CONTRACT DOCUMENTS

FOR

**WAIKIKI SURF RACKS**

2395 Kalakaua Avenue
Honolulu, Oahu, Hawaii

TAX MAP KEY: 2-6-001: 008, 015, 018, 019

FOR THE

DEPARTMENT OF DESIGN AND CONSTRUCTION
CITY AND COUNTY OF HONOLULU
HONOLULU, HAWAII

JOB NO. 26-P-07

SOLICITATION NO. RFB-DDC-2006307

ARCHITECT: WCIT ARCHITECTURE, INC.

SEPTEMBER 2026

ARCHITECT'S CERTIFICATION




Signature

April 30, 2028
Expiration Date of the License

This work was prepared by me or
under my supervision

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# RFB-DDC-2006307

## NOTICE TO OFFERORS

COMPETITIVE SEALED BIDS (must be hardcopy) shall be received no later than 3:00 p.m. HST, October 27, 2026, in the Office of the Division of Purchasing, Department of Budget and Fiscal Services, City and County of Honolulu, City Hall, Room 115, 530 South King Street, Honolulu, Hawaii 96813 for:

WAIKIKI SURF RACKS

JOB NO. 26-P-07

Unless otherwise stated in the solicitation, competitive sealed bids shall be read aloud at the public bid opening held shortly after the deadline for offers, as amended.

Offerors shall be licensed in accordance with Chapter 444, HRS, relating to the licensing of Contractors.

Pursuant to Section 3-122-16.05 of the Hawaii Administrative Rules, a pre-bid conference shall be held for construction or design-build projects with a total estimated contract value of $500,000.00 or more. A pre-bid conference will be held at 2395 Kalakaua Avenue on October 7, 2026 at 10:00 a.m. All potential interested offerors, subcontractors, and union representatives are invited to attend.

Requests for clarification regarding this bid solicitation shall be directed to Romona Maeshiro of the Division of Purchasing by email to bfspurchasing@honolulu.gov. The CITY will accept requests for substitution submitted electronically to bfspurchasing@honolulu.gov. All requests shall be received no later than October 14, 2026. Requests received after this date may not be given consideration.

Following are modifications to the General Instructions to Offerors dated 02/09/2017:

- Delete Item (2) of Section 2.19(b), Notification of Addenda in its entirety.
- Delete subsection (a) of Section 8.4 in its entirety and replace with the following:

  "(a) Notarization

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

- Add new Section 3.3 as follows:

  "3.3 Hawaii Bidder/Offeror Preference.

  The Hawaii Bidder/Offeror preference shall be applicable to this solicitation, for evaluation purposes only. Bidders/Offerors that wish to qualify for the five percent (5%) discount preference shall submit a completed Hawaii Bidder/Offeror Preference Certification form with its bid/offer. The five percent (5%) discount shall be applied to the Bidder's/Offeror's bid/offer price.

THIS IS A CITY AND COUNTY OF HONOLULU SOLICITATION. Bidders/Offerors shall not use any other Hawaii Bidder/Offeror Certification form except the form provided in the solicitation. Hawaii Bidder/Offeror Preference Certifications submitted for previous or other solicitations shall not be accepted.

The preference shall only apply if the total bid or offer price is less than $10,000,000.00. The preference shall only apply when at least one (1) qualified Bidder/Offeror competes against at least one (1) Bidder/Offeror that does not qualify for the preference. The preference shall not be applied if all bidders/offerors are Hawaii Bidders/Offerors.

Upon the City's written request, the Bidder/Offeror shall provide sufficient documentation to the City to demonstrate full compliance with this preference. The documentation must be provided within the time stated in the request.

Award shall be made at the Bidder's/Offeror's bid/offer price and not at the reduced evaluated price. During the contract period, failure to maintain the Hawaii Bidder/Offeror qualifications shall cause a reduction of price equal to the value of the preference applied and may constitute cause for debarment pursuant to Hawaii Revised Statutes §103D-702."

– This space left intentionally blank. –

## SCHEDULE AND SIGNIFICANT DATES

| MILESTONE | DATE |
|---|---|
| Pre-Bid Conference | Wednesday, October 7, 2026 |
| Requests for Clarification/Substitution due date | Wednesday, October 14, 2026 |
| Last Day for Issuance of Addenda | Thursday, October 22, 2026 |
| Bid Opening Date | Tuesday, October 27, 2026 |

PAULA A. YOUNGLING
Purchasing Administrator
City and County of Honolulu

# CITY AND COUNTY OF HONOLULU

HAWAII BIDDER/OFFEROR
PREFERENCE CERTIFICATION FORM
(AS DEFINED IN HAWAII REVISED STATUTES §103D-1001)

I, _____, _____ of
(Name of Authorized Person on behalf of the Bidder/Offeror) (Position Title)

