.

1. Name of manufacturer.

2. Name of contents and products code.

3. Net volume of contents.

4. Lot or batch number.

5. Storage temperature limits.

6. Shelf-life expiration date.

7. Mixing instructions and proportions contents.

8. Safety information and instructions.

B. Storage of Materials at Job Site:

1. Store and protect materials from damage and weather in accordance with manufacturer's instructions.

2. Storage materials at temperatures between 50 and 90 degrees F. Keep out of direct sunlight.

1.06 PROTECTION AND CLEANING

A. Protection

1. Any work or materials damaged during roofing installation shall be restored to their original (undamaged) condition or replaced.

2. Protective coverings shall be installed necessary to prevent the marring of existing surfaces.

1.07 WARRANTY

Submit manufacturer's 20-year warranty for the fluid applied roofing system. In no event shall the warranty system be less than 20 years from the date of the final acceptance of the work, roofing system applicator's or manufacturer's unpaid invoices for installation, supplies, or service. The warranty shall state that:

A. When within the warranty period the fluid applied roofing system delaminates because of defective materials or workmanship, the repair or replacement of effective materials shall be the responsibility of the manufacturer.

B. When the manufacturer or the manufacturer's approved applicator fails to perform repairs within 72 hours of written notification, emergency repairs performed by others will not void the warranty; and

1. The first and second years of this warranty shall be covered under the Contract Bond. The third through fifteenth years of this warranty will not be binding against the provider of the Contract Bond.

2. Roofing system components, where possible and feasible, should be supplied by the same manufacturer.

3. The Surety shall not be held liable beyond two (2) years, from the Project Acceptance date.

PART 2 – PRODUCTS

2.01 FLUID APPLIED ROOFING SYSTEM

A. The following specifications are based around products manufactured or approved by

Triton Inc. to establish minimum quality and performance requirements for this project. Products of other manufacturers meeting or exceeding the requirements listed here-in are acceptable having been pre-approved by the Officer-in-Charge.

B. Materials:

1. Liquid Membrane – Two-component, cold spray-applied rubber, TritoFlex 2K. Membrane shall be spray-applied instant setting and applied by a manufacturer certified applicator to create a roof membrane. The system is water based and solvent free which transforms into an instant setting seamless roof membrane as it is spray-applied to the substrate and catalyzed by an accelerator component. The liquid is spray-applied in a single coat to achieve a minimum monolithic membrane thickness of 80 dry mils (2 mm) for a 20-year warranty and possess physical properties no less than the values listed below:

PROPERTY	TEST	VALUE
Solid Content	Vacuum cure	63%
Flame Exposure	ASTM E108	Class A, Self-Extinguishing
Water Vapor Permeability	ASTM E96	0.1 perms
Elongation	ASTM D412	1200% or greater
Hydrostatic Pressure	BS EN 12380-8	Pass – No penetration
Impact and Hail Resistance	ASTM D3746	Pass
Dynamic Puncture Resist.	ASTM D5635	2.80 J/mm or greater
Adhesion to Cap Sheet	ASTM D4541	729 psi
UV Exposure (Xenon)	ASTM G155	No effect
Cured to the Touch	After Sprayed	Instantly
Wind, Fire, Foot Traffic, UC	FM 4470	Pass (1-900, Class A)

2. Patching and Flashing Membrane – One-component, brush-applied rubber. TritoFlex 1K brush-grade rubber, flexible waterproofing membrane that is water-based and solvent free. Product is used for touch-up patching and reinforcing of flashing areas in the TritoFles 2K membrane.

3. Reflective/Protective Topcoat – TrytoCryl 2K, highly reflective acrylic elastomeric EnergyStar top coat that is water-based. Apply 30 dry mils for 20-year warranty.

4. Catalyst (Accelerator) – Specialty Calcium Chloride water mixture used as the catalyst component in conjunction with spraying the TritoFlex 2K and TrytoCryl 2K that produces an instant setting membrane, allowing for the rapid build-up of the membrane to thickness desired in one coat. Catalyst shall be as manufactured by or approved by the manufacturer. Catalyst shall be non-toxic to aquatic and human life and meet all State and Federal regulations.

5. Repair Tape – TritoBond Repair Tape, premium-grade butyl repair tape with TPO-facer, used to repair existing substrate in a variety of situations.

6. Reinforcing Fabric – Polyester fiber (3 oz. per square yard, ASTM D 6182 for tensile strength and elongation). Install over metal flashing or as indicated with TritoFlex 1K (brush-grade rubber coating). TritoFlex 1K is not instant-setting and is use to allow the fabric to be saturated in the membrane.

D. Roofing System shall meet or exceed the Standard Factory Mutual Class I 4470 for Fire Rating and susceptibility to leakage.

2.02 ACCESSSORY, MISCELLANEOUS MATERIALS

A. Roof Vents – Spun-Aluminum one-way vents, as manufactured by OlyVent or approved my roofing manufacturer. Install as indicated on drawings but not greater than one per 1200 sq. ft.

B. 0.5-inch DensDeck Recovery Board.

C. Precast Curb and Sealant System: Shall be ChemCurb System, as manufactured by Chem Link, Inc., Weather-Tite Lockin' Pocket Inter-Locking Pitch Pocket System by WTT Systems or pre-approved substitute. Curb and sealant system shall include pre-manufactured curb, structural bonding adhesive and pourable sealant. Products shall be as manufactured by single manufacturer and fully compatible with roofing system to be installed on and encapsulated with.

D. Single layer, torch-applied SBS or APP smooth surface membrane for interim waterproofing prior to application of fluid applied roofing system and as indicated or required by the roofing system manufacturer's representative.

E. Cant Strips: Cant Strips can be made from EPS, polyisocyanurate, or perlite.

2.03 INSULATION

A. Polyisocyanurate: 1.5 inches (3.81 cm) minimum thickness. Max board size 4 ft by 8 ft (1.219 m by 2.438 m) if mechanically fastened or 4 ft by 4 ft (1.219 m by 1.219 m) if adhered with Factory Mutual approved roofing adhesive. Closed cell with factory laminated facer. Foam core to have rated flame spread of 25 or less and minimum compressive strength of 250 psi (1724 kPa).

B. Expanded Polystyrene: Must be termite resistant (Perform Guard), 1.5 inches (3.81 cm) minimum thickness a minimum of 1.5 lb/cf (24.30 kg/cu. m) density. Max board size is 4 ft. by 8 ft. (1.219 m by 2.438 m) mechanically fastened or 4 ft by 4 ft (1.219 m by 1.219 m) if adhered with Factory Mutual approved roofing adhesive.

2.04 ROOF WALKWAY COATING

Roof walkway coating shall be an approved system of the fluid applied roofing system. Water-based acrylic elastomeric coating, TritoWalk, as manufactured by Triton Inc. or pre-approved substitute. Where indicated install TritoWalk with reinforced fabric as approved by the manufacturer. Reinforced system shall be installed generally at areas of higher use. Standard unreinforced system shall be installed at other areas.

2.05 APPLICATION EQUIPMENT

Apply fluid applied roofing membrane utilizing equipment furnished and/or approved by the manufacturer.

PART 3 – EXECUTION

3.01 Apply fluid applied roofing membrane in full compliance with manufacturer's written instructions and recommendations. Only manufacturer's trained and certified applicators shall perform the work of this section.

3.02 EXAMINATION

A. Coordinate work with that of other trades to ensure that components which are to be incorporated into the roofing system, are available to prevent delays or interruptions as the work progresses. Verify existing conditions in advance.

B. Examine substrates to which the fluid applied roofing system is to be applied to ensure that their condition is satisfactory for its application. Substrates shall be dry and free of oil, dirt, grease, sharp edges, and debris. Inspect substrate, and correct defects before application.

3.03 SPECIAL PRECAUTIONS

A. Do not apply waterproofing to surfaces unacceptable to manufacturer.

B. Do not allow contact between various materials through application equipment.

C. Do not use equipment containing the remains of previous material.

3.04 PREPARATION

A. Protect adjacent surfaces not designated to receive Roofing system.

B. Clean and prepare surfaces to receive roofing system by removing all loose and flaking particles, grease and laitance.

C. Correct defects and inaccuracies in roof deck surface to eliminate poor drainage and hollow or low spots and perform the following:

D. Seal cracks and joints with sealant materials using depth to width ratio as recommended by sealant manufacturer.

E. Prep and encapsulate edge flashing and wall flashing with TritoFlex 1K and fabric. Install repair tape as required.

F. Install roof vents as shown.

3.05 INSTALLATION OF INSULATION AND CANT STRIPS

A. Either mechanically fasten or adhere the board-stock insulation to the roof deck, depending on the substrate. If mechanically fastening the insulation board, utilize fastener screws (with washer flanges) of an appropriate length so as to extend into the roof substructure as required by the manufacturer for wind uplift rating. Space fasteners as recommended by insulation board manufacturer according to the size of the panel so that it is securely fastened to the deck. If using adhesive to secure the

insulation to the substrate, follow manufacturer's installation instructions to meet wind uplift requirement of the City and County of Honolulu's Building Code.

B. Roof deck areas shall have positive slope to drain. Taper the insulation panels around drains and scuppers, and add crickets or additional insulation as necessary to facilitate proper drainage of water from the roof.

3.06 INSTALLATION OF PROTECTION BOARD

Install protection board over insulation as recommended by the product manufacturer and the roofing system manufacturer.

3.07 APPLICATION OF FLUID APPLIED ROOFING MEMBRANE AND NEW ROOF INSULATION, FLASHING, ETC. – ROOFS ALL ROOFS

A. Install new roof insulation with proper slopes to drain. Install recovery board.

B. Application of the Trito-Flex 2K shall be per manufacturer's written instructions and directives. Application shall be done in a continuous, monolithic and seamless uniform thickness, 80 mils thick. Coat all areas including prepped edge flashing, wall flashing, roof vents, etc.

C. When a spot repair is required during application, re-spray area within 15 minutes of initial spray application.

D. Perform wet mil thickness tests (with manufacturer's supplied mil gauge) at regular intervals while spraying, 130 wet mils for 80 dry mils.

E. After the TritoFlex 2K membrane has fully dried and can be walked-on without leaving indentations, apply TritoFlex 1K Brush-Grade Rubber to any visible voids or thin spots in the TritoFlex 2K membrane prior to rinsing and application of top-coat. Surface shall be completely dry prior to application of top coating.

F. After surface has completely dried, apply TritoCryl 2K acrylic coating in two layers to achieve a final minimum dry film thickness of 30 mils. First coat shall be applied to assure adhesion to the textured TritoFlex surface. Each layer shall be 23 mils wet for a total 46 wet mils, to achieve 30 dry mils.

G. Apply roofing system to a total thickness of 110 mils dry film total cured thickness.

3.09 INSTALLATION OF ADJOINING WORK

A. Unless otherwise shown on the plans, all adjoining work shall be done in accordance with the specifications and details of the manufacturer of the assembly being used. The Contractor shall coordinate the installation and any work that require tying-in with the roofing so that the combined installation is leak proof.

B. Install retro-drains per manufacturer's written instructions and recommendations. Install new retro-drains and dome strainers for all existing roof drains. Clean and roto-route all existing drains to assure proper draining prior to installing retro-drains.

3.10 APPLICATION OF TRAFFIC WALKING SURFACE

A. Surface to be applied shall be clean of dirt and debris.

B. Tape-off area to receive application using painter's tape over completed fluid-applied roofing system (include fluoropolymer color retention coating). Allow roofing system to cure minimum 5 calendar days or as directed by the manufacturer.

C. Apply TritoWalk, fluid applied walking surface where indicated on the drawings. For pedestrian traffic areas, apply to a thickness of 50 – 55 mils, dry film thickness. Apply in two coats. First coat shall be applied at 2.5 gallons at 100 sf. Allow to dry at least 24 hours and apply second coat at 2.5 gallons at 100 sf. Break-up walkway with 1" wide breaks in the walking surface approximately 3 ft. on center to allow water to flow to the drains.

D. Where indicated as high traffic areas, embed Triton Polyester Fabric into the first coat of TritoWalk. Allow to dry 24 hours and apply second coat. The reinforced TritoWalk's dry film thickness shall be a minimum of 60 – 65 mils.

E. Carefully remove tape and discard.

3.11 CLEANING

Immediately clean roofing system from unscheduled surfaces in accordance with the manufacturer's recommendations.

END OF SECTION

DIVISION 9 - FINISHES

SECTION 09900 - PAINTING

PART 1 - GENERAL

1.01 SUMMARY

A. The work includes painting and finishing of exterior and interior items and surfaces throughout the project, whether scheduled or not, except as otherwise indicated. Painting shall include new work and existing new surfaces made bare or damaged during construction and existing surfaces as indicated. Surface preparation, priming, and coats of paint specified are in addition to shop-priming and surface treatment specified under other sections of the work and are included in this section.

B. The work includes field painting of exposed bare and covered pipes, and of hangers, exposed steel and iron work.

C. “Paint” as used herein means all coating systems materials, including primers, enamels, sealers, and fillers, and other applied materials whether used as prime, intermediate, or finish coats, except as specifically noted herein.

D. Paint all exposed surfaces whether or not colors are designated in “schedules”. Where items or surfaces are not specifically mentioned, paint these the same as adjacent similar materials or areas. If color of finish is not designated, the City & County of Honolulu (City and County) will select these from standard colors available for the materials systems specified.

1.02 PAINTING NOT INCLUDED

The following categories of work are not included as part of the field-applied finish work, or are included in other sections of these specifications.

A. Concealed Surfaces (Present and Future): Unless otherwise indicated, painting is not required on surfaces such as walls or ceiling in concealed areas and generally inaccessible areas, furred areas, and pipe spaces.

B. Finished Metal Surfaces: Metal surfaces of anodized aluminum, stainless steel, chromium plate, and similar finished materials will not require finish painting, unless otherwise indicated.

C. Labels: Do not paint over any code-required labels, such as Underwriters’ Laboratories, or any equipment identification, performance rating, name, or nomenclature plates.

1.03 SUBMITTALS

A. Submit in accordance with requirements of this section.

B. Schedule of Finishes: Submit four sets of the proposed painting finish schedule to the Officer-in-Charge for acceptance. The schedule shall indicate the wet film thickness (mils) at which the proposed paints/coatings will be applied that are necessary to achieve the final dry film thickness indicated on the Schedule of Finishes item entitled “SCHEDULE OF FINISHES” herein below.

C. Color Samples: Submit the following to the Officer-in-Charge for acceptance:

1. Four sets of each color finish sample.

2. After the color finish has been accepted, one set of color finish samples painted onto 8-1/2 inch x 11-inch cardboard shall be submitted. The cardboard shall be divided into three horizontal strips and painted as follows:

a. Prime 3 strips.

b. First coat bottom 2 strips.

c. Second coat bottom strip.

D. Schedule of Operations: Before work on the project is commenced, submit complete sets of a work schedule showing Contractor’s sequence of operations and dates.

E. Warranty: Submit warranty as stipulated in item entitled “WARRANTY” herein below.

F. Certifications: Submit copies of asbestos-free, lead-free, zinc-chromate-free, strontium-chromate-free, cadmium-free, and mercury-free paint certificates.

G. Manufacturer’s Product Data Sheets: Submit copies of the Manufacturer’s Product Data Sheets for the primers, paints, coatings, solvents, sealing and patching materials, sealants and caulking, and other materials being used. Data sheets shall indicate thinning and mixing instructions, required film thickness (mil) and application instructions.

H. Manufacturer’s Material Safety Data Sheets for coatings, solvents, and other hazardous materials.

1.04 ANALYZING AND TESTING

A. All paints and their applied thickness shall be subject to testing whenever the Officer-in-Charge deems necessary to determine conformance to the requirements of these specifications. Should testing by a laboratory be required, the laboratory shall be selected by the Officer-in-Charge and the cost of testing shall be borne by the Contractor. However, should the test results show that the paint is in compliance with the specifications, the cost shall be borne by the City and County.

B. All rejected material shall be removed from the job site immediately. Surfaces painted with the rejected material shall be redone at no additional cost to the City and County.

C. Where the required paint thickness is deficient, the affected surfaces(s) shall be recoated as necessary to provide the required paint thickness at no additional cost to the City and County.

1.05 QUALITY ASSURANCE

A. Painting Terminology: Refer to ASTM D 16, “Standard Terminology for Paint, Related Coatings, Materials, and Applications”.

B. Gloss/Sheen Levels: ASTM D 523, "Specular Gloss", as follows:

Description	Units @ 60 degrees	Units @ 85 degrees
Matte or Flat	0 to 5	10 max
Velvet	0 to 10	10 to 35
Eggshell	10 to 25	10 to 35
Satin	20 to 35	35 min
Semi-Gloss	35 to 70	
Gloss	70 to 85	
High Gloss	more than 85	

C. Where the Contractor proposes to employ airless spraying, the applicator(s) shall have completed an accepted “Spray Applicator Certification Program” conducted by the Painting Industry of Hawaii.

D. As a minimum, the certification shall include material and equipment selection, use and maintenance, hands-on application, and safety training.

1.06 WARRANTY

A. The Contractor shall warrant that the work performed under this section conforms to the contract requirements and is free of any defect in the materials used and workmanship performed by the Contractor. Such warranty shall continue for a period of two years from the project acceptance date and the Contractor shall remedy any such defect which is discovered during that period at no cost to the City and County.

B. The Officer-in-Charge will notify the Contractor in writing within a reasonable time after discovery of any failure or defect.

C. Should the Contractor fail to remedy any failure or defect described in Paragraph A above within 10 working days after receipt of notice thereof, the City and County shall have the right to repair or otherwise remedy such failure or defect and charge the Contractor for the cost of same.

1.07 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. Safety methods used during coating application shall comply with SSPC-PA Guide 3.

C. Protection:

1. Persons:

a. The Contractor shall take all necessary precautions to protect public pedestrians, including tenants from injury.

b. The Contractor shall provide, erect, and maintain safety barricades around scaffolds, hoists, and wherever Contractor's operation create hazardous conditions in order to properly protect the public and workmen.

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 City and County and other individuals in the vicinity of the work area during the execution of this Contract. Contractor 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. Where the damaged property cannot be cleaned and restored to its original condition (i.e. prior to being damaged) it shall be replaced with a new product of equal quality. No proration or use of "used" products will be permitted.

5. Fire Safety: The Contractor shall direct his employees not to smoke in the vicinity and to 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.

D. Right of Rejection: The Officer-in-Charge will have the right to reject all work which is not in compliance with the plans and specifications. Rejected work will be redone at no additional cost to the City and County. In addition, the Officer-in-Charge will have the right to require the immediate removal of any paint applicator who demonstrates negligence, lack of competence or repeated non-compliance with the contract requirements.

E. Sequence of Operations: The sequence of operations shall divide the surfaces into work areas and present a schedule for:

1. Surface preparation and spot prime.

2. Prime coat.

3. First finish coat.

4. Second finish coat.

F. Inspection and Acceptance: The Contractor shall obtain written acceptance from the Officer-in-Charge upon completion of each phase of work (phases of work are: surface preparation and spot prime; prime; first finish coat; second finish coat) before proceeding into the next phase of work. The Contractor shall give the Officer-in-Charge one day (24 hours minimum) advance notice of completion of any phase of work for a work area only when he deviates from the previously submitted work schedule. The Contractor shall provide necessary access to areas to be inspected. Failure to obtain acceptance of any phase of work for a work area may result in redoing the operation at no cost to the City and County.

1.08 DELIVERY, STORAGE AND HANDLING

A. Deliver paint materials to the job site in original unopened containers with original labels intact.

B. No paint material, empty cans and paint brushes and rollers, drop cloths and rags, may be stored in buildings, and shall be stored in separate storage facilities away from the buildings. Receiving, opening, and mixing of painting materials shall be done in this area.

C. The Contractor may furnish a job site storage facility. Such facility shall comply with requirements of the local Fire Department. The storage area shall be kept clean and facility shall be locked when not in use or when no visual supervision is possible.

D. Ensure the safe storage and use of paint materials and the safe storage and disposal of waste at the end of each work day.

E. Handle manufactured materials as recommended by the manufacturer.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Asbestos Prohibition: All paint shall be asbestos-free.

B. Lead Prohibition: All paint shall be lead-free.

C. Mercury Prohibition: All paint shall be mercury-free.

D. Chromate Prohibition: All paint shall be free of zinc-chromate and/or strontium-chromate.

E. Cadmium Prohibition: All paint shall be cadmium-free.

F. Material shall be equal in quality to that specified under the Schedule of Finishes and any given finish shall be as labeled by one manufacturer.

G. 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.

H. Paints shall be as manufactured by Ace, Benjamin Moore, Cabot's, Carboline, Dupont, Dutch Boy, Fine Line Paint Corp., Henkel, Devoe, Devoe Coatings, Glidden, Glidden Professional, Martin Senour, General Polymers, Olympic Stain, Pervo, PPG Protective & Marine Coatings, Pittsburg, Porter Inti., Pratt & Lambert, Rust-Oleum, Sherwin-Williams, Smiland (Styletone), Spectra-Tone, Thoro Systems, Tnemec, United Paint and Coatings, or approved substitute.

I. 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.

J. 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.

K. 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.

2.02 SCHEDULE OF FINISHES

A. The Schedule of Finishes is made for the convenience of the Contractor and indicates the types and quality of finishes to be applied to the surfaces. Refer to Finish Schedule for symbols indicating location for various finishes. Provide additional systems for surfaces to be painted not listed hereinafter.

B. All paints unless otherwise noted, are the products of Benjamin Moore and Glidden Professional and are so named to establish desired quality and standard of materials. Painting materials, equal to those mentioned by trade name under the various treatments may be used, provided they meet with the acceptance of the Officer-in-Charge.

C. Treatments shall be applied on exposed surfaces of designated materials, in conformity with instructions of the paint product used.

D. Exterior Painting:

1. Galvanized Metal:

   Prime coat: 169 Latex Exterior Primer
   1.3 mils OFT @ 425 sf/gal.

   2nd and 3rd coats: 170 Latex House & Trim Paint (Medium Gloss)
   1.1 mils OFT@ 475 sf/gal./coat

2. Aluminum:

   1st and 2nd coats: 170 Super Spec Latex House & Trim Paint (Medium Gloss)
   1.1 mils OFT@ 475 sf/gal./coat

3. Wood:

   Prime coat: 169 Latex Exterior Primer
   1.3 mils OFT @ 425 sf/gal.

   2nd and 3rd coats: 170 Super Spec Latex House & Trim Paint (Medium Gloss)
   1.1 mils OFT@ 475 sf/gal./coat

4. Metal Roofing and Flashing (Top Exposed Surfaces):

   Pretreatment: Ospho or MP-7 Rust Solution or approved substitute (For Rusted Areas)
   Prime coat: ICI Paints 4020 DEVFLEX DTM Flat Interior/Exterior Waterborne

   Primer and Finish
   2.2 to 3.5 mils OFT @ 275 - 350 sf/gal.

   2nd and 3rd coats: ICI Paints 3018 ULTRA-HIDE Interior/Exterior 100% Acrylic Floor Enamel@ 300-350 sf/gal./coat

E. Interior Painting: Use low VOC/low odor paint to maximum extent possible.

1. Gypsum Wallboard:

   Prime coat: 372 Eco Spec WB Interior Latex Primer
   1.2 mils OFT @ 450 sf/gal.

   2nd and 3rd coats: 374 Eco Spec WB Interior Latex Eggshell Finish
   1.4 mils OFT @ 425 sf/gal./coat

2. Concrete Floor and Base: Chemical Resistant Urethane Floor Coating by Chern Master or approved substitute.

Prime coat: DuraGuard 100
200 sf/gal.

2nd coat: DuraGuard 120
80 - 110 sf/gal.

3rd coat: DuraGuard 320
300 sf/gal.

3. Exposed Concrete Masonry:

Filler coat: 285 Latex Block Filler
9.5 mils OFT@ 112 sf/gal.

2nd and 3rd coats:
376 Eco Spec WB Interior Latex Semi-Gloss Finish
1.5 mils OFT @ 425 sf/gal./coat

2.03 COMPATIBILITY OF PAINTING SYSTEMS AND SUBSTRATES

A. The Contractor shall ensure that painting systems specified are compatible with existing painted surfaces. Alkyd paints shall not be applied over existing latex coating. Alkyd paints shall be used over cementitious surfaces. Latex paints shall not be applied directly over alkyd paints without proper conditioner and accepted by the Officer-in-Charge.

B. Field Tests for Alkyd or Latex Paints: The Contractor shall perform the following field tests for compatibility of substrates to new paint systems prior to ordering paint:

1. Latex films will dissolve when wiped with rubbing alcohol; alkyd films will not.

2. When sanded, latex films will "clog" sandpaper; alkyd films will sand clean.

3. Alkyds will soften after applying a 10 percent solution of Drano in water; latex films will not soften.

4. Alkyds will burn when exposed to a flame; latex film will not burn.

5. Paints which do not respond to two or more of these tests are probably epoxy, urethane, or other type of coating.

6. Provide a packaged swab test in accordance with the package directions.

7. Existing paint identified or suspect of having lead-containing paint shall be tested in a manner that does not produce airborne or uncontrolled lead debris.

C. Should there be any discrepancies between the specified Schedule of Finishes and the existing paint systems, the Contractor shall notify the Officer-in-Charge in writing of any incompatible systems specified and submit a revised Schedule of

Finishes for acceptance when necessary. With the acceptance of the revised Schedule of Finishes, the Contractor shall make any corrections and/or revisions necessary to resolve the discrepancies and/or inconsistencies. The Contractor shall not proceed with any painting systems that are incompatible, although specified otherwise, until all incompatible conditions detrimental for the proper application and performance of the painting systems have been corrected. The failures due to the application of the incompatible paint systems shall be corrected at no additional cost to the City and County. Proceeding with the work shall imply acceptance of the specified Schedule of Finishes and the compatibility with the existing painted surfaces by the Contractor.

PART 3 - EXECUTION

3.01 SURFACE PREPARATION

A. General:

1. Surface preparation shall be in accordance with the Painting and Decorating Contractors of America, "Architectural Specification Manual", methods are applicable to all substrates.

2. Scrub surfaces with stiff nylon bristle brush and T.S.P. solution at rate of 3/4 cup T.S.P. per gallon of warm water to remove accumulated film of wax, oil, grease, smoke, dust, dirt, chalky, or other foreign matter which would impair bond or bleeding through new finish. Thoroughly sponge wipe surfaces with clean water. Allow surfaces to thoroughly dry before priming, painting, calking, or sealing.

   a. Following sponge wiping, the surfaces shall be allowed to dry for a minimum of 24 hours.

   b. Wood surfaces shall have a maximum moisture content of 12 percent when measured with an electronic moisture meter.

3. Cracks and openings found at joints and where different materials about each other shall be sealed with a caulking compound compatible with the substrate and primer/paint. The caulking shall be applied and allowed to set in accordance with the manufacturer's recommendations and instructions.

4. Mildew Removal: Remove all mildew and sterilize the surface to be painted using one of the following methods: Apply a treatment solution composed of the following ingredients and in the noted proportions to the affected surface using a sponge of 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.

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 priming, painting or the applying of sealing and caulking compounds.

B. The painting contractor shall be wholly responsible for the finish of his work and shall not commence any part of it until surfaces are in proper condition. If painting contractor considers any surfaces unsuitable for proper finish of his work, he shall notify the Officer-in-Charge of this fact in writing and he shall not apply any material until the unsuitable surfaces have been made satisfactory, or until the Officer-in-Charge has instructed him to proceed. Major defects shall be restored by the proper trades. In general, follow paint manufacturer's directions for surface preparation for the paint to be applied.

C. Surfaces adjacent to areas being finished shall be protected and left clean of paints, stains, etc. Clean drop cloths shall be used until completion of job.

D. Unprimed galvanized metal shall be washed with a solution of chemical phosphoric metal etch and allowed to dry.

E. Metal surfaces shall be made clean and free of any defects or condition that may produce unsatisfactory finish. Touch-up any chipped or abraded places on surfaces that have been shop coated with the proper primer.

F. Wood Surfaces: Surfaces shall be free from dust and other deleterious substances and in a condition accepted by the Officer-in-Charge prior to receiving paint or other finish. Do not use water to clean uncoated wood.

3.02 PAINT APPLICATION

A. General:

1. Apply coating materials in accordance with SSPC-PA 1. SSPC-PA 1 methods are applicable to all substrates, except as modified herein. Thoroughly work coating materials into joints, crevices, and open spaces. Touch-up damaged coatings before applying subsequent coats.

2. Work shall be done in a workmanlike manner by skilled and experienced mechanics and shall conform to the best painting practices.

3. Materials shall be applied in accordance with the manufacturer's specifications and the finished surfaces shall be free from runs, sags, drips, 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 acceptance.

4. No exterior painting of unprotected surfaces shall be done in rainy, damp weather. Coats shall be applied only to surfaces that are thoroughly dry.

5. Mixing shall be done outside the buildings.

B. Application:

1. Paint application shall be by brush or roller. Airless spraying may be permitted only with the acceptance of the Officer-in-Charge for otherwise inaccessible areas.

2. Drying Time: Allow time between coats, as recommended by the coating manufacturer, to permit thorough drying. Provide each coat in specified condition to receive the next coat.

3. Primers and Intermediate Coats: Do not allow primers or intermediate coats to dry more than 30 days, or longer than recommended by the manufacturer, before applying subsequent coats. Follow manufacturer's recommendations for surface preparation if primers or intermediate coats are allowed to dry longer than recommended by manufacturers of subsequent coatings. Each coat shall cover the surface of the preceding coat or surface completely, and there shall be a visually perceptible difference in shades of successive coats.

4. Finished Surfaces: Provide finished surfaces free from runs, drops, ridges, waves, laps, brush marks, and variations in selected colors.

C. Colors: Each coat shall be tinted a different shade from the preceding coat. Colors shall match existing or as selected by the Officer-in-Charge.

D. Finish Film Thickness: Apply primer, intermediate, and finish coats to not less than 1.5 mils dry film thickness, 4 mils wet unless recommended otherwise in writing by the manufacturer, for each coat and in accordance with the manufacturer's recommendations. Verify mil thickness by use of a suitable wet film gauge. Use a Tooke or other dry film gauge to test for total dry film thickness.

3.03 MISCELLANEOUS

A. Installation of Removed Items: After completion of final paint coat, removed items shall be reinstalled.

B. At the completion of other trades, touch up damaged surfaces.

3.04 CLEAN UP

A. 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.

B. Upon completion of the work, staging, scaffolding, containers, and all other debris shall be removed from the site. All paint, shellac, oil or stains splashed or spilled upon adjacent surfaces not requiring treatment (hardware, fixture, floor) shall be removed and the entire job left clean and acceptable.

END OF SECTION

DIVISION 13 - SPECIAL CONSTRUCTION

SECTION 13281 - REMOVAL AND DISPOSAL OF ASBESTOS-CONTAINING MATERIALS

PART 1 - GENERAL

1.01 SUMMARY

A. This Section specifies Contractor responsibilities for controlling lead hazards if Asbestos-containing materials (ACM) are identified in the project area of the Neal Blaisdell Center Concert Hall Cooling Tower Replacement project.

B. The Contractor shall furnish all labor, materials, and equipment necessary to carry out the safe removal of asbestos-containing material (ACM) in compliance with all applicable laws and regulations.

C. It shall be the responsibility of the Abatement Contractor to verify the areas and quantities identified as asbestos-containing and verify the total work and/or effort to remove identified ACM. No additional payment will be considered for multiple layers for the materials identified for removal.

D. Post-removal encapsulation work shall include the coating of the substrate after ACM has been removed.

E. The Abatement Contractor shall protect the substrate after the ACM has been removed. Protective covering shall remain in-place until re-installation of new materials is complete, or unless otherwise directed by the Officer-in-Charge.

F. Visual clearance inspection shall be conducted by the Abatement Contractor’s foreman and the City and County's Qualified Consultant (QC) at the end of each work shift. All waste debris and other materials shall be picked up from the work area, properly package and removed each day.

G. The abatement contractor shall coordinate all removal work with the General Contractor.

H. The Contractor shall implement Construction Barriers to minimize visual exposure to protect site workers, on-site personnel, the public, and the environment.

I. In general, the principal items of work shall be as follows:

1. Protection of all on-site personnel, visitors, neighboring building occupants and the general public.

2. Removal, disposal and clearance of each phase of abatement prior to occupancy by other subcontractors.

3. Preparation of work area.

4. ACM removal and encapsulation of surfaces.

5. Protection of the substrates after ACM removal to prevent damage to the building surfaces prior to continue renovation and repair work.

6. Proper disposal with documentation of ACM and asbestos-contaminated waste generated during this project.

7. Final cleanup, visual clearance and air monitoring.

8. The asbestos abatement work shall include removal of all ACM within the work area that was identified in the Contractor's Hazardous Materials Survey performed in accordance with SECTION 01715 - EXISTING CONDITIONS - ASBESTOS / LEAD / HAZARDOUS MATERIAL SURVEY.

1.02 COORDINATION

A. The Abatement Contractor shall coordinate the asbestos removal work with the City and County, the City and County's Qualified Consultant, the General Contractor, and the Officer-in-Charge.

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

1.03 SUBMITTALS

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

B. Pre-Project Submittals: The following submittals must be provided within ten calendar days from the award to the City and County unless otherwise specified:

1. Detailed Work Plan: The plan shall state the actual start and completion dates for each phase of the asbestos removal work and other work specified. The schedule shall be formulated on a day/week basis. The schedule shall be updated weekly, with copies submitted to the Officer-in-Charge.

2. Notices: As early as possible but prior to commencement of work as regulated by each agency, but not later than 20 working days before commencement of any on-site project activity, send a written "10-day notice" in accordance with the State of Hawaii, Hawaii Administrative Rules (HAR) Title 11, Department of Health, Chapter 501 Asbestos Requirements Standard for Demolition and Renovation Section 11-501-7, of the proposed asbestos abatement work with copies to State of Hawaii, Department of Health, Clean Air Branch, 919 Ala Moana Boulevard, Room 203, Honolulu, Hawaii 96814.

C. Permits: Submit copies of all permits and arrangements for transportation and disposal of asbestos-containing or contaminated materials.

D. Manufacturer's Data: Submit copies of manufacturer's specifications, material safety data sheets (MSDS), installation instructions and field test procedures for each material, and all equipment related to asbestos handling and abatement (e.g., chemical mastic remover), including other data as may be required to show compliance with these specifications and proposed uses within ten consecutive calendar days from the award. Indicate by transmittal form that a copy of each installation instruction has been distributed to the installer.

E. Samples: Submit samples of the following items for approval prior to ordering materials:

1. Asbestos Encapsulant(s): Submit copies of manufacturer's literature including all laboratory data, MSDS, and application instructions.

2. Plastic Sheeting: Three 8-1/2- by 11-inch pieces of each thickness and type with labels indicating actual mil thickness.

3. Surfactant: Submit copies of manufacturer's literature, including all laboratory data, MSDS, mixing and application instructions.