_____ (the "Hawaii Bidder/Offeror"), certify the following
(Hawaii Bidder's/Offeror's Legal Business Name)

under penalty of perjury that:

1. The Hawaii Bidder/Offeror holds a valid commercial place of business located in the State of Hawaii that has been staffed by the Hawaii Bidder/Offeror or an employee of the Hawaii Bidder/Offeror for not less than two (2) consecutive years immediately preceding the time and date set for the opening of bids or receipt of proposals; and

2. The bid or proposal in response to Solicitation No. RFB-DDC-2006307 is submitted under the name under which the Hawaii Bidder/Offeror is authorized to do business in the State of Hawaii; and

3. Not less than fifty-one percent (51%) of the total direct labor hours required for performance of the contract will be performed in the State of Hawaii; and

4. The Hawaii Bidder/Offeror will maintain these qualifications throughout contract performance; and

5. If the Hawaii Bidder/Offeror is a joint venture, the Hawaii Bidder/Offeror is composed entirely of parties meeting the requirements of paragraphs 1, 2, 3, and 4 above.

I hereby certify under penalty of perjury that the above statement is true. Any changes in eligibility shall be reported to the Officer-in-Charge or the contact person identified in the solicitation. I agree to maintain the above qualifications throughout contract performance. I acknowledge that failure to maintain the above qualifications triggers a reduction of price equal to the value of the preference applied and may be cause for debarment of the Hawaii Bidder/Offeror pursuant to Hawaii Revised Statutes §103D-702.

_____ _____
(Signature) (Date)

# 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.

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RFB-DDC-2006307

# OFFER

_____
Offeror's Legal Business 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:

WAIKIKI SURF RACKS

2395 KALAKAUA AVENUE, HONOLULU, HAWAII, 96815

TAX MAP KEY: 2-6-001: 008, 015, 018, 019

JOB NO. 26-P-07

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.

Basic Bid

| Item No. | Quantity | Description | Bid Amount |
|---|---|---|---|
| 1. | Lump Sum | Waikiki Surf Racks, complete in accordance with the drawings and specifications | $_____ |

The Undersigned also agrees as follows:

1. That the bids 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 material, 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. Award of the contract shall be made to the responsive, responsible bidder submitting the lowest BASIC BID.

3. That the time of completion for the Basic Bid shall be within three hundred four (304) consecutive calendar days 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. The necessary permits for this project is anticipated to take six (6) 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. Please refer to Paragraph 1.03 Coordination with Department of Enterprise Services, PART 1 General, Section 01015 Contractor Use of Premises, Division 1 General Requirements for these Specifications, for additional information on the project scheduling requirement.

   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 365 calendar day period after execution of the contract.

   Please also refer to Paragraph 1.02 Notice To Proceed For Construction, PART 1 General, Section 01035 Construction Project Procedures, Division 1 – General Requirements of these Specifications, for additional information on the Notice To Proceed (NTP).

4. Construction sign will be provided by the Offeror.

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 Offer 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 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 per cent of the amount bid.

Respectfully submitted,

_____
Offeror’s Legal Business Name

By: _____
Authorized Signature

_____
Print or Type Name and Title of Above

Dated: _____

Address of Offeror _____

_____

Telephone Number _____

Email Address: _____

In accordance with Section 103D-302 HRS, 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 HAR § 3-120-2. Offers that do not comply with this requirement may be evaluated in accordance with Section 103D-302(b) of the HRS.

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 contractor’s 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 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 (SPO) 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 (DLIR) 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 contractors 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 of work to be performed by each.

| COMPLETE NAME OF JOINT CONTRACTOR OR SUBCONTRACTOR | CONTRACTOR LICENSE NUMBER | SPECIFIC DESCRIPTION OF THE NATURE AND SCOPE OF WORK |
|---|---|---|
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## ACKNOWLEDGMENT OF LIQUIDATED DAMAGES PROVISION

PROJECT NAME AND NUMBER: Waikiki Surf Racks, Job No. 26-P-07

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 Section SP 3 of the Special Provisions, and that submittal of our bid constitutes acceptance of the provisions and amount of liquidated damages that may be assessed per calendar day as specified in the Special Provisions.

_____
Offeror's Legal Business Name

_____
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: Waikiki Surf Racks, Job No. 26-P-07

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 offers in excess of $100,000 shall include a signed certification from the Offeror that a written safety and health plan for the job will be available and implemented by the notice to proceed dates of the project. The written safety and health plan shall include:

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

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

(3) The details of:

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

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

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

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

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

_____
Offeror’s Legal Business Name

_____
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 or 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's Legal Business Name: _____

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 _____
_____
*(Required Amount of Bid Security)*
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 by Number and Brief 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 _____, _____.

(Seal) _____
Name of Principal (Offeror)

_____
Signature

_____
Title

(Seal) _____
Name of Surety

_____
Signature

_____
Title

(This page intentionally left blank.)

# CONTRACT NO. <Contract Number>

Solicitation No. <Solicitation Number>

THIS AGREEMENT (or "Agreement"), made and entered into on _____, 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, with offices at Honolulu Hale, 530 South King Street, Honolulu, Hawaii 96813, hereinafter called the "CITY" (or "City"), and <CONTRACTOR NAME>, whose principal place of business is <contractor's address>, hereinafter called the "CONTRACTOR" (or "Contractor").

WITNESSETH THAT:

WHEREAS, the CITY desires to engage the CONTRACTOR for the <PROJECT NAME>; and

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. <Solicitation Number>

CONTRACTOR's Offer

The Contract Documents as listed hereinabove are in the order of controlling preference should there be any conflict in the terms.

2. The CONTRACTOR shall furnish all services, labor, goods, materials, supplies, equipment and other incidentals reasonably 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 <DOLLAR AMOUNT WRITTEN OUT> AND xx/100 DOLLARS ($xxx,xxx.xx), which is the maximum

SAMPLE

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 Contract shall be the duration as provided in Solicitation No. <Solicitation Number>.

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. <Solicitation Number>.

[End of page, signatures on following page]

SAMPLE

IN WITNESS WHEREOF, this AGREEMENT is executed herein by the duly authorized officers or agents of the CITY and the CONTRACTOR.

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

APPROVED AS TO FORM AND
LEGALITY

_____

Deputy Corporation Counsel
City and County of Honolulu

SAMPLE

# 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 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 adjustment shall be made and the contract modified in writing accordingly. 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: $500.00

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 its offer in a separate sealed envelope identified on the outside by Offeror's name, project title and marked "Bid Schedule of Values Data", a breakdown of its overall bid on the bid schedule of values data sheet provided with the offer.

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.

If the bid schedule of values data sheet is not provided with the offer, and if requested by the City, the Offeror shall provide this data within three (3) City business days.

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 shall maintain records pertaining to the Contractor's performance on contracts with the City. The Contractor shall be required to participate in performance assessment activities during or after 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. ALLOWANCES. If the City listed allowances in the Offer section, the Contractor shall coordinate all work covered under the allowance. No demand for expenses or profit other than these included in the Contract Basic Bid shall be allowed. Allowances shall be used with the approval of the Officer-in-Charge. Any balance shall remain with the City.

SP 8. 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 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 or 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 or 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 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 9. INDEMNITY. Delete Section 2.10, Indemnity, of the GENERAL CONDITIONS in its entirety and replace with the following:

“2.10 Indemnity

The Contractor shall perform the work as an independent contractor and shall indemnify and hold harmless the City, its departments, and all of their officers, employees or agents, from any and all deaths, injuries, losses and damages to persons or property, and any and all claims, demands, suits, action and liability therefor including reasonable attorney fees and cost of defense, caused by error, omissions, negligence or willful or intentional misconduct in the performance of the contract by the Contractor or the Contractor's subcontractors, agents and employees, and this requirement shall survive the termination of contract.”

SP 10. ANTI-DISCRIMINATION. In accordance with Section 1-11 of the Revised Ordinances of Honolulu 2021, as amended, the Contractor shall not engage in discriminatory practices for any work provided under this Agreement. Discriminatory practices are practices that discriminate on the basis of a classification protected by any federal, State, or City law, including retaliation for opposing discrimination or participation in an investigation or proceeding that alleges discrimination.

SP 11. HAWAII BIDDER/OFFEROR PREFERENCE. If the Contractor is subject to the Hawaii Bidder/Offeror preference and fails to maintain the requirements of a Hawaii Bidder/Offeror throughout the entirety of contract, the Contractor shall be subject to a reduction of price equal to the value of the preference applied. The City may also pursue debarment of the Contractor pursuant to Hawaii Revised Statutes §103D-702. Any changes in eligibility shall be reported to the Officer-in-Charge.

At any time during the contract, the City may request the Contractor to provide sufficient documentation to the City to demonstrate full compliance with the Hawaii Bidder/Offeror preference. The documentation must be provided within the time stated in the request.