4. Tapes and Adhesives: Submit Copies of manufacturer's literature including all laboratory data.

5. Warning labels and Signs: Submit copies of examples of all required signage.

6. Protective Clothing: Submit copies of manufacturer's literature on all protective clothing and one sample of each item (which will be returned to the Abatement Contractor).

7. Respirator Equipment: Submit copies of manufacturer's literature on all respirator equipment and one sample of each item (which will be returned to the Abatement Contractor).

F. Drawings: Submit to the City and County of Honolulu copies of drawings with the following items as a minimum

1. Description of any equipment to be employed not discussed in this Section.

2. Outline of work procedures to be employed.

G. Documentation For Instruction: Submit to the City and County documentation that each and every individual including foremen, supervisors, other company personnel or agents, and any other individual who may be exposed to airborne asbestos fibers, who may be responsible for any aspects of abatement activities, or who is allowed or permitted to enter areas where such exposure may occur, is AHERA- trained (and current) which includes instruction on the hazards and health effects of asbestos exposure. Also submit to the City and County documentation that the personnel stated above have had instructions on the nature of the activities and operations which create a risk of asbestos exposure and the necessary protective steps, on use and fitting of respirators (in accordance with qualitative procedures as detailed in NIOSH 12-145, Qualitative

and Quantitative Fit Testing Procedures), on protective dress, on use of showers, on entry and exit from the work areas under normal and emergency conditions, on all aspects of work procedures and protective measures, and on all provisions of NIOSH 12-145, and that each and every employee understands this instruction. This documentation shall be an outlined format of the instruction and shall be signed by all employees to be engaged on this project and by all individuals before being allowed within the project site and must include acknowledgment and an assumption of the potential risk of exposure by that individual and a release of liability of the City and County for any such exposure. The Abatement Contractor shall be responsible for keeping the documentation up to date and subsequent submittals to the City and County before any additional employee or individual, not currently on this list, is allowed within the project site.

H. State of Hawaii Certification: The Abatement Contractor shall submit to the City and County of Honolulu training documentation and certification (i.e., copies of current State of Hawaii asbestos certification card) that each and every individual including foremen, supervisors, other company personnel or agents, and any other individuals who may be exposed to airborne asbestos fibers, who may be responsible for any aspects of abatement activities, or who is allowed or permitted to enter areas where such exposure may occur has a valid and current certification from the Director as required in the State of Hawaii, Title 11, HAR, Department of Health, Chapter 504, Asbestos Abatement Certification Program, Section 11-504-4 Certification Requirements. In addition, the Abatement Contractors personnel on site shall have available at all time their personal State of Hawaii Asbestos Certification ID card. The validity of this card may be checked at any time during the project by the City and County's Hired Qualified Consultant or any other authority governing this project.

I. Physician's Documentation: Submit to the City and County documentation from a physician that all employees or agents who may be exposed to airborne asbestos have been medical monitored to determine whether they are physically capable of working while wearing the respirator required without suffering adverse health effects. In addition, documentation that all individuals permitted within the project site have received medical monitoring or had such monitoring made available to them as required in NIOSH 12-145-11(a). The Abatement Contractor must be aware of and provide information to the examining physician about unusual conditions in the work place environment (e.g., high temperatures, humidity, chemical contaminants) that may have an impact on the employee's ability to perform work activities. The Abatement Contractor shall keep and make available to all affected individuals a record and the results of such examinations.

J. HEPA Vacuums: Submit the manufacturer's certification that vacuums conform to ANSI Z9.2-79, Fundamentals Governing the Design and Operation of Local Exhaust Systems as applicable to this project.

K. Air Supply Equipment and Respirators: Submit certification that respirators meet all requirements of NIOSH and the EPA. Document NIOSH approval of all respiratory protective devices utilized on site. Include the manufacturer's certification of HEPA filtration capabilities for all cartridges and filters.

L. Rental Equipment: When rental equipment is to be used in abatement areas or to transport asbestos-containing waste, a written notification concerning intended use of the rental equipment must be provided to the rental agency with a copy submitted to the City and County.

M. Post-Project Submittals: Maintain a log of all personnel other than the Abatement Contractor's employees and agents who enter the work area while asbestos operations are in progress until after final clearance is received that the work area is suitable for re-occupancy. A sample form is provided at the end of this Section. The log shall contain the following information as a minimum:

1. Date of visit.

2. Visitor's name, employer, business address, and telephone number.

3. Time of entry and exit from work area.

4. Purpose of visit.

5. Type of protective clothing and respirator worn.

6. Certificate of release signed and filed with the Abatement Contractor.

N. Daily Log: Maintain a daily log documenting the dates and times of, but not limited to, the following items:

1. Meetings: purpose, attendees, brief discussion.

2. Visitations, authorized and unauthorized at the job site.

3. Special or unusual events, e.g., equipment failures, accidents.

4. Air monitoring tests and test results.

5. Documentation of the Abatement Contractor's completion of the following:

a. Inspection of work area preparation prior to start of removal and daily thereafter.

b. Progress of the work.

c. Abatement Contractor's inspections prior to areas from which such materials have been removed.

d. Removal of waste materials from work area.

e. Decontamination of equipment.

f. Abatement Contractor's final inspection/final visual inspection.

O. Waste Disposal Manifest Forms: Submit copies of all transport manifests, trip tickets and disposal receipts for all asbestos-containing waste materials removed from the work area during the abatement process to the City and County.

P. Final payment will not be made until copies of all submittals have been furnished to the City and County.

1.04 PRODUCT HANDLING

A. Delivery and Storage of Materials: Deliver materials to the site in original packages, containers or bags fully identified with the manufacturer's name brand and lot number. Store materials in a dry, well-ventilated space, under cover, off the ground and away from surfaces subject to dampness or condensation as approved by the City and County. Material that becomes contaminated with asbestos shall be disposed of in accordance with applicable regulations. Replacement materials shall be stored outside the contaminated work area until abatement is completed.

1.05 PROTECTION

A. Site Security: The work area is to be restricted only to authorized, trained, and protected personnel. These may include the Abatement Contractor's employees, employees of sub-contractors, the City and County Representatives, City and County inspectors and any other designated individuals. A list of authorized personnel shall be established prior to commencing with work activities for this project.

1. Entry to the work area by unauthorized individuals shall not be permitted without the prior approval of the Officer-in-Charge or City and County's Qualified Consultant and any such entry shall be reported immediately to the Officer-in-Charge or City and County's Qualified Consultant by the Abatement Contractor.

2. A Visitor's Log shall be maintained daily, throughout the duration of the project.

3. The Abatement Contractor shall have control, subject to approval of the Officer-in-Charge, of security in the work area and in proximity of the Abatement Contractor's equipment and materials.

B. Site Protection and Safety: As a minimum, follow the requirements of EPA, HIOSH, OSHA and NIOSH. Take all necessary precaution to ensure there is no asbestos contamination to those areas not included in the work schedule.

C. Protective Covering: The Abatement Contractor shall provide and install additional protective covering on walls, fixtures and other items in the work area to protect from possible damage. Protective covering shall be clean plastic sheeting. Note: It is the responsibility of the Abatement Contractor to ensure that removal of the protective sheeting does not result in the damage of walls, fixtures or other surfaces. Surfaces shall be returned to their original condition as directed by the City and County.

D. Fall Protection: The Abatement Contractor shall provide fall protection for all abatement personnel, City and County's Qualified Consultant, or other City and County Inspector's (where applicable).

E. Safeguarding of Property: The Abatement Contractor shall take whatever steps necessary to safeguard his work and also the property of the city and county and other individuals in the vicinity of his work area during the execution of this contract. They shall be responsible for and make good on any and all damages by his employees' negligence. The Abatement Contractor shall not load the structure with weight that will endanger the structure.

F. Completed Work: The Abatement Contractor shall provide all necessary protection for surfaces encapsulated under this Section.

1.06 ABBREVIATIONS

A. AHERA: Asbestos Hazard Emergency Response Act

B. ANSI: American National Standards Institute, Inc.

C. ASTM: American Society for Testing and Materials

D. CFR: Code of Federal Regulations.

E. HAR: Hawaii Administrative Rules.

F. HIOSH: Division of Occupational Safety and Health, Department of Labor and Industrial Relations, State of Hawaii.

G. EPA: U.S. Environmental Protection Agency.

H. NESHAPS: National Emission Standards for Hazardous Air Pollutants.

I. NIOSH: National Institute for Occupational Safety and Health.

J. OSHA: Occupational Safety and Health Administration.

1.07 GENERAL REQUIREMENTS

A. In performing this asbestos abatement project, all possible safeguards, precautions, and protective measures should be utilized to prevent exposure of any individual to asbestos fibers.

B. Furnish Abatement Contractor certification, within ten (10) calendar days from award, that the Abatement Contractor is experienced with the EPA, OSHA and HIOSH regulations related to asbestos application, removal, disposal, and treatment.

C. Furnish employee certifications, within ten (10) calendar days from award, that employees have had instructions on the dangers of asbestos exposure, on respirator use, and decontamination, from an EPA-approved training facility, as required by AHERA Regulations 40 CFR 763, Appendix C to Subpart E (worker training), April 30, 1987.

D. Abatement Contractor shall examine and have at all times in his possession at his office (one copy) and in view at each job-site office (one copy) a current issue of the following publications:

1. State of Hawaii: Occupational Safety and Health Standards; Title 12, Subtitle 8, Part 3, Chapter 145, Asbestos.

2. State of Hawaii: Hawaii Administrative Rules (HAR) Chapter 11-501, 503, and 504.

3. Title 29, Code of Federal Regulations, Part 1926 Construction Industry, Occupational Safety and Health Administration (OSHA), U.S. Department of Labor.

4. State of Hawaii: Occupational Safety and Health Standards. Title 12, Subtitle 8, Part 1.

5. State of Hawaii: Occupational Safety and Health Standards, Title 12, Chapter 203 - Hazard Communication.

5. Title 40, Code of Federal Regulations, Part 61, Subparts A and M, National Emission Standards for Hazardous Air Pollutants.

6. Guidance for Controlling Asbestos-Containing Materials in Buildings (purple book).

7. Title 34, Code of Federal Regulations, Part 231, Appendix C, Procedures for Containing and Removing Building Materials Containing Asbestos.

8. ANSI Z88.80 Practice for Respiratory Protection.

9. EPA, Model Accreditation Plan, 40 CFR Part 763 Subpart E, Appendix C.

E. The Abatement Contractor shall comply with the above requirements and any applicable Federal, State and/or local regulations. Where conflict or any inconsistency among requirements or with this specification exists, the more stringent requirements shall apply. Additional costs to the Abatement Contractor due to ignorance of the above requirements and any applicable Federal, State and local regulations, shall not be paid by the City and County.

F. All regulations shall govern over these specifications, except that any more stringent specification or specification providing greater protection against asbestos exposure, injury, loss or liability shall control to the extent permitted by regulation. Any questions regarding conflict or inconsistency between specifications and/or regulations should be directed to the City and County's QC or Officer-in-Charge.

G. Whenever approval of the City and County is required prior to proceeding with other work, the following shall be complied with:

1. The Abatement Contractor shall allow the City and County 24-hours from notification to respond to the request for inspection.

2. The Abatement Contractor shall designate one person (either a foreman or superintendent) who will be authorized to request inspections. The name of the designated person shall be submitted in writing to the City and County prior to commencing the work. Requests from any other person will not be considered an official request.

3. The designated person, when requesting inspection, shall provide the following information:

4. Name of caller.

5. Building areas or rooms to be inspected.

6. Work phase of inspection, as specified.

H. The Abatement Contractor shall provide all required protective barriers to isolate the areas where asbestos removal is taking place from the surrounding areas and other portions of the building.

I. The Abatement Contractor shall cut off, disconnect power to and lockout all air conditioning, ventilation and electrical systems to the areas where asbestos removal are taking place prior to the start of cleaning and preparation operations. Appropriate signs and protective devices shall be placed at all switches controlling the devices to assure that the affected equipment is not inadvertently started during the work.

1.08 PERSONNEL PROTECTION REQUIREMENTS

A. The Abatement Contractor acknowledges that he alone is responsible for instruction and enforcement of personal protection requirements and that these specifications provide only a minimum acceptable standard.

B. Provide workers with personally issued and marked respiratory equipment approved by NIOSH and accepted by OSHA and HIOSH. Work area preparation shall be performed, at a minimum, in half-mask dual cartridge respirators equipped with HEPA cartridges approved for asbestos by NIOSH. All removal work related to the removal and bagging of asbestos-containing materials except acoustical plaster ceiling work, shall be performed in, at a minimum, half-face, dual cartridge respirators equipped with HEPA cartridges approved for asbestos by NIOSH. Removal and bagging of acoustical plaster ceiling materials shall be conducted using no less than PAPR.

C. Loading and Unloading of Double-Bags at the Project Site and Landfill: This task will be performed in, at a minimum, half-face dual-cartridge respirators equipped with HEPA cartridges that are NIOSH approved for asbestos.

D. Other: Should any condition, for any reason, be encountered where the exposure level exceeds the action levels provided by the City and County and/or regulatory standards, the Abatement Contractor shall stop work and determine the causes

of the excessive levels. Should the action level continue to be exceeded, the Abatement Contractor shall stop work. Work will not be resumed until approval is received from the City and County.

E. Beards: Prohibit beards that interfere with the seal of the respirator face piece.

F. Provide workers with sufficient sets of disposable protective full body clothing consisting of material impenetrable by asbestos fibers and of the proper size for each individual to accommodate movement without tearing. Such clothing shall consist of full-body coveralls, footwear, gloves, and headgear. Provide hard hats as required by applicable safety regulations. Disposable clothing shall not be allowed to accumulate and shall be disposed of as asbestos-contaminated waste. Protective clothing shall be worn by all personnel within the work area from the start of the removal through post-removal encapsulation work, until the Abatement Contractor has received acceptance of the asbestos-containing material removal and post-removal encapsulation work.

G. No visitors shall be allowed in work areas, except as authorized by the City and County's QC or Officer-in-Charge. Provide authorized visitors with suitable disposable protective full-body clothing consisting of material impenetrable by asbestos fibers and of the proper size for each individual to accommodate movement without tearing. Such clothing shall consist of full-body coverall, footwear, gloves and headgear, including hard hat when required and insulated rubber boots or equal. It shall be the authorized visitor's responsibility to provide their own respiratory protection and proof of current respirator fit testing.

H. All electrical systems used for asbestos abatement operations shall as a minimum be protected with "Ground Fault Circuit Interrupters (GFCI)" selected and installed in strict accordance with the manufacturer's instructions, the National Electric Code and all other pertinent ones.

I. Additional safety equipment (e.g., hard hats meeting the requirements of ANSI Z89.1-1981, eye protection meeting the requirements of ANSI Z87.1-1979, safety shoes meeting the requirements of ANSI Z41.1-1967, disposable PVC gloves), as necessary, shall be provided to all workers and authorized visitors.

1.09 DEFINITIONS

A. Abatement: Procedure to control fiber release from asbestos-containing building materials.

1. Removal: All herein specified procedures necessary to remove asbestos-containing materials from an area and disposal of the material at an approved site in an acceptable manner.

2. Post-Removal Surface Encapsulation: Procedures necessary to coat surfaces from which asbestos-containing materials have been removed and where designated on the drawings to control any residual fiber release.

B. Air-Monitoring: The process of measuring the fiber content of a specific, known volume of air in a stated period of time. For this project, NIOSH 7400 Method or approved substitute per HIOSH Regulation's, shall be used.

C. Amended Water: Water to which a surfactant has been added to reduce water surface tension and thereby provide more effective penetration.

D. APR: Air Purifying Respirator

E. Asbestos-Containing Material: Asbestos-Containing Material (ACM), a material that contains any type of asbestos in amounts greater than 1%.

F. Authorized Visitor: The City and County's QC, Officer-in-Charge, air monitoring personnel, or a representative of any regulatory or other agency having jurisdiction over the project.

G. City and County's Hired Qualified Consultant: Person responsible for onsite inspection and air monitoring during Abatement Contractor's work activities. He/she will ensure the Abatement Contractor conducts work in accordance with the specifications and applicable regulatory requirements.

H. Fixed Object: A unit of equipment or furniture in the work area which cannot be removed from the work area without dismantling.

I. Friable Asbestos: Asbestos-containing material which can be crumbled to dust, when dry, under hand pressure.

J. HEPA Filter: A High Efficiency Particulate Air filter capable of trapping and retaining 99.97 percent of mono-dispersed particles 0.3 micrometers or greater in diameter.

K. HEPA Vacuum Equipment: Vacuuming equipment that utilizes a High Efficiency Particulate Air (HEPA) filter.

L. Holding Area: A secure area used for the storage of double-bagged asbestos-containing material before removal from the site to an approved disposal site.

M. Post-Removal Encapsulation: To apply a liquid material to surfaces from which asbestos-containing material has been removed to control the possible release of residual fibers, either by creating a membrane over the surface (bridging encapsulant) or by penetrating into the material and binding its components (penetrating encapsulant).

N. PAPR: Powered Air Purifying Respirator.

O. Surfactant: A chemical-wetting agent added to water to improve penetration, thus reducing the quantity of water required for a given operation or area.

P. Project Monitor: A person certified by the City and County as a project monitor may provide services that include the following:

1. Recommend to the building owner abatement options to mitigate the health hazard posed by the asbestos-containing materials in the building;

2. Collect air samples for the purpose of area and clearance monitoring at abatement project sites provided that the monitor is not an employee of the

abatement entity performing the abatement, unless the project is conducted solely by in-house employees;

3. Provide advice regarding personal protective equipment;

4. Oversee abatement projects carried out by abatement entities;

5. Perform visual inspections of completed abatement projects to determine if the project meets completion requirements; and

6. To serve as the City and County's representative to ensure that abatement is done correctly.

Q. Certified Industrial Hygienist: Person certified by the American Board of Industrial Hygiene. Person educated, trained and certified in recognizing and evaluating work place hazards and stress (in this instance, asbestos abatement and related work), and providing methods and means of removing or correcting such hazards and stresses within the work environment.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Asbestos Prohibition: No asbestos-containing materials or equipment shall be used under this section. The Abatement Contractor shall ensure that all materials and equipment incorporated in the project are asbestos-free.

B. Plastic Sheeting: Minimum thickness of 6-mil polyethylene film.

C. Plastic Bags: Minimum thickness 6-mil polyethylene film labeled as specified hereinafter.

D. Tapes: Tape shall be capable of sealing joints of adjacent sheets of polyethylene and for attaching polyethylene sheets to finished or unfinished surfaces of dissimilar materials and capable of adhering under both dry and wet conditions, including the use of amended water. Silver cloth duct tape, minimum two (2)-inch wide, and double-faced foam tapes, by Nashua, 3-M, Arno, or approved substitute shall be used on polyethylene sheeting, red or NATO orange tape, minimum 2 inches wide for exit arrows.

E. Adhesives: Adhesives shall be capable of sealing joints of adjacent sheets of polyethylene and for attachment of polyethylene sheet to finished or unfinished surfaces of dissimilar materials and capable of adhering under both dry and wet conditions, including use of amended water. 3-M #76, #77, or approved substitute.

F. Surfactant (Wetting Agent): 50 percent (%) polyoxyethylene ester and 50 percent (%) polyoxyethylene ether, or equivalent, and shall be mixed with water to provide a concentration of one (1) ounce, or more as needed, of surfactant to five (5) gallons of water. (An equivalent surfactant shall be understood to mean material with a surface tension of 29 dynes/cm as tested in its properly-mixed

concentration, using ASTM Method D 1331-56, "Surface and Interfacial Tension of Solutions of Surface-Active Agents.")

G. Asbestos Encapsulant: Encapsulant shall be non-flammable with a Class A fire classification. Encapsulant shall be odorless when dry, and compatible with materials applied by others (this Contract). All references to application at strengths below full strength shall be as approved by the product manufacturer for the intended use.

H. Warning Labels and Signs: As required by OSHA regulations 29 CFR 1910.1001, 29 CFR 1926.58 and HIOSH regulation 12-145. Permanent signage for access panels and areas with encapsulated asbestos-containing materials shall be as specified hereinafter. Signage shall be approved by the City and County.

I. Protective Clothing: The Abatement Contractor is cautioned that during the summer and fall, there is usually a tremendous shortage of coveralls due to the consumption of these items by mainland contractors for summer abatement projects. The Abatement Contractor shall have all the required sets of coveralls required for this project on island prior to the start of work. There will be no time extension for the unavailability of coveralls or related equipment.

J. Other Materials: Provide all other materials, which may be required to properly prepare and complete this project.

2.02 MATERIALS

A. Asbestos Prohibition: No asbestos-containing materials or equipment shall be used under

2.03 TOOLS

A. General: Provide and fabricate suitable tools for the asbestos abatement procedures.

B. Water Sprayer: Airless or a pressure sprayer for amended water application as applicable.

C. HEPA Vacuum: High Efficiency Particulate Air (HEPA) vacuum.

D. Paint/Encapsulant Sprayer: Airless type.

E. No power-driven tools or equipment shall be permitted for removal of asbestos-containing materials.

F. Other tools and equipment as necessary.

PART 3 - EXECUTION

3.01 WORK AREA PREPARATION

A. Work by the Asbestos Abatement Contractor

1. Step 1:

   a. Posting of Caution Signs: Post caution signs in and around the work area to comply with 29 CFR 1910.1001, 29 CFR 1926.58, 12-145-8 and all other Federal, State and local requirements. Signs shall be posted at a distance sufficiently far enough away from the work area to permit a person to read the sign and take the necessary protective measures to avoid exposure.

   b. Inspect the Building Openings: At the beginning and end of each work day, the Abatement Contractor shall inspect and ensure that all doors, windows and other openings of the affected building are closed and locked.

   c. Sealing Openings: Seal all openings, including but not limited to corridors, vents, and any other penetrations of the work area, with 2-layers of plastic sheeting sealed with tape. Doorways and corridors that will not be used for passage during the work shall be sealed with a minimum of 2-layers of 6-mil thick plastic sheeting completely sealed with tape to provide airtight barriers.

   d. Construct barriers to minimize visual exposure of the contractor's employees to occupants, neighboring building occupants and general public.

2. Step 2:

   a. Provide Decontamination Area: Designate a Personnel Decontamination Area and Equipment for Decontamination as approved by the City and County's QC or Officer-in-Charge and specified hereinafter.

3. Step 3:

   AFTER THE SEALING AND TEMPORARY BARRIER INSTALLATION WORK IS COMPLETED, NOTIFY THE CITY AND COUNTY OR CITY AND COUNTY'S REPRESENTATIVE AND GET HIS APPROVAL PRIOR TO PROCEEDING WITH STEP 4.

4. Step 4:

   a. Temporary utility services are also generally specified under the General Specifications. Requirements specified herein amplify the General Specifications as they apply to the asbestos abatement operations.

   b. Temporary Electricity and Lighting
      (1) Existing electrical service to the building may be used for temporary electrical power during abatement and replacement work; however, the electrical power to the work areas will be shut down during abatement work.

(2) The Abatement Contractor shall verify the location(s) of available service outside the work areas and shall tie into the existing system at a location approved by the Officer-in-Charge.

(3) Install circuit and branch wiring, with area distribution boxes located so that power is available throughout the project by use of construction-type power cords. The Abatement Contractor shall use ground fault circuit interrupter (GFCI) for all electrical equipment used inside the work area.

c. Temporary Water:
(1) Existing domestic water service to the building may be used for temporary water during construction. Location of tie-in shall be approved by the Officer-in-Charge.

(2) Install branch piping with taps as necessary throughout the construction area.

d. Temporary Sanitation Facilities:
(1) Existing toilet facilities may be used by the Abatement Contractor's personnel during asbestos abatement work. Personnel must be in a decontaminated state, before using toilet facility.

(2) Maintain toilet facility in a clean and sanitary condition in compliance with applicable codes and ordinances.

e. Temporary Fire Protection:
(1) Provide and maintain temporary fire protection equipment during the asbestos abatement operations.

(2) Equipment shall be of the appropriate type to fight fires associated with the existing building materials and those materials used during the construction operations.

5. Step 5:

AFTER STEP 4 IS COMPLETED, NOTIFY THE CITY AND COUNTY'S QC OR OFFICER-IN-CHARGE AND GET HIS WRITTEN APPROVAL PRIOR TO PROCEEDING WITH REMOVAL WORK AS SPECIFIED HEREINAFTER. COMMENCEMENT OF WORK SHALL NOT START UNTIL THE CITY AND COUNTY HAS APPROVED THE FOLLOWING:

a. Pre-abatement submissions, notifications, postings and permits have been provided and are satisfactory.

b. All equipment for abatement, clean-up and disposal are on hand.

c. All worker training (and certification) is completed and current.

3.02 DECONTAMINATION ENCLOSURE SYSTEMS

A. General: The Abatement Contractor shall construct a decontamination enclosure system or use portable units, acceptable to the Qualified Consultant and Officer-in-Charge, for all removal work. Connect system to the work area and framed-in or accordion tunnels, if necessary, and the tunnels with plastic sealed with duct tape at all joints. All vertical surfaces subject to observation from the exterior non-contaminated areas shall be constructed of opaque materials.

B. Access: In all cases, access between contaminated rooms or areas shall be through an airlock. In all cases, access between any two rooms within the decontamination enclosure systems shall be through a curtained doorway.

C. Personnel Decontamination Unit: Provide a personnel decontamination enclosure system continuous to the work area consisting of three (3) totally enclosed chambers as follows:

1. An equipment room with two (2) curtained doorways, on to the work area and on to the shower room.

2. A shower room with two (2) curtained doorways, one to the equipment room and one to the clean room. The shower room shall contain at least one shower with clean water. Careful attention must be paid to the shower enclosure to insure against leakage of any kind. Ensure a supply of soap at all times in the shower. Drainage from the shower shall be disposed of as contaminated wastewater and filtered as specified hereinafter.

3. A clean room with two (2) curtained doorway, one to the shower room and one entrance/exit door to non-contaminated spaces. The clean room shall have sufficient space for storage of worker's street clothes and personal effects, towels, and other non-contaminated items.

4. All curtained doorways shall be at the minimum double sheeted.

D. Maintenance of Decontamination System: At the beginning of each work shift and throughout abatement operations, all areas shall be kept clean at all times.

E. The Abatement Contractor shall designate a worker responsible for the decontamination system, cleaning, repairing and sanitizing respirator equipment after each use and who will be responsible for maintenance of the decontamination system.

1. At the end of each work shift the shower shall be thoroughly disinfected, the filter bag shall be returned to the equipment room for disposal, and the equipment room shall be thoroughly HEPA vacuumed *and* wet cleaned.

F. Personnel Protection Notice: Post the following notice in each decontamination area:

1. All workers and authorized personnel, in order to enter the work areas, shall:

   a. Remove applicable street clothing, unless it is to remain in the equipment room for eventual disposal.

   b. Don the appropriate respiratory protection and follow all training procedures and manufacturer's instructions.

   c. Don protective clothing (full-body coveralls, gloves, boots, headgear, etc.) after donning respirator.

   d. No smoking, eating, or drinking shall be allowed inside the work area or the decontamination area.

2. All workers and authorized personnel, in order to leave the work area, shall enter the decontamination area and:

   a. Remove gross (visible) contamination from themselves and their equipment using HEPA vacuum and/or wet methods.

   b. With the respirator still in place, remove protective clothing (full-body coveralls, gloves, boots, headgear, etc.) and dispose and/or store appropriately.

   c. Remove respirator and place in container/plastic bag for storage and re- use.

3.03 WASTE WATER FILTERING SYSTEM

A. All wastewater shall be treated as contaminated with asbestos and shall be filtered using two in-line filter cartridges (Filterite Type 6CMC-1 or approved substitute) with 2" inlets and outlets. The outlet of the first cartridge shall connect to the inlet of the second cartridge. The first cartridge shall contain six (6) 100-micron pre-filters and a second cartridge shall contain six (6) 0.5 micron filters or equal staging according to filtering unit type. Filtered wastewater shall be collected and disposed of properly in the county sanitary sewer system in accordance with current City and County of Honolulu, Environmental Services, Division of Environmental Quality Standards. Discharge of water in the county storm drain system is prohibited unless proper permit is acquired. Dispose of contaminated filters as asbestos-contaminated material.

3.04 NEGATIVE AIR PRESSURE SYSTEMS

A. Quality of Exhaust Units: The Abatement Contractor shall determine the number of units based on the size of the work area and provide one complete air change every 15 minutes in all locations of the work areas. Actual jobsite inspection and negative pressure differential of -0.02 inches of water column has been achieved. The Abatement Contractor shall inspect the correct deficient airtight barriers if required negative pressure cannot be achieved. Additional units shall be provided by the Abatement Contractor at no additional charges to maintain the required negative pressure. The Abatement Contractor shall provide one

spare exhaust unit of the equal size and capacity as the largest operation unit at the jobsite. The Abatement Contractor shall be responsible for maintaining the integrity of the negative pressure within the work areas.

B. Location of Exhaust Units: Locate units so that make-up air enters the work area primarily through the decontamination enclosure unit and traverses the work area as much as possible. Vent all exhaust units to the outside of the building. Provide flexible or rigid ducting as necessary to provide an airtight enclosure where ducting passes through the work area or occupied portions of the building and for the intake repositioning as required during the removal work.

C. Air Openings: Provide additional make-up openings as may be necessary to effectively move air through the work area and to avoid creating too high a pressure differential that would damage or cause “blow-in” of temporary barriers and plastic sheeting. Provide inlets by making openings in the plastic sheeting near the ceiling and as far back as possible from the exhaust units. Seal openings whenever the pressure differential drops below the required minimum.

D. Air Exchanges: A Minimum of four (4) air changes per hour. Minimum of 72 air changes is required prior to clearance testing.

E. Negative Pressure Exhaust Unit Filter Replacement: Change filters in exhaust units in accordance with the manufacturer’s recommendations and in accordance with EPA Guidance For Controlling Asbestos-Containing Materials in Buildings, Appendix J, paragraph J.3.2.2.1 or when there is an obvious loss of negative pressure.

F. System Dismantling: When the clearance criteria have been achieved, remove and dispose of pre-filters and shut off the exhaust units. If the exhaust units are to be used in another work area, leave the final HEPA filter in place and seal all intake openings to the unit to prevent contamination due to the asbestos filter collected in the final filter, wet wipe all exposed surfaces, seal the unit completely with plastic sheeting and move unit as required.

3.05 REMOVAL OF ASBESTOS-CONTAINING MATERIALS

A. Coordinate all work with the General Contractor, Officer-in-Charge, and the City and County's Qualified Consultant. Remove asbestos-containing materials to the structural substrate and the satisfaction of the Qualified Consultant and the Officer-in-Charge.

B. Workers performing removal work shall wear full body protective clothing and respirator as specified.

C. Lightly wet the ACM with low pressure spray and amended water. Initially wet the surface and continuously apply a mist for the duration of the removal work.

D. Do not use liquids or moisture on live electrical items.

E. Remove asbestos-containing materials from locations identified for renovation. Materials shall be removed by methods which do not create dust and do not make the materials friable. For this project hand tools shall be used. No sawing,

grinding, sanding, drilling, pulverizing, wire-brushing, or other dust producing operations shall be permitted.

1. The asbestos-containing sink undercoating shall be removed by dismantling piping and dislodging entire sink from counter. The entire sink shall be packaged while still moist into sealable double plastic bags or plastic sheeting, sealed airtight. The work area shall be cleaned at the end of each day. The Abatement Contractor shall have adequate quantities of bags as to not overfilling waste bags. Bags shall be sealed to prevent accidental opening and leakage by typing tops of bags in an overhand knot or by taping in a gooseneck fashion. Do not seal with wire or cord. At no time shall waste bags permitted to be dropped or thrown.

2. The asbestos-containing flooring and/or associated mastic shall be removed in small sections and packed while still moist into sealable double plastic bags. The work area shall be cleaned at the end of each day. The Abatement Contractor shall have adequate quantities of bags as to not overfilling waste bags. Bags shall be sealed to prevent accidental opening and leakage by typing tops of bags in an overhand knot or by taping in a gooseneck fashion. Do not seal with wire or cord. At no time shall waste bags permitted to be dropped or thrown.

3. The asbestos-containing electrical light insulation pad (heat shield) shall be removed in whole and packed while still moist into sealable double plastic bags. The Abatement Contractor shall coordinate with the General and Electrical Contractors for access to ACM. The work area shall be cleaned at the end of each day. Bags shall be sealed to prevent accidental opening and leakage by typing tops of bags in an overhand knot or by taping in a gooseneck fashion. Do not seal with wire or cord. At no time shall waste bags permitted to be dropped or thrown.

4. The asbestos-containing black vinyl tack stripping shall be removed in small sections. The work area shall be cleaned at the end of each day. The Abatement Contractor shall have adequate quantities of bags as to not overfilling waste bags. Bags shall be sealed to prevent accidental opening and leakage by typing tops of bags in an overhand knot or by taping in a gooseneck fashion. Do not seal with wire or cord. At no time shall waste bags permitted to be dropped or thrown.

5. The asbestos-containing acoustical ceiling plaster and wire lathe shall be removed in small sections. The work area shall be cleaned at the end of each day. The Abatement Contractor shall have adequate quantities of bags as to not overfilling waste bags. The Abatement Contractor shall not use excessive amounts of water (No bagging water). Bags shall be sealed to prevent accidental opening and leakage by typing tops of bags in an overhand knot or by taping in a gooseneck fashion. Do not seal with wire or cord. At no time shall waste bags permitted to be dropped or thrown. During the removal of acoustical plaster ceiling materials, the contractor shall not use any respiratory protection less than a PAPR.

6. The asbestos-containing sealant/mastic and duct insulation shall be removed in whole sections as feasible. The work area shall be cleaned at

the end of each day. The Abatement Contractor shall have adequate quantities of bags and/or poly sheeting. Bags and/or sheeting shall be sealed to prevent accidental opening and leakage by typing tops of bags in an overhand knot or by taping in a gooseneck fashion. Do not seal with wire or cord. At no time shall waste bags permitted to be dropped or thrown.

7. The asbestos-containing corrugated cementitious (Transite TM) panels and/or baffles shall be removed in whole sections. The Abatement Contractor shall coordinate with the General Contractor for access to ACM. The work area shall be cleaned at the end of each day. The Abatement Contractor shall have adequate quantities of bags as to not overfilling waste bags. Bags shall be sealed to prevent accidental opening and leakage by typing tops of bags in an overhand knot or by taping in a gooseneck fashion. Do not seal with wire or cord. At no time shall waste bags permitted to be dropped or thrown.

8. The asbestos-containing black tar/asphaltic mastic over cork insulation on mechanical piping and/or pipe fittings gaskets shall be removed in small sections. The Abatement Contractor shall coordinate with the General, Mechanical, and Recycling Contractors for access to ACM. The work area shall be cleaned at the end of each day. The Abatement Contractor shall have adequate quantities of bags as to not overfilling waste bags. Bags shall be sealed to prevent accidental opening and leakage by typing tops of bags in an overhand knot or by taping in a gooseneck fashion. Do not seal with wire or cord. At no time shall waste bags permitted to be dropped or thrown.