RFB-DDC-2006307

# BID SCHEDULE OF VALUES DATA

_____
Offeror's Legal Business Name

1. Each Offeror should submit with its Offer in a separate envelope identified on the outside by Offeror name, project name, and marked "Bid Schedule of Values Data", a breakdown of the overall bid showing the amounts included therein for the following work:

| | | |
|---|---|---|
| A. | Mobilization | $_____ |
| B. | Best Management Practices | $_____ |
| C. | Geotextile | $_____ |
| D. | Demolition | $_____ |
| E. | Earthwork | $_____ |
| F. | Trenching | $_____ |
| G. | Site Water Distribution | $_____ |
| H. | Sanitary Sewerage | $_____ |
| I. | Storm Drainage | $_____ |
| J. | Concrete Sidewalk | $_____ |
| K. | Restoring Pavements and Other Improvements | $_____ |
| L. | Concrete Forming and Accessories | $_____ |
| M. | Concrete Reinforcing | $_____ |
| N. | Cast-in-Place Concrete | $_____ |
| O. | Architectural Concrete | $_____ |
| P. | Concrete Finishing | $_____ |
| Q. | Non-Shrink Grouting | $_____ |

| | | |
|---|---|---|
| R. | Structural Steel | $_____ |
| S. | Metal Fabrications | $_____ |
| T. | Perforated Metal Panels | $_____ |
| U. | Composite Decking | $_____ |
| V. | Direct-Applied Finish Systems | $_____ |
| W. | Sheet Metal Flashing and Trim | $_____ |
| X. | Joint Sealants | $_____ |
| Y. | Sliding Aluminum Doors | $_____ |
| Z. | Finish Hardware | $_____ |
| AA. | Painting and Coating | $_____ |
| BB. | Fire Protection Work | $_____ |
| CC. | Electrical Work | $_____ |
| DD. | Plumbing Work | $_____ |
| EE. | Miscellaneous Restoration | $_____ |

TOTAL SUM BASIC BID $_____

2. This information is required for analytical purposes and shall have no bearing upon the determination of the lowest responsive, responsible Offeror, and will not be divulged to the public at bid opening.

3. If a breakdown of the items listed under Item No. 1 is not provided with the offer, and if requested by the City, the Offeror shall provide this data within three (3) City business days.

4. The successful Offeror, upon request from the Officer-in-Charge, shall furnish a breakdown of the items listed under Item No. 1 above for Labor and Non-Labor cost.

# CONSTRUCTION SIGN BOARD

Revised March 6, 2023




NOTES:

1. Use 48"x 96" aluminum coated material (ACM), front side laminated to a solid black polyethylene core trim to final size of 47”x 95”.
2. UV print sign directly to on ACM.
3. Insert appropriate names and agencies only.
4. City Seal shall be integrated into sign and printed directly to sign.
5. Color:
   Background Color: White
   Border Color: as indicated.
6. Letter Point Size 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. An editable electronic file will be provided to Contractor including the graphics and sample text for the construction sign by the Officer–in-Charge.
11. 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 full scale colored electronic file proof of 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 on 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.

1 Pantone Color and Point size indicated in RED



# DETAILED SPECIFICATIONS

## DIVISION 1 – GENERAL REQUIREMENTS

## SECTION 01010 – GENERAL REQUIREMENTS

### PART 1 - 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 APPLICABLE REGULATIONS: 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. Scope of Work:

Reconstruction of previously removed surfboard storage racks including, but not limited to the following:

1. Demolition of existing light poles.
2. Selective demolition of existing flagstone walkway.
3. Inclusion of new concrete slab on grade.
4. Replacement of existing drinking fountain.
5. Installation of new surfboard and standup paddle board locker racks.
6. Inclusion of new perforated aluminum and concrete end cap wall perimeter enclosure with gates.
7. Installation of new fire protection system.
8. Installation of new light fixtures.
9. Installation of new security camera provisions.

B. 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, either direct or implied, is assumed by the City 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.
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.

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.

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:

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.

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 (OIC) for clarification and instructions.

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

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.

Phrase “or equal” shall mean “or approved substitute.”

The term “Owner” shall mean “City.”
The terms “Architect” or “Engineer” shall mean “Officer-in-Charge.”

1.05 AS-BUILT DRAWINGS: 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 OIC. REVIEW AND ACCEPTANCE: OIC. 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: 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.

Should existing utilities not shown on the plans be encountered in the field during the operation, the Contractor shall promptly notify the OIC 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 OIC, 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: Storage of materials, equipment and fabricating areas will not be permitted at the project sites.

1.09 RESTORATION OF EXISTING AREAS: 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.

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 REFERENCE STANDARDS AND ABBREVIATIONS: All work shall be done in accordance to the most current standards listed in the Special Provisions, Detailed Specifications, DPR Standard Specifications (not physically 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 Terms and Conditions, City and County of Honolulu.

BC: Latest approved building, electrical, plumbing and energy codes of the City and County of Honolulu.

SS: Standard Specifications for Public Works Construction, Department of Public Works, City and County of Honolulu.

SD: Standard Details of the Department of Public Works, City and County of Honolulu, dated September 1984, including Plumbing Codes for the City and County of Honolulu.

BWS: Board of Water Supply, City and County of Honolulu, Water System Standards, Vol. 1, and Approved Material List and Standard Details for Water System Construction, Vol. 2, dated 2002, and Water System External Corrosion Control Standards, Vol. 3, dated 1991. Do all work in accordance with the above standards as amended and amplified herein.

OIC: 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

# DIVISION 1 – GENERAL REQUIREMENTS

## SECTION 01015 – CONTRACTOR USE OF PREMISES

## PART 1 - 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 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 on site work commences, the Contractor, if need be, shall air freight at his own cost, all materials and equipment needed at the jobsite in order to complete the work within the project completion time.

B. Within twenty-five (25) calendar days of the date that work is projected to start at the job site, the Contractor shall submit for approval, a performance schedule to include all construction and phasing activities related to this project, to the Officer-in-Charge, as required by paragraph (e) Payment and Performance Schedules, Item 5. Performance, Chapter 5 – Construction Contract Provisions Supplement of the General Terms and Conditions, City and County of Honolulu. This schedule shall clearly identify when temporary utility connections will occur and/or when City operations shall be affected.

All Contractors 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.

Unless otherwise specifically indicated, it is the intent of this project that all City functions shall continue during this construction contract. These City functions include, but are not limited to activities such as park programs, public safety functions such as police, fire, ambulance, performance events such as those at the Blaisdell Center, and public service offices such as for real property, road maintenance, City administration, satellite city halls, etc.

The Contractor must employ whatever reasonable methods and means necessary to carry out his work so as not to cause any objectionable interruption or interference to the normal operations of the City and County of

Honolulu. The Contractor shall schedule its objectionable operations to be performed during City's non-working hours at no additional cost to the City. Objectionable operations are work that causes interruption and interference to the normal operations of the City and may include (1) scheduled events, (2) demolition work, (3) work such as drilling, grinding, tamping, and saw cutting and/or using equipment emanating loud noise, (4) non-containable dust inducing operations, and (5) use of liquid that emits offensive and/or irritating odor or fumes. The Contractor shall include in his total lump sum bid all additional costs related to the foregoing matter. The Contractor shall not be required to pay for the cost of inspection for overtime work during non-working hours that the City requests the Contractor work because of objectionable operations. All other costs of inspection for overtime work shall be paid for by the Contractor.

C. Contractor shall maintain a safe passageway to and from the building for the City personnel and the public at all times.

D. Contractor shall call the Construction Management Branch of the Facilities Division, Department of Design and Construction, telephone number 768-8457, and give five (5) working days notice before starting any work.

1.03 COORDINATION WITH DEPARTMENT OF ENTERPRISE SERVICES:

The Contractor's project schedule shall be coordinated with the operations and events of the Department of Enterprise Services (DES) by the City's Officer-in-Charge. The Contractor is forewarned that the work may be limited by the operations and events of the facilities. To allow DES to coordinate events and activities, the Contractor shall prepare and submit a preliminary construction schedule and phasing plan to the Officer-in-Charge five (5) working days prior to the Pre-construction Conference. These documents shall identify periods planned for temporary utility disconnections. The Officer-in-Charge will review with DES and advise the Contractor of any needed modifications to the construction schedule.

1.04 PROTECTION OF PROPERTY: The Contractor shall continually maintain adequate protection of all his work from damage and shall protect all property at the project site, including buildings, equipment, furniture, 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.

PART 2 - PRODUCTS (NONE)

PART 3 - EXECUTION (NONE)

END OF SECTION

# DIVISION 1 – GENERAL REQUIREMENTS

## SECTION 01035 – CONSTRUCTION PROJECT PROCEDURES

### PART 1 - 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 NOTICE TO PROCEED FOR CONSTRUCTION:

It is the intent of the City to issue a Notice to Proceed (NTP) within three hundred sixty-five (365) calendar days of execution of the construction contract.

Reference also, Paragraph 3 of the OFFER, relating to the construction period for the construction contract.

1.03 MATERIAL SUBMITTALS: Upon issuance of the NTP, the Contractor shall immediately begin processing submittals of shop drawings, catalog cuts, samples, etc., for approval.

PART 2 - PRODUCTS (NONE)

PART 3 - EXECUTION (NONE)

END OF SECTION

# DIVISION 1 – GENERAL REQUIREMENTS

## SECTION 01051 – GRADES, LINES, AND LEVELS

### PART 1 - 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 WORK INCLUDED: To furnish all labor, materials and equipment necessary to lay out the entire work and verify all dimensions and elevations, all as shown on the drawings and as specified herein.

A. It shall be the responsibility of the Contractor to examine the project site and determine for himself the existing conditions.

B. Obvious conditions of the site existing on the date of the bid opening shall be accepted as part of the work, even though they may not be clearly indicated on the drawings and/or described herein or may vary there from.

### PART 2 - PRODUCTS (NONE)

### PART 3 - EXECUTION

3.01 LAYING OUT: The laying out of base lines for the entire work shall be done by the Contractor, and he shall be solely responsible for their accuracy.