F. HEPA vacuum and wet wipe surfaces; and apply lockdown encapsulate to areas where ACM has been removed.

3.06 ASBESTOS FIBER CONCENTRATIONS IN THE WORK AREA

A. The maximum permissible exposure to airborne concentrations or asbestos fibers within the work area when under respirator shall be in accordance with Hawaii OSHA, Rule 12-202-13(b). The work shall stop whenever these limits are exceeded and the Abatement Contractor shall remedy the condition prior to commencing the work. The expenses resulting from the delays shall be the Abatement Contractor's responsibility and shall not be paid by the City and County.

3.07 DISPOSAL OF ASBESTOS-CONTAINING MATERIAL AND ASBESTOS CONTAMINATED WASTE (SOLID AND/OR LIQUID)

A. As the work progresses and waste is generated, the Abatement Contractor shall legally transport to the authorized disposal site(s) all waste generated daily unless specifically approved by the City and County's QCor Officer-in-Charge to delay a disposal operation as specified for waste container storage below. The Abatement Contractor shall pre-schedule and obtain the approval of the City and County's QC or Officer-in-Charge prior to removing the waste from the work area(s). Transport all waste to the pre-designated disposal site(s) in accordance with EPA regulation 40 CFR 61.152, Department of Transportation regulations 49 CFR Parts 171 and 172, HIOSH regulation 12-145-10 and local regulations.

The Abatement Contractor shall keep abreast of all changes to transportation regulations and fully comply with them.

B. Sealed waste bags may be temporarily stored in the work area, or in a pre-designated outside area (e.g., a locked container or dumpster) until a truckload quantity is obtained when approved by the City and County's QC or Officer-in-Charge. The storage area shall be prominently identified and posted with signs. Waste containers shall be lined with polyethylene sheets. No waste materials shall be left in the work area overnight.

C. The workers shall then move the bagged material from a designated holding area to the storage area or waste container. Ensure that all containers are sealed properly before removing for transport and disposal. Bags and containers shall be marked with OSHA labels prescribed by the Hawaii OSHA regulations referenced in these specifications. Label shall state, "DANGER - CONTAINS ASBESTOS FIBERS -AVOID CREATING DUST - CANCER AND LUNG DISEASE HAZARD." Additionally, label bags in accordance with OSHA requirement 29 CFR 1910.1001, HIOSH regulation 12-145-8 or EPA regulation 40 CFR 61.150 if more restrictive. The outside of all waste containers or bags shall be clean before leaving the work area. For ACM waste material to be transported off the facility site, label containers or wrapped waste materials with the name of the waste generator and the location at which the waste was generated.

D. A label with the name of the waste generator and location from which the waste was generated shall be clearly indicated on the outside of the bags in accordance with the November 20, 1990 NESHAP Revision, Final Rule, Waste Disposal Section describing marking, labeling and offsite disposal requirements. Shipment records shall be maintained using forms described in this latest NESHAP Revision.

E. Vehicles used for transporting waste to the disposal sites shall have a completely enclosed, lockable storage compartment. Storage compartments shall be plasticized and sealed with a minimum of one layer of 6-mil polyethylene sheeting on the sides and top and two layers of 6-mil polyethylene sheeting on the floor (bed). If allowed by HIOSH, waste materials, except those with sharp edges (metal edging, screws, nails, broken tile with sharp edges, etc.), properly double bagged may be transported to the disposal site without being placed in drums if the transporting vehicle is prepared as specified above in addition to any more stringent requirements by HIOSH. The compartment shall be thoroughly wet-cleaned and/or HEPA vacuumed following the disposal of each load at the disposal sites at an approved location with electrical power as required. At the conclusion of the asbestos abatement, or before transport vehicles are used for other purposes, the polyethylene sheeting shall be properly removed and disposed of as contaminated waste. After this has been accomplished, compartments shall once again be wet-cleaned and HEPA vacuumed in order to eliminate all debris.

F. Workers unloading bags at the disposal sites shall be dressed in full-body protective clothing and HEPA cartridge respirators.

G. Waste disposal manifest forms shall be properly completed to assure custody and disposal of all asbestos-containing material and asbestos-contaminated waste at approved disposal sites. Forms shall be kept on file as directed by the City and County with copies submitted to the City and County the next working day after each trip.

NOTE: IT IS THE ABATEMENT CONTRACTOR'S RESPONSIBILITY TO ASSURE THAT ANY LANDFILL USED FOR DISPOSAL OF ASBESTOS-CONTAINING OR ASBESTOS CONTAMINATED WASTE IS APPROVED FOR THAT PURPOSE.

H. Bags must be placed in the hole for burial. Dumping of bags from the containers will not be allowed. However, if a bag is torn and if acceptable by the landfill, the entire container may be buried or the tear shall immediately be mended with duct tape and the bag placed into another bag and sealed.

I. Liquid waste for disposal into the sanitary sewer system shall be filtered as specified hereinbefore for wastewater filtering system.

J. If, at any time, the Officer-in-Charge or Qualified Consultant decides that work practices are violating pertinent regulations, or endangering workers, or contaminating the environment, he/she will immediately notify the Abatement Contractor and corrective action must be taken immediately.

K. The Abatement Contractor shall pay all waste disposal charges including special handling fees which shall be included in the bid proposal and no reimbursement of these charges will be made to the City and County. The Abatement Contractor shall make a 24-hour advance notice of all deliveries to the landfill. Delivery time shall be as directed by the landfill operator.

3.08 FINAL CLEANUP

A. Remove all visible accumulation of asbestos-containing materials and debris. The work area shall be totally visibly clean. The Abatement Contractor, in the presence of the Officer-in-Charge and/or the Qualified Consultant, shall make a complete visual inspection of the work area to ensure debris and dust free conditions.

B. Following visual clearance, the Abatement Contractor shall then encapsulate the removal areas (as applicable). If the removal area does not pass visual clearance inspection, the Abatement Contractor shall conduct additional cleaning as directed by the Qualified Consultant, with subsequent visual clearance inspections until the area is acceptably clean.

C. The Abatement Contractor shall remain in proper respiratory protection until approval by the Qualified Consultant.

D. Once the Qualified Consultant has indicated that the work area has passed visual inspection, the City and County's Qualified Consultant will conduct final clearance air sampling. Following completion and verification by phase contrast microscopy (PCM) that the work area air samples are within acceptable

concentrations, less than 0.01 fibers per cubic centimeter (l/cc). The work area will be open to all trades and personnel without respiratory protection.

E. Remove signage required by the asbestos removal work. Signage applicable to job site safety and the performance of the remaining portions of the work shall remain as applicable.

F. Completely remove all temporary materials when their use is no longer required. Clean and repair damage caused by temporary installations or use of temporary facilities. Restore existing facilities to their original condition as approved by the Officer-in-Charge.

3.09 FINAL CLEANUP

A. Remove all visible accumulation of asbestos-containing materials and debris. The work area shall be totally visibly clean. The Abatement Contractor, in the presence of the Officer-in-Charge.

3.10 EQUIPMENT AND FURNISHING CLEANING

A. All contaminated equipment and tools used for removal work shall be washed and cleaned in the work area prior to removing them from the work areas. No washing of contaminated equipment and tools will be allowed outside the work area.

3.11 PERSONAL AIR MONITORING

A. The Abatement Contractor is responsible for all Federal and State occupational monitoring requirements.

3.12 ADDITIONAL CHARGES FOR TESTING/AIR MONITORING BEYOND CONTRACT TIME

A. The Abatement Contractor shall be responsible for the direct reimbursement to the City and County of all air monitoring charges required by the Abatement Contractor's not completing the work in the specified contract period. The Abatement Contractor shall also be responsible for the reimbursement of additional fees incurred for additional clearance samples if the first set does not pass

END OF SECTION

SECTION 13282 - LEAD-CONTAINING PAINT CONTROL MEASURES

PART 1 - GENERAL

1.01 SUMMARY

A. This Section specifies the Contractor responsibilities for controlling lead hazards if lead-containing paints (LCP) are identified in the project area of the Neal Blaisdell Concert Hall Cooling Tower Replacement project.

1. LCP is defined as any paint containing a measurable level of lead. Lead- based paint (LBP) is defined as 5,000 milligrams per kilogram (mg/kg) or 0.5% by weight lead or higher.

2. Contractor is required to complete lead paint-related work in accordance with applicable federal, state, and local regulations.

3. The lead abatement work shall include removal of all LCP within the work area that was identified in the Contractor's Hazardous Materials Survey performed in accordance with SECTION 01715 - EXISTING CONDITIONS - ASBESTOS / LEAD / HAZARDOUS MATERIAL SURVEY.

B. Contractor must implement appropriate engineering controls and safety measures to prevent site worker, public, and environmental exposures to lead hazards.

C. Contractor shall ensure that employees and subcontractors involved in disturbing or removing lead paint debris or waste materials have access to relevant information, understand, and control lead hazards. Refer to Section 13288 - TESTING/AIR MONITORING for the Contractor responsibilities involving requirements for compliance associated with LCP-related work.

D. Costs incurred due to the Contractor's negligence in controlling hazards shall be borne by Contractor, including but are not limited to, medical, legal, public and regulatory relations, investigation, clean-up, monitoring, and reporting.

1.02 PRELIMINARY

A. In conducting renovation or demolition of surfaces with LCP, utilize possible safeguards, precautions, and protective measures to prevent exposure of individuals to lead.

B. Disturbance of lead-containing paints and coatings may cause lead-containing dust and debris to be released into the atmosphere, thereby creating a potential health hazard to workers and other personnel within and outside the project area. Inform workers, supervisory personnel, subcontractors, and consultants of the potential health hazards and of proper work procedures which must be followed when working with LCP.

C. The Contractor and his/her subcontractors shall review plans and specifications and ensure that site workers, including subcontractors, fully understand its contents, including hazard identification and control.

D. The Contractor shall take appropriate and continuous measures and methods to provide necessary information and devices, to protect workers from the potential hazards of lead

exposure through airborne lead-containing dust. Such measures must comply with applicable federal, state, and local regulations.

E. Ensure the Contractor's workers are trained in accordance with the U.S. Occupational Safety and Health Administration (OSHA) Lead in Construction Standard [29 Code of Federal Regulations (CFR) 1926.62].

F. Complete work under this contract in strict accordance with applicable federal, state, and local regulations, standards, and codes governing the preparation, treatments, handling, storage, transport, and disposal of lead-containing paints and coatings. The most recent edition of the aforementioned shall govern the execution of this project.

G. Requirements of the National Emission Standards of Hazardous Air Pollutants (NESHAP) apply to this project. Lead paint disturbance activities shall be controlled and monitored.

1.03 PATENTED DEVICES, MATERIAL AND PROCESS

Not applicable.

1.04 WORK SPECIFIED IN THIS SECTION

A. Control lead hazards during the project related work in accordance with laws, regulations, and current best work practices.

B. It is the responsibility of the Contractor to understand and control potential lead hazards. Work covered by this Section includes the incidental procedures and equipment required to protect site workers, the public, and the environment from lead exposures.

C. Conduct work in accordance with 29 CFR 1910.1025, 29 CFR 1926.62, and the requirements specified herein.

1.05 COORDINATION WITH OTHER SECTIONS

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

B. Related Sections are:

1. Section 01715 - EXISTING CONDITIONS - ASBESTOS / LEAD / ARSENIC/ HAZARDOUS MATERIAL SURVEY for general requirements

2. Section 13288 - TESTING/AIR MONITORING for requirements for monitoring and clearance in support of compliance

1.06 SUBMITTALS

A. Before start of work: Do not begin work until these submittals are returned, indicating that the information contained in the submittal is concurred by the Officer-In-Charge.

B. Lead Hazard Control Statement: Submit a detailed job-specific statement of the work procedures to be used during LCP-related work. Statement shall include, but are not limited to:

1. Clear scope of work involving LCP

2. Methods to control lead hazards and methods to prevent worker exposure to lead

3. Name and contact information of the Competent Person on-site

4. Training Certificates: Submit a copy of workers and the Competent Person's OSHA required "Lead in Construction" training, who will conduct lead removal or disturbance

C. Closure Document: Upon completion of the lead paint-related work, the Competent Person shall submit a closure document, including but are not limited to:

1. Start and completion dates of lead-paint related work

2. Name, address, and signature of each inspector and the Competent Person conducting clearance and the date of clearance completion

3. Clearance results and laboratory report, if sampling and analysis is conducted

4. Detailed written description of lead hazard controls, including methods used, locations of components where work was carried out, rationale for selecting particular lead hazard control methods for each component, and any monitoring results or control of encapsulants or enclosures

5. Waste disposal documents

D. Records

1. Laboratory Analytical Results: Submit a copy of air monitoring results, if performed, and lead-containing dust clearance results to the Officer-In- Charge within 24-hours of receipt from the laboratory.

2. Uniform Hazardous Waste Manifest Form: Submit completed waste manifests, as applicable within 5 days of disposal. Before any disposal documentation is drafted, the quantities and types of waste generated shall be reported to the Officer-In-Charge.

3. Manufacturer's Safety Data Sheets: Submit for any chemicals and chemical products brought on-site.

4. EPA Waste Generator Identification Number for the site if hazardous waste is generated.

1.07 PRODUCT HANDLING:

A. Dispose of materials that become contaminated with lead in accordance with applicable regulations.

1.08 REFERENCES:

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

A. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI). ANSI Z88.2 (2015) Practice for Respiratory Protection

B. CODE OF FEDERAL REGULATIONS (CFR)

1. 29 CFR 1910.134 Safety and Health Standards (Respiratory Protection)

2. 29 CFR 1910.1025 Safety and Health Standards (Lead)

C. U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT (HUD). Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing

D. HAWAII ADMINISTRATIVE RULE (HAR) Title 11, chapter 41 Lead-Based Paint Activities

E. UNDERWRITERS LABORATORIES, INC. UL-586 (2004) High-Efficiency, Particulate, Air Filtration Units

1.09 GENERAL REQUIREMENTS

A. Title to Materials: Waste material resulting from this work shall become the property of the Contractor and shall be disposed of as specified herein. In an event hazardous waste is generated, the EPA ID number shall be obtained from the Officer-In- Charge.

B. Medical Surveillance: Before exposure to lead-containing dust, the Contractor shall provide workers with a comprehensive medical examination as required by 29 CFR 1910.1025 if the worker has potential to be exposed to the Permissible Exposure Limit (PEL; 50 micrograms per cubic meter air) for 30 days a year or more. Examination is not required if records show the employee has been examined as required by 29 CFR 1910.1025 within the past 12 months. Maintain complete and accurate records of employees' medical records and certificates of workers’ acknowledgement for 50 years.

C. Training: Within 12 months prior to assignment to lead work, each employee shall receive training with regard to the hazards of lead, safety and health precautions, the use and requirements for protective clothing, equipment, and respirators, and the additional requirements of 29 CFR 1910.1025. Furnish each employee with a respirator fit test as required by 29 CFR 1910.1025, if the worker is exposed to PEL for 30 days or more per year. The training shall include engineering and other hazard control techniques and procedures.

D. Respiratory Protection Program: Establish and implement a respiratory protection program as required by ANSI A88.2, 29 CFR 1910.134, and 29 CFR 1910.1025.

E. Health and Safety Compliance: In addition to detailed requirements of this Section, comply with laws, ordinances, rules, and regulations of federal, state, and local authorities regarding handling, storing, transporting, and disposing of lead waste materials. Submit matters of interpretation of standards and of specification requirements to the Officer-In-Charge for resolution before bidding. Where specification requirements and referenced documents vary, the most stringent requirement shall apply.

F. Competent Person: Lead paint related work shall be performed under the supervision of the Contractor's Competent Person. The Competent Person shall complete the following tasks:

1. Ensure employee training is compliant with federal, state, and local requirements.

2. Review and approve the lead hazard control work statement and ensure applicable standards are met.

3. Conduct regular inspections of work performance for compliance with the specifications and prepare a daily log of work performed.

4. Implement engineering controls to prevent lead exposure to site workers, the public, and the environment.

5. Prepare and submit the Closure Document (Part 1.06 B).

6. Specify the locations, extents, and conditions of lead-containing paint removed or disturbed.

1.10 DEFINITIONS

A. Air Monitoring: Sampling and assessment of lead concentrations at the project area, project vicinity, and/or worker breathing zone.

B. Competent Person: Contractor personnel who is capable of identifying existing and suspect lead paint hazards in the work area and project site, selecting the appropriate control strategy to prevent lead exposure, and who has the authority to take prompt corrective measures to manage exposure.

C. Lead: Metallic lead, inorganic lead compounds, and inorganic lead soaps.

D. Lead Control Area: An area where lead removal operations are completed and is isolated by physical boundaries to prevent unauthorized entry of personnel and to prevent the spread of lead-containing dust, paint chips, or debris.

E. Lead Permissible Exposure Limit (PEL): The limit is 50 micrograms per cubic meter ($\mu g/m_3$) of air as an 8-hour time-weighted average (TWA) as determined by Appendix A of 29 CFR 1910.25.

F. Action Level (AL): The AL for an 8-hour TWA exposure to airborne lead is 30 $\mu g/m_3$.

G. High Efficiency Particulate Air (HEPA) Filter Equipment: HEPA filtered vacuuming equipment with a UL 586 filter system capable of collecting and retaining lead- containing dust.

H. Personal Monitoring: Sampling of air for lead concentrations within the breathing zone of an employee to determine the 8-hour TWA in accordance with 29 CFR 1910.1025. The samples shall be representative of the employee's work tasks. The breathing zone is considered the area within 12 inches of the nose or mouth of an employee.

I. Time-Weighted Average (TWA): The TWA is an 8-hour time-weighted average of airborne lead per cubic meter of air, which represents the employee's 8-hour workday as determined by 29 CFR 1910.1025.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.01 PREPARATION PRIOR TO DISTURBANCE OF LEAD-CONTAINING PAINT

A. Document existing paint chips or debris prior to work, as applicable.

1. If there are any paint chips or debris in the project area, Contractor shall pre-clean horizontal surfaces within the work area prior to disturbing existing LCP.

2. Contractor shall treat paint chips or debris collected during pre-cleaning and during project related activities as lead-containing waste.

B. Minimize lead-containing dust during work performance using wet methods and equipment with HEPA collection devices. If visual inspection, air monitoring, or clearance by Competent Person or Officer-In-Charge indicates that control measures are inadequate, Contractor shall stop work, clean up the affected area, and implement enhanced engineering controls at no additional cost to the City and County.

C. Establish a lead control area. Isolate and protect the portions of the building or area not within the scope of work using 6-mil polyethylene sheeting, or equivalent.

D. Demarcate the exterior lead control area using lead warning tape.

1. Lead warning tape shall be at least 20 feet away from the closest painted surface being disturbed.

2. Lead warning tape may be placed closer only if existing structural conditions prevent a 20 foot space between the lead warning tape and the working surface.

3. Place drop cloths around exterior surfaces.

4. Secure drop cloths so that wind or other forces will not dislodge the cloths.

5. Drop cloths shall extend horizontally to capture all paint debris.

6. Drop cloths shall be periodically cleaned.

E. Pre-work visual inspection: Inspect the immediate project and adjacent areas for the presence of paint chips or debris and document the physical conditions with photographs and narratives. This documentation will serve as baseline conditions to which final visual clearance will be compared.

3.02 ACTIVITIES DISTURBING LEAD-CONTAINING PAINT

A. Complete paint removal or demolition as required for this project, and minimize lead-containing dust using wet methods and HEPA equipment. If visual inspection indicates control measures inadequate, Contractor must stop work, conduct clean-up, and implement enhanced engineering controls immediately, at no additional cost to the City and County.

B. Do not execute dry removal or dry sweeping. Waste or paint debris generated during removal shall be promptly staged or bagged, and shall not accumulate uncontrolled at any time. Lead-containing waste shall be properly marked and stored in secure containers appropriate for storing lead-containing waste.

C. Contractor shall not allow lead-containing waste to be stored outside the lead control area, in a high traffic unsecured area, or where the waste could interact with rainfall or wind and create a secondary hazard or contamination.

3.03 LEAD CONCENTRATIONS IN THE WORK AREA

A. Maximum permissible exposure to airborne concentrations of lead within the project area shall be 30 µg/m_3. Stop work whenever this limit exceeded, and Competent Person shall remedy the condition prior to commencing work.

B. Instruct and train each worker:

1. Minimize airborne lead hazards

2. Use respiratory protection appropriate for the lead-containing dust levels encountered in the work place or as required for other toxic or oxygen- deficient situations encountered.

C. Air Purifying Respirators: If the worker exposure is anticipated to reach or exceed the PEL, 50 micrograms per cubic meter air, provide half-face or full-face type respirators.

1. Filter Cartridges: Provide, at a minimum, HEPA type filters labeled with the National Institute for Occupational Safety and Health (NIOSH) Certification for "Radionuclides, Radon Daughters, Dust, Fumes, Mists including Asbestos-Containing Dusts and Mists" and color coded in accordance with ANSI Z228.2. In addition, a chemical cartridge section may be added.

2. Non-Permitted Respirators: Do not use single use, disposable or quarter- face respirators.

3. Require that respiratory protection be used whenever there is any possibility of LCP disturbance, intentional or accidental.

D. Fit Testing

1. Initial Fitting: Provide initial fitting of respirators during a respiratory protection course of training. Fit types of respirator to be actually worn by each individual. Allow an individual to use only those respirators for which training and fit testing have been provided.

2. On an Annual Basis: Check the fit of each worker's respirator by having irritant smoke blown onto the respirator from a smoke tube. Valid fit test certificates shall be included in the Lead Hazard Control statement.

3. Upon Each Wearing: Require that each time an air-purifying respirator is donned, it will be checked for proper fitting with a positive and negative pressure fit checks in accordance with the manufacturer's instructions or ANSI Z88.2 (2015).

E. Type of Respiratory Protection Required

1. Provide respiratory protection as indicated in paragraph below. Higher levels of protection may be provided as desired by Competent Person or workers. Where the paragraph below does not apply, determine the proper level of protection by dividing the expected or actual airborne lead- containing dust levels in the work area by the "protection factors" given below.

2. Use the following unless air monitoring results indicate greater protection is necessary. Refer to the Protection Factors table for choice of respirators.

a. Loose equipment cleaning prior to removal in uncontaminated area: Half-face dual cartridge-type respirator.

b. Plastic installation which does not disturb LCP: Half-face dual cartridge-type respirator.

c. Removing or cleaning items or plastic installation when such operation may disturb LCP or dust: Dual Cartridge, Half-face Air Purifying Respirators.

d. Lead-containing material removal: Dual Cartridge, Half-face Air Purifying Respirators.

e. Gross cleaning of removal area(s): Dual Cartridge, Half-face Air Purifying Respirators.

f. Loading and unloading drums on truck (outside work area): Dual Cartridge, Half-face Air Purifying Respirators.

g. Lead-Containing Paint removal: Dual Cartridge, Half-face Air Purifying Respirators.

3.04 PROTECTIVE CLOTHING:

A. Furnish personnel exposed to lead-containing dust with disposable protective whole body clothing, head covering, gloves, and foot coverings, as applicable. Furnish disposable plastic or rubber gloves to protect hands from lead.

PROTECTION FACTORS

RESPIRATOR TYPE	PROTECTION
Air purifying: Negative pressure respirator HEPA filter Half face piece	Up to 500 µg/m_3
Powered-Air Purifying Respirator (PAPR): Negative pressure respirator HEPA filter	Up to 2,500 µg/m_3
RESPIRATOR TYPE	PROTECTION
Full face piece	
PAPR Positive pressure respirator HEPA filter Half or full face piece or Type C supplied air: Positive pressure respirator Continuous-flow half or full face piece	Up to 5,000 µg/m_3

3.05 WARNING SIGNS AND LABELS:

A. Provide warning signs at approaches to the lead control areas, if lead-containing paint is disturbed.

B. Locate signs at such a distance that personnel may read the sign and take necessary precautions before entering the area.

C. Provide and affix labels to impermeable bags, lead waste drums, and other containers containing lead materials, scrap, waste, or debris.

D. Signs and labels shall comply with the requirements of 29 CFR 1910.1025.

3.06 TOOLS:

A. Filters on vacuums and exhaust equipment shall be absolute HEPA filters and UL 586 labeled.

3.07 AIR MONITORING

A. Employee Monitoring

1. Contractor shall initially determine if any employee may be exposed to lead at or above the action level, 30 micrograms per cubic meter of air.

2. For the purpose of this part, employee exposure is that exposure which would occur if the employee is not using a respirator.

3. Contractor shall collect personal samples representative of a full shift including at least one sample for each job classification in each work area.

4. Full shift personal samples shall be representative of the monitored employee's regular, daily exposure to lead.

5. Until Contractor performs exposure assessment per paragraph (d) of 29 CFR 1926.62, the Contractor shall assume that the worker is exposed above the PEL, 50 micrograms per cubic meter of air, and shall implement worker protective measures.

B. Work area and adjacent areas: Contractor shall visually inspect the controlled area and outside of the controlled area. Contractor activities shall not adversely impact the indoors or outdoors air and soil qualities of the project site.

3.08 STOP ACTION LEVELS

A. Inside Work Area: No visible emissions shall be permitted.

1. If visible emissions are observed, revise work procedures to lower ambient dust levels.

2. Stop work except corrective action, and the Competent Person shall notify Officer-In-Charge. After correcting the cause of lead-containing dust levels, do not recommence work for 24 hours unless otherwise authorized, in writing, by Competent Person.

B. If the visible emissions are the result of Contractor failure of work area isolation measures, initiate the following actions:

1. Decontaminate the affected area(s).

2. Require that respiratory protection be worn in affected area until the area is cleared for other trades or on-site staff.

3. After a Certification of Visual Inspection has been completed for the work area, lead dust wipe samples may be collected from the indoors horizontal surface. Refer to Section 13288 - TESTING/AIR MONITORING for requirements and clearance criteria.

C. If visible emission was the result of causes other than the Contractor's, Officer-In-Charge will initiate corrective actions.

D. Effect on Contract Sum. Complete corrective work with no change in the Contract Sum if visible emissions were caused by Contractor activities. Costs involving delay, additional lead air monitoring and quality control, investigation, and reporting shall be borne by Contractor.

3.09 ANALYTICAL METHODS

A. NIOSH 7082 method shall be used in analyzing air samples. Filters used shall be in accordance with the referenced method.

B. NIOSH 9100 method shall be used in analyzing lead dust wipe samples.

3.10 LEAD AIR SAMPLE MEDIUM:

A. Air samples will be collected on 37 millimeter (mm) cassettes with 50 mm extension cowl with 0.8 micrometer cellulose ester membrane.

3.11 LABORATORY TESTING

A. Services of an accredited testing laboratory shall be employed by Contractor. Lead air sample results will be made available to Officer-In-Charge within 12 hours upon receipt of laboratory analytical results.

B. Officer-In-Charge will have access to air monitoring tests and clearance results.

3.12 CLEAN UP

A. Maintain surfaces of the lead control area free of accumulations of paint chips and dust. Prevent the spread of dust and debris; keep waste from being distributed over the general project area.

1. Do not dry sweep the area.

2. When the paint removal, demolition, or renovation is completed:

a. Clean visible lead paint contamination by vacuuming with a HEPA vacuum followed by wet mopping and wiping.

b. Contractor shall certify that the work was completed in accordance with 29 CFR 1910.1025 and that there are no visible accumulations of lead-containing paint and dust in the project areas.

c. Competent Person shall visually inspect the affected surfaces for residual paint chips and accumulated dust after the work is completed.

d. Contractor shall re-clean areas showing dust or residual paint chips to the satisfaction of the Officer-In-Charge.

B. Contractor is responsible for the restoration and cleaning of any areas outside the work area impacted by or contaminated by lead-containing dust or debris generated by the Contractor’s work, such as removal, handling, or storage of lead-containing waste. Contractor shall perform remedial cleaning and restoration of these areas, if any, at no additional cost to the City and County.

3.13 CLEARANCE

A. Contractor shall visually inspect the affected surfaces for residual lead paint chips and accumulated dust. Before the removal of the lead control area, Contractor’s Competent Person shall inspect the project area.

B. Contractor shall visually inspect exterior areas adjacent to the work area for lead paint chips or debris and ensure zero visible emissions. Contractor shall restore any areas impacted by lead-containing dust or debris to their original condition or better.

C. In settling disputes: Lead dust wipe sampling shall be conducted by a certified LBP Risk Assessor or Project Designer. Lead dust wipe samples shall be analyzed by the NIOSH 7082 method, and the results per room shall be less than 40 micrograms per square foot (µg/ft_2) for floor and less than 250 µg/ft_2 for window sills.

3.14 DISPOSAL

A. The levels of lead in paint (<100 mg/kg) found in this project area are not anticipated to result in hazardous waste; however, landfill may require a representative sample of the waste to be generated from this project and analyzed by a qualified laboratory for Toxicity Characteristic Leaching Procedure (TCLP) analysis.

1. If analytical result indicates the TCLP level is below the EPA guideline or within the landfill acceptance criteria, the waste generated from the project can be disposed of as general construction and demolition (C&D) debris.

2. If the TCLP test fails or the result exceeds the landfill acceptance criteria, the waste shall be treated as hazardous waste and be disposed of in a Resource Conservation Recovery Act (RCRA) permitted landfill. Contractor shall contact Officer-In-Charge for EPA ID number.

B. Officer-In-Charge will review for equitable adjustment of contract amount upon evaluation and acceptance of the TCLP results to determine the hazard characteristics. If the waste is determined to be RCRA hazardous waste, the waste shall be disposed of at an off-island EPA-approved facility.

C. Contractor shall submit a copy of the TCLP analytical results, if performed, Hazardous Waste Manifest, and Landfill Receipt, to Officer-In-Charge prior to disposal.

3.15 GENERAL

A. Waste is to be hauled by a waste hauler with required licenses from state and local authority with jurisdiction.

B. Protect interior of truck or dumpster with Critical and Primary Barriers, as applicable.

C. Carefully load containerized or bagged waste in fully enclosed dumpsters, trucks or other appropriate vehicles for transport. Exercise care before and during transport, to ensure that no unauthorized persons have access to the material. Vehicles should be placarded with Department of Transportation labels, as appropriate.

D. Do not store containerized or bagged waste outside of the work area. Take containers from the work area directly to a sealed truck or dumpster.

E. Do not transport lead waste materials on open trucks. If waste material is to be transported in drums, label drums with the same warning labels as the bags.

F. Advise the waste storage facility or landfill in advance of transport and of the quantity of material to be delivered.

G. Retain and submit a copy of receipts from waste storage facility or landfill for materials disposed of.

H. After completion of hauling and disposal of each load, submit a copy of waste manifest, chain of custody form (if applicable), and waste storage facility receipt to Officer-In-Charge. Final contract payment shall not be made until documents are submitted.

3.16 MEASUREMENT AND PAYMENT:

A. Except for hazardous waste as indicated in Part 3.14B, removal and disposal of paint waste and demolition debris shall not be measured or paid for separately, but shall be considered incidental to the lump sum price bid for the item of which it is a part in the Bid Schedule.

END OF SECTION

APPENDIX A

HAZARDOUS WASTE DISPOSAL LOG (Sample)

Name of project _____

Street address _____

City and County of Honolulu, State, Zip code _____

Year 20___	**Description of Hazardous Waste**	**Approximate Weight Kg Pound**	**Special Handling**
January			
February			
March			
April			
May			
June			
July			
August			
September			
October			
November			
December			

_____

By Signature

_____

Print Name

APPENDIX B

PROJECT HAZARDOUS WASTE LOG (Sample)

Project: _____
Job number: _____

Start date: _____ Completion date: _____

General contractor: _____
Address: _____
_____
Telephone/fax no.: _____
Name of superintendent for this project: _____

Name of generator: _____
Address: _____
_____
Telephone/fax no.: _____

Description of hazardous waste: _____
_____
Approximate weight (kg or pounds):
Monthly disposal log:
Month: Weight:
_____
_____
Disposal site: _____

Contractor disposing of hazardous waste: _____
Address: _____
_____
Telephone/fax no.: _____

Disposal contractor is a (check one):

Conditionally Exempt Small Quantity Generator	
Small Generator	
Large Generator	

APPROVAL:
Competent Person: _____
Company: _____
Address: _____
_____
Telephone no. _____

_____
Signature Date

SECTION 13288 - TESTING / AIR MONITORING

PART 1 - GENERAL

1.01 SUMMARY

A. This Section defines the Contractor's responsibility for air monitoring, inspection, and testing while conducting work which disturbs materials that have potential to generate airborne hazards, such as lead-containing paint (LCP), at the Neal Blaisdell Center Concert Hall Cooling Tower Replacement project.

B. Testing and air monitoring shall be conducted for the purpose of:

1. Verifying compliance with applicable codes, regulations, and laws regarding working with LCP.

2. Ensuring that the legally required documentation is collected.

3. Providing engineering controls during the project to prevent exposures.

C. Contractor must implement appropriate engineering controls and safety measures to prevent site workers, on-site staff, the public, and the environment from exposure to lead hazards. Costs incurred due to Contractor negligence or failure to control hazards shall be borne by the Contractor, including but are not limited to, investigations, medical, legal, regulatory and public relations, cleanup, monitoring, and reporting.

1.02 DEFINITIONS

A. Abatement Contractor: Firm engaged to remove, encapsulate, and/or dispose of LCP and lead-containing debris.

B. Competent Person: Contractor personnel who is capable of identifying existing and suspect lead hazards in the work area and project site, selecting appropriate control strategy to prevent lead exposures, and who has the authority to take prompt corrective measures to minimize exposures.

C. Contractor: General Contractor engaged in the miscellaneous repairs or renovations of the facility's project areas.

D. HUD: United States Department of Housing and Urban Development

E. Lead: Metallic lead, inorganic lead compounds, and inorganic lead soaps.

F. Lead Control Area: An area where LCP is disturbed and is isolated by physical boundaries to prevent unauthorized entry of personnel and to prevent the spread of lead-containing dust, paint chips, or debris.

G. High Efficiency Particulate Air (HEPA) Filter Equipment: HEPA filtered vacuuming equipment with a UL 586 filter system capable of collecting and retaining lead- containing dust.

1.03 COORDINATION:

A. Testing/air monitoring requirements included in the scope of work shall be coordinated with Section 01715 – EXISTING CONDITIONS, and Section 13282 – LEAD-CONTAINING PAINT CONTROL MEASURES.

1.04 PRE-CONSTRUCTION MEETING

A. A meeting shall be held prior to site work and shall be conducted by the Contractor.

B. Attendance: Contractor, Officer-In-Charge, and Competent Person shall attend.

C. Agenda

1. Review final schedule for project.

2. Review legal requirements and special and sensitive conditions and constraints.

3. Verify compliance with pre-construction requirements, and obtain a copy of notifications to the Hawaii Department of Health, if applicable.

4. Review Contractor's scheduled work and equipment, engineering controls, personal protective equipment, and hazard control measures for workers, on-site staff, the public, and the environment.

5. Review work procedures and responsibilities.

6. Clarify the scope of work and its impact on the users of the building and the surroundings.

1.05 TESTING/AIR MONITORING/SUPERVISION AND AIR MONITORING

A. Project supervision and personal air monitoring shall be conducted by the Contractor's Competent Person.

B. Laboratory used for sample analysis shall be proficient in the National Institute for Occupational Safety and Health (NIOSH) Proficiency Analytical Testing (PAT) program.

1.06 DESCRIPTION OF WORK:

A. Furnish labor, materials, and equipment necessary to carry out the personnel and environmental monitoring, record keeping, and proper disposal in compliance with applicable federal, state and local laws and regulations during the performance of the project. Work shall be conducted with zero visible emission.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 COMPETENT PERSON'S RESPONSIBILITIES

A. Contractor's competent person shall prepare a Lead Hazard Control Statement per 13282 Part 1.06 A.

B. Competent person shall coordinate with the landfill and, if required by the landfill, review Toxicity Characteristic Leaching Procedure (TCLP) results and waste documents. In the event that the waste is determined to be hazardous, inform Officer-In-Charge to consider equitable adjustment to the contract.

3.02 CONTRACTOR RESPONSIBILITIES

A. Contractor is responsible for submitting complete work statements for review and concurrence by the Officer-In-Charge. Refer to Section 13282 LEAD-CONTAINING PAINT CONTROL MEASURES Part 1.06 A for requirements of the work statement.

B. Contractor is responsible for worker monitoring and necessary records for the Contractor's employees as required by OSHA (29 CFR 1926.562, Hawaii Administrative Rules), and other applicable laws.

C. Contractor shall obtain legally required documentation for air monitoring and a respiratory protection program as part of the contract.

D. Costs involving investigations, air monitoring, legal, medical, testing, and reporting due to the Contractor's failure to control hazards shall be borne by the Contractor, and shall be deducted from the final contract payment.

E. Additional testing requested by the Officer-In-Charge shall be accommodated by the Contractor but shall not remove the Contractor from the responsibility of monitoring required by law and the contract specifications.

F. For final cleanup and decontamination following disturbance, remove the final polyethylene sheeting or drop cloths but leave the coverings for critical barriers, such as doors, windows, air ducts, etc., until successful clearance is obtained.

G. Lead Clearance: The Contractor's Competent Person shall conduct clearance of lead control areas by visual inspection. If there are conflicting requirements, the most stringent requirement shall be implemented.

1. In settling disputes: Lead dust wipe sampling shall be conducted in each space or the decision area in question.

2. Certified Lead Risk Assessor or Project Designer shall collect the dust wipe samples and analyze by the NIOSH 7082 method. Lead dust wipe clearance results per decision area shall be less than 40 micrograms per square foot ($\mu g/ft_2$) for floor and less than 250 $\mu g/ft_2$ for window sills.

H. Additional area air monitoring and/or testing necessary as a result of insufficient cleanup efforts by the Contractor will be supplied at the Contractor's cost.

3.03 MONITORING AND INSPECTIONS BY COMPETENT PERSON

A. Duties of the Competent Person

1. Photographic Record of Project: Record site work with representative photos. Photos shall become the property of the City and County and must be accompanied by a detailed log.

2. Project Log: Maintain daily field reports detailing key activities during LCP-related work and submit a summary of project activities to the Officer-In- Charge. Incorporate daily field reports with other project data into a final closeout report.

3. Visual Inspection of Project Areas: Conduct regular inspection of project and adjacent areas. Conduct inspections during the actual work performance of the Contractor to document the work practices employed by the Contractor. Verify that scheduled abatement or mitigation work is completed, and the area was properly and promptly cleaned and ready for other trades involved in the project or for on-site staff.

4. Change Order: If changes are necessary once construction begins, review the request for change and provide rationale to the Officer-In-Charge. Per Section 13282 Part 3.16, paint disturbance and disposal of waste will not be measured or paid for separately, except for the hazardous waste determined by the TCLP testing (Section 13282 Part 3.14B).

B. Site Monitoring

1. On-site environmental and personnel air monitoring as required by the EPA, OSHA, and the project specifications

2. Laboratory analysis of lead in the air using NIOSH 7082 method

3. Monitoring of decontamination procedures at the control area entry/exit

4. Monitoring of the controlled area maintenance by visual inspection.

5. Interface with the maintenance staff, representatives of regulatory agencies, and the Officer-In-Charge

6. Ensure proper respiratory protection is utilized by personnel within control areas

7. Relay to the Officer-In-Charge any discrepancies or deviations in the Contractor's action from provisions of the project specifications

3.04 TESTING/AIR MONITORING

A. The Competent Person shall have authority to stop work or to exercise engineering controls during the project.

B. The Competent Person may conduct additional testing and air monitoring at his/her discretion at the Contractor’s cost.

C. Monitoring activities shall be documented and submitted to the Officer-In-Charge with test results, interpretations, follow-up actions, and final resolutions within 10 days of the completion of lead paint disturbance.

3.05 SAMPLING DESIGN

A. The following is a typical sampling design per the control area during the construction. Number of sample quantities and volume may vary, depending on each project's objectives.

B. Background Samples: Background baseline samples shall be taken prior to LCP work to establish existing airborne concentration levels. Three high volume continuous-flow samples shall be taken per anticipated control area. Work area samples shall be analyzed by the NIOSH 7082 method for lead in air. The reference TWA (time weighted average) for lead shall be established prior to the control area preparations.

C. Work Area Samples: Low volume samples of a maximum of 480 liters each shall be taken in the work area. Ambient air samples shall be taken in the work area for comparison to barrier samples in an effort to ensure that containment or control systems are secure and that the persons entering the work area have proper respiratory protection. If monitoring results inside and outside the controlled area indicate airborne concentrations are greater than or equal to 30 micrograms lead per cubic meter air, the Contractor shall correct the condition(s) causing the increase and ensure that the Contractor maintains the ambient conditions below the action levels.

D. Barrier Samples: As applicable, collect two air samples per barrier.

E. Outdoors Environmental Samples: Each task area shall be controlled so that airborne dust cannot escape into occupied areas or public access areas. Per the Competent Person’s discretion, high volume or low volume samples per controlled area shall be taken.

F. Lead Wipe Samples: For each space or decision area, lead dust wipe samples shall be collected from each of the following interior locations, to settle disputes:

1. Floors – Wipe results shall not exceed 40 $\mu g/ft^2$

2. Interior Window Sills – Wipe results shall not exceed 250 $\mu g/ft_2$ Both lead dust wipe results must be below the HUD clearance criteria.

3.06 DAILY TESTING RECORDS

A. At the conclusion of each day's testing, the Competent Person shall provide a copy of air monitoring records of each control area, as applicable, to the Officer-In-Charge.

3.07 MEASUREMENT AND PAYMENT

A. Work involving site/task monitoring, worker protection, waste characterization, documentation, and compliance for disturbance and disposal of lead paints shall not be measured or paid for separately but shall be considered incidental to the lump sum price bid for the item of which it is a part in the Bid Schedule.

END OF SECTION

DIVISION 15 - MECHANICAL

SECTION 15050 – BASIC MECHANICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.01 SUMMARY

A. These general mechanical requirements apply to all sections of Division 15 - Mechanical of this project specification, unless specified otherwise in the individual sections.

B. The organization of the Division 15 Mechanical specifications into sections and articles and arrangement on the drawings are not intended to divide the Work among subcontractors or in establishing the extent of Work to be performed by any trade. The Contractor is responsible for providing all Work specified in the specifications and indicated on the drawings.

C. "Provide" shall mean "furnish and install." Connect exterior utility systems to building systems 5 feet beyond the building line and as shown on the drawings.

1.02 QUALITY ASSURANCE

A. The Contractor shall furnish all labor, materials, tools and equipment and perform all work and services necessary for complete and properly operated mechanical systems, as shown on the drawings and as specified, in accordance with provisions of the Contract Documents and completely coordinate his work with that of all other trades.

B. The Contractor shall completely examine the Contract Documents and shall report to the Officer-in-Charge any error, inconsistency or omission he discovers. Bidders are cautioned to review the Technical Specifications carefully and thoroughly. The submittal of a bid shall be considered as acceptance of the specifications as published. Protests concerning the Technical Specifications lodged after bid opening shall not be considered.

C. Provide all supplementary or miscellaneous items, hangers, supports, details, appurtenances and devices incidental to or necessary for a sound, secure, complete and operating mechanical system where work required is not specifically indicated.

D. Drawings and specifications shall be taken together. Provide work specified or stated in one or the other document as though mentioned in both.

E. Substitution of another manufacturer's product for materials or equipment specified and for items with "approved substitute" after the brand name requires approval in accordance with the General Instructions to Offerors (02/09/17). Substitutions will not be considered after the bid opening unless specifically approved by the City as an exception. The City reserves the right to make the decision unilaterally. Equal

products are acceptable in lieu of those specified hereinafter by specific manufacturer and model number if approved.

F. The Contractor shall warrant that all materials and equipment, furnished under this Contract, will be new and that all work will be of good quality, free from faults and defects, in conformance with the Contract Documents for a guarantee period of one year.

G. The Contractor shall maintain at the site, a minimum of one (1) copy of all Drawings, Specifications, Addenda, approved Shop Drawings, Change Orders and other modifications, in good order and marked to record all changes made during construction. These shall be made available to the Officer-in-Charge upon request.

H. The Contractor shall, at all times, keep the premises free from accumulation of waste materials or rubbish caused by his operations. Upon completion of the work each day, the Contractor shall remove all waste materials and rubbish from and about the project, as well as all his tools, construction equipment, machinery and surplus materials and shall clean all new equipment, materials, items and accessories.

I. The Contractor shall give the Officer-in-Charge timely notice of its readiness for testing any work, including the scheduling of agencies with the jurisdiction over the work, test equipment and personnel, and all other data arrangements for the City to observe the testing. The Contractor shall bear all cost of such tests.

J. Workmanship and Materials:

1. Workmanship shall be of the best quality and none but competent mechanical workers skilled in their trades and thoroughly familiar with the work involved shall be employed. The Contractor shall furnish the services of an experienced superintendent, who will be constantly in charge of the work, until the project is completed and accepted.

2. References to standards are intended to be the latest revision of the standard specified.

3. Unless otherwise specified later in this section, each article of its kind shall be the standard product of a single manufacturer.

4. Whenever the words “or approved substitute” or other words of similar intent or meaning are used, implying that judgment is to be exercised, it is understood that it is the judgment of the Officer-in-Charge.

5. The City shall have the right to accept or reject any material, equipment and/or workmanship and determine when the Contractor has complied with the requirements specified in this section and all technical sections that refer to this section.

6. All manufactured materials shall be delivered and stored in their original containers. Equipment shall be clearly marked or stamped with the manufacturer’s name and rating. Equipment and materials shall be carefully handled, properly stored and adequately protected to prevent damage before and

during installation, in accordance with the manufacturer's recommendations and as approved by the Officer-in-Charge. Damaged or defective items, in the opinion of the Officer-in-Charge, shall be replaced.

K. All exposed new work or disturbed existing work shall be painted. Color to match adjacent area.

1.03 CONTRACT DRAWINGS

A. Contract drawings are essentially diagrammatic, indicating general layout and approximate locations toward establishing the scope for uniform estimating basis for all bidders. They are not intended to be detailed construction working drawings. Equipment, ductwork and piping arrangements shall fit into space allotted and shall allow adequate clearances for servicing and maintenance. Reasonable modifications to indicated locations and arrangement to suit job conditions shall not constitute basis for requesting additional funds from the City.

B. Because of the small scale of drawings, it is not possible to indicate all offsets, fittings, and accessories which may be required. The Contractor shall carefully investigate structural and finish conditions affecting his work and arrange such work accordingly, furnishing such fittings, traps, valves, ductwork, piping, supports, and accessories as may be required to meet such conditions.

C. Verification of Dimensions: The Contractor shall be responsible for the coordination and proper relation of his work to the building structure and to the work of all trades. The Contractor shall visit the premises and thoroughly familiarize himself with all details of the work and working conditions, to verify all dimensions in the field, and to advise the Officer-in-Charge of any discrepancy before performing any work.

1.04 SUBMITTALS

A. Submit in accordance with Section 01300 – Submittal Procedures.

1. Substitution Requests: Substitute materials or equipment may be used if qualified by written permission from the City. Submit a list of the substitutions with qualifying data for approval prior to bidding.

2. Shop Drawings: Submit prints of dimensioned shop drawings, indicating equipment layout, piping, hangers, equipment bases, support details, wiring diagrams for control and interlock and locations and sizes of pipe sleeves and duct openings. Drawings shall indicate adequate clearance for operation, maintenance, and replacement of operating equipment devices and components. Coordinate drawings with other trades to avoid interferences. Drawings shall be minimum 24 inches by 36 inches in size, to scale, except as specified elsewhere. Provide one (1) set of reproducible transparencies and six (6) sets of bond prints. Approval of shop drawings does not relieve the Contractor from responsibility of a complete installation or proper performance. No work shall commence until shop drawings are approved by the Officer-in-Charge.

a. The Contractor shall review, stamp with his approval, and submit all Shop Drawings required by the Contract Documents.

b. At the time of submission, the Contractor shall inform the Officer-in- Charge in writing of any deviations in the Shop Drawings from the requirements of the Contract Documents.

c. By approving and submitting Shop Drawings, the Contractor certifies that he has determined and verified all field measurements and obstructions, field construction criteria, materials, catalog numbers and similar data, that he has checked and coordinated each Shop Drawing with the requirements of the work and of the Contract Documents and that all equipment fits within designated spaces.

3. Color Samples: If specified in other sections of Division 15 – Mechanical, submit three (3) color samples.

4. Product Data: Submit data of equipment showing manufacturer's name, trade name, catalog model or number, project specification and paragraph reference, material specifications, performance data, certified dimensions and motor sizes and if applicable, sound power levels by octave bands. Performance data shall meet the criteria and standards specified in the technical sections for the model being furnished. Submit eight (8) complete sets. Equipment and material shall not be ordered without prior approval of the submittal from the City.

5. Schedule: Submit schedules of mechanical equipment which include a complete list of materials and equipment together with names and addresses of manufacturers and the Hawaii based authorized representative, catalog numbers, and trade names.

6. Certified Test Reports: Before delivery of materials and equipment, certified copies of all test reports specified in the individual sections shall be submitted for approval.

7. Certificates of Conformance or Compliance:

   a. Submit certification from the manufacturer attesting that materials and equipment to be furnished for this project comply with the requirements of this specification and of the reference publications. Preprinted certifications will not be acceptable; certifications shall be in the original. The certification shall not contain statements that could be interpreted to imply that the product does not meet all requirements specified, such as "as good as"; "achieve the same end use and result as materials formulated in accordance with the referenced publication," "equal or exceed the service and performance of the specified material." The certification shall simply state that the product conforms to the requirements specified.

   b. Standards Compliance: When materials or equipment are specified to conform to the standards of organizations such as the American National Standards Institute (ANSI), Air Conditioning and Refrigeration Institute (ARI), Air Movement and Control Association (AMCA), American Society for

Testing and Materials (ASTM), Factory Mutual Engineering and Research Corporation (FMERC or FM), National Electrical Manufacturers Association (NEMA), National Fire Protection Association (NFPA), and Underwriters Laboratories (UL), proof of such conformance shall be submitted to the City for approval. If an organization uses a label or listing to indicate compliance with a particular standard, the label or listing will be acceptable evidence, unless otherwise specified in the individual sections. In lieu of the label or listing, the Contractor may submit a certificate from an independent testing organization, which is competent to perform acceptable test and is approved by the City. The certificate shall state that the item has been tested in accordance with the specified organization's test methods and the item conforms to the specified organization's standard. For materials and equipment whose compliance with organizational standards of specifications is not regulated by an organization using its own listing or label as proof of compliance, a certificate of compliance from the manufacturer shall be submitted for approval. The certificate shall identify the manufacturer, the product and the referenced standard and shall simply state that the manufacturer certifies that the product conforms to all requirements of the project specification and of the referenced standards listed.

8. Operation and Maintenance Manual: Submit bound copies of the Operating and Maintenance Manual on all equipment and the system as a whole.

9. Other Reports: Submit as required by individual technical sections.

10. As-Built Drawings: Record changes from the contract drawings of all concealed piping. Show exact locations and sizes, as actually installed, of mechanical equipment, piping, isolating valves and items requiring maintenance or inspection. Dimension underground piping from a visible point on structure. Keep at the job site a complete, accurate record of all approved deviations from the contract drawings, shop drawings and specifications. Keep these changes on reproducible prints of the drawings affected and submit to the Officer-in-Charge at the completion of the project. The field-posted as-built drawings shall be the same drawings as the contract drawings, not the shop drawings, to allow the consultant to accurately transfer the changes to the contract document CAD files since the CAD files will be submitted to the City at the completion of the project.

1.05 LAWS, REGULATIONS AND CODES

A. The following shall govern where applicable; the Building Code of the County of Honolulu, State of Hawaii Department of Health Regulations, Fire Code of the County of Honolulu, National Fire Protection Association Standards, International Building Code, Uniform Plumbing Code, OSHA Rules and Regulations and all other codes and standards referenced in these specifications and as adopted by the County of Honolulu. Where requirements differ in these codes and standards, the more stringent shall apply.

1.06 PERMITS AND INSPECTIONS

A. Obtain and pay for all fees, permits, licenses, assessments, connection charges and inspections required for this project.

B. The Contractor shall apply and pay for all necessary inspections required by any public authority having jurisdiction.

1.07 MANUFACTURER'S RECOMMENDATIONS

A. Equipment installed under this Division of the Specifications shall be installed according to the manufacturer's recommendations, unless otherwise shown on the drawings or specified in this section. Where installation procedures or any part thereof are required to be in accordance with the recommendations of the manufacturer of the equipment being installed, printed copies of these recommendations shall be furnished to the Officer-in-Charge, prior to installation. Installation of the item will not be allowed to proceed until the recommendations are received.

B. Failure to furnish these recommendations can be cause or rejection of the equipment. Certain specified construction and details may not be regularly included in the manufacturer's catalogued product. The Contractor shall provide the material or equipment complete as specified.

1.08 OPERATING AND MAINTENANCE INSTRUCTIONS

A. Bound Instructions: Unless otherwise indicated, furnish eight (8) copies of an operation, maintenance, and troubleshooting manual for each item of equipment and the system as a whole. Furnish one (1) complete manual prior to the time that equipment tests are performed and furnish the remaining manuals before the contract is completed. Inscribe the following identification on the cover; the words OPERATION AND MAINTENANCE MANUAL, the name and location of the building, the name of the Contractor, the name of the Consultant, date, and the contract number. The manual shall include the names, addresses and telephone numbers of each subcontractor installing equipment and of the local representative for each item of equipment. Also include a list of equipment by manufacturer, with the model number and serial number, tag number, quantity of each unit, location of unit, and area served. When standard manufacturer's brochures are used, adequately indicate (highlight, arrow, etc.) the project related information and delete (X or cross-out) the non-applicable information. Flysheet or divider sheet shall be placed before instructions covering each subject. The instruction sheets shall be approximately 8-1/2 by 11 inches, with large sheets of drawings folded in. The manual shall have a table of contents and be assembled to conform to the table of contents with the tab sheets placed before instructions covering the subject. The instructions shall be legible and easily read, with large sheets of drawings folded in. The manual shall include:

1. System layout showing equipment, ductwork, piping, controls, etc.;

2. Wiring and control diagrams with data to explain detailed operation and control of each item of equipment;

3. A control sequence describing startup, operation and shutdown;

4. Description of the function of each principal item of equipment;

5. The procedure for starting;

6. The procedure for operating;

7. Shutdown instructions;

8. Maintenance instructions;

9. Lubrication schedule including type, grade, temperature range and frequency;

10. Manufacturer's bulletins, cuts and descriptive data;

11. Safety precautions, test procedures; performance data; and Parts list. The parts lists for equipment shall indicate the sources of supply, recommended spare parts and the service organization which is reasonably convenient to the project site.

12. Failure to furnish these recommendations can be cause or rejection of the equipment. Certain specified construction and details may not be regularly included in the manufacturer's catalogued product. The Contractor shall provide the material or equipment complete as specified.

B. The manual shall be complete in all respects for equipment, controls, accessories and associated appurtenances provided.

1.09 SPARE-PARTS DATA

A. After approval of materials and equipment and one month prior to the date of beneficial occupancy, the Contractor shall furnish a complete list of parts and supplies, with current source of supply.

1.10 SUBSTITUTION OF EQUIPMENT OR MATERIAL

A. Design is based on equipment and material as described in drawings. Any changes in equipment, bases, piping, connections, controls, electrical equipment specified and required by the approved substitutions shall be made by Contractor at no additional cost to the City. The Contractor shall ensure proper fit, clearances, compatibility with other trades (e.g. electrical, ceiling, etc.), compatibility with controls and communication with the controls system, operation and maintainability for any equipment or material that is substituted for that indicated.

1.11 DISCREPANCIES

A. The Drawings and Specifications are intended to be cooperative. Any materials, equipment or system related to this division and exhibited on the Architectural, Electrical or Mechanical Drawings but not mentioned in the Specifications are to be

executed to the intent and meaning thereof, as if it were both mentioned in the Specifications and set forth on the Drawings.

B. In case of differences between the Drawings and Specifications, the Specifications shall govern first, and then the Drawings. Large scale details shall take precedence over small scale Drawings as to the shape and details of construction. Specifications shall govern as to materials.

C. Drawings and Specifications are intended to be fully cooperative and to agree, but should any discrepancy or apparent difference occur between Drawings and Specifications or should errors occur in the work of others affecting the work, the Contractor shall notify the Officer-in-Charge at once. If the Contractor proceeds with the work affected without instructions from the City, he is responsible for that change and shall correct any resultant damage, rework, extra work or defect at no additional cost to the City. All interpretations of Drawings and Specifications shall be clarified by the Officer-in-Charge.

1.12 OMISSIONS

A. It is the intent of the plans and specifications to provide a complete installation. Should there be omissions, the Contractor shall call the attention of the Officer-in-Charge to such omissions in fifteen (15) days advance of the date of bid opening so the necessary corrections can be made.

1.13 GUARANTEE AND CERTIFICATE

A. The Contractor shall guarantee and certify in writing the following items:

1. All equipment, piping, accessories and material furnished for a period of one (1) year commencing from the date of final acceptance against all defects in material and workmanship. If any equipment, piping or material fails, does not operate satisfactorily or shows undue wear, the Contractor will be notified, and shall be required to correct the defect and damage to other work caused by such defect, immediately and at no additional cost to the City. If the above period of warranty does not coincide with the manufacturer's standard warranty period, the Contractor shall include all costs for extending the warranty for the period specified above in his bid.

2. All equipment, piping and materials to provide the results specified or shown.

3. All equipment to be properly installed in strict accordance with manufacturer's recommendations and to be free of vibration or objectionable noise.

4. All piping to be drip free and properly installed to be free of vibration, pounding or objectionable noise.

B. The above guarantee shall not be interpreted as voiding, limiting or reducing any equipment manufacturer's warranty or any guarantee permitted by law.

C. The City shall have the right to require a written certificate, dated and signed by a responsible employee of the Contractor, evidencing the performance of any portion of the work, or any testing; as a condition precedent to the acceptance of any work or the result of any test. Whenever a regulatory agency performs inspections or tests of any portion of the work, a certificate shall be furnished by the Contractor showing the inspection or test was satisfactorily passed.

D. The Contractor shall provide a written guarantee that all work is as specified, and shall be bound to reinstall material or equipment defective due to workmanship or materials for a period of one (1) year from the date of final acceptance of the installation by the City. Contractor shall not be responsible, however, for defects proven to the City's satisfaction to be due to misuse, accident or negligence by other parties.

E. Further, the Contractor shall be held responsible for all damages to any part of the premises, building or contents caused by leaks or other defects in pipe, equipment or materials provided under this specification, of a period of one (1) year from the date of final acceptance of the installation by the Officer-in-Charge.

F. Terms of this guarantee are in addition to other guarantee provisions of the specifications, and do not substitute for other more stringent terms, if any.

G. In addition to the Guarantee on materials and workmanship, the installer shall provide a Maintenance Service Contract, Countersigned by the General Contractor, that will validate said guarantee.

1.14 ELECTRICAL WORK

A. All power wiring, including final hookup to all mechanical equipment will be provided under the Electrical Division of this Specification. Control devices for mechanical systems required that are energized from the power system (i.e. 100 volts and higher) shall be provided by the Mechanical Subcontractor. The power wiring, conduits and appurtenant work including connection to the mechanical equipment and control devices shall be provided by the Electrical Subcontractor.

B. Electrical work under Electrical Division of the specifications is based on the electrical rating of equipment indicated on the Mechanical Drawings. Additional electrical work caused by any deviation under the requirements of the Mechanical Division drawings and specifications shall be paid for by the Mechanical Subcontractor.

C. All control wiring for communication, signals and control power less than 100 volts are included under mechanical work and shall be in accordance with Division 16 – Electrical requirements, except where specified otherwise in Division 15 – Mechanical.

D. The Mechanical Subcontractor shall furnish all starters, variable speed drives, control transformers, motor controllers, any disconnect devices specified as part of the mechanical equipment and any other electrically powered devices for installation by the Electrical Subcontractor. The Mechanical Subcontractor shall turn over these items to the Division 16 - Electrical Subcontractor at the site after receipt of notice from the Electrical Subcontractor that he is ready to install said items.

1.15 SAMPLES

A. When called for in the Technical Sections, furnish samples of materials which accurately represent if not identical to the materials to be used. Where samples are specified to demonstrate method of installation, furnish all materials, labor, ingredients and tools. Samples shall also be furnished when materials are proposed as substitutions for those specified. Materials used in the work shall be identical to samples that have been approved by the Officer-in-Charge.

1.16 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Furnish new equipment, materials and accessories bearing the manufacturer's identification. Coordinate deliveries to avoid interference or construction delays. Protect products during delivery, storage, installation, and the remainder of the contract period after installation.

1.17 OPENINGS, CUTTING AND REPAIRING

A. The Mechanical Contractor shall cooperate with the work to be done under other sections in providing information as to openings required in walls and slabs for all piping including sleeves where required.

B. Any drilling or cutting required for the performance of work under this Section shall be the responsibility of the Contractor and the cost there shall be borne by him.

C. Holes in Concrete: The Mechanical Contractor shall pay all costs for cutting holes. All holes through existing concrete shall be either core drilled or saw cut. All holes required shall have the approval of the City prior to cutting and drilling. Cutting of holes through the concrete floor shall require x-ray of proposed area to be cut to determine the extent of reinforcing bars, electrical conduit, etc. that is present. X-ray scans shall be scheduled for after hours. Contractor is responsible for coordination of x-ray scan with the Officer-in-Charge and for protection of the required clear area for the scan. Contractor is responsible for protection of lower floors or adjacent spaces during core drilling or saw cutting, including protecting from water and slurry damage to existing surfaces and equipment.

D. It shall be the responsibility of the Contractor to ascertain that all openings are properly located.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. As specified in all sections of Division 15 - Mechanical.

B. Materials and equipment shall be cataloged products of manufacturers regularly engaged in production of such materials or equipment and shall be manufacturer's

latest design that complies with the specification requirements. Materials and equipment shall duplicate items that have been in satisfactory commercial or industrial use at least 2 years in Hawaii prior to bid opening. Where two or more items of the same class of equipment are required, these items shall be products of a single manufacturer; however, the component parts of the items need not be the products of the same manufacturer except where specified. Each item of equipment shall have the manufacturer's nameplate. Name of the distributing agent in lieu of the manufacturer's nameplate will not be acceptable.

C. All materials shall be new, of equivalent or better quality than of materials specified. For ease of maintenance and parts replacement, select equipment from a single manufacturer as much as possible. Substitutions require pre-bid approval.

2.02 NAMEPLATES

A. Each item of equipment shall have manufacturer's engraved nameplate of corrosion resisting metal attached in a conspicuous location. Nameplate data shall include manufacturer's name, address, model number, serial number, capacity, rating and such other performance data as required to completely identify the item. In addition, the manufacturer shall provide a separate corrosion resisting metal tag or plastic, unless specified otherwise, to carry the equipment designation as shown on drawings. Except as otherwise specified nameplate lettering shall be stamped or engraved on the nameplate. Nameplates shall be fastened by means of corrosion resisting metal screws, rivets or wire, 14-gage.

2.03 TOOLS AND SUPPLIES

A. Special tools and supplies shall be provided if required to maintain equipment provided for this project. The items shall be packaged or boxed to provide protection in storage, and shall be identified as to use. Tools and supplies shall be accompanied by information as to source of supply.

2.04 FACTORY-APPLIED PAINT

A. Ferrous surfaces of equipment shall have baked enamel finish painting as standard with the manufacturer. Special coating shall be applied when specified in the Technical Sections, and in such cases the coating used shall be certified in compliance with the Certificates paragraph in this section.

B. All interior, exposed ferrous support materials shall have factory-applied protective coating.

C. All exterior, exposed ferrous support materials shall have factory-applied protective prime coat as follows:

1. Pre-Treatment - Commercial Blast Cleaning in accordance with Steel Structures Painting Council No. 6 (not less than 2 mils profile).

2. Primer - Epoxy based or as recommended by the paint manufacturer and shall be asbestos-free, lead-free, cadmium-free, zinc-chromate-free and mercury-free.

PART 3 - EXECUTION

3.01 VERIFICATION OF DIMENSIONS

A. The Contractor shall check all dimensions at the site and shall establish all lines and levels. The Contractor shall be responsible for correctness of all dimensions and fitting of equipment, ductwork, fixtures and piping into the available space. Should field measurements show conditions that require relocation of any work, such conditions shall be reported to the Officer-in-Charge in advance of installation, and the work shall proceed in accordance with his decisions.

3.02 PROTECTION OF WORK IN PROGRESS

A. Ducts, conduits (if provided by Division 15 - Mechanical technical specifications) and pipe openings shall be closed with caps or plugs until connections are made. Equipment shall be securely covered for protection against physical or chemical damage. In areas exposed to weather, materials unused at the end of each day's work shall be stored in weather-protected locations. Damage to materials or equipment due to the Contractor's neglect shall be repaired or replaced to the satisfaction of the Officer-in-Charge by, and at the expense of the Contractor.

3.03 LOCAL TECHNICAL SUPPORT

A. The mechanical equipment suppliers that furnish equipment for this project shall have a local Hawaii sales and service office, staffed with factory trained representatives fully capable of providing instruction, routine maintenance and emergency maintenance service on all system components supplied for this project. If the maintenance service is provided by a separate company, that company shall be specifically trained by manufacturer and authorized to perform maintenance on the equipment furnished for this project.

3.04 SAFETY REQUIREMENTS

A. Belts, pulley, chains, gears, couplings, projecting setscrews, keys and other rotating parts located so that any person can come in close proximity thereto shall be fully enclosed or properly guarded. High temperature equipment and piping so located as to endanger personnel or create a fire hazard shall be properly guarded or covered with insulation of a type as specified in other mechanical sections. Items such as catwalks, ladders and guard rails shall be provided where required for safe operation and maintenance of equipment.

3.05 PAINTING

A. Unless specified in other mechanical specification sections, the Contractor shall be responsible for complete coverage in painting all exposed ferrous metal that has not been factory finish coated.

3.06 PIPING IDENTIFICATION

A. Identification of all new above grade pipe lines except sanitary, waste and vent plumbing pipes shall be by means of colored, waterproof, all temperature, self-adhering labels and directional arrow. Color coding shall conform to ANSI/OSHA specifications.

B. At Contractor's option in lieu of the self-adhering labels, each and every system may be identified by painting with contrasting colors, using 3/4 inches high minimum stencil letters and directional arrow.

C. All exposed pipes, whether insulated or not, shall be identified. Insulated pipes shall be labeled on the outside of the insulation.

D. Identification labels shall be placed as follows:

1. Near each valve, branch, and equipment connection.

2. Wherever piping merges or disappears from view from the floor or room in which it is installed.

3. Labels shall not be more than 50 feet apart.

3.07 VALVE IDENTIFICATION

A. Valves shall be identified with brass tags where identification is required by other mechanical sections of these specifications.

B. Attach tags with stainless steel chains or wires to valve body or stems. Attachment shall be permanent.

C. Tag numbers shall match identification numbers shown on as-built drawings.

D. Provide 1-1/2-inch diameter brass tags for all valves with identification numbers as indicated. Each tag shall have stamped service designation and valve number designation in 1/4-inch black-filled letters over 1/2-inch black-filler numbers. Tags shall be fastened to valves with brass jack chain. Chart of all valves shall be furnished by the Contractor and shall include:

1. Valve I.D. number

2. Location

3. Purpose of system (Service)

4. Normally open or normally closed

5. Type & Size of valve

3.08 IDENTIFICATION TAGS FOR MECHANICAL EQUIPMENT AND DEVICES

A. All mechanical equipment, panels, control devices such as temperature sensors, carbon dioxide sensors, pressure transmitters, pressure gauges and other devices shall be provided with an identification tag that indicates the name of the item. The name shall coincide with the Operations and Maintenance Manual and the as-built drawings.

B. The tag shall be plastic nameplate, 1" x 3" minimum size, engraved laminated phenolic, white with black core. The tags shall be fastened to the equipment or device with metal screws or fastened with a brass jack chain if it cannot be mounted with screws.

3.09 ONE YEAR MAINTENANCE SERVICE CONTRACT

A. In addition to the guarantee on materials and workmanship, the installer shall submit copies of the Maintenance Service Contract, countersigned by the Contractor, which will validate the guarantee.

B. The maintenance service shall extend for a period of one (1) years commencing after 30 consecutive days of trouble-free operation after the Project Acceptance Date or the equipment acceptance date, if earlier than the Project Acceptance Date, and shall include all labor, materials, equipment and parts necessary to service the complete system, in accordance with the attached Schedule of Maintenance Service so as to assure proper operation and function of the system. All costs for the periodic maintenance, including emergency calls, shall be borne by the Contractor. The maintenance period and guarantee period shall run concurrently (same start and stop dates).

C. Trouble-free operation is defined as a non-disabling condition of a non-recurring failure or disruption and the following:

1. The system shall be free of all discrepancies, contamination and debris which require correction in excess of those described for the monthly service which is included in the Schedule of Maintenance.

2. The system is maintaining operational conditions and other parameters as measured during acceptance tests.

D. Periodic basis shall mean a minimum of once every month. Where the Manufacturer's Service Manual requires a shorter period, the shorter period shall apply.

E. For each system provided by this contract, the Installer shall include a listing of the following items along with the Maintenance Service Contract:

1. Name of the servicing contractor.

2. System acceptance date.

3. Service contract expiration date.

4. Monthly inspection schedule for the maintenance period.

5. Itemized listing of the equipment covered under the service contract, including a description of the equipment identified, its model and serial numbers and manufacturer's name(s).

F. The Maintenance Service Contract shall be submitted along with the Operations and Maintenance Manual on/or before the Project Acceptance Date.

Distribution of submittal:
1 copy: Contractor
6 copies: Officer-in-Charge

G. The Contractor shall keep a separate log recording all maintenance calls to the project at Contractor's office. Log shall include at least the following information.