3.02 VERIFY DIMENSIONS AND ELEVATIONS: The Contractor shall verify all dimensions and elevations as shown on the drawings. In accordance with paragraph 5.2.2.l Surveys and Construction Stakes, Lines & Grades, Chapter 5. Construction Contract Provisions Supplement, of the General Terms and Conditions, City and County of Honolulu, the Contractor shall notify the Officer-in-Charge in writing immediately upon discovery of any error, omission, or discrepancy in the layout work.

END OF SECTION

# DIVISION 1 – GENERAL REQUIREMENTS

## SECTION 01060 – REGULATORY REQUIREMENTS

### PART 1 - 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 LICENSED OFFERORS:

All prospective offerors must hold a current “B” General Building contractor’s license from the State of Hawaii. No offer will be accepted from any unlicensed offeror.

Please also note in the Offer, the requirement for listing of all joint contractors or subcontractors.

PART 2 - PRODUCTS (NONE)

PART 3 - EXECUTION (NONE)

END OF SECTION

# DIVISION 1 – GENERAL REQUIREMENTS

## SECTION 01300 – SUBMITTALS

### PART 1 - 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 SUBMITTALS:

A. Substitution of Materials and Equipment: Substitution requests shall be in accordance with Paragraph 2.18(b) Request for Substitution, Chapter 2.0 SOLICITATION, of the General Instructions to Offerors.

B. Shop Drawing/Material Submittal:

1. Submittal Schedule: Submit two (2) copies of schedule. Arrange the following in tabular format:

a. Scheduled date for submittal

b. Specification Section number and title

c. Description of work covered

d. Scheduled date for City's final release and approval

2. Submittal Identification:

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

(JOB TITLE)
(JOB NO.)

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

SUBMITTAL # _____
SPEC. SEC. # AND NAME _____
SUBCONTRACTOR NAME _____
SUPPLIER NAME _____
MANUFACTURER NAME _____

_____
CONTRACTOR'S NAME

CERTIFIED BY _____
(Contractor's Signature)

   b. This stamp "filled in" should appear on the title sheet of each shop drawing, on a cover sheet of the submittals in an 8 ½" x 11" format or on one face of a cardstock tag (minimum 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 page 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: Submittals shall be transmitted with a letter in the format as shown on the attached submittal sample at the end of this section. All non-applicable data shall be blocked out and minor deviations from specifications and plans shall be clearly marked and justified. Unless otherwise indicated in the applicable specification sections, the Contractor shall present the submittal items according to the following:

   a. Certification of Compliance: The original and two (2) copies of the signed manufacturer's certificate indicating compliance to the

provisions of the specifications and certifying that the material does not contain asbestos. The Certificate of Compliance shall be on an 8½" x 11" sheet.

b. Product Data: Six (6) copies of product data, such as a manufacturer's data, Manufacturer's Safety Data Sheet (MSDS) and catalog cuts that indicate conformance to the provisions of the specifications regarding materials, appearance, and finishes. Product data shall conform to an 8½" x 11" format.

c. Samples: Three (3) samples of each material as indicated in the applicable specification sections. Samples required by specification sections for color, texture, or finish selection and/or approval, shall be no smaller than 3" x 3" and of the actual material to be used. Catalog cuts, photographs, or otherwise "similar" representations are not acceptable submittals.

   Each sample shall be properly labeled, cross-referencing the specification item; as well as planned location (i.e., New Weight Room, etc.).

d. Shop Drawings: Ten (10) prints of drawings indicating how specific portions of the work are to be fabricated or installed by the Contractor. Drawings are either confirmation of conditions detailed in the construction documents, clarification, or 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 ½" x 11" format (i.e., capable of being folded to 8 ½" x 11" for filing), but in no case shall exceed 24" x 36" size sheets.

e. Guarantee/Warranties: The original and three (3) 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. Guarantees shall conform to an 8 ½" x 11" format.

f. Test Reports: Six (6) copies of test reports for any material used in this contract shall be submitted when specified or required by the Officer-in-Charge.

g. Maintenance Data and Operating Instructions: Six (6) copies of maintenance data and operating instructions shall be submitted at the

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

4. Electronic Submittal Format: Electronic submittals may be made at the discretion of the Officer-in-Charge. The intent of the Electronic Submittal Format is to expedite the construction process; therefore it is at the discretion of the Officer-in-Charge to eliminate the Electronic Format if at any time the process is not a benefit to the project. Requirements of the Electronic Submittal shall adhere to the format requirements above and to the following:

   **a. Electronic submittals are to be sent as a single file.**

   **b. 8 ½"x11" and 11"x17" format submittals are the only allowed Electronic Submittal.**

   c. Submittals shall be transmitted with the Submittal Identification and a letter as shown on the attached submittal sample at the end of this section.

   d. Submittals are to be transmitted via email; File Transfer Protocol (FTP) transmissions are not acceptable. Compressed file formats such as "ZIP" files are not allowed. Attachment file sizes shall not be larger than 20 megabytes (mb). It is the responsibility of the Sender (entity sending the Electronic Submittal) to confirm the receiving entity has received the Electronic Submittal. The Officer-in-Charge will provide email addresses of persons authorized to receive emailed submittals.

   e. The Electronic Submittal Format process is not intended for the Certification of Compliance, Samples, Guarantee/Warranties and the Maintenance Data and Operating Instructions submittals.