1. Name of person making service call.

2. Date of call.

3. Time in and out from project.

4. Nature of call.

5. Equipment readings and maintenance performed.

6. The type and cost (labor, materials, parts and equipment) of repair work performed on the unit, if any.

7. Documents and other data pertaining to the maintenance performed.

It will be the responsibility of the Contractor to maintain the report/checklist by recording the above noted date after each scheduled maintenance and emergency repairs, and have the checklist available for inspection at the building site. The report shall be sufficiently detailed to properly reflect the past maintenance history of the equipment.

Reports shall be certified by a representative of the facility being served and shall be submitted to Officer-in-Charge monthly or at the completion of the service or trouble call.

In addition, the Contractor shall submit written reports of maintenance performed within three (3) working days to Department of Enterprise Services (DES). (See Service Maintenance Report form attached)

H. Work Schedule: All maintenance work shall be performed between the hours of 7:30 a.m. to 4:00 p.m., on normal working days, Monday through Friday, excluding State holidays.

I. Trouble Calls

1. Emergency service and repairs required between regular service calls shall be rendered within 24 hours after the Contractor is notified, non-working days excluded.

2. The Contractor shall call the Officer-in-Charge the next working day after being notified of the problem and report the status of the repairs.

J. All costs for periodic maintenance services and for emergency calls shall be included in the lump sum bid price.

K. Maintenance Schedule: As described on attachments following this section:

1. Attachment A – Schedule of Maintenance – Air Conditioning and Ventilation System

L. The Maintenance Service Contract does not include repairs resulting from vandalism, negligent use or misuse of equipment. Provide hourly costs for such calls.

3.10 CLEANUP AND WORK PRACTICES

A. The Contractor shall keep the job site free of debris, litter, discarded parts, etc. and shall clean all oil drippings during the daily progress of work. The Contractor shall remove all tools, parts and equipment from the service areas upon completion of the work.

B. The Contractor shall exercise caution during the progress of his maintenance and repair work to prevent damage to the ceilings, roofing and other building structure. The Contractor shall restore all damages, caused by his negligence, to its original condition at his own expense.

ATTACHMENT A
SCHEDULE OF MAINTENANCE SERVICE

INDUCED DRAFT COOLING TOWERS

All services performed by the Contractor shall include applicable items listed but shall not be limited to the following maintenance tasks. If the Manufacturer's Service Manual requires a shorter period than listed below, the shorter period shall apply.

A. COOLING TOWER

Monthly Service

1. Check for unusual noises, leaks, vibration, and excessive drift; patch, correct or repair as required.
2. Check fan and inlet louvers
3. Check and adjust water make-up float valve and bleed rate.
4. Certify performance of monthly maintenance service, correct and report all discrepancies.

Quarterly Service

1. Check general condition or tower interior and water distribution pattern.
3. Check and lubricate motor and fan bearings
4. Check all drives for wear; check oil level and refill as required.
5. Check vibration switch enclosure for loose wiring and moisture. Adjust sensitivity if required.
6. Remove foreign material from inside the tower.
7. Certify performance of quarterly maintenance service, correct and report all discrepancies.

Semi-Annual Service

1. Drain, clean and flush tower; coordinate with water treatment service.
2. Clean condenser suction screen, drift eliminators and spray nozzles.

3 Certify semi-annual cleaning of towers and correct and report all discrepancies.

END OF SECTION

SECTION 15400 – MECHANICAL PIPING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes the furnishing, fabrication, delivery and installation of condenser water piping, water piping, drain piping and accessories associated with installation of new cooling towers complete, including but not limited to the following:

1. Condenser water piping, fittings, and valves
2. Potable make up water piping, fittings and valves
3. Drain piping and fittings
4. Supports for piping
5. Manufacturer's literature, shop drawings and record drawings.
6. Inspection, test, and guarantee

B. Related Sections

1. Mechanical work as specified in Section 15050 – Basic Mechanical Materials and Methods unless specified otherwise in other sections of Division 15 - Mechanical.
2. Cooling towers specified in Section 15640 – Induced Draft Cooling Towers
3. Testing, adjusting and balancing of condenser water systems specified in Section 15950 – Testing, Adjusting, and Balancing for HVAC.
4. Painting work specified in Section 09900 - Painting.
5. Electrical work specified in Division 16 - Electrical.

1.02 ACTION SUBMITTALS

A. Submit the following in accordance with Section 013000 – Submittal Procedures and 15050 – Basic Mechanical Materials and Methods:

B. Product Data: Submit product data for the following:

1. Piping and fittings

1.03 INFORMATIONAL SUBMITTALS

A. Quality Standard Compliance Certificates:

1. Piping and fittings

B. Guarantee and Certificate: Submit one year guarantee and certificate in accordance with Section 15050 Basic Mechanical Materials and Methods.

PART 2 - PRODUCTS

2.01 COPPER TUBING FOR POTABLE WATER PIPING

A. General: Use copper tubing when connecting to existing copper chilled water lines.

B. Copper tubing: Provide copper tube conforming to ASTM B88, Type L or M for aboveground tubing.

C. Fittings and End connections (Solder and Flared Joints): Wrought copper and bronze solder joint pressure fittings, including unions and flanges, shall conform to ASME B16.22 and ASTM B75/B75M. Provide adapters as required. Cast copper alloy solder-joint pressure fittings, including unions and flanges, shall conform to ASME B16.18. Cast copper alloy fittings for flared copper tube shall conform to ASME B16.26 and ASTM B62. ASTM B42 copper pipe nipples with threaded end connections shall conform to ASTM B42.

D. Solder: Provide solder in conformance with ASTM B32, grade Sb5, tin-antimony alloy. Solder flux shall be liquid or paste form, non-corrosive and conform to ASTM B813.

E. Brazing Filler Metal: Filler metal shall conform to AWS A5.8/A5.8M, Type BAg-5 with AWS Type 3 flux, except Type BCuP-5 or BCuP-6 may be used for brazing copper-to-copper joints.

2.02 STEEL PIPING FOR CONDENSER WATER PIPING

A. General: Use steel piping when connecting to existing steel condenser water lines. Provide steel piping with a ANSI/ASME Class 125 service rating, which for 150 degrees F, the pressure rating is 175 psig.

B. Steel Pipe: Steel pipe, conform to ASTM A53/A53M, Schedule 40, Type E or S, Grades A or B. Do not use Type F pipe.

C. Fittings and End Connections (Joints): Piping and fittings 1 inch and smaller shall have threaded connections. Piping and fittings larger than 1 inch and smaller than 3 inches shall have either threaded, or welded connections. Piping and fittings 3 inches and larger shall have welded, flanged or grooved connections. The manufacturer of each fitting shall be permanently identified on the body of the fitting in accordance with MSS SP-25.

1. Threaded Connections: Use threaded valves and pipe connections conforming to ASME B1.20.1. Used threaded fitting conforming to ASME B16.3. Use threaded unions conforming to ASME B16.39. Use threaded pipe nipples conforming to ASTM A733.

2. Flanged Connections: Flanges shall conform to ASME B16.1, Class 125. Gaskets shall be nonasbestos compressed material in accordance with ASME B16.21, 1/16 inch thickness, full face or self-centering flat ring type. These gaskets shall contain aramid fibers bonded with styrene butadeine rubber (SBR) or nitrile butadeine rubber (NBR). Bolts, nuts, and bolt patterns shall conform to ASME B16.1.

3. Welded Connections: Welded valves and pipe connections (both butt-welds and socket-welds types) shall conform to ASME B31.9. Butt-welded fittings shall conform to ASME B16.9. Socket-welded fittings shall conform to ASME B16.11. Welded fittings shall be identified with the appropriate grade and marking symbol.

4. Mechanical Couplings for Grooved End Connections: Manufactured in two segments of cast ductile iron, conforming to ASTM A-536, Grade 65-45-12. Gaskets shall be pressure responsive synthetic rubber, grade to suit the intended service, conforming to ASTM D-2000. Mechanical coupling bolts shall be zinc plated (ASTM B-633) heat treated carbon steel track head conforming to ASTM A-449 and ASTM A183, minimum tensile strength 110,000 psi.

2.03 PVC PIPING

A. Polyvinyl chloride (PVC) plastic pipe, Schedules 40 or 80, ASTM D1785. Fittings shall be socket type, solvent welded, ASTM D2466, polyvinyl chloride (PVC) plastic pipe fittings, Schedule 40 or 80.

2.04 CPVC PIPING

A. Chlorinated polyvinyl chloride (CPVC) plastic pipe, schedule 40 and 80, ASTM F441/F441M. Fittings shall be socket-type, solvent welded chlorinated polyvinyl chloride (CPVC) plastic pipe fittings, Schedule 40, ASTM F438.

2.05 VALVES

A. General: Provide valves with a ANSI/ASME Class 125 service rating, which for 150 degrees F, the pressure rating is 175 psig.

B. Gate Valves: Gate valves 2-1/2 inches and smaller shall conform to MSS SP-80 Class 125 and shall be bronze with wedge disc, rising stem and threaded, soldered, or flanged ends. Gate valves 3 inches and larger shall conform to MSS SP-70, Class 125, cast iron with bronze trim, outside screw and yoke, and flanged or threaded ends.

C. Globe and Angle Valve: Globe and angle valves 2-1/2 inches and smaller shall conform to MSS SP-80, Class 125. Globe and angle valves 3 inches and larger shall conform to MSS SP-85, Class 125.

D. Check Valves: Check valves 2-1/2 inches and smaller shall conform to MSS SP-80. Check valves 3 inches and larger shall conform to MSS SP-71, Class 125.

E. Butterfly Valve: Butterfly valves shall conform to MSS SP-67, Type 1 and shall be either the wafer or lug type. Valves smaller than 8 inches shall have throttling handles with a minimum of seven locking positions. Valves 8 inches and larger shall have totally enclosed manual gear operators with adjustable balance return stops and position indicators.

F. Plug Valve: Plug valves 2 inches and larger shall conform to MSS SP-78, have flanged or threaded ends, and have cast iron bodies with bronze trim. Valves 2 inches and smaller shall be bronze with NPT connections for black steel pipe and brazed connections for copper tubing. Valve shall be lubricated, non-lubricated, or tetrafluoroethylene resin-coated type. Valve shall be resilient, double seated, trunnion mounted with tapered lift plug capable of 2-way shutoff. Valve shall operate from fully open to fully closed by rotation of the handwheel to lift and turn the plug. Valves 8 inches or larger shall be provided with manual gear operators with position indicators.

G. Ball Valve: Full port design. Ball valves 1/2 inch and larger shall conform to MSS SP-72 or MSS SP-110 and shall be cast iron or bronze with threaded, soldered, or flanged ends. Ball valves may be provided in lieu of gate valves.

2.06 PIPING ACCESSORIES

A. Strainers:

1. ASTM F1199, except as modified and supplemented in this specification. Strainer shall be the cleanable, "Y" type, the same size as the pipeline. Strainer bodies shall be fabricated of bronze or cast iron with bottoms drilled, and tapped. The bodies shall have arrows clearly cast on the sides indicating the direction of flow.

2. Provide strainer with removable cover and sediment screen. The screen shall be made of minimum 22 gauge monel, or corrosion-resistant steel, with small perforations numbering not less than 400 per square inch to provide a net free area through the basket of at least 3.30 times that of the entering pipe. The flow shall be into the screen and out through the perforations.

B. Flexible Pipe Connectors: Provide flexible bronze or stainless steel piping connectors with single braid. Equip flanged assemblies with limit bolts to restrict maximum travel to the manufacturer's standard limits. Unless otherwise indicated, the length of the flexible connectors shall be as recommended by the manufacturer for the service intended. Internal sleeves or liners, compatible with circulating medium, shall be provided when recommended by the manufacturer. Provide covers to protect the bellows where indicated.

C. Pressure and Vacuum Gauges: Gauges, ASME B40.100 with throttling type needle valve or a pulsation dampener and shut-off valve. Provide gauges with 4.5 inch dial, brass or aluminum case, bronze tube, and siphon. Gauge shall have a range from 0 psig to approximately 1.5 times the maximum system working pressure. Each gauge

range shall be selected so that at normal operating pressure, the needle is within the middle-third of the range.

D. Thermometers: Mercury filled lens tube type with separable socket, adjustable, 9 inch scale, 2-degree increments, 0 - 120°F range.

2.07 PIPE HANGERS AND SUPPORT

A. Hangers and supports shall be of manufacturer and type specified or as indicated or approved substitute. Pipe supports and hangers in contact with copper piping shall be copper or plastic coated. Provide hot dipped galvanized pipe hangers and supports.

B. Shields: Provide protection shields at hanger or support points of insulated piping. Shields shall be minimum of 12 inches long, Anvil Fig. 167 or approved substitute.

C. Supports:

1. Piping shall be supported from structural steel, grouted CMU walls, or concrete slab only; piping shall not be supported in any manner from the roofing.

2. Drilled-In Threaded Inserts: Where supports in slabs are required after concrete has been poured, Phillips "Redhead" drilled in threaded inserts shall be provided, installed in accordance with manufacturer's recommendations.

3. Expansion Anchors and Power-Actuated Fasteners and Devices: Install lead shield anchors or power actuated sleeves, fasteners and devices in accordance with manufacturer's recommendations. Powder actuated pins are not allowed to be "shot" into the concrete structure.

D. Schedules: Pipe support spacing and sizes of pipe hanging suspension rods shall conform to the following table, except support spacing for copper tubing and PVC piping shall not exceed 6 feet on centers.

PIPE SIZE	SUPPORT SPACING
1/2-inch & 3/4-inch	Not over 6-ft.-6-inch
1-inch & 1-1/4-inch	Not over 8-ft.-6-inch
1-1/2-inch	Not over 10-ft.-0-inch
2-inch & 2-1/2-inch	Not over 12-ft.-0-inch
3-inch	Not over 12-ft.-0-inch
4-inch	Not over 14-ft.-0-inch
5-inch	Not over 14-ft.-0-inch
6-inch	Not over 17-ft.-0-inch

PIPE SIZE	ROD SIZE
Up to 2-inch	3/8-inch
2-1/2-inch	1/2-inch
4-inch to 5-inch	5/8-inch
6-inch	3/4-inch

E. Supplementary Steel: Provide all necessary supplementary steel for proper support or attachment of hangers. Steel shall be painted with one coat of rust inhibiting primer.

F. Single Hangers: Unless otherwise indicated, support single pipe runs as follows:

1. Pipe 2-1/2 inch and smaller: Split ring type hanger, Grinnell Fig. 104, Crawford Fig. 104, Fee and Mason Fig. 199, Elcen Fig. 92 or adjustable clevis hanger, or approved substitute.

2. Pipe 3 inch and larger: Clevis hanger conforming to MSS SP-69, Type 1.

PART 3 - EXECUTION

3.01 COOPERATION WITH OTHER TRADES AND CONFLICT IN WORK

A. The Contractor shall examine all drawings of proposed work and coordinate his work with other trades. Work conflicts shall be brought to attention of City and work rearranged or modified in accordance with his decision.

B. If changes in indicated locations or arrangements of work are required, they shall be made by Contractor without additional charge to the City provided that these changes were ordered before work is installed and no extra material or labor is required.

C. Should Contractor determine that extra material and labor will be required to accommodate any rearrangement, he shall first submit detailed estimate of cost for required changes and proceed with work only upon written authority of the Officer-in-Charge.

3.02 PIPING INSTALLATION

A. Cut pipe accurately to measurements established at the jobsite, and work into place without springing or forcing, completely clearing all windows, doors, and other openings. Cutting or other weakening of the building structure to facilitate piping installation is not permitted without written approval. Cut pipe or tubing square, remove burrs by reaming, and fashion to permit free expansion and contraction without causing damage to the building structure, pipe, joints, or hangers.

B. Notify the Officer in Charge in writing at least 15 calendar days prior to the date the connections are required. Obtain approval before interrupting service. Furnish materials required to make connections into existing systems and perform, and incidental labor as required. Furnish labor and tools for making actual connections to existing systems.

C. Directional Changes: Make changes in direction with fittings. Mitering or notching pipe or other similar construction to form elbows or tees is not permitted.

D. Reducing fittings shall be used for changes in pipe sizes. Cap or plug open ends of pipelines and equipment during installation to keep dirt or other foreign materials out of the system.

E. Pipe not otherwise specified shall be uncoated. Connections between ferrous and copper piping shall be electrically isolated from each other with dielectric waterways or flanges.

F. Fittings and End Connections:

1. Threaded Connections: Threaded connections shall be made with tapered threads and made tight with PTFE tape complying with ASTM D3308 or equivalent thread-joint compound applied to the male threads only. Not more than three threads shall show after the joint is made.

2. Brazed Connections: Brazing, AWS BRH, except as modified herein. During brazing, the pipe and fittings shall be filled with a pressure regulated inert gas, such as nitrogen, to prevent the formation of scale. Before brazing copper joints, both the outside of the tube and the inside of the fitting shall be cleaned with a wire fitting brush until the entire joint surface is bright and clean. Do not use brazing flux. Surplus brazing material shall be removed at all joints. Steel tubing joints shall be made in accordance with the manufacturer's recommendations. Piping shall be supported prior to brazing and not be sprung or forced.

3. Welded Connections: Branch connections shall be made with welding tees or forged welding branch outlets. Pipe shall be thoroughly cleaned of all scale and foreign matter before the piping is assembled. During welding, the pipe and fittings shall be filled with an inert gas, such as nitrogen, to prevent the formation of scale. Beveling, alignment, heat treatment, and inspection of weld shall conform to ASME B31.9. Weld defects shall be removed and rewelded at no additional cost to the City. Electrodes shall be stored and dried in accordance with AWS D1.1/D1.1M or as recommended by the manufacturer. Electrodes that have been wetted or that have lost any of their coating shall not be used.

4. Flared Connections: When flared connections are used, a suitable lubricant shall be used between the back of the flare and the nut in order to avoid tearing the flare while tightening the nut.

5. Flanges and Unions: Except where copper tubing is used, union or flanged joints shall be provided in each line immediately preceding the connection to each piece of equipment or material requiring maintenance such as coils, pumps, control valves, and other similar items. Flanged joints shall be assembled square end tight with matched flanges, gaskets, and bolts. Gaskets shall be suitable for the intended application.

G. Valves: Isolation gate or ball valves shall be installed on each side of each piece of equipment, at the midpoint of all looped mains, and at any other points indicated or required for draining, isolating, or sectionalizing purpose. Isolation valves may be omitted where balancing cocks are installed to provide both balancing and isolation functions. Each valve except check valves shall be identified. Valves in horizontal lines shall be installed with stems horizontal or above.

H. Flexible Pipe Connectors: Connectors shall be attached to components in strict accordance with the latest printed instructions of the manufacturer to ensure a vapor tight joint.

I. Thermometers: Thermometers shall be located on coolant supply and return piping at each heat exchanger, and where indicated or required for proper operation of equipment. Thermal wells for insertion thermometers and thermostats shall extend beyond thermal insulation surface not less than 1 inch.

3.03 ELECTRICAL INSTALLATION

A. Install electrical equipment in accordance with NFPA 70 and manufacturer's instructions.

3.04 CLEANING AND ADJUSTING

A. Pipes shall be cleaned free of scale and thoroughly flushed of all foreign matter. A temporary bypass shall be provided for all water coils to prevent flushing water from passing through coils. Strainers and valves shall be thoroughly cleaned. Prior to testing and balancing, air shall be removed from all water systems by operating the air vents. Temporary measures, such as piping the overflow from vents to a collecting vessel shall be taken to avoid water damage during the venting process. Air vents shall be plugged or capped after the system has been vented. Control valves and other miscellaneous equipment requiring adjustment shall be adjusted to setting indicated or directed.

3.05 FIELD TESTS

A. Field tests shall be conducted in the presence of the Officer in Charge or his designated representative to verify systems compliance with specifications. Any material, equipment, instruments, and personnel required for the test shall be provided by the Contractor.

B. Equipment and Component Isolation: Prior to testing, equipment and components that cannot withstand the tests shall be properly isolated.

C. Pressure Tests: Each piping system shall be hydrostatically tested at a pressure not less than 100 psig or 1.5 time working pressure, (whichever is higher) for period of time sufficient to inspect every joint in the system and in no case less than 2 hours. Test pressure shall be monitored by a currently calibrated test pressure gauge. Leaks shall be repaired and piping retested until test requirements are met. No leakage or reduction in gage pressure shall be allowed.

D. Leaks shall be repaired by re-welding, re-brazing or replacing pipe or fittings. Caulking of joints will not be permitted. Concealed and insulated piping shall be tested in place before concealing.

E. Submit for approval pressure tests reports covering the above specified piping pressure tests; describe the systems tested, test results, defects found and repaired,

and signature of the pressure tests' director. Obtain approval from the Officer in Charge before concealing piping or applying insulation to tested and accepted piping.

F. HVAC TAB: Requirements for testing, adjusting, and balancing (TAB) of HVAC water piping, and associated equipment is specified in Section 15915 Testing, Adjusting, And Balancing For HVAC. Coordinate with the TAB team, and provide support personnel and equipment as specified in Section 15915 Testing, Adjusting And Balancing For HVAC to assist TAB team to meet the TAB work requirements.

3.06 PIPE SUPPORT

A. Supports shall secure pipes or conduits in place, shall prevent pipe vibration, maintain required grading by proper adjustment, provide for expansion and contraction, and shall make neat appearance.

B. Design supports of strength and rigidity to suit loading, service, and in a manner which will not stress unduly the building construction.

C. Where support is from concrete construction, take care not to weaken concrete or penetrate waterproofing.

3.07 PAINTING

A. All ferrous metal shall be given one shop coat of red lead or other approved rust resisting paint. Where zinc coated metal is furnished, it shall not be shop primed unless specifically called for, but all abraded places and welds shall be touched up with Galvalloy or approved substitute.

B. Pipe hangers, supports and other iron work in concealed spaces shall be thoroughly cleaned and painted with one coat of asphalt varnish. Finish painting of exposed items is specified in Section 09900 – Painting.

3.08 TESTING, ADJUSTING AND BALANCING

A. Test, adjust and balance each piece of equipment as required to assure proper operation. Testing, adjusting and balancing is specified in Section 15950 – Testing, Adjusting, and Balancing for HVAC.

END OF SECTION

SECTION 15640 – FRP INDUCED DRAFT COOLING TOWERS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes the furnishing, fabrication, delivery and installation of two FRP induced draft cooling towers complete, including but not limited to the following:

1. Cooling Towers
2. Variable Frequency Controls
3. Water Level controls
4. Operation and maintenance instructions and manuals
5. Manufacturer's literature, shop drawings and record drawings.
6. Inspection, test, and guarantee

B. Related Sections: Mechanical work as specified in Section 15050 – Basic Mechanical Materials and Methods unless specified otherwise in other sections of Division 15 Mechanical.

1.02 CODES, STANDARDS, REGULATIONS

A. All applicable codes, regulations and ordinances of public bodies having jurisdiction are considered a part of these specifications; all work installed and materials provided must comply with the current edition of such codes, regulations and ordinances.

B. Present to the Officer-in-Charge certificates of inspection and approval from proper authorities.

1.03 REFERENCES

A. American National Standards Institute (ANSI):

1. ANSI/ASME A13.1 – Scheme for the Identification of Piping Systems

B. ASTM International Publications:

1. ASTM A53 - Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
2. ASTM E84 –Standard Test Method for Surface Burning Characteristics of Building Materials

C. National Fire Protection Associations (NFPA)

1. NFPA 70 – National Electric Code

D. Occupational Safety And Health Administration (OSHA)

1. 29 CFR 1910.23 – Ladders

1.04 CONTRACT DRAWINGS

A. Contract drawings are essentially diagrammatic, indicating general layout and approximate locations toward establishing the scope for uniform estimating basis for all bidders. They are not intended to be detailed construction working drawings. Equipment, ductwork and piping arrangements shall fit into space allotted and shall allow adequate clearances for servicing and maintenance. Reasonable modifications to indicated locations and arrangement to suit job conditions shall not constitute basis for requesting additional funds from the City.

B. Capacities of all equipment and materials shall be not less than those indicated.

C. Nameplate: Each major component of equipment shall have the manufacturer's name, address, and catalog number on a plate securely attached to the item of equipment.

D. Verification of Dimensions: The Contractor shall be responsible for the coordination and proper relation of his work to the building structure and to the work of all trades. The Contractor shall visit the premises and thoroughly familiarize himself with all details of the work and working conditions, to verify all dimensions in the field, and to advise the City of any discrepancy before performing any work.

1.05 ACTION SUBMITTALS

A. Submit the following in accordance with Section 01300 – Submittal Procedures and Section 15050 – Basic Mechanical Materials and Methods:

B. Product Data: Submit product data for the following:

1. Cooling Towers. Product data submittal shall include:

a. Manufacturer’s catalog data indicating salient features as specified and appurtenances

b. Performance engineering data sheets

c. Sound power level data (decibels) for each octave band for the equipment

d. Electrical connection requirements

e. Electrical power connection and control logic wiring diagrams. Diagrams shall differentiate between factory installed and field installed wiring.

2. Variable Frequency Drives

3. Level Controller

C. Shop Drawings: Submit shop drawings of plans, performance data and details showing locations and installation including but not limited to the following.

1. Cooling towers. Shop drawings shall include:

a. Dimensional and orientation information (plan and elevation) for the cooling tower.

b. Overall dimensions, access door locations, and piping and electrical connection points.

c. Unit base support structural drawing

D. Operation and Maintenance Manuals: Submit in accordance with Section 15050 – Basic Mechanical Materials and Methods:

1. Cooling towers

2. Variable frequency drives

3. Level controllers

E. INFORMATIONAL SUBMITTALS

F. Quality Standard Compliance Certificates:

1. Guarantee and Certificate: Submit one year guarantee and certificate in accordance with Section 15050 – Basic Mechanical Materials and Methods.

1.06 OMISSIONS

A. It is the intent of the plans and specifications to provide a complete installation. Should there be omissions, the Contractor shall call the attention of the City to such omissions in fifteen (15) days advance of the date of bid opening so that the necessary corrections can be made.

1.07 QUALITY ASSURANCE

A. Manufacturer qualifications: Company specializing in manufacturing the products specified in this section with a minimum of five years documented experience with similar equipment and the refrigerant offered.

B. Installer qualifications: Minimum three years' experience in the installation and start-up of packaged cooling towers.

C. Regulatory Requirements: Products Requiring Electrical Connection – Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

D. Factory Run Test: Cooling towers shall be factory operational run tested with water flowing through the equipment prior to shipment.

E. Cooling tower manufacturer shall have a factory trained and supported service organization permanently based in the United States.

1.08 DELIVERY AND HANDLING

A. Unit shall be delivered to job site with all interconnecting components and internal wiring ready for field installation.

B. Provide protective covering over vulnerable components for unit protection during shipment.

C. Unit shall be stored and handled per Manufacturer's instructions.

D. Acceptance at Site:

1. Verify cooling towers are delivered in original factory packaging/crating and are free from damage and corrosion before installing.

2. Comply with the manufacturer's instructions for rigging and handling.

3. Replace equipment or parts delivered to job site that do not comply with above requirements at no expense to Owner.

E. Storage and Protection: Store products in temporary protected storage area(s) while in transit to the site. Store on-site as directed by the Owner.

1.09 WARRANTY

A. Manufacturer shall warrant the casing and structure of its cooling tower against defects in workmanship and material for a period of 15 years from date of shipment.

B. Fan Motor/Drive System: Warranty period shall be Five (5) years from date of unit shipment from factory (fan motor(s), fan(s), bearings, mechanical support.

PART 2 - PRODUCTS

2.01 MATERIAL AND EQUIPMENT

A. All materials shall be new, of equal or better quality of materials specified, and approved by the Officer-in-Charge. For ease of maintenance and parts replacement,

select equipment from a single manufacturer as much as possible. Substitutions require pre-bid approval.

2.02 OPEN TYPE INDUCED DRAFT COOLING TOWERS

A. General: Provide and install a factory assembled and tested, induced draft cooling tower complete with fan, fill, louvers, accessories, and rigging supports.

B. Design Requirements:

1. The unit shall be constructed and operate in accordance with the referenced design standards

2. Thermal performance shall be certified in accordance with CTI STD-201.

3. Equipment shall be seismically certified with an equipment importance factor of Ip=2.0.

4. Unit shall meet or exceed energy efficiency per ASHRAE 90.1.

C. Cooling Tower Components

1. Materials of Construction:

a. The lower water basin section, upper body section, and the fan deck shall be constructed of fiberglass reinforced polyester (FRP) material made with high-grade isophthalic polyester resin and ultraviolet (UV) inhibitor. Unless otherwised indicated, FRP components shall have a thickness no less than ¼ inch.

b. Fill media modules, drift eliminators, and air inlet louvers shall be fabricated from rigid, corrugated UV protected polyvinyl chloride (PVC) sheets. The PVC material shall be resistant to rot, fungi, bacteria and organic/inorganic acids and alkalis as commonly found in cooling towers; and shall meet CTI STD-136.

2. Cooling Tower Components

a. Lower water basin section shall be constructed as a seamless piece basin section, and shall be water-tight and leak-proof. Provide additional reinforced framing members to the basin structure, walls and bottom where required for added structural strength. No side fasteners will be allowed in the sidewalls of the basin. No metal support or structure in direct contact with water.

b. Upper body section shall be constructed as a seamless piece body, and shall be water-tight and leak-proof. Provide additional reinforced framing members to the structure and walls where required for added structural strength.

c. Fan Deck: The fan deck with duct shall be reinforced as required to ensure its structural strength. The fan deck duct will contain the direct drive fan or gear-drive fan motor mounted on a structural hot dipped galvanized steel support. The fan deck opening shall be covered with a corrosion-resistant safety screen mesh / fan guard.

d. Water Distribution: Hot water shall enter the cooling tower through a single inlet. Cooled water shall exit through a single outlet. All interior distribution piping shall be PVC schedule 80 pipe. Water shall be evenly distributed over the fill media by removable 2 1/2 inch spray nozzles fabricated of polypropylene (PP). Spray nozzles shall contain internal, interchangeable flow devices to provide an optimal spray pattern within the 5 psig operating pressure range.

e. Drift Eliminators: Drift eliminators shall be fabricated from rigid, corrugated UV protected PVC sheets and shall be furnished in lightweight, easily removable sections. The drift eliminators shall create 2 changes in air direction to remove entrained water particles from the leaving airstream. Drift losses shall not to exceed 0.0005% of the design circulating flow. Drift eliminators' flame spread rating shall be less than 25 according to ASTM E84, and shall be self-extinguishing.

f. Fill media modules shall be fabricated from rigid, corrugated UV protected PVC sheets. The sheets shall form a cross-corrugated pattern with an angle of 60 degrees from the horizontal between adjacent sheets, to provide a continuous and horizontal redistribution of air and water. Fill media modules shall provide no less than 69 ft2 /ft3 of surface area and a void-to-volume ratio of 95%. Fill media modules' flame spread rating shall be less than 20 according to ASTM E84, and shall be self-extinguishing in less than 5 seconds according to ASTM D635.

g. Air inlet louvers shall be designed to minimize splash-out of falling water, reduce light transmission into the tower and reduce sound transmission out of the tower at minimal airside pressure loss. Air inlet shall be easily removable to provide access for cleaning. Air inlet louvers' flame spread rating shall be less than 20 according to ASTM E84, and shall be self-extinguishing in less than 5 seconds according to ASTM D635.

3. Fans and Motors

a. Cooling Tower fans shall be propeller type, adjustable-pitch blades. Fan blades must be manufactured of spark and corrosion resistant extruded aluminum. The hub shall consist of two steel disks, connected to the top and bottom sides of the hub boss. The blades shall be connected to the hub through extruded aluminum pillow blocks in between the hub disks.

b. Fan shaft bearings: Minimum L-10 life of 100,000 hours.

c. Coupling: Elastomeric coupling (natural rubber or neoprene) with finished-bore or TAPER-LOCK flange design. The coupling shall require no lubrication.

d. Fan motors shall be direct drive, totally enclosed air over (TEAO) type with 1.15 service factor, suitable for installation in cooling towers. Motors shall be NEMA Premium efficiency, severe duty, and shall be inverter rated.

e. The fan motors shall be provided with a motor shaft grounding ring to protect against electrical bearing damage due to VFD-induced shaft currents.

4. Water Level Control

a. Provide each cooling tower with a mechanical float valve assembly to supply make-up water to the basin. The float valve assembly shall consist of a heavy duty bronze make-up valve connected to a copper float using a threaded stem. Adjustments to the water level shall be made by repositioning the float and stem using locknuts. Position the float valve assembly where it is easily accessible from the outside of the unit through the removable air inlet louver.

5. Accessories

a. Provide aluminum ladder with OSHA safety cage welded construction and assembled to ladder. Shipped loose for field installation. Use hot dip galvanized steel fasteners provided by manufacturer for installation. Cage's construction material are hot dip galvanized steel and OSHA 1910.23 standard.

b. Provide a motor davit support and davit for each fan motor.

c. Provide removable fill inspection panel access door.

d. Provide Catwalk is a one-section non-skid welded construction plate, and catwalk's handrail welded construction in several sections. Catwalk and catwalk's handrail construction material are hot dip galvanized steel and meet OSHA 1910.23 standard.

e. Provide basin sweeper piping with schedule 80 PVC piping with high flow nozzles to facilitate basin cleaning.

6. Vibration Isolation and Seismic restraint: Vibration switch case are: Weatherproof, NEMA 4 Enclosure Types 4 & 12, Range 0- 4.5G, Single Pole, Double throw load contacts, 120VCA reset coil voltage , Protects Your Equipment from Excessive Shock or Vibration, Fine Adjustment to Precisely Select the Degree of Sensitivity. Robertshaw Model 366-A8

2.03 Variable Frequency Drives (VFD)

A. Furnish complete variable frequency drive with bypass (VFDs) as specified herein for the cooling towers. All standard and optional features shall be included within the VFD enclosure, unless otherwise specified. The VFDs installed in the cooling tower enclosure shall be housed in a NEMA 4X enclosure. Model ABB ACH550, JCI AYK 550, or approved substitute.

B. The VFD shall convert incoming fixed frequency three-phase AC power into a variable frequency and voltage for controlling the speed of three-phase AC motors. The motor current shall closely approximate a sine wave. Motor voltage shall be varied with frequency to maintain desired motor magnetization current suitable for the fan and to eliminate the need for motor derating.

C. With the motor's rated voltage applied to the VFD input, the VFD shall allow the motor to produce full rated power at rated amps, RMS fundamental volts, and speed without using the motor's service factor. VFDs utilizing sine weighted/coded modulation (with or without 3rd harmonic injection) must provide data verifying that the motor will not draw more than full load current during full load and full speed operation.

D. The VFD shall include an input full-wave bridge rectifier and maintain a fundamental power factor near unity regardless of speed or load.

E. The VFD and options shall be tested to ANSI/UL Standard 508. The complete VFD, including all specified option, shall be assembled by the manufacturer, which shall be UL-508 certified for the building and assembly of option panels. Assembly of the option panels by a third-party panel shop is not acceptable. The appropriate UL stickers shall be applied to both the VFD and option panel, in the case where these are not contained in one panel.

F. The VFD shall have a DC link reactor on both the positive and negative rails of the DC bus to minimize power line harmonics. VFDs without a DC link reactor shall provide a minimum 5% impedance line reactor.

G. The VFDs full load amp shall meet or exceed NEC Table 430-150. The VFDs shall be able to provide full load output current continuously, 110% of rated current for 60 seconds and 160% of rated current for up to 0.5 second while starting.

H. An automatic energy optimization selection feature shall be provided standard in the VFD. This feature shall automatically and continually monitor the motor's speed and load and adjust the applied voltage to maximize energy savings and provide up to an additional 3% to 10% energy savings.

I. Galvanic and/or optical isolation shall be provided between the VFD's power circuitry and control circuitry to ensure operator safety and to protect connected electronic control equipment from damage caused by voltage spikes, current surges, and ground loop currents. VFDs not included either galvanic or optical isolation on both analog I/O and discrete I/O shall include additional isolation modules.

J. VFD shall minimize the audible motor noise through the use of an adjustable carrier frequency. The carrier frequency shall be automatically adjusted to optimize motor and VFD efficiencies while reducing motor noise.

K. Protective Features:

1. Class 20 i2t electronic motor overload protection for single motor applications and thermal-mechanical overloads for multiple motor applications shall be provided.

2. Protection against input transients, loss of AC line phase, output short circuit, output ground fault, overvoltage, undervoltage, VFD overtemperature and motor overtemperature. The VFD shall display all faults in plain English. Codes are not acceptable:

    a. VFD shall include a coordinated AC transient surge protection system consisting of 4 MOVs (phase to phase & phase to ground), capacitor clamp, 1600 PIV Diode Bridge and chokes.

    b. VFDs shall have 5% impedance AC reactors or internal dual 5% DC chokes to reduce harmonics to the power line and as protection from AC line transients. VFD’s with only one DC choke shall have OEM add AC UL 508 listed and approved line reactors.

    c. VFD shall automatically mitigate harmonics throughout the effective load range using Swinging chokes or other devices designed to lower harmonics when VFD is at partial loads. VFD’s using thin wall or metallic type capacitors must add active harmonic filters to prevent high frequency harmonics from corrupting the electrical system.

3. Protect VFD from sustained power or phase loss. The VFD shall provide full rated output with an input voltage as low as 90% of the nominal. The VFD will continue to operate with reduced output with an input voltage as low as 164 V AC for 208/230 volt units, and 313 V AC for 460 volt units.

4. The VFD shall incorporate a motor preheat circuit to keep the motor warm and prevent condensation build up in the stator.

5. VFD package shall include semi-conductor rated input fuses to protect power components.

6. To prevent breakdown of the motor winding insulation, the VFD shall be designed to comply with IEC Part 34-17. Otherwise the VFD manufacturer must ensure that inverter rated motors are supplied.

7. VFD shall include a "signal loss detection" circuit to sense the loss of an analog input signal such as 4 to 20 mA or 2 to 10 V DC, and shall be programmable to react as desired in such an instance.

8. VFD shall function normally when the keypad is removed while the VFD is running and continue to follow remote commands. No warnings or alarms shall be issued as a result of removing the keypad.

9. VFD shall catch a rotating motor operating forward or reverse up to full speed.

10. VFD shall be rated for 100,000 amp interrupting capacity (AIC).

11. VFD shall include current sensors on all three output phases to detect and report phase loss to the motor. The VFD will identify which of the output phases is low or lost.

12. Drive shall continue to operate without faulting until input voltage reaches 300 V AC on 208/230 volt VFD5, and 539 V AC on 460 volt VFDs.

L. Interface Features:

1. Hand/Start, Off/Stop and Auto/Start selector switches shall be provided to start and stop the drive and determine the speed reference.

2. The VFD shall be able to be programmed to provide a 24 V DC output signal to indicate that the VFD is in Auto/Remote mode.

3. The VFD shall provide digital manual speed control. Potentiometers are not acceptable.

4. Lockable, alphanumeric backlit display keypad can be remotely mounted up to 10 feet away using standard 9-pin cable.

5. The keypads for all sizes shall be identical and interchangeable.

6. To set up multiple VFDs, it shall be possible to upload all setup parameters to the VFD's keypad, place that keypad on all other VFDs in turn and download the setup parameters to each VFD. To facilitate setting up VFDs of various sizes, it shall be possible to download from the keypad only size independent parameters.

7. A red FAULT light, a yellow WARNING light and a green POWER-ON light shall be provided. These indications shall be visible both on the keypad and on the drive when the keypad is removed.

8. A quick setup menu with factory preset typical HVAC parameters shall be provided on the VFD eliminating the need for macros.

9. The VFD shall include a standard RS 485 serial communications port and be connected at a future date to a BACNET compatible Direct Digital Controls at no additional cost to the City and County. The connection shall be software selectable by the user.

10. As a minimum, the following points shall be controlled and/or accessible:

    a. VFD Start/Stop

    b. Speed reference

    c. Fault diagnostics

    d. Meter points

        (1) Motor power in HP
        (2) Motor power in kW
        (3) Motor kW-hr
        (4) Motor current
        (5) Motor voltage
        (6) Hours run
        (7) Feedback signal #1
        (8) Feedback signal #2
        (9) DC link voltage
        (10) Thermal load on motor
        (11) Thermal load on VFD
        (12) Heatsink temperature

11. Four additional Form C 230 volt programmable relays shall be available for factory or field installation within the VFD.

12. Two set-point control interlace (PID control) shall be standard in the unit. VFD shall be able to look at two feedback signals, compare with two set-points and make various process control decisions.

13. Floating point control interface shall be provided to increase/decrease speed in response to switch closures.

14. Four simultaneous displays shall be available. They shall include frequency or speed, run time, output amps and output power. VFDs unable to show these four displays simultaneously shall provide panel meters.

15. Sleep mode shall be provided to automatically stop the VFD when its speed drops below set "sleep" level for a specified time. The VFD shall automatically restart when the speed command exceeds set "wake" level.

16. The sleep mode shall be functional in both follower mode and PID mode.

17. Run permissive circuit shall be provided to accept a "system ready" signal to ensure that the VFD does not start until dampers or other auxiliary equipment are

in the proper state for VFD operation. The run permissive circuit shall also be capable of sending an output signal as a start command to actuate external equipment before allowing the VFD to start.

18. The following displays shall be accessible from the control panel in actual units: Reference Signal Value in actual units, Output Frequency in Hz or percent, Output Amps, Motor HP, Motor kW, kWhr, Output Voltage, DC Bus Voltage, VFD Temperature in degrees, and Motor Speed in engineering units per application (in percent speed, GPM, CFM, etc.). VFD will read out the selected engineering unit either in a linear, square or cubed relationship to output frequency as appropriate to the unit chosen.

19. The display shall be programmed to read in inches of water column (in-wg) for an air handler application, pressure per square inch (psi) for a pump application, and temperature (°F) for a cooling tower application.

20. VFD shall be able to be programmed to sense the loss of load and signal a no load/broken belt warning or fault.

21. If the temperature of the VFD's heat sink rises to 80°C, the VFD shall automatically reduce its carrier frequency to reduce the heat sink temperature. If the temperature of the heat sink continues to rise the VFD shall automatically reduce its output frequency to the motor. As the VFD's heat sink temperature returns to normal, the VFD shall automatically increase the output frequency to the motor and return the carrier frequency to it's normal switching speed.

22. The VFD shall have temperature controlled cooling fans for quiet operation and minimized losses.

23. The VFD shall store in memory the last 10 faults and record all operational data.

24. Eight programmable digital inputs shall be provided for interfacing with the systems control and safety interlock circuitry.

25. Two programmable relay outputs, one Form C 240 V AC, one Form A 30 V AC, shall be provided for remote indication of VFD status.

26. Three programmable analog outputs shall be provided and shall accept a direct-or-reverse acting signal. Analog reference inputs accepted shall include two voltages (0 to 10 V DC, 2 to 10 V DC) and one current (0 to 20 mA, 4 to 20 mA) input.

27. Two programmable 0 to 20 mA analog outputs shall be provided for indication of VFD status. These outputs shall be programmable for output speed, frequency, current and power. They shall also be programmable to provide a selected 24 V DC status indication.

28. Under fire mode conditions the VFD shall automatically default to a preset speed.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General: Rig and Install in full accordance with Manufacturer's installation, operation and maintenance manual requirements.

B. Location: Locate cooling towers as indicated on drawings, including cleaning and service maintenance clearance per Manufacturer instructions. Components: Contractor shall provide and install all auxiliary devices and accessories for fully operational cooling tower.

C. Structural support: Provide corrosion resistant steel support base in hot-dipped galvanized steel for the cooling towers. Coordinate installation with seismic and vibration isolation design, the project structural design information, and the existing roof supports. Adjust and level cooling towers on support structure.

D. Electrical: Coordinate electrical requirements and connections for all power feeds with Electrical Contractor.

E. Controls: Coordinate unit and system control requirements with Controls Contractor – Building Automation System.

3.02 ELECTRICAL WORK

A. Provide wiring, conduits, switches and devices required for controlling electrical equipment in accordance with Division 16 - ELECTRICAL.

3.03 REPAIR/RESTORATION

A. Repair any product components broken during installation or startup with replacement parts supplied by the product manufacturer.

B. Substitute replacement parts from other manufacturers are not acceptable.

C. Unit casing: Installing Contractor shall patch up any damaged and abraded factory finish that occurs during installation. Request touch up kit. If damage falls under the warranty, a factory representative will patch up the damage.

3.04 FIELD QUALITY CONTROL

A. Manufacturer's Field Services:

1. Verify that the units are installed and operational in accordance with the manufacturer's written installation instructions.

2. Both the Contractor and Manufacturer's Representative(s) shall sign start-up and operational checklist to confirm proper system installation and operation.

3.05 DEMOSTRATION AND START-UP

A. Provide Demonstration and Start-up visits to site for start-up.

1. Site visit to coincide with initial start-up of unit(s) after completion of phased installation. Upon completion of this site visit, unit installations and test and balance shall be complete, and 100% functional and ready for Owner's acceptance and use.

B. Provide factory authorized consulting services for a period of one year from start-up to include:

1. Installation and system start-up procedure recommendations.

2. Pre-operation system clean-out procedure supervision.

3. Monthly field service visits during wet operation.

C. Start-up and operate cooling towers in accordance with the submitted and approved manufacturer's written installation, operation and maintenance manual.

D. Verify operating sequence submitted and approved manufacturer's written installation, operation and maintenance manual.

E. Document start-up and operational checks using the manufacturer's installation checklist and submit in accordance with submittal requirements.

F. Commissioning: Perform tests and verification procedures required for the phased commissioning process.

3.06 TESTS

A. Manufacturer's recommended testing: Conduct the manufacturer's recommend field testing. Furnish a qualified field representative authorized by and to represent the equipment manufacturer at the complete execution of the field acceptance testing.

B. Operational test: Conduct a continuous 24 hour operational test for cooling tower. Equipment shutdown before the test period is completed will result in the test period being started again and run for the required duration. For the duration of the test period, compile an operational log of each item of equipment. Log required entries every two hours.

C. Report forms: Type data entries and writing on the test report forms. Completed test report forms for each cooling tower must be reviewed, approved, and signed by the Contractor's quality control representative. The manufacturer's field test representative must review, approve, and sign the report of the manufacturer's recommended test. Signatures must be accompanied by the person's name typed.

D. Deficiency resolution: Deficiencies identified during the tests must be corrected in compliance with the manufacturer's recommendations and corrections retested in order to verify compliance.

3.07 PAINTING AND IDENTIFYING

A. The items furnished under this section are to be painted and identified under Section 09900 - PAINTING. Do not paint over name plates or other identifying labels.

3.08 CLEANING

A. Upon completion of installation and prior to initial start-up, clean internal and external surfaces.

3.09 FIELD INSTRUCTION

A. The Contractor shall provide the services of a certified representative for a period 4 hours of training for the Officer-in-Charge. Instruction shall include:

1. System startup
2. Normal system operation
3. System shutdown
4. Preventative maintenance

3.10 ONE YEAR MAINTENANCE SERVICE CONTRACT

A. Comply with all the requirements specified in Section 15050 – Basic Mechanical Materials and Methods.

3.11 OPERATION AND MAINTENANCE MANUAL

A. Comply with all the requirements specified in Section 15050 – Basic Mechanical Materials and Methods.

3.12 SCHEDULE OF MAINTENANCE SERVICE

A. Comply with all the requirements specified in Section 15050 – Basic Mechanical Materials and Methods.

END OF SECTION

SECTION 15910 - DIRECT DIGITAL CONTROL SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. This section covers the integration of the new cooling towers into the existing direct digital control (DDC) system. The DDC system shall be a multi-loop, standalone and distributed digital control system as manufactured by a company specializing in HVAC controls. The DDC system shall provide all hardware and software to control all HVAC control functions including input, logic, processing and output functions. Input functions shall include analog and digital (binary, on/off, open/close) control signals to the microprocessor based digital controllers.

B. Output shall be transmitted via interface ports to allow connection to other controllers, terminals, a portable computer or a central site computer. The interface equipment will not provide day to day control of the HVAC system but will allow the operator to enable and disable equipment, change set points, change operating schedules, receive trends and alarms and allows loading and downloading of control programs. The system shall communicate with graphic operator work station located in the building (direct connection to a communication LAN) or at a remote site (connected to the digital controller through a LAN or modems and a telephone line).

C. DDC System Description, Operator Interface: All new BACnet objects defined in this contract shall be mapped to the existing controls system user workstation. Controls shall provide all graphic creation and point mapping, and all necessary protocol interface hardware to interface into the existing controls system. The successful General Contractor shall in its bid, include costs for the work to be done by new controls.

D. Related Sections:
   1. Requirements of DIVISION 1 – GENERAL REQUIREMENTS apply to this section.
   2. SECTION 15050 – BASIC MECHANICAL MATERIALS AND METHODS
   3. SECTION 15640 – FRP INDUCED DRAFT COOLING TOWERS
   4. SECTION 15950 – HVAC TESTING/ADJUSTING/BALANCING
   5. SECTION 15959 – COMMISSIONING OF HVAC SYSTEMS
   6. DIVISION 16 – material and installation requirements for control wiring.

1.02 REFERENCES

A. Codes and Ordinances: The work shall be in accordance with current governing State and Local Ordinances, Codes and Regulations, including NFPA Regulations and Factory Mutual, all of which are hereby made a part of these requirements. The contractor shall furnish, without any extra charge, any additional material or labor, or both, required for compliance with these rules and regulations, although not mentioned in these requirements nor indicated on the contract drawings. The latest editions of the publications

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

1. ASME 831.1-2007 Power Piping.

2. NFPA 70-2005 National Electric Code.

3. ASHRAE 135-2004 Data Communication Protocol for Building Automation and Control Networks.

4. UL 916-1998 UL Standard for Safety; Energy Management Equipment

5. ANSI C12.10-2004 Standard for Electromechanical Watt-hour Meters.

6. ANSI C57.13.2-2005 Standard Conformance Test Procedures for Instrument Transformers

7. ASME B16.5-1996, Pipe Flanges and Flanged Fittings NPS: ½ Through NPS 24.

8. ASTM A 126-2004, Standard Specification for Grey Iron Castings for Valves, Flanges, and Pipe Fittings.

9. UL 1449-1996, UL Standard for Safety Transient Voltage Surge Suppressors.

10. NFPA 90A-2002, Standard for the Installation of Air Conditioning and Ventilation Systems.

11. UL 555S-1999 UL Standard for Safety Leakage Rated Dampers for Use in Smoke Control Systems.

12. ANSI B40.1 00-1998 Gauges – Pressure Indicating Dial Type – Elastic Element.

1.03 DEFINITIONS

A. BACnet: BACnet is a standard communication protocol developed by the American Society of Heating Refrigeration and Air Conditioning Engineers (ASHRAE). The controller manufacturer shall have a company policy to support the implementation of BACnet.

B. Digital Controller: A control module which is microprocessor based, programmable by the user, has integral 110, and performs stand-alone operations.

C. Direct Digital Control (DDC): A digital controller as defined in this Document. The controller directly senses building environment and makes control decisions based on user defined, controller resident programs. The controller outputs control signals that directly operate valves, dampers, and motor controllers. No conventional control devices, pneumatic or electronic, such as

receiver-controllers, thermostats, and logic units are present within or interface with a direct digital control loop. Actuators are electric or pneumatic, and the controller output is converted to the appropriate type of signal.

D. DDC System: A system made up of one or more digital controllers. Required climate control and energy management functions for complete operation of an HVAC system are provided by DDC from digital controllers. No conventional control devices (pneumatic or electronic) such as receiver-controllers, thermostats, and logic units are used. Digital controllers in a system are linked in a communication network composed of one or more levels of local area networks (LAN).

E. Distributed Control: The intent of distributed control is to install the controllers near the equipment being controlled, and to distribute the processing to each stand-alone DDC panel. The control system is built up of stand-alone controllers, utilizing sensor inputs and control outputs.

F. Dynamic Control: A process that optimizes operation of HVAC systems (air handler units, converters, chillers, and boilers) by increasing and decreasing setpoints or starting and stopping equipment in response to heating and cooling needs of downstream equipment. A requirement of dynamic control is knowing the heating/cooling demand status of downstream equipment; therefore, dynamic control requires controllers connected in a communications network.

G. Firmware: Firmware is software programmed into read only memory (ROM) and erasable programmable read only memory (EPROM) chips. Software may not be changed without physically altering the chip.

H. Graphic Sequence of Operation: A drawing or graphic showing all interlocks and control loop sequences between the input and output points. Graphic sequence of operation is a graphical representation of the sequence of operation. The graphic sequence of operation will show all inputs, outputs, and logic blocks.

I. Hand-Held Terminal: A hand-held terminal is a portable device, control system manufacturer-specific, which can be connected directly to a communications port on a digital controller and through which the digital controller can be interrogated and, in some cases, programmed.

J. Input/Output (I/O): I/O refers to analog inputs (AI), digital inputs (01), analog outputs (AO), and digital outputs (DO) in a digital controller. Inputs are from analog sensors (temperature, pressure, humidity, flow) and digital sensors (motor status, flow switches, switch position, and pulse output devices). Outputs operate modulating and on/off control devices.

K. I/O Unit: An I/O unit provides additional point capacity to a digital controller and communicate with the stand-alone digital controller on LAN. An I/O unit is not standalone because the control program does not reside in the I/O units microprocessor.

L. Integration: The ability of control system components to have interoperability between different manufacturers to connect together and provide coordinated control via real-time data exchange and control functions through a common communications data exchange protocol. Integration shall extend to the operator's workstation software, which shall support user interaction with all control system components. Methods of integration include industry standard protocols such as: BACnet, ARCnet, LonMark/LonTalk, OLE for Process Control (OPC) or integrator interfaces between cooperating manufacturer's systems.

M. Local Area Network (LAN):
   1. A communications bus that interconnects digital controllers for peer-to-peer communications. Different levels of LANs are possible within a single DDC system. In this case, a digital controller on a higher level LAN acts as a network controller to the controllers on the lower level LAN. The network controller, then, has at least two LAN communications ports. One port supports peer-to-peer communications with other digital controllers on the higher level LAN. The other port supports communications with the digital controllers on the lower level LAN.

   2. LANs permit sharing global information, make it possible to apply building wide control strategies such as peak demand limiting, permit dynamic control strategies, allow coordinated response to alarm conditions, and permit remote monitoring and programming of digital controllers.

   3. Facility-wide LAN refers to a commercially available local area network. These LANs allow the connection to an existing or new facility-wide LAN.

N. Microprocessor: A microprocessor refers to the central processing unit (CPU) that contains all the registers and logic circuitry that make it possible for digital controllers to do computing.

O. Open Protocol Bus (OPB): A pre-programmed communications integrator that allows devices from one manufacturer to communicate and interact with those of another.

P. Open System Port (OSP): A user programmable communications port that provides the ability to develop custom communications processes to integrate other operating systems with the DDC System.

Q. Output Signal Conversion: Output signal conversion refers to the changing of one kind of control output into a proportionally related signal appropriate for direct actuation of the controlled device. Signals are converted by a transducer which may be external to the digital controller originating the output.
   1. Examples in modulating control of pneumatic actuators are conversion of 4-20ma signals into proportional 3-15 psig signals.

2. An example of output signal conversion in on/off or open/close control is a contact closure originating in a digital controller which activates a solenoid air valve which passes main air, thereby forcing a damper to open fully.

R. Optimum Start: Optimum start is a method of starting the HVAC equipment prior to occupancy time in order to have the building at setpoint at occupancy. Optimum start shall be based on the zone temperatures, zone setpoints, and outdoor temperature. Optimum start will bring the zone to setpoint at occupancy time.

S. Peer-to-Peer: Peer-to-Peer refers to controllers connected on a communications LAN that act independently, as equals and communicate with each other to pass information which facilitates control.

T. PID: PID refers to proportional, integral, and derivative control; the three types of actions that are used in controlling modulating equipment.

U. Resolution: Refers to the number of possible states an input value or output value can take and is a function of the digital controller 110 circuitry; the AID converter for input and the D/A converter for output. Ten bit resolution has 1024 possible states and eight bit resolution has 256 possible states.

V. Stand-Alone Control: Refers to the digital controller being able to perform required climate control, and energy management functions without connection to another digital controller or central site computer. Digital controller requirements for stand-alone control are a time clock, a microprocessor, microchip resident control programs, PID control, a communications port for interfacing with and programming the controller, firmware for interrogation and programming, and 1/0 for sensing and effecting control of its control environment.

W. Terminal Control Unit (TCU): An off-the-shelf, stand-alone digital controller equipped for communication on a lower level local area network. TCUs may deviate from stand-alone only in receiving energy management and time information from a stand alone digital controller. A TCU is commonly application specific and is used for distributed control of specific HVAC subsystems. A TCU communicates with the digital controllers. Typically, a TCU communicates on a lower level LAN. Examples where TCUs might be used to control of small air handling units (AHUs), variable air volume (VAV) boxes, fan coil units, and heat pumps.

1.04 SUBMITTALS

A. Submit under provisions of SECTION 15050 – BASIC MATERIALS AND METHODS.

B. Manufacturer's Catalog Data
   1. DDC hardware

   2. DDC capabilities

3. Workstation software

4. Input devices

5. Output devices

6. Surge and transient protection

7. Laptop computer

8. Hand-held terminal

9. Panel mounted display and keypad

C. Equipment and software for which specification compliance data shall be submitted include but not limited to the following:
   1. DDC Hardware
      a. I/O; capable of supporting platinum RTD, precision thermistor, 4-20 ma, 0-10 VDC

      b. Programs will reside in microprocessor; controllers are stand-alone

      c. Communications ports; all communications ports as specified

      d. Protected memory; minimum hours required by this specification

      e. Operating temperature limits

   2. DDC Capabilities
      a. Communications; baud rate, communication ports, stand-alone

      b. Trending; capable of trending every point

      c. Alarming; capable of alarm generation as indicated

      d. Messages; as indicated

      e. Self diagnostics; identification of a failed module

      f. PID control; capable of PID control

   3. Workstation Software
      a. Mouse and keyboard operation

      b. Communications

      c. Program upload and download

      d. Dynamic point update

e. Program modification

f. Database modification

g. Graphics and graphics modifications

h. Penetration of graphics

4. Input Devices
   a. Transmitters; accuracy, 4-20 ma, 0-10 VDC

   b. Temperature sensors; accuracy, stability, 100 percent factory screening, platinum RTD or thermistor

   c. Pressure sensor; accuracy

   d. Flow or motor proof; type

   e. Sensor wells; type

5. Output Devices
   a. Valves; types

   b. Actuators

   c. Control Relays

6. External Surge and Transient Protection
   a. Power line

   b. Communications links and/or devices (between buildings)

D. Shop Drawings: Submit the following drawings. Provide hard copies as required by Section 01300 Submittal Procedures and electronic copies on CD for review.
   1. Control system schematic
   2. Wiring diagrams
   3. I/O points list. Submit as excel file on CD.

E. Design Data: Submit test data demonstrating the following installed components will meet specification requirements.
   1. Temperature sensor accuracy: Submit manufacturer's specification of temperature sensor accuracy. Literature shall make clear sensor accuracy as specified.

   2. Temperature sensor stability: Provide manufacturer's specification of five year stability of RTDs and thermistors. Literature shall make clear sensor stability as specified.

F. Schedules:
   1. List of shop drawings.

   2. List of symbols and abbreviations used on shop drawings.

   3. List of I/O points: For each input and output physically connected to a digital controller on a controller by controller basis, provide the following:
      a. Point description: for example: mixed air temperature, supply fan start/stop, etc.

      b. Point type: AO, AI, D0, or 01.

      c. Point range: 4-20 ma, 3-15 psi, platinum RTD resistance ohm, thermistor.

      d. Sensor range associated with point range: for example 0-100 degrees F, 0-2 inches of water.

      e. Software name(s) associated with point, if any.

      f. Terminal number to which point is connected.

   4. Equipment components list: Submit a listing of controllers and connected devices shown on control system schematic. List the following:
      a. Control system schematic component name

      b. Description

      c. Manufacturer of controller

      d. Controller's name

      e. Equipment part numbers

      f. Cv for valves

      g. For actuators:
         1) Motive force (such as pneumatic, or electric)

         2) Normal position

         3) Nominal operating range (such as 3-7 psi, 4-8 ma)

   5. AC power table: Submit a table listing each controller and the circuit breaker number, panel box number, and physical location of each controller's source of AC power.

H. Statements
   1. Contractors' qualifications: Submit statements required in Part 1, Quality Assurance, Qualifications.

2. Training: Submit schedule, syllabus, and training materials in accordance with Part 3, EXECUTION.

I. Records: Provide administrative and closeout submittals:
   1. Training course Documentation: Training course Documentation shall include a manual for each trainee plus two additional copies and two copies of audiovisual training aids, if used. Documentation shall include an agenda, defined objectives for each lesson and detailed description of the subject matter of each lesson.

   2. Service organization: Qualified service organization list that shall include the names and telephone numbers of organizations qualified to service the HVAC control systems

   3. Contractor certification: Provide certification that the installation of the control system is complete and the technical requirements of this section have been met.

J. Operation and Maintenance Manuals
   1. Controls and HVAC System Operators Manual: Construct and provide a Control and HVAC Systems Operators Manual. This manual is designed to Document the HVAC and control system. Construct this manual using a 3 ring binder with a minimum of the following 7 sections. Use tabs to divide each section.
      a. Section 1. Description of HVAC Systems: Provide a description of the HVAC system components and control system. Include sequences of operation and a complete points list.

      b. Section 2. Controls Drawings: Provide drawings as specified.

      c. Section 3. Control Program Listings: Provide listing of all control programs, including terminal equipment controller setup pages.

      d. Section 4. Current Operating Parameters: Provide printouts of input and output setup information, database setups. This section is intended to provide information such as point addresses, slopes and offsets for all points, database of points, etc.

      e. Section 5. Design Information: Provide tab, but leave this section blank.

      f. Section 6. Control Equipment Cut Sheets: Provide cut sheets of all controller hardware and accessories. Include temperature versus resistance charts for temperature sensors, and calibration charts for pressure transducers.

      g. Section 7. Control Program: Provide a fully operational control system disk (CD disk format preferred) identical to the original control program as installed. In addition, provide a restore - backup disk of

the control program and backup copy of ACAD controls drawings on a 3.5 inch disk. It is understood that the software will be available to the base and used only for the buildings in this contract.

2. DDC Manufacturer's Hardware and Software Manuals:
   a. Section 1. Installation and Technical Manuals for all digital controller hardware.

   b. Section 2. Operators Manuals for all digital controllers.

   c. Section 5. Programming Manuals for all digital controllers.

3. Provide one (1) additional set of as-built drawings, wiring diagrams and points list as hard copy and on CD to be stored in pouch or compartment in main DDC panel.

1.05 QUALITY ASSURANCE

A. General
   1. The Direct Digital Control (DDC) System herein specified shall be fully integrated and installed as a complete package by the Direct Digital Control System Contractor. The System shall include all wiring, piping, installation supervision, calibration, adjustments, and checkout necessary for a complete and fully operational system.

   2. The Direct Digital Control System Contractor shall be regularly engaged in the engineering, programming, installation and service of Direct Digital Control systems of similar size and complexity.

   3. The DDC Contractor shall have a local facility in Oahu. Emergency service shall be available on a 24-hour, 7-day-a-week basis.

   4. The DDC Contractor shall be responsible for all work fitting into place in a satisfactory and neat workmanlike manner acceptable to the Officer-in-Charge.

B. Experience Record
   1. The DDC Contractor shall have a minimum of five years of experience with the complete installation of Direct Digital Control systems of similar size and technical complexity. The DDC Contractor shall provide a list of three comparable projects that have Direct Digital Control Systems with the features as specified for this project. These projects must be on-line and functional.

   2. The DDC Contractor shall employ specialists in the field of Direct Digital Control Systems including: Programming, Engineering, Field Supervision, and Installation. Specialists shall present factory training certification of the submitted equipment upon request.

C. Governing Code Compliance: The DDC Contractor shall comply with all current governing codes, ordinances and regulations, including UL, NFPA, the local Building Code, NEC, and so forth.

D. FCC Regulation: All electronic equipment shall conform to the requirements of FCC Regulation, Part 15, Section 15, Governing Radio Frequency Electromagnetic Interference, and be so labeled.

E. Standard Products
   1. Materials and equipment shall be standard products of manufacturer regularly engaged in the manufacturing of such products, using similar materials, design and workmanship. The standard products shall have been in commercial or industrial use for 2 years prior to bid opening. The 2 year use shall include applications of similarly sized equipment and materials used under similar circumstances. The 2 year experience must be satisfactorily completed by a product which has been sold on the commercial market through advertisements, manufacturer's catalogs, or brochures.

   2. The equipment items shall be supported by a service organization.

F. Nameplate and Tags
   1. Nameplates bearing legends as shown and tags bearing device unique identifiers as shown shall be engraved or stamped. Nameplates shall be permanently attached to HVAC control panel doors.

   2. For each field mounted piece of equipment, not in a finished area, a plastic or metal tag with equipment name and point identifier shall be attached.

G. Verification of Dimensions: The contractor shall become familiar with all details of the work, shall verify all dimensions in the field, and shall advise the Officer-in-Charge of any discrepancy before performing the work.

H. Drawings: Because of the small scale of the drawings, it is not possible to indicate all offsets, fittings, and accessories that may be required. The Contractor shall carefully investigate the mechanical, electrical, and finish conditions that could affect the work to be performed, and shall finish all work necessary to meet such conditions.

I. Modification of References: The advisory provision in ASME B31.1 and NFPA 70 shall be considered mandatory. Substitute the work "shall" for "should" wherever it appears and interpret all references to the "authority having jurisdiction" and "owner" to mean the City and County.

J. Storage: Stored products shall be protected from the weather, humidity and temperature variations, dirt and dust, and other contaminants, within the storage condition limits published by the equipment manufacturer.

1.06 WORK INCLUDED

A. Integration into existing Direct Digital Control (DDC) System

1. The DDC Contractor shall integrate all new mechanical systems into the existing Control (DDC) System as included in the project Documents. The DDC system will provide the functional features as defined in Part 1 - General Requirements, Part 2 - Products, and Part 3 - Execution of these Specifications. The DDC Contractor shall provide a complete and operational system to perform all sequences of operations stated within Part 3 or-shown on the control drawings.

2. The work under this Section shall include all materials and labor to perform all work required for the installation of the DDC as specified.

3. The drawings and specifications are complementary to one another - meaning that what is called for on one is to be considered called for in both. Where conflicts exist between the specifications and/or drawings, the more stringent requirement shall apply.

4. The DDC Contractor shall be responsible for field verification of site conditions and for gathering all necessary field data for all items to be provided under this contract prior to submitting his or her bid.

5. Where work specified under other Sections of this Specification connects to equipment or systems that are listed and described in this Section, the DDC Contractor shall provide proper connection(s) to such equipment including trade coordination.

1.07 COORDINATION

A. Divisions

1. The DDC Contractor shall cooperate with other divisions performing work on this project as necessary to achieve a complete and neat installation. The Contractor shall also consult the drawings and specifications of all trades to determine the nature and extent of others' work.

2. Contractors, Sub-contractors, Employees: It will be the duty of this Contractor to work in cooperation with other contractors, and with other sub-contractors and employees, rendering assistance and arranging his or her work so that the entire project.

1.08 MANUALS

A. All manuals shall be provided in hard copy format or on a single Compact Disk (CD) as part of an on-line Documentation system through the operator workstation.

PART 2 - PRODUCTS

2.01 SYSTEM ARCHITECTURE

A. First Tier Network

1. The first tier network shall be based on a PC industry standard of Ethernet TCP/IP, or ARCnet. PC Workstation LAN controller cards shall be standard "off the shelf" products available through normal PC vendor channels.

2. The DDC system shall network multiple operator workstations, network controllers, system controllers, and application-specific controllers. The first tier network shall provide communications between operator workstations and first tier DDC (Direct Digital Control) controllers.

3. The first tier network shall operate at a minimum communication speed of 2.5 M baud, with full peer-to-peer network communication.

4. Network Controllers shall reside on the first tier.

B. First Tier Network Protocol Integration
   1. The protocol used between two different vendor systems will be BACnet over Ethernet and comply with the ASHRAE BACnet Standard 135-2004.

   2. The system installed under this contract shall allow bi-directional communications between the existing host system if applicable or a BACnet system over an Ethernet TCPIIP data link, or ARCnet. Supported media shall include fiber, 10base2, and 10baseT.

   3. A complete Protocol Implementation Conformance Statement (PICS) shall be provided for all BACnet system devices.

   4. The ability to share data and change of state (COS) between the existing designated host system and the system installed under this contract shall be provided.

C. Second Tier Network
   1. The second tier network is used to communicate between the first tier DDC controllers and field controllers.

   2. Second tier networks shall utilize either "Peer-to-Peer," Master-Slave, or Supervised Token Passing communications or LONWORKS.

D. Second Tier Controller Protocol Integration
   1. Hardwired
      a. Analog and digital signal values shall be passed from one system to another via hardwired connections.

      b. There will be one separate physical point on each system for each point to be integrated between the systems.

      c. Analog points will be 4-20 mA signals originating at the "from system" and being received by the "to system".

d. Digital points will be "dry contact" signals originating at the "from system" and being received by the "to system."

2. Direct Protocol
   a. The DDC system shall include appropriate hardware equipment and software to allow data communications between the DDC system and 3rd party manufacturers control panels. The DDC shall receive, react to, and return information from multiple building systems, variable frequency drives, power monitoring systems, etc.

   b. All data required by the application shall be mapped into the First Tier Network DDC Controller's database, and shall be transparent to the operator.

   c. Point inputs and outputs from the third-party controllers shall have real-time interoperability with DDC software features such as: Control Software, Energy Management, Custom Process Programming, Alarm Management, Historical Data and Trend Analysis, Totalization, and Dial-Up and Local Area Network Communications.

   d. Integration shall be via RS-232 or RS-485 technologies.

   e. The system operator shall have the ability to verify, and diagnose communication messages and point information between third-party controllers and the DDC system.