1.03 AS-BUILT DRAWINGS: 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. 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.

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, drawings are to be prepared using software compatible with the City and County of Honolulu, Department of Design and Construction, Facilities Division software, review with Officer-In-Charge. The file shall be provided to the City on compact disks (CD).

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

_____
CONTRACTOR'S NAME

_____
Signature Date

Monthly and final payments to the Contractor shall be subject to prior approval of these drawings. Upon 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 of the project shall be considered.

1.04 COMPLETION FOLDER: Upon completion of the work, the Contractor shall deliver to the Officer-in-Charge three (3) sets of a completion folder containing the information listed below. The listed items may be requested elsewhere and shall be in addition to that request.

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.

D. Guarantees – A copy of guarantees and warranties.

E. Equipment – An inventory listing of the equipment.

F. Instruction/Operation Manuals – A listing of the instruction and operation manuals provided.

G. Additional Material – A listing of the additional project material (paint, carpet, etc.), quantity, and location material delivered to.

(SHOP DRAWING/MATERIAL SUBMITTAL – SAMPLE)

DATE: _____

Director
Department of Design and Construction
City and County of Honolulu
650 South King Street, 11th Floor
Honolulu, Hawaii 96813

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 of letter.

END OF SECTION

# DIVISION 1 – GENERAL REQUIREMENTS

## SECTION 01450 – SERVICE OF MANUFACTURER'S REPRESENTATIVE

## PART 1 - 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 SCOPE: The services of the Manufacturer's Representative shall be required for the products as called for in other sections of these specifications.

1.03 RELATED WORK: Individual requirements are described in pertinent other sections of these specifications.

1.04 QUALITY ASSURANCE: 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: Obtain the Manufacturer's Representative service and be responsible for the Manufacturer's Representative.

## PART 2 - PRODUCTS (NOT APPLICABLE)

## 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 the 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. Instructions to Personnel: Instruct the operating personnel in the aspects of installed product maintenance.

6. Operations and Maintenance Manual: Demonstrate the contents of the operations and maintenance manual if required to be submitted under Section 01300 – SUBMITTALS.

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

END OF SECTION

# DIVISION 1 – GENERAL REQUIREMENTS

## SECTION 01500 – CONSTRUCTION FACILITIES AND TEMPORARY UTILITIES

### PART 1 - 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 SECTION INCLUDES:

A. Temporary Utilities: Electricity, lighting, ventilation, telephone service, water, and sanitary facilities.

B. Temporary Controls: Barriers, fencing, protection of the work, security and temporary fire protection.

C. Construction Facilities: Access, parking, and progress cleaning.

1.03 REFERENCE: HIOSH-Occupational Safety and Health Standards, State of Hawaii.

1.04 REGULATORY REQUIREMENTS: Comply with DOSH, including but not limited to Part 3 – Construction Standards.

1.05 TEMPORARY VENTILATION: Ventilate enclosed areas to assist cure of materials to dissipate humidity, and to prevent accumulation of dust, fumes, and vaporous organisms.

1.06 SANITARY FACILITIES:

A. Temporary Toilet Facilities: The Contractor is responsible for providing their own temporary toilet facility, at their own expense.

1.07 BARRIERS:

A. Provide barriers, covers and flashers to prevent unauthorized entry to construction areas and to prevent existing facilities and adjacent properties from damage from construction operations.

B. Protect non-owned vehicular traffic, stored materials, site and structures from damage.

C. The Contractor shall take precaution to protect people and property from injury and damage. 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.

D. The Contractor shall be responsible for Contractor's security and protection of Contractor's property, including mobilization yard barriers.

E. Provide protection for plant life designated to remain. Replace damaged plant life.

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

1.08 PROTECTION OF INSTALLED WORK:

A. Protect installed work and provide special protection where specified in individual specification sections.

B. Provide temporary and removable protection for installed products. Control activity in immediate work area to minimize damage.

1.09 SECURITY: Provide security and facilities to protect work from unauthorized entry, vandalism, or theft.

1.10 TEMPORARY FIRE PROTECTION: Provide fire protection and prevention in accordance with DOSH, Chapter 113.

1.11 ACCESS AND PARKING AREAS:

A. Access: Arrange Contractor's access to project site with the Officer-in-Charge and make changes as work progresses.

B. Parking: Contractor's employees, agency and subcontractors and their employees, shall make their arrangements for parking with the Officer-in-Charge. Contractor and their subs may need to find additional parking on the street-metered stalls.