2.02 DDC SYSTEM

A. Provide a DDC system as a distributed control system. The system shall have standalone digital controllers, a communications network (new or existing), and a separate workstation computer with workstation software.

B. Provide an operator programmable system, based on the user applications, to perform closed-loop, modulating and/or on-off control of building equipment. Connect all digital controllers through the communication network to share common data and report to workstation computers. The workstation computers will be capable of being programmed to supervise the digital controllers. The control system shall be capable of down-loading and up-loading of programs between the workstation and the digital controllers.

C. Provide the quantity of digital controllers indicated on the drawings that will perform required climate control, energy management, and alarm functions. The quantity of controllers shall be no less than the number shown on drawings. All material used shall be currently in production.
   1. Direct Digital Controllers: DDC hardware shall be UL 916 rated.
      a. Distributed Control: Apply digital controllers in a distributed control manner.

      b. Environmental Operating Limits: Provide digital controllers that operate in environmental conditions between 32 and 120 degrees Fahrenheit.

c. Stand-Alone Control: Provide stand-alone digital controllers.

d. Internal Clock: Provide clock with each controller on the first tier local area network (LAN) and shall have its clock backed up by a battery or capacitor with sufficient capacity to maintain clock operation for a minimum of 72 hours during a line power outage.

e. Memory:
   1) Provide sufficient memory for each controller to support required control and communication functions.

   2) Memory Protection: Programs residing in memory shall be protected either by using EEPROM or by an uninterruptible power source (battery or uninterruptible power supply (UPS)). The backup power source shall have sufficient capacity to maintain volatile memory in event of an AC power failure. Where the uninterruptible power source is rechargeable (a rechargeable battery), provide sufficient capacity for a minimum of seventy two hours back-up. The rechargeable power source shall be constantly charged by charging circuitry while the controller is operating under normal line power. Where a non-rechargeable power source is used, provide sufficient capacity for a minimum of two years accumulated power failure. Batteries shall be designed to allow replacement without soldering.

f. Inputs: Provide input function integral to the direct digital controller. Provide input type as required by the DDC design.
   1) Analog Inputs: Allowable input types are three wire 100 ohm or higher platinum RTD's, stable 10,000 ohm thermistors, 0-10 VDC and 4 to 20 mA. Thermistor and direct RTD inputs must have appropriate conversion curves stored in controller software or firmware. Analog to digital (A/D) conversion shall be a minimum of 10 bit resolution.

   2) Digital Inputs: Digital inputs shall sense open/close, on/off, or other two state indications.

g. Outputs: Provide output function integral to the direct digital controller. Provide output type as required by the DDC design. Ensure that outputs of controllers are compatible with controlled devices.
   1) Analog Outputs: Provide controllers with a minimum output resolution of 8 bits. Output shall be 4 to 20 ma or 3 to 15 psi or 0-10 VDC. Each pneumatic output shall have feedback for monitoring of the actual pneumatic signal. Feedback shall be integral to the output function.

   2) Digital Outputs: Provide contact closure with contacts rated at a minimum of 1 ampere at 24 volts.

h. PID Control: Provide controllers with proportional, proportional plus integral, and proportional plus integral plus derivative control capability. Terminal controllers are not required to have the derivative component.

i. Digital Controller Networking Capabilities: The upper level digital controllers shall be capable of being networked with other similar upper level controllers. Upper level controllers shall also be capable of communicating over a network between buildings.

j. Communications Ports
   1) Controller-to-Controller LAN Communications Ports: Controllers in the building DDC system shall be connected in a communications network. Controllers shall have controller to controller communication ports to both peer controllers (lower level controller). Network may consist of more than one level of local area network and one level may have multiple drops. Communications network shall permit sharing between controllers of sensor and control information, thereby allowing execution of dynamic control strategies and coordinated response to alarm conditions.

   2) On-Site Interface Ports: Provide a RS-232, RS-485, or RJ-11, or RJ-45 communications port for each digital controller that allows direct connection of a computer or hand held terminal and through which the controller may be fully interrogated. Controller access shall not be limited to access through another controller. On-site interface communication ports shall be in addition to the communications port(s) supporting controller to controller communications. Communication rate shall be 56K Baud minimum. Every controller on the highest level LAN shall have a communications port supporting direct connection of a computer; a hand held terminal port is not sufficient. By connecting a computer to this port, every controller in the direct digital control system shall be able to be fully interrogated and programmed. The following operations shall be available: downloading and uploading control programs, modifying programs and program data base, and retrieving or accepting trend reports, status reports, messages, and alarms.

   3) Remote Work Station Interface Port: Provide one additional direct connect computer port in each DDC system for permanent connection of a remote operator's workstation, unless the workstation is a node on the LAN. All operations possible by directly connecting a computer to a controller at the highest level LAN shall be available through this port.

   4) Telecommunications Interface Port: Provide one additional telecommunications port in each DDC system permitting remote communications via telephone. All operations possible by directly

connecting a computer to a controller at the highest level LAN shall be available through the telecommunications port. A telecommunications port provided on a digital controller shall be in addition to the port required for directly connecting a computer to the controller. Telecommunication baud rate shall be 96K minimum.

k. Modem: Provide one modem per DDC system to communicate between the digital control system and the workstation.

l. Digital Controller Cabinet: Each digital controller cabinet shall protect the controller from dust and. be rated NEMA 1, unless specified otherwise. Controller cabinets, or enclosures the controller's is mounted in shall be provided with a lock.

m. Main Power Switch: Each controller on the highest level LAN shall have a main power switch for isolation of the controller from AC power. The switch shall be protected from tampering within the DDC cabinet.

2. Terminal Control Unit Controllers
   a. TCU controllers shall be manufactured by the same company as the digital controllers.

   b. TCU controllers shall automatically start-up on return of power after a failure, and previous operating parameters shall exist or shall be automatically downloaded from a digital controller on a higher level LAN.

   c. TCU controllers do not require an internal clock, if they get time information from the digital controller.

3. DDC Software: Software resides in the digital controllers and performs control sequences.
   a. Sequence of Control: Provide, in the digital controllers, software to execute the sequence control. Provide sequences of control written in both text and graphic format.

   b. Database Modification: Provide software to modify the control program database. Database modification shall be accomplished through connected computer or hand held terminal or through a keypad integral to the controller. Database modification shall be accomplished without having to make changes directly in line-by-line programming. As a result of this requirement, when the control program is of the line-by-line type, database parameters in the following list that take real number values shall require assignment of variable names so parameters can be changed without modifying the line-by-line programming. Alternatively, block programming languages shall provide for modification of these database parameters in fill-in-the-blank screens. The following shall be modifiable in this way:

1) Set points

2) Deadband limits and spans

3) Reset schedules

4) Switchover points

5) PID gains and time between control output changes

6) Time

7) Timed local override time

8) Occupancy schedules

9) Holidays

10) Alarm points, alarm limits, and alarm messages

11) Point definition database

12) Point enable, disable, and override

13) Trend points, trend intervals, trend reports

14) Analog input default values

15) Passwords

16) Communications parameters including network and telephone communications setups

c. Differential: Where equipment is started and stopped or opened and closed in response to some analog input such as temperature, pressure, or humidity, include a differential for the control loop to prevent short cycling of equipment.

d. Motor and Flow Status Delay: Provide an adjustable delay between when a motor is commanded on or off and when the control program looks to the motor or flow status input for confirmation of successful execution of the command.

e. Runtime Accumulation: Provide resettable run time accumulation for each controlled electrical motor.

f. Timed Local Override: Provide user definable adjustable run time for each push of a momentary contact timed local override. Pushes shall be cumulative with each push designating the same length of time. Provide a user definable limit on the number of contact closures

summed, such as 6, before the contact closures are ignored. Timed local overrides are to be disabled during occupancy periods.

g. Time Programs: Provide programs to automatically adjust for leap years, and make daylight savings time and standard time adjustments.

h. Scheduling
   1) Each control output point shall be adjustable for selection of operation based on time of day, day of week, and day of year. Output points may be associated into groups. Each group may be associated with a different schedule. Changing the schedule of a group shall change the schedule of each point in the group. Points may be added to and deleted from groups. Groups may be created and deleted by the operator.

   2) Provide capability that will allow current schedules to be viewed and modified in a seven day week format. When control program does not automatically compute holidays, provide capability to allow holiday schedules to be entered one full year at a time.

i. Point Override: I/O and virtual points shall be able to be software overridden in the software and commanded to any possible value from the main building digital controller.

j. Alarming: I/O points and virtual points shall be alarmable. Alarms may be enabled and disabled for every point. Alarm limits shall be adjustable on analog points. Controllers connected to an external communications device such as a printer, terminal, or computer, shall download alarm and alarm message when alarm occurs. Otherwise alarms will be stored and automatically downloaded when a communications link occurs. The following conditions shall generate alarms:
   1) Motor is commanded on or off but the motor status input indicates no change

   2) Room temperature, humidity, or pressure strays outside selectable limits

   3) An analog input takes a value indicating sensor failure

   4) A module is "dead" to the LAN

   5) A power outage occurs

k. Messages: Messages shall be operator defined and assigned to alarm points. Messages shall be displayed when a point goes into alarm.

l. Trending: DDC system shall have the capability to trend I/O and virtual points. Points may by associated into groups. A trend report

may be set up for each group. The period between logging consecutive trend values shall range from one minute to 60 minutes at a minimum. Trend data type shall be selectable as either averages over the logging period or instantaneous values at the time of logging. The minimum number of consecutive trend values stored at one time shall be 30 per variable. When trend memory is full, the most recent data shall overwrite the oldest data. Trend data shall be capable of being uploaded to computer. Trend data shall be available on a real time basis; trend data shall appear either numerically or graphically on a connected computer's screen as the data being processed from the DDC system data environment. Trend reports shall be capable of being uploaded to computer disc and archived.

m. Status Display: Current status of I/O and virtual points shall be displayed on command. Points shall be associated into functional groups, such as all the I/O and virtual points associated with control of a single air handling unit, and displayed as a group, so the status of a single mechanical system can be readily checked. A group shall be selectable from a menu of groups having meaningful names; such as AHU-4, Second Floor, and other such names.

n. Diagnostics: Each controller shall perform self-diagnostic routines and provide messages to an operator when errors are detected. DDC system shall be capable of recognizing a nonresponsive module on a LAN. The remaining, responsive modules on a LAN shall not operate in a degraded mode.

o. Power Loss: In event of a power outage, each controller shall assume a disabled status and outputs shall go to a user definable state. Upon restoration of power, DDC system shall perform an orderly restart, with sequencing of outputs.

p. Program Transfer: Provide software for download of control programs and database from a computer to controllers and upload of same to computer from controllers. Every digital controller in the DDC system shall be capable of being downloaded and uploaded to through a single controller on the highest level LAN.

q. Password Protection: Provide at least three levels of password protection to the DDC system permitting different levels of access to the system.

r. Energy Data Recording: Provide a resettable signal accumulation for each meter at the main building digital controller.
   1) Calculated chilled water thermal energy in BTU/HR using chilled water supply temperature and flow and chilled water return temperature signals.

   2) Record electrical energy in KWH and electrical demand in KW.

4. Maintenance Personnel Interface Tools: Provide a notebook computer for field communication with the digital controllers. In addition to changing set points, and making operational changes, field personnel shall be able to upload and download programs with the notebook computer.
    a. Provide laptop computer, necessary software, and direct connection cable to communicate with the digital controllers when directly connected.
        1) Intel Duo Core P8600 (2.4 GHz, 3M L2 Cache, 1066 MHz FSB
        2) 1.0GM, DRR2-8 SDRAM, 1 DIMM
        3) 15.4” WXGA (1280x800) LED Display
        4) 80 GB HD, 5400RPM
        5) Windows 7 Professional, 64 bit
        6) NVIDIA Quadro FX 770M, 512MB
        7) 8x DVD with Cyberlink Power DVD
        8) 6 Cell Battery
        9) USB-2 Ports, three minimum
        10) AC Adaptor
        11) 10/100/1000 Network Connection
        12) Microsoft Office 2007 Basic
        13) Three Year Warranty
    b. Recommended by the digital controller manufacturer, and a direct connection cable to communicate with the digital controller.

2.03 SENSORS AND INPUT HARDWARE

A. Field Installed Temperature Sensors
    1. Thermistors: Precision thermistors may be used in temperature sensing applications below 200 degrees F. Sensor accuracy over the application range shall be 0.36 degree F or less between the range of 32 to 150 degrees F. Sensor manufacturer shall utilize 100 percent screening to verify accuracy. Thermistors shall be pre-aged, and inherently stable. Stability error of the thermistor over five years shall not exceed 0.25 degree F cumulative. Sensor element and leads shall be encapsulated. Bead thermistors are not allowed. AID conversion resolution error shall be kept to 0.1 degree F. Total error for a thermistor circuit shall not exceed 0.5 degree F, which includes sensor error and digital controller AID conversion resolution error. Provide thermistor and digital controller manufacturer Documentation and the Contractor's engineering

calculations which support the proposed thermistor input circuit will have a total error of 0.5 degree F or less. Provide 18 gage twisted and shielded cable for thermistors.

2. Resistance Temperature Detectors (RTDs): Provide RTD sensors with 1000 ohm, or higher, platinum element that are compatible with digital controllers. Sensors shall be encapsulated in epoxy, series 300 stainless steel, anodized aluminum, or copper. Temperature sensor accuracy shall be 0.1 percent (1 ohm) of expected ohms (1000 ohms) at 32 degrees F. Temperature sensor stability error over five years shall not exceed 0.25 degree F cumulative. Direct connection of RTDs to digital controllers, without transmitters, is preferred provided controller supports direct connection of RTDs. When RTDs are connected directly to the controller, keep lead resistance error to 0.25 degree F or less. Provide 3 wire sensing circuits to not exceed the 0.25 degree F lead resistance error. Total error for a RTD circuit shall not exceed 0.5 degree F, which includes sensor error, lead resistance error or 4 to 20 milliampere transmitter error, and AID conversion resolution error. Provide manufacturer Documentation and the Contractor's engineering calculations which support the proposed RTD circuit will have a total error of 0.5 degree F or less for the specified application.
   a. Wiring: Provide 18-gage twisted and shielded pair cable for direct connected RTDs. Provide 18-gage twisted and shielded pair cable for RTDs using 4 to 20 milliampere transmitters.

   b. Transmitters: Provide 4 to 20 milliampere transmitters for RTDs where Digital controllers do not support direct connection of RTDs to controllers; Digital controllers do not meet temperature resolution requirement of 0.5 degree F

3. Temperature Sensor Details
   a. Room: Conceal element behind protective cover matched to the room interior. Room temperature sensor shall have integral pushbutton, digital input to the controller for system override, and a setpoint adjustment, analog input to the controller. Digital sensors that communicate directly with the terminal control unit are acceptable. Provide a connection to allow interrogation of the digital controller.

   b. Duct Averaging Type: Continuous averaging RTDs for ductwork applications shall be 1 foot in length for each 4 square feet of ductwork cross-sectional area with a minimum length of 6 feet. Probe type duct sensors of one foot length minimum are acceptable in ducts 12 feet square and less.

   c. Immersion Type: 3 inches and 6 inches where needed total immersion for use with sensor wells, unless otherwise indicated.

   d. Sensor Wells: Brass materials; provide thermal transmission material compatible with the immersion sensor. Provide heat-sensitive transfer agent between exterior sensor surface and interior well surface.

e. Outside Air Type: Provide element on the buildings north side with sunshade to minimize solar effects. Mount element at least 3 inches from building outside wall. Sunshade shall not inhibit the flow of ambient air across the sensing element. Shade shall protect sensing element from rain.

B. Transmitters: Transmitters shall have 4 to 20 ma, or 0-10 VDC output linearly scaled to the temperature, pressure, humidity, or flow range being sensed. Transmitter shall be matched to the sensor, factory calibrated, and sealed. Total error shall not exceed 0.1 percent of 20 milliampere (0.02 milliampere) at any point across the 4 to 20 ma span. Supply voltage shall be 24 volts ac or dc. Transmitters shall have non-interactive offset and span adjustments. For temperature sensing, transmitter stability shall not exceed 0.05 degree F a year.
   1. Spans and Ranges: Transmitter spans or ranges shall be the following and shall be suitable for the application:
      a. Temperature:
         1) 50 degree F span: Room, chilled water, cooling coil, discharge air, return air sensors

         2) 100 degree F span: Outside air, hot water, heating coil discharge air, mixed air sensors

         3) 200 degree F span: High temperature hot water, heating hot water, chilled/hot water system sensors

      b. Pressure
         1) 0 to 100 psi differential: Water differential range

         2) 0 to 5 inches water range: Duct static pressure

C. Relative Humidity Transmitters: Provide integral humidity transducer and transmitter. Output of relative humidity instrument shall be a 4 to 20 milliampere or 0 to 10 VDC signal proportional to 0 to 100 percent relative humidity input. Accuracy shall be 2 percent of full scale within the range of 20 to 80 percent relative humidity. Sensing element shall be chilled mirror type, polymer, or thin film polymer type. Supply voltage shall be 24 VDC. Transmitter shall meet specified requirements.

D. Pressure Transmitters: Provide integral pressure transducer and transmitter. Output of pressure instrument shall be a 4 to 20 milliampere or 0 to 10 VDC signal proportional to the pressure span. Span shall be as specified. Accuracy shall be 1.0 percent. Linearity shall be 0.1 percent. Supply voltage shall be 24 VDC. Transmitter shall meet specified requirements.

E. Current Transducers: Provide current transducers to monitor amperage of motors. Select current transducer range for normal amperage to be above 50 percent of the range. Current transducers shall have an accuracy of 1 percent and a 4 to 20 milliampere output signal.

F. Input Switches
   1. Differential Static Pressure Switch: Provide diaphragm type differential static pressure switches for binary (two position) operation as specified in sequence of operation. Devices shall withstand pressure surges up to 150 percent of rated pressure. Contacts shall be single pole double throw and switch may be wired for normally open or normally closed operation. Trip set point shall be adjustable. Pressure switch shall be sized so that operating pressure trip point is approximately midpoint of pressure switch adjustable range. Repetitive accuracy shall be 2 percent.

   2. Induced Current Operated Solid State Switches: Provide adjustable ranging to monitor continuous loads up to 200 amperes. Switch shall indicate whether it is normally open or normally closed. Limit off-state leakage to 2 milliampere or less.

   3. Timed Local Override: Provide momentary contact push button override with override time set in controller software. Provide to override DDC time of day program and activate occupancy program for assigned units. Upon expiration of override time, the control system shall return to time-of-day program. Time interval for the length of operation shall be software adjustable and shall expire unless reset.

G. Energy Metering
   1. Electric Meters: Provide kilowatt-hour (kWh) meter for building as indicated. Integrate electric meter signal into DDC system.

   2. Meter: ANSI C12.10. Provide watt-hour meter and socket corresponding to the ratios of the current transformers and transformer secondary voltage. Meter shall be selected for -volt, three-phase, three four-wire wye delta system, three-element type with three current transformers. Meters shall be complete with a box mounted socket having automatic circuit closing bypass. Provide watt-hour meter with not less than four pointer-type kWh registers, provisions for pulse initiation, and a universal Class 2 indicating maximum kW demand register, sweep pointer indicating type, with a 15 30 60 -minute interval. Meter accuracy shall be within plus or minus one percent. The correct multiplier shall be provided on face of meter.

   3. Current Transformer: ANSI C57.13. Provide three current transformers with 600-volt insulation, rated for metering with voltage, BIL, momentary, and burden ratings coordinated with the ratings of the associated meters. Provide a butyl molded donut or window type transformers mounted on a bracket to allow secondary cables to connect to the transformer bushings. Identify the wiring of the current transformer secondary feeders to permit field current measurements to be taken with hook-on ammeters.

2.04 OUTPUT HARDWARE

A. Valves

1. Valve Assembly: Valves shall have stainless steel stems. Valve bodies shall be designed for not less than 125 psig working pressure or 150 percent of the system operating pressure, whichever is greater. Valve leakage rating shall be 0.01 percent of rated Cv. Class 125 copper alloy valve bodies and Class 150 steel or stainless steel valves shall conform to ASME/ANSI B16.5 as a minimum. Cast iron valve components shall conform to ASTM A 126 Class B or C as a minimum.

2. Butterfly Valve Assembly: Butterfly valves shall be threaded lug type suitable for dead-end service and for modulation to the fully closed position, with noncorrosive discs, stainless steel shafts supported by bearing, and EPDM seats suitable for temperatures from minus 20 degrees F to plus 250 degrees F. Valves shall have a manual means of operation independent of the actuator

3. Valves for Chilled Water Service: Bodies for valves 1-1/2 inches and smaller shall be brass or bronze, with threaded or union ends. Bodies for valves from 2 inches valves shall have threaded ends. Bodies for valves from 2-1/2 to 3 inches shall have flanged-end connections. Internal valve trim shall be brass or bronze except that valve stems may be Type 316 stainless steel. Water valves shall be sized for a 3 psi differential through the valve at rated flow, except as indicated otherwise. Select valve flow coefficient (Cv) for an actual pressure drop not less than 50 percent or greater than 125 percent of the design pressure drop at design flow. Valves 4 inches and larger shall be butterfly valves.

B. Actuator: Provide electric type with spring return so that, in the event of power failure, actuators shall fail safe in either the normally open or normally closed position as specified. Actuators shall be quiet operating and function properly within the range of 85 to 110 percent of the motive power. Provide a minimum of one actuator for each damper.
   1. Electric Actuators: Provide direct drive electric actuators for all damper control applications. When operated at rated voltage, each operator shall be capable of delivering the torque required for continuous uniform movement of the valve or damper and shall have end switch to limit travel or shall withstand continuous stalling without damage. Operators shall function properly with range of 85 to 110 percent of line voltage. Provide gears of steel or copper alloy. Fiber or reinforced nylon gears may be used for torques less than 16 inch pounds. Provide hardened steel running shafts in sleeve bearing of copper alloy, hardened steel, nylon, or ball bearing. Provide two-position operators of the single direction, spring return, or reversing type. Provide proportioning operators capable of stopping at all points in the cycle and starting in either direction, from any point. Provide reversing and proportioning operators with limit switches to limit travel in either direction unless operator is stall type. Equip valve operators with a force limiting device such as spring yield so that, when in a relaxed position, device shall maintain a pressure on valve disc equivalent to system pressure at valve. Provide reversible shaded pole, split capacitor, synchronous, or stepped type electric motors.

C. Output Switches
   1. Control Relays: Shall be double pole, double throw (DPDT), UL listed, with contacts rated to the application, and enclosed in a dustproof enclosure. Equip with a light indicator which is lit when coil is energized and is off when coil is not energized. Relays shall be socket type, plug into a fixed base, and be replaceable without need of tools or removing wiring.

2.05 ELECTRICAL POWER AND DISTRIBUTION

A. For control power, provide a new, 120 volts or less, 60 Hz, two-pole, three wire (black, white and green) circuit. Run green ground wire to panel ground. Conduit grounding will not be accepted.

B. Transformers: Transformers shall conform to UL 506. Power digital controllers and digital controllers serving terminal control units shall be fed from dedicated circuit breakers with surge protection specified. Transformers for digital controllers serving terminal equipment on lower level LANs may be grouped to have specified surge protection sized for the number of controllers on a single transformer. Provide a fuse cutout on the secondary side of the transformer.

C. Surge Protection: Surge and transient protection consist of devices installed externally to digital controllers.
   1. Power Line Surge Protection: Surge suppressors external to digital controller, shall be installed on all incoming AC power. Surge suppressor shall be rated by UL 1449, and have clamping voltage ratings below the following levels:
      a. Unit is a transient voltage surge suppressor (TVSS) 120VAC/single phase/2wire plus ground. Hard wire individual equipment protector.

      b. Unit must react with 5 nanoseconds and automatically reset.

      c. Voltage protection threshold, line to neutral, starts at no more than 21 volts peak on the 120 VAC line.

      d. TVSS must have an independent secondary stage equal to or greater than the primary stage joule rating.

      e. The primary suppression system components must be pure Silicon Avalanche Diodes.

      f. Silicon Avalanche Diodes (SAC) or Metal Oxide Varistors (MOV) are acceptable in the independent secondary suppression system.

      g. The Transient Suppression System shall incorporate an indicating light which denotes whether the primary and/or secondary transient protection components is/are functioning.

h. All system functions of the Transient Suppression System must be individually fused and not short circuit the AC power supply at any time.

i. The Transient Suppression System shall incorporate an EMI/RFI noise filter with a minimum attenuation of 13 db at 10kHz to 300 MHz.

j. The system must comply with IEEE C52.41, Class “B" requirement and be tested according to IEEE C62.45.

k. The system shall operate at -20 degrees C to +50 degrees C.

2. Telephone and Communication Line Surge Protection: Provide transient surge protection to protect the DDC controller and LAN related devices from surges that occur on the phone lines (modem and direct connect) and on inter-unit LAN communications. Devices shall be UL listed.
   a. The surge protection shall be a rugged package with continuous, non-interrupting protection and not use "crowbar" circuiting. Instant automatic reset after safely eliminating transient surges, induced lightning and other forms of transient over voltages.

   b. Unit must react within 5 nanoseconds using only solid-state silicon avalanche technology.

   c. Unit shall be installed at the proper distance within system as recommended by the manufacturer.

3. Controller Input/Output Protection: Controller input/output points shall be surge protected with optical isolation, MOV or silicon avalanche devices. Fuses are not permitted for surge protection.

D. Wiring:
   1. Provide complete electric wiring for DDC system, including wiring to transformer primaries. Control circuit conductors which run in the same conduit as power wiring over 100 volts. Circuits operating at more than 100 volts shall be in accordance with Division 16 Electrical. Circuits operating at 100 volts or less shall be defined as low voltage and shall be run in rigid or flexible conduit, metallic tubing, metal raceways or wire trays, armored cable, or multi-conductor cable installed in metal raceway. Provide circuit and wiring protection as required by NFPA 70. HVAC plenums include the space between a drop ceiling and the architectural ceiling, within walls and within ductwork. Protect exposed wiring from abuse and damage by installing wiring in metal raceway.
      a. AC Control Wiring: Control wiring for 24 volt circuits shall be insulated copper 18 AWG minimum and shall be rated for 300 VAC service.

      b. Wiring for 120 volt shall be 14 AWG minimum and shall be rated for 600 VAC service.

c. Analog Signal Wiring: Analog signal wiring shall be 18 AWG single or multiple twisted pair. Each cable shall be 100 percent shielded and have 20 AWG drain wire. Each wire shall have insulation rated to 300 VAC. Cables shall have an overall aluminum-polyester or tinned-copper (cable-shield tape), overall 20 AWG tinned copper cable drain wire and overall cable insulation rated to 300 VAC. Install analog signal wiring in conduit separate from AC power circuits.

2.06 INDICATORS

A. Thermometers: Provide thermometers in locations as indicated. Thermometers shall have either 9 inch scales, or 3.5 inch dials and shall have insertion, immersion or averaging elements as indicated. Provide thermowells for liquid sensing applications. Select thermometer ranges so normal temperatures are approximately equal to midpoint readings on the scale, unless otherwise stated.

B. Pressure Gages: Provide pressure gages as indicated. Select gage range so normal pressures are approximately equal to the midpoint readings on the scale, unless otherwise specified. Accuracy shall be plus or minus 2 percent of the range. Gages shall conform to ANSI/ASME B40.1 00. Select Bourdon tube material in accordance with the recommendation by the manufacturer for the service flu id being measured. Provide shutoff cock for each gauge connection.
   1. Gages indicating pneumatic outputs shall have 2 inch diameter faces. Scale shall be 0 to 30 psi, with 1 psi graduations.

   2. Gages for low differential pressure measurements shall be 4-1/2 inches (nominal diameter) size with two sets of pressure taps, and shall have a diaphragm actuated pointer, white dial with black figures, and pointer zero adjustment. Gage shall have ranges and graduations as shown. Accuracy shall be plus or minus 2 percent of scale range.

   3. Gages for static pressure shall be 4-1/2 inches (nominal diameter) size with bottom threaded connection.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Perform installation under supervision of competent technicians regularly employed in the installation of DDC systems. Provide components for a complete and operational system.

B. Wiring Criteria
   1. Input/Output identification: Permanently label each field wire, cable, or pneumatic tube at each end with unique identification.

   2. Rigid or flexible conduit shall be terminated at all sensors and output devices.

3. Surge Protection: Install surge protection in accordance with the manufacturer's recommendations.

4. Grounding: Ground controllers and cabinets to a good earth ground. Ground controller to a ground in accordance with Division 16. Grounding of the green ac ground wire, at the breaker panel, alone is not adequate. Run metal conduit from controller panels to adequate building grounds. Ground sensor drain wire shields at controller end.

5. Contractor is responsible for correcting all associated ground loop problems.

C. Digital Controllers
   1. Do not divide control of a single mechanical system such as an air handling unit, boiler, chiller, or terminal equipment between two or more controllers. A single controller shall manage control functions for a single mechanical system. It is permissible, however, to manage more than one mechanical system with a single controller.

   2. Provide digital control cabinets that protect digital controller electronics from dust, at locations shown on the drawings.

   3. Provide a main power switch at each highest level LAN digital controller within controller cabinet.

   4. No multiplexing of points is allowed.

D. Temperature Sensors: Provide temperature sensors in locations to sense the appropriate condition. Provide sensor where they are easy to access and service without special tools. Calibrate sensors to accuracy specified. In no case will sensors designed for one application be installed for another application.
   1. Immersion Temperature Sensors: Provide thermowells for sensors measuring temperature in liquid applications or pressure vessels. Locate wells to sense continuous flow conditions. Do not install wells using extension couplings. Where piping diameters are smaller than the length of the wells, provide wells in piping at elbows to effect proper flow across entire area of well. Wells shall not restrict flow area to less than 70 percent of pipe area. Increase piping size as required to avoid restriction. Provide thermowells with thermal transmission material within the well to speed the response of temperature measurement. Provide wells with sealing nuts to contain the thermal transmission material.

   2. Outside Air Temperature Sensors: Provide outside air temperature sensors on north side of the building, away from exhaust hoods, air intakes and other areas that may affect temperature readings. Provide sunshields to protect outside air sensor from direct sunlight.

E. Thermometers: Provide thermometers at locations indicated. Mount thermometers to allow readability when standing on the floor.

F. Pressure Sensors
   1. Differential Pressure
      a. General - Install pressure sensing tips in locations to sense appropriate pressure conditions.

      b. Pumping Proof with Differential Pressure Switches: Install high pressure side between pump discharge and check valve.

G. Control Drawings: Post laminated copies of as-built control system drawings in each mechanical room. Provide six (6) sets of as-built drawings to the activity.

H. Identification: Label control hardware components in accordance with Section 15050.

3.02 ADJUSTMENTS

A. Calibrate instrumentation and controls and verify the specified accuracy using test equipment with test equipment accuracy. Adjust controls and equipment to maintain conditions indicated, to perform functions indicated, and to operate in the sequence specified.

3.03 FIELD QUALITY CONTROL

A. General
   1. Demonstrate compliance of the heating, ventilation, and air conditioning control system with the contract Documents. Furnish personnel, equipment, instrumentation, and supplies necessary to perform calibration and site testing. Ensure that tests are performed by competent employees of the DDC system installer or the DDC system manufacturer regularly employed in the testing and calibration of DDC systems.

   2. Testing will include the field tests and the performance verification tests. Field tests shall demonstrate proper calibration of input and output devices, and the operation of specific equipment. Performance verification test shall ensure proper execution of the sequence of operation and proper tuning of control loops.

   3. Obtain approval of the plan for each phase of testing before beginning that phase of testing. Give to the Officer-in-Charge written notification of planned testing at least 45 days prior to test. Notification shall be accompanied by the proposed test procedures. In no case will the Contractor be allowed to start testing without written Officer-in-Charge approval of test procedures. The test procedures shall consist of detailed instructions for complete testing to prove performance of the heating, ventilating and air conditioning system and digital control system.

   4. Before scheduling the performance verification. Test, furnish the field test Documentation and written certification to the Officer-in-Charge that the installed system has been calibrated, tested, and is ready for the

performance verification test. Do not start the performance verification test prior to receiving written permission from the Officer-in-Charge.

3.04 TRAINING

A. The controls contractor shall provide the following training services:

1. One (1) day of on-site orientation by a field engineer who is fully knowledgeable of the specific installation details of the project. This orientation shall, at a minimum, consist of a review of the project as-built drawings, the control system software layout and device locations.

2. General: Provide training course schedule, syllabus, and training materials 45 days prior to the start of training. Conduct training courses for designated personnel in the maintenance and operation of the HVAC and DDC system. Orient training to the specific system being installed under this contract. Use operation and maintenance manual as the primary instructional aid. Operational and maintenance manuals shall be provided for each trainee with four additional sets, two sets delivered for archiving at the project site, one set for the mechanical contractor, and one set for the Officer-in-Charge. Training manuals shall include an agenda, defined objectives and a detailed description of the subject matter for each lesson. Furnish audio-visual equipment and all other training materials and supplies. A training day is defined as 8 hours of classroom or lab instruction, including two 15 minute breaks and excluding lunch time, Monday thru Friday, during the daytime shift in effect at the training facility. For guidance, assume the attendees will have a high school education and are familiar with HVAC systems. The minimum amount of training for this project shall be 24 hours.

3. Operator Training: Operator training shall include the detailed review of the control installation drawings, points list, and equipment list. The instructor shall then walk through the building identifying the location of the control devices installed. For each type of systems, the instructor shall demonstrate how the system accomplishes the sequence of operation.

4. From the workstation, the operator shall demonstrate the software features of the system. As a minimum, the operator demonstrate and explain logging on, setting passwords, setting up a schedule, trend, point history, alarm, and archiving the database.

5. Maintenance Training: The system maintenance course shall be taught at the project site within one month after the completion of the operators training. The course shall last for one 8 hour training day. The course shall include answering questions from the last training session, trouble shooting and diagnostics, repair, instructions, preventive maintenance procedures and schedules, and calibration procedures.

3.05 SEQUENCE OF OPERATION

A. Sequence of operations shall be as indicated on the drawings.

3.06 SYSTEMS INTEGRATION DDC SPECIFIC REQUIREMENTS

A. DDC Remote Access: The Direct Digital Control (DDC) system provided shall include the capability for multiple users to access the -DDC simultaneously from remote locations. Interface shall be to the entire DDC and provide the capability to monitor all I/O and adjust parameters.

B. Open Systems Integrator
   1. VFD Integrator Interface
      a. The BAS system shall include appropriate hardware equipment and software to allow two way data communications between the BAS system and the VFD manufacturer's control panel.

      b. It shall be the responsibility of the BAS Contractor to coordinate with the VFD manufacturer to provide a functional data communications connection.

      c. All data supported by the VFD communication protocol shall be mapped into the supervisory DDC controller's database and shall be displayed on data screens at the Operator Workstation and shall be transparent to the Operator Workstation and shall be transparent to the operator.

      d. The BAS Contractor shall furnish either the OSP or BACnet communications interface as required by the VFD manufacturer.

      e. The BAS Contractor shall provide all communications and power wiring and gateway panel installation for the DDC system. The VFD manufacturer shall provide all hardware for connection of the manufacturer's processor.

      f. The BAS Contractor shall provide all hardware and software required for the VFD manufacturer's gateway interface.

3.07 COMMISSIONING

A. DDC contractor shall provide support for Commissioning specified in Section 15959, including graphic screenshots, trending and functional testing.

END OF SECTION

SECTION 15950 – TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes testing, adjusting, and balancing (TAB) of the new heating, ventilating, and cooling (HVAC) water distribution systems affected by this project including equipment, and piping which are located within, on, under, between, and adjacent to buildings.

B. Mechanical work as specified in Section 15050 – Basic Mechanical Materials and Methods unless specified otherwise in other sections of Division 15 – Mechanical.

1.02 SUBMITTALS

A. Submit the following in accordance with Section 01300 - Submittal Procedures and Section 15050 – Basic Mechanical Materials and Methods.

1. Statements

a. Independent TAB agency personnel qualifications

b. Design review report

c. Pre-field TAB engineering report

d. Advanced notice TAB field work

e. Check out list

2. Independent TAB agency personnel qualifications

a. For agency proposed for approval, submit information certifying that: The TAB agency is a subcontractor who is not affiliated with any other company participating in work on this contract; the work to be performed by the TAB agency shall be limited to testing, adjusting, and balancing of HVAC air systems to satisfy the requirements of this specification section. Submit the following, for the agency, to the Officer-in-Charge for approval in compliance with paragraph entitled "TAB Personnel Qualification Requirements."

(1) Independent AABC or NEBB certified TAB agency: Associated Air Balance Council (AABC) registration number and expiration date of current certification; or National Environmental Balancing Bureau (NEBB) certification number and expiration date of current certification.

(2) TAB team supervisor: Name and copy of AABC or NEBB TAB supervisor certificate and expiration date of current certification.

(3) TAB team field leader: Name and documented evidence that the team field leader meets the qualification requirements.

(4) TAB team field technicians: Names and documented evidence that each field technician meets the qualification requirements.

(5) Current certificates: Registrations and certifications shall be current, and valid for the duration of this contract. Certifications which expire prior to completion of the TAB work, shall be renewed in a timely manner so that there is no lapse in registration or certification. TAB agency or TAB team personnel without a current registration or current certification shall not perform TAB work on this contract.

3. Design Review Report: Submit typed report describing omissions and deficiencies in the HVAC system's design that would preclude the TAB team the TAB work requirements of this section. Provide a complete explanation including supporting documentation detailing the deficiencies. State that no deficiencies are evident if that is the case.

4. Field Test Reports

5. Certified TAB report

6. Submit certified reports in the specified format including the above data.

   a. Certified TAB Reports: Submit Certified TAB Report in the following manner:

      (1) Report format: Submit the completed pre-field data forms approved in the pre-field TAB Engineering Report completed by TAB field team, reviewed and certified by the TAB supervisor. Bind the report with a water resistant front and back cover. Include a table of contents identifying by page number the location of each report. Report forms and report data shall be typewritten. Handwritten report forms or report data are not acceptable.

      (2) Temperatures: On each TAB report form reporting TAB work accomplished on HVAC thermal energy transfer equipment, include the indoor and outdoor dry bulb temperature range and indoor and outdoor wet bulb temperature range within which the TAB data was recorded.

      (3) Instruments: List the types of instruments actually used to measure the tab data. Include in the listing each instrument's unique identification number, calibration date, and calibration expiration date.

      (4) Certification: Include the typed name of the TAB supervisor and the dated signature of the TAB supervisor.

7. TAB Work Schedule: Compliance with the approved construction schedule is the Contractor's responsibility. The Contractor shall coordinate and schedule the TAB subcontractor when the systems are ready for testing and balancing.

1.03 REFERENCES

A. Comply with the recommendations and requirements of the codes and Standards listed hereinafter in addition to detailed requirements of this specification. In the event of conflicting requirements, this specification shall prevail.

1. Associated Air Balance Council (AABC)

    a. AABC MN-1 - Testing and Balancing Heating, Ventilating and Air Conditioning Systems

2. American National Standards Institute (ANSI)

    a. ANSI S1.4 (ASA 47) - Sound Level Meters

    b. ANSI S1.11 (ASA 65) - Octave- Band and Fractional-Octave-Band Analog and Digital Filters

3. American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc. (ASHRAE)

    a. ASHRAE HA - Handbook, HVAC Applications

4. National Environmental Balancing Bureau (NEBB)

    a. NEBB CMSV - Calculations and Measurements of Sound and Vibration

    b. NEBB TABES - Testing, Adjusting, Balancing of Environmental Systems

5. Sheet Metal & Air Conditioning Contractors' National Association, Inc. (SMACNA)

    a. SMACNA HVACTAB - HVAC Systems Testing, Adjusting and Balancing

1.04 QUALITY ASSURANCE

A. Modifications of References: Accomplish work in accordance with referenced publications of AABC or NEBB except as modified by this section. In the references referred to herein, consider the advisory or recommended provisions to be mandatory, as though the word "shall" had been substituted for the words "should" or "could" or "may" wherever they appear. Interpret reference to the "authority having jurisdiction," the "Administrative Authority," or the "Design Engineer" to mean the "Officer-in-Charge.

B. TAB Personnel Qualification Requirements

1. Independent AABC or NEBB Certified TAB Agency: Provide services of a TAB agency certified by AABC or NEBB to perform and manage TAB work on HVAC air and water systems. This TAB agency shall not be affiliated with any company participating in any other phase of this contract, including design, furnishing equipment, or construction.

2. TAB Team Personnel: The TAB team approved to accomplish work on this contract shall be full-time employees of the TAB agency. No other personnel shall do TAB work on this contract.

    a. TAB Team Supervisor: Supervisor shall be qualified by AABC or NEBB as a TAB supervisor or a TAB engineer.

    b. TAB Team Field Leader: Leader shall have satisfactorily performed full-time supervision of TAB work in the field for not less than 3 years immediately preceding this contract's bid opening date.

    c. TAB Team Field Technician: Technician shall have satisfactorily assisted a TAB team field leader in performance of TAB work in the field for not less than one year immediately preceding this contract's bid opening date.

3. Responsibilities: The Contractor shall be responsible for ensuring compliance with the requirements of this section. The following delineation of specific work responsibilities is specified to facilitate execution of the various work efforts by personnel from separate organizations. This breakdown of specific duties is specified to facilitate adherence to the schedule.

    a. Contractor: HVAC documentation: Furnish one complete set of the following HVAC-related documentation to the TAB Agency:

        (1) Contract drawings and specifications

        (2) Approved submittal data for equipment

        (3) Construction work schedule

4. Up-to-date revisions and change orders for the previously listed items

    a. Submittal and work schedules: Ensure that the schedule for submittals and work required by this section are met.

    b. Coordination of supporting personnel: Provide the technical personnel, such as factory representatives or HVAC controls installer required by the TAB field team to support the TAB field measurement work. Provide equipment mechanics to operate HVAC equipment to enable TAB field team to accomplish the TAB field measurement work. Conversely, ensure that the HVAC controls installer has required support from the TAB team field leader to complete the controls check out.

c. Deficiencies: Ensure that equipment defects and deficiencies reported by the TAB team field leader are brought to the attention of the Officer-in- Charge. Ensure that design deficiencies reported by the TAB field leader, or the TAB team supervisor, are transmitted to the Officer-in- Charge within 7 calendar days from date of receipt from the TAB agency.

d. Prerequisite HVAC work: Complete check out and debugging of HVAC equipment, ducts, and controls prior to the TAB engineer arriving at the project site to begin the TAB work. Debugging includes searching for and eliminating malfunctioning elements in the HVAC system installations, and verifying all adjustable devices are functioning as designed. Prior to the TAB field team's arrival, ensure completion of the applicable inspections and work items listed in the TAB team supervisor's pre-field engineering report. List as prerequisite work items, the deficiencies, pointed out by the TAB team supervisor in the design review report. Ensure that the TAB Agency gets a copy of the prerequisite HVAC work checklist specified in the paragraph entitled "Submittals." Do not allow the TAB team to commence TAB field work until all of the following are completed.

(1) HVAC system installations are fully complete.

(2) HVAC prerequisite checkout work lists have been completed, submitted, and approved.

(3) HVAC system filters and strainers are clean for TAB field work.

5. TAB Agency: Provide the services of a TAB team which complies with the requirements of paragraph entitled "TAB Personnel Qualification Requirements."

a. TAB Team Supervisor:

(1) Overall management: Supervise and manage the overall TAB team work effort, including preliminary and technical TAB procedures and TAB team field work.

(2) Support required: Specify the technical support personnel required from the Contractor other than the TAB agency; such as factory representatives for temperature controls or for complex equipment. Inform the Contractor in writing of the support personnel needed and when they are needed. Furnish the notice as soon as the need is anticipated, either with the design review report, or the pre-field engineering report or during the TAB field work.

(3) Pre-field engineering report: Utilizing the following HVAC-related documentation; contract drawings and specifications, approved submittal data for equipment, up-to-date revisions and change orders; prepare this report.

(4) Prerequisite HVAC work checklist: Ensure the Contractor gets a copy of this checklist at the same time as the pre-field engineering report is submitted.

(5) Technical Assistance for TAB Work: Provide immediate technical assistance to the TAB field team for the TAB work.

(6) Certified TAB report: Certify the TAB report. This certification includes the following work:

(i) Review: Review the TAB field data report. From this field report, prepare the certified TAB report.

(ii) Verification: Verify adherence, by the TAB field team, to the TAB plan prescribed by the pre-field engineering report and verify adherence to the procedures specified in this section.

(7) Deficiencies: Submit in writing as soon as possible, to the Contractor and the Officer-in-Charge, each deficiency reported by the TAB field team. Provide, in this submittal, a complete explanation including supporting documentation detailing the deficiency.

b. TAB Team Field Leader:

(1) Field manager: Manage, in the field, the accomplishment of the work specified in Part 3, "Execution."

(2) Full time: Be present at the contract site when TAB field work is being performed by the TAB team; ensure day-to-day TAB team work accomplishments are in compliance with this section.

(3) Prerequisite HVAC work: Do not bring the TAB team to the contract site until a copy of the prerequisite HVAC Checklist, with all work items certified by the Contractor to be working as designed, reaches the office of the TAB Agency.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 TAB Procedures

A. TAB Field Work: Test, adjust, and balance the listed HVAC systems to the state of operation indicated on and specified in the contract design documents. Air systems shall be proportionately balanced and reported in the TAB report. Provide instruments and consumables required to accomplish the TAB work. Conduct TAB work on the listed HVAC systems in conformance with the AABC MN-1, or NEBB TABES, and NEBB CMSV, except as modified by this section:

1. Maintenance and calibration of instruments.

2. Accuracy of measurements.

3. Preliminary procedures: Test ports required for testing by the TAB engineer shall be located in the field by the TAB engineer during TAB field work. It shall be the responsibility of the sheet metal contractor to provide and install test ports as required by the TAB supervisor.

4. .Water distribution Pre-TAB work:

    a. Prior to demolition or removal of existing cooling towers, measure and record flow rates and temperatures of condenser water supply and condenser water return.

5. Water distribution systems TAB work:

    a. Condenser water systems including system balance valves and flow measuring devices.

6. Air conditioning systems shall be adjusted to within plus or minus 10% of the design values.

B. Data From TAB Field Work: After completion of the TAB work, prepare a pre-final TAB report using the reporting forms approved in the pre-field engineering report. Data required by those approved data report forms shall be furnished by the TAB team. Except as approved otherwise in writing by the Officer-in-Charge, the TAB work and the TAB report shall be considered incomplete until the TAB work is accomplished to within the accuracy range specified in the paragraph entitled "Workmanship" of this section. Prepare the report neatly and legibly; the pre-final TAB report shall be the final TAB report minus the TAB supervisor's review and certification.

C. Quality Assurance for TAB Field Work:

1. Field check: Test shall be made to demonstrate that capacities and general performance of water systems comply with the contract requirements.

2. Procedures: Measurement and test procedures shall be the same as approved for work for forming basis of the certified report.

D. Marking of Settings: Permanently mark the settings of HVAC adjustment devices including valves, splitters, and dampers so that adjustment can be restored if disturbed at any time. The permanent markings shall indicate the settings on the adjustment devices which result in the data reported on the submitted certified TAB report.

E. Marking of Test Posts: The TAB team shall permanently and legibly mark and identify the location points of the duct test ports. If the ducts have exterior insulation, these markings shall be made on the exterior side of the duct insulation. The location of test ports shall be shown on the as-built mechanical drawings with dimensions given where the test port is covered by exterior insulation.

F. Commissioning: TAB contractor shall provide support for Commissioning specified in Section 15959, including TAB verification and Functional Testing.

END OF SECTION

SECTION 15959 - COMMISSIONING OF HVAC SYSTEMS

PART 1 - GENERAL

1.01 GENERAL CONDITIONS

A. Mechanical General Provisions as specified in section 15050 shall apply to work specified in this section.

1.02 DESCRIPTION OF WORK

A. This section covers the commissioning of two cooling towers and associated field mounted variable frequency drives, condenser water piping, and controls. Commissioning is the process of achieving, verifying and documenting the performance of the chilled water plant to meet the design intent and functional and operational needs.

1.03 RELATED WORK SPECIFIED IN OTHER SECTIONS

A. The cooling tower system as specified in other sections of DIVISION 15 - MECHANICAL.

B. Electrical work as specified in DIVISION 16 - ELECTRICAL.

1.04 SUBMITTALS

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

B. Submit the following:

1. Shop Drawings: None

2. Product Data: None

3. Schedules:
   a. Commissioning Team: List of team members who will represent the Contractor in the pre-commissioning checks and functional performance testing, at least 2 weeks prior to the start of pre-commissioning checks. Propose revisions to the list, prior to the start of the impacted work.

   b. Test Procedures: Detailed procedures for pre-commissioning checks and functional performance tests, at least 4 weeks prior to the start of pre-commissioning checks.

   c. Test Schedule: Schedule for pre-commissioning checks and functional performance tests, at least 2 weeks prior to the start of pre-commissioning checks.

4. Reports.
   a. Test Reports: Completed pre-commissioning checklists and functional performance test checklists organized by system and by subsystem and submitted as one package. The results of failed tests shall be included along with a description of the corrective action taken.

5. Certificates of Conformance or Compliance: None.

6. As-Built Drawings: None

7. Operations and Maintenance Manuals: None

8. Guarantee and Certificate: None.

1.05 SEQUENCING AND SCHEDULING

A. The work described in this Section shall begin only after all work required in related Sections, including SECTION 15950 - HVAC TESTING/ADJUSTING/ BALANCING and SECTION 15910 – DIRECT DIGITAL CONTROL SYSTEMS, has been successfully completed, and all test and inspection reports and operation and maintenance manuals required in these sections have been submitted and approved.

PART 2 - PRODUCTS (NONE)

PART 3 - EXECUTION

3.01 COMMISSIONING TEAM AND CHECKLISTS

A. The Contractor shall designate team members to participate in the pre-commissioning checks and the functional performance testing specified. The team members are:

1.

Symbol	Function
Q	Contractor's Chief Quality Control Representative
M	Contractor's Mechanical Representative
E	Contractor's Electrical Representative
T	Contractor's Testing, Adjusting, and Balancing Representative
C	Contractor's Direct Digital Controls Representative
O	City's Commissioning Agent

3.02 TESTS

A. The pre-commissioning checks and functional performance tests shall be performed in a manner which essentially duplicates the checking, testing, and inspection methods established in the related Sections. Where checking, testing, and inspection methods are not specified in other Sections, methods shall be established which will provide the information required. Testing and verification required by this Section shall be performed during the Commissioning phase. Requirements in related Sections are independent from the requirements of this Section and shall not be used to satisfy any of the requirements specified in this Section. The Contractor shall provide all materials, services, and labor required to perform the pre-commissioning checks and functional performance tests. A pre-commissioning check or functional performance test shall be aborted if any system deficiency prevents the successful completion of the test or if any participating commissioning team member of which participation is specified is not present for the test. The Contractor shall reimburse the City for all costs associated with effort lost due to tests that are aborted. These costs shall include salary,

travel costs and per diem (where applicable) for commissioning team members.

B. Pre-Commissioning Checks: Deficiencies discovered during these checks shall be corrected and retested in accordance with the applicable contract requirements.

C. Functional Performance Tests: Functional performance tests shall begin only after all pre-commissioning checks have been successfully completed. Tests shall prove all modes of the sequences of operation, and shall verify all other relevant contract requirements. Tests shall begin with equipment or components and shall progress through subsystems to complete systems. Upon failure of any functional performance test checklist item, the Contractor shall correct all deficiencies in accordance with the applicable contract requirements. The checklist shall then be repeated until it has been completed with no errors.

END OF SECTION

DIVISION 16 - ELECTRICAL

SECTION 16011 - GENERAL ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.01 GENERAL CONDITIONS

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

1.02 SUMMARY

A. This section specifies the general electrical requirements for all labor, materials, equipment, and services provided under Division 16 - Electrical.

1.03 WORK INCLUDED:

A. The Contractor under this Division shall provide all labor, materials, equipment, supervision and services required for the construction of the electrical systems. The finished installations shall be complete, operable and shall include all work specified herein and shown on the Drawings.

B. The work shall include complete testing of all equipment and wiring at the completion of the work and making any minor connection changes or adjustments necessary for the proper functioning of the system and equipment. All systems shall be properly adjusted and in working order at the time of final acceptance.

C. All concrete work shall conform to the applicable requirements of the detailed equipment specifications as prescribed in appropriate sections.

D. It is the intent of these Specifications and other Contract Documents to require an installation complete in every detail. Consequently, the Contractor will be responsible for minor details or for any special construction which may be found necessary to properly furnish, install, adjust, test, and place in successful and continuous operation, the entire electrical system and the cost of same shall be included in the contract price.

1.04 DESCRIPTION OF WORK

A. Work specified in this Division shall include, but not be limited to the following:

1. Secondary electrical distribution system, including overcurrent protection devices and feeders.

2. Include in the bid and pay for the permits, plan review fees, inspection fees and deliver the certificate of final inspection to Officer-in-Charge.

3. Testing.

1.05 REFERENCES

A. Comply with local ordinances; National Electrical Code; National Electrical Safety Code; applicable regulations of the National Board of Fire Underwriters; specifications of ANSI, NEMA, UL, IES, and IPCEA; and regulations of the City and County of Honolulu.

B. In the event of conflict between pertinent codes and regulations, and the requirements of the referenced standards, or those indicated in Specifications and on drawings, the provisions of the more stringent shall govern.

1.06 SUBMITTALS

A. Submit in accordance with Section 01300 - Submittal Procedures.

B. Certificates:

1. Submit written certification that electrical systems are complete and operational as stipulated in item entitled “DEMONSTRATION OF COMPLETE ELECTRICAL SYSTEMS” hereinbelow.

2. Submit certificate of final inspection and acceptance as stipulated in item entitled “INSPECTION” hereinbelow.

C. Test records.

D. Warranty: Submit warranty as stipulated in item entitled “WARRANTY” hereinbelow.

E. As-Built Drawings: Submit in accordance with Section 01300 - Submittal Procedures.

1.07 QUALITY ASSURANCE

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

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

items of the same class of equipment are required, these items shall be products of a single manufacturer; however, the component parts of the item need not be the products of the same manufacturer unless stated in the technical section.

C. Products manufactured more than 3 years prior to date of delivery to site shall not be used, unless specified otherwise.

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

1.08 PERMITS

A. All permits required by local ordinances shall be obtained and paid for by the Contractor.

1.09 COORDINATION

A. Refer to all project Drawings and to all Sections of the project Specifications. Coordinate and fit all work accordingly so that all equipment will be properly located and readily accessible. The Drawings indicate the relation of wiring and connections and must not be scaled for exact locations.

B. Verify all construction dimensions at the project and make changes necessary to conform to the building as constructed. Work improperly installed due to lack of construction verification shall be corrected at the Contractor's expense.

C. Work shall be scheduled to avoid delays, interferences, and unnecessary work. If any conflicts occur, necessitating departures from the Drawings and Specifications, details of departures and reasons therefore shall be submitted immediately for consideration by the Officer-in-Charge.

1.10 DELIVERY, HANDLING AND STORAGE

A. Deliver all materials of this Division in manufacturer's original unopened packages or containers with label intact and legible.

B. Use means necessary to protect the materials of this section before, during and after installation; to protect the installed work and materials of all other trades; and to protect the original structure, work and materials of the City.

C. In the event of damage, immediately make all repairs and replacements necessary to the acceptance of the Officer-in-Charge and at no additional cost to the City.

1.11 DRAWINGS AND SPECIFICATIONS

A. Electrical system drawings are diagrammatic and symbolic. Locations of devices, raceways, apparatus, etc., shown are approximate and shall be installed with the required maintenance and code clearances and to avoid conflict with other systems and trades. Visit site and verify lineal footages required and check scales and

dimensions shown on drawings prior to bidding to verify locations, routing and lineal footages of electrical work required for inclusion into bid. Study the project drawings and specifications, and make installation in most logical manner for eye appeal and coordination with other systems and trades. Unless dimensioned or noted otherwise, orderly configuration and visual composition are fully intended.

B. Include additional components and wiring which are not shown or specified herein but are required for proper control and operation to provide for a complete and operable system within intent indicated on the drawings and specifications.

C. Study the project drawings and specifications prior to bidding and provide additional wiring including apparatus and devices for equipment furnished by others without additional cost.

D. Relocate devices, apparatus and associated wiring including raceways, from locations shown, without additional cost, for code compliance and to avoid conflict with other systems or trades, structures, utilities and when directed before installation.

1.12 MANUFACTURER'S NAMEPLATE

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

1.13 WARRANTY

A. Installation shall be complete in every detail as specified and ready for use. Unless otherwise indicated, any items supplied by Contractor developing defects of design, construction, or quality within one year of final acceptance by Officer-in-Charge shall be replaced by such new materials, apparatus or parts to make such defective portion of the complete system conform to the true intent and meaning of the Drawings and Specifications at no additional cost to the City.

B. The warranty shall be countersigned by the General Contractor.

PART 2 - PRODUCTS

2.01 MATERIALS AND WORKMANSHIP

A. All materials shall conform to the latest issue of all applicable standards as established by NEMA, NFPA, ANSI, IEEE, IES, ASTM and Underwriters' Laboratories, and shall bear the manufacturer's name and trade name and when available, the Underwriters' Label.

B. Neat appearances in the finished work will be required. Only experienced electrical workers shall be employed for the electrical installation.

C. All work not installed and completed in accordance with the latest rules and regulations of the NEC, OSHA and all local ordinances shall be removed and reinstalled correctly at the Contractor's expense.

PART 3 - EXECUTION

3.01 GENERAL

A. Install all electrical materials and equipment in accordance with manufacturer's recommendations and as accepted by the Officer-in-Charge for the seismic zone classification at the project site in accordance with the Building Code.

B. Cut, break, drill and patch as required, to install electrical system. Repair any surface damaged or marred by notching, drilling or any other process necessary for installation of electrical work. Patch any damaged surfaces to match the existing surface.

C. The Electrical Contractor shall coordinate his work with other trades to avoid conflicts with structural, mechanical and architectural elements of this project.

3.02 JOBSITE CONDITIONS

A. These specifications are accompanied by construction drawings including building and site plans showing locations of service runs, feeder runs, devices, and other electrical equipment. The locations are approximate and before installing, study adjacent architectural details and make installation in most logical manner. Any device may be relocated within 10 feet before installation at the direction of the Officer-in-Charge without additional cost to the City.

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

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

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

3.03 FIELD APPLIED PAINTING

A. Paint electrical equipment as required to match finish of adjacent surfaces or to meet the indicated or specified safety criteria. Painting shall be as specified in Section 09900 - Painting.

3.04 DEMONSTRATION OF COMPLETE ELECTRICAL SYSTEMS

A. Submit written certification that electrical systems are complete and operational. Submit certification with Contractor's request for final review.

B. At the time of final review of electrical work, demonstrate the operation of electrical systems. Provide labor, apparatus and equipment for systems' demonstration. The various tests shall be under the direction and supervision of the Officer-in-Charge.

C. The Contractor shall provide all test equipment, materials, labor, and temporary power hook-ups to perform start-up and all tests as required, to obtain final field acceptance from the City. All tests shall be conducted in the presence of the Officer-in-Charge or his representative. All test procedures shall conform to this specification and applicable standards. (ANSI, IEEE, NEMA, OSHA, NFPA, NETA, etc.)

D. The Contractor shall be responsible for all tests and test record. Testing shall be performed by and under the immediate supervision of the Contractor. Test record shall be kept for each piece of equipment. Copies shall be furnished to the Officer-in-Charge for his review and/or acceptance.

E. A visual inspection of all electrical equipment, to check for foreign material, tightness or wiring and connection, proper grounding, matching nameplate charts with specification, etc., shall be made prior to actual testing.

F. After demonstration of systems, submit to the Officer-in-Charge 6 sets of keys for electrical equipment locks.

3.05 INSPECTION

A. Arrange for periodic inspection by the local authorities and deliver the certificate of final inspection to the Officer-in-Charge.

END OF SECTION

SECTION 16100 - ELECTRICAL WORK

PART 1 - GENERAL

1.01 GENERAL CONDITIONS

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

1.02 SUMMARY

A. This section includes, but is not limited to, secondary electrical systems as indicated in the drawings.

B. RELATED WORK: Section 16011 - General Electrical Requirements applies to this section with additions and modifications specified herein.

1.03 APPLICABLE PUBLICATIONS

A. The publications cited within this specification form a part of this specification to the extent referenced. Unless otherwise indicated, the most recent edition of the publication with current revisions and amendments will be enforced.

1.04 SUBMITTALS

A. Submit in accordance with Section 01300 - Submittal Procedures.

B. Product Data:

1. Overcurrent protection devices.

2. Safety switches.

C. Field Test Reports: Submit the following test results for approval in report form as stipulated in item "FIELD QUALITY CONTROL" hereinbelow:

1. 600-volt wiring test.

PART 2 - PRODUCTS

2.01 GENERAL

A. Materials shall be new and those items listed by the Underwriters' Laboratories shall bear "UL" label of approval.

B. Brand names, manufacturer's names and catalog numbers indicate standard of design and quality required. Acceptable manufacturers for electrical apparatus include General Electric, Square D, Siemens, and Eaton. All apparatus supplied shall bear the name of the approved manufacturer on its nameplates.

C. Electrical equipment shall be supplied through the manufacturer’s designated representative by a local distributor.

D. Proof of compliance shall be furnished when shop drawings are submitted.

E. Where two or more similar type items are furnished, all shall be of the same manufacture, e.g., safety switches shall be of the same manufacturer unless otherwise noted.

F. Where electrical apparatus is to be installed outdoors, NEMA 4X stainless steel housings shall be provided, unless noted otherwise.

2.02 RACEWAYS

A. Rigid Steel Conduit: Rigid steel, zinc-coated inside and outside, for use with threaded fittings. ANSI C80.1.

B. Fittings for Metal Conduit: UL 514B. Ferrous fittings shall be cadmium- or zinc-coated in accordance with UL 514B. Threaded-type. Split couplings unacceptable.

2.03 CONDUCTORS

A. Solid or stranded copper, sizes according to American Wire Gauge, as shown on Drawings and #12 AWG minimum unless otherwise indicated. Stranded conductors only for #8 AWG and larger. All wiring shall be color coded.

B. Conductors Larger Than #8 AWG: Type XHHW or RHW-2.

C. Conductors for Equipment Connection: Stranded flexible type.

D. Cabling: Not acceptable.

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

1. 480/277 Volt, 3-Phase:

    a. Phase A - brown.

    b. Phase B - orange.

    c. Phase C - yellow.

2. 208/120 Volt, 3-Phase:

   a. Phase A - black.

   b. Phase B - red.

   c. Phase C - blue.

2.04 SPLICES AND TERMINATION COMPONENTS

A. UL 486A-486B for wire connectors and UL 510 for insulating tapes. Connectors for No. 10 AWG and smaller diameter wires shall be insulated, pressure-type in accordance with UL 486A-486B or UL 486C (twist-on splicing connector). Provide solderless terminal lugs on stranded conductors.

2.05 SEPARATELY ENCLOSED CIRCUIT BREAKERS AND SAFETY SWITCHES

A. Circuit breakers, unless otherwise shown, shall be molded case, toggle mechanism operated, with no-fuse ambient-compensated thermal-magnetic overload automatic trip units for overcurrent, ground fault and short-circuit protection, interchangeable trip units when available and contacts rated to interrupt short-circuit currents as specified on Drawings. Multi-pole breakers shall have single, common operating handle for all poles. Toggle positions "ON", "OFF" and "TRIPPED" and breaker rating engraved or embossed on body and visible without removing enclosure cover.

B. Safety switches shall be heavy-duty grade, horsepower rated and sized as indicated or as to match branch circuit overcurrent device rating.

C. Enclosures for separately enclosed breakers shall be NEMA 1 for interior locations and NEMA 4X stainless steel for exterior locations.

2.06 MANUFACTURER’S NAMEPLATE

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

2.07 WARNING SIGNS

A. Provide warning signs for flash protection in accordance with NFPA 70E and NEMA Z535.4 for panelboards that are likely to require examination, adjustment, servicing, or maintenance while energized. Provide field installed signs to warn qualified persons of potential electric arc flash hazards when warning signs are not provided by the manufacturer. The marking shall be clearly visible to qualified persons before examination, adjustment, servicing, or maintenance of the equipment.

2.08 HARDWARE, SUPPORTS, BACKING, ETC.:

A. Provide all hardware, supports, backing and other accessories necessary to install electrical equipment. Wood materials shall be treated against termites, iron or steel materials shall be galvanized for corrosion protection, and non-ferrous materials shall be brass or bronze.

B. Bolts, nuts, washers, and screws used for exterior use shall be high quality stainless steel or brass.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Electrical installations, including weatherproof locations and ducts, plenums and other air-handling spaces, shall conform to requirements of NFPA 70 and IEEE C2 and to requirements specified herein.

B. Conductors:

1. Provide insulated conductors installed in rigid steel conduit, except where specifically indicated or specified otherwise or required by NFPA 70 to be installed otherwise. Utilize non-wax type lubricants for pulling, chemically neutral to insulation and sheath. Mechanical means for pulling to be tongue-limiting type and not be used for #2 AWG wires and smaller. Grounding conductor shall be separate from electrical system neutral conductor. Provide insulated green equipment grounding conductor for circuit(s) installed in conduit and raceways.

2. Install pull wires in empty conduits. Pull wire shall be plastic having minimum 200-pound force tensile strength. Leave minimum 36 inches of slack at each end of pull wire.

3. No-solder pressure connectors or crimp connections for #8 AWG and larger wires. Remove all sharp points that can pierce tape. Reinsulate according to wire manufacturer’s directions. Make splices within boxes in accessible locations.

4. Clean all raceways, boxes, and enclosures before pulling wires and cables. Form neatly in enclosures for minimum of cross-overs.

C. Conduit Installation:

1. Install conduit parallel with or at right angles to ceilings, walls, and structural members.

2. Use conduits with approved coupling and connectors. All cuts square, using saw. Ream the ends. Bends made with approved tools. Reject flattened or crushed conduit. No running thread. Bushing and two (2) locknuts at connection to boxes and enclosures.

3. All raceways shall be blown and swabbed after installation to remove any water then immediately sealed to prevent water infiltration during construction. Raceways must remain sealed except when pulling conductors. If water is discovered during the warranty period the Contractor shall remove water from raceways and associated boxes at no additional cost to the City.

4. Exposed conduit runs to be parallel and/or perpendicular to architectural and structural elements.

5. Minimum conduit diameter shall be 3/4-inch trade size except that 1/2-inch conduit will be permitted for branch circuit (non-signal) raceways with a maximum of two current carrying conductors #10 AWG and smaller.

6. Conduit Support: Support conduit by pipe straps, wall brackets, hangers, or ceiling trapeze. Fasten by wood screws to wood; by toggle bolts on hollow masonry units; by concrete inserts or expansion bolts on concrete or brick; and by machine screws, welded threaded studs, or spring-tension clamps on steel work. Threaded C-clamps may be used on rigid steel conduit only. Do not weld conduits or pipe straps to steel structures. Load applied to fasteners shall not exceed one-fourth proof test load. Fasteners attached to concrete ceiling shall be vibration resistant and shock-resistant. Holes cut to depth of more than 1 1/2 inches in reinforced concrete beams or to depth of more than 3/4-inch in concrete joints shall not cut main reinforcing bars. Fill unused holes.

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

8. Locknuts and Bushings: Fasten conduits to sheet metal boxes and cabinets with two (2) locknuts where required by NFPA 70, where insulated bushings are used, and where bushings cannot be brought into firm contact with the box; otherwise, use at least minimum single locknut and bushing. Locknuts shall have sharp edges for digging into wall of metal enclosures. Install bushings on ends of conduits, and provide insulating type where required by NFPA 70. Provide threaded, weatherproof hubs for all raceway connections to boxes and enclosures exposed to the weather.

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

E. Grounding and Bonding: Provide in accordance with NFPA 70. Ground exposed, non-current-carrying metallic parts of electrical equipment, metallic raceway systems, grounding conductor raceways, and neutral conductor of wiring systems.

3.02 IDENTIFICATION

A. All overcurrent protection devices and safety switches shall be provided with plastic plate identifying itself and its use.

B. Plastic plate shall be laminated black and white, engraved 1/4-inch high lettering to expose black layer. Plate shall be riveted to the cover and located directly below device handle, or top side of door.

C. CAUTION SIGNS shall be provided as required by Ordinances and/or by OSHA.

3.03 FIELD APPLIED PAINTING

A. Paint electrical equipment as required to match finish of adjacent surfaces or to meet the indicated or specified safety criteria. Painting shall be as specified in Section 09900 - Painting.

3.04 FIELD QUALITY CONTROL

A. Furnish test equipment and personnel and submit written copies of test results. Give Officer-in-Charge ten (10) working days' notice prior to each test.

1. Devices Subject to Manual Operation: Each device subject to manual operation shall be operated at least five (5) times, demonstrating satisfactory operation each time.

2. 600-Volt Wiring Test: Test wiring rated 600-volt and less to verify that no short circuits or accidental grounds exist. Perform insulation resistance tests on wiring No. 6 AWG and larger diameter using instrument which applies voltage of approximately 500 volts to provide direct reading of resistance. Minimum resistance shall be 250,000 ohms. Submit results to the Officer-in-Charge.

3. Inspect conduit system for completeness, loose couplings and proper support.

END OF SECTION