1.12 STAGING AND WORK AREAS: There will be a limited, confined staging area in the proximity of the jobsite, provided by the City.

1.13 PROGRESS CLEANING AND WASTE REMOVAL:

A. Comply with the General Terms and Conditions.

B. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly fashion.

C. Remove debris and rubbish from pipe chases, and other closed or remote spaces, prior to enclosing space.

D. Clean areas prior to start of surface finishing, and continue cleaning to eliminate dust.

E. Contractor shall remove waste materials, debris, and rubbish from the site daily and legally dispose off-site, or as requested by the Officer-in-Charge.

F. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.14 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS:

A. Remove temporary utilities, equipment, facilities, and materials prior to Substantial Completion inspection.

B. Clean and repair damage caused by installation or use of temporary work.

C. Restore existing facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

1.15 SAFETY MEASURES: Comply with the amended Section 3307 Protection of Adjoining Property of the 2012 International Building Code, by addition of a second paragraph which reads as follows:

"The Contractor doing the excavation or fill shall be responsible to implement safety measures, to include but not limited to safety nets, retaining walls or fences, and berms or trenches, to prevent falling rocks, boulders, soil, debris and other dangerous objects from falling, sliding or flowing onto adjoining properties, streets or natural watercourses, or otherwise causing injury or damage to persons or property in fulfillment of the Revised Ordinances of Honolulu (ROH) 1991."

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

# DIVISION 1 – GENERAL REQUIREMENTS

## SECTION 01533 – BARRICADES

## PART 1 - 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 DESCRIPTION OF WORK: Provide barricades as required, and as acceptable to the Officer-in-Charge (OIC), 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 OIC. 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 personnel.

END OF SECTION

# DIVISION 1 – GENERAL REQUIREMENTS

## SECTION 01560 – ENVIRONMENTAL CONTROLS

## PART 1 - 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 ENVIRONMENTAL PROTECTION: 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 and animal health or welfare, unfavorably alter ecological balances of importance to human and animal life, affect other species of importance to man, or degrade the utilization of the environment for aesthetic and recreational purposes.

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

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

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

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

4. Other regulations as noted on the drawings.

PART 2 - PRODUCTS (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, 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. Industrial-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 hazardous substances, including debris, are allowed to fall, flow, leach, or otherwise enter any surface or ground water.

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

3.03 DISPOSAL:

A. Construction waste, such as crates, boxes, building materials, pipes and other rubbish shall be disposed of at the County Disposal areas. Large size objects shall be reduced to a size acceptable by the County Specifications. Other areas or methods proposed by the Contractor will be approved only if the Officer-in-Charge determines that their effect on the environment is equal to or less than those described herein.

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

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

END OF SECTION

# DIVISION 2 – SITE CONSTRUCTION

## SECTION 02050 – BEST MANAGEMENT PRACTICES

### PART 1 - 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:

A. Section includes site management and site construction requirements to prevent or reduce discharge of pollutants.

1.03 REFERENCES:

A. City and County of Honolulu, Storm Water Best Management Practice Manual, Construction, Draft, August 2017.

https:www.honolulu.gov/swq/wp-content/uploads/sites/32/2023/10/CCH_Construction_BMP_Manual_2017.pdf.

1.04 SUBMITTALS:

A. Submit Best Management Practices (BMP) site specific plan and checklist for duration of project.

B. Product Data: Submit information for each type of product used.

1.05 QUALITY ASSURANCE:

A. Comply with applicable requirements of “Storm Water Best Management Practice Manual”.

B. Maintain a copy of each document on site.

### PART 2 - PRODUCTS

2.01 MATERIALS:

A. Provide materials in accordance with "Storm Water Best Management Practice Manual”.

## PART 3 - EXECUTION

### 3.01 BEST MANAGEMENT PRACTICES:

A. Provide and maintain best management practices for the duration of the project in accordance with "Storm Water Best Management Practice Manual".

B. Determine exact nature of work and means, methods, techniques, sequences and procedures to be used.

C. Determine BMP selection by an evaluation of existing conditions and requirements of project area.

D. Provide continued inspections and maintenance of BMP to maximize effectiveness of devices, applications, or procedures.

E. At project completion remove temporary items from site and legally dispose.

END OF SECTION

# DIVISION 2 – SITE CONSTRUCTION

## SECTION 02054 – GEOTEXTILE

## PART 1 - 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:

A. Section includes geotextile.

1.03 DESIGN REQUIREMENTS:

A. Manufacturer's Standard of Design and Quality: Specification of product by model name/manufacturer is intended to represent a standard of quality, and is not intended to restrict competition. Specified product is manufactured by manufacturer indicated. Specifications are based on information furnished by manufacturer. Other products with similar properties and function are acceptable, subject to approval by the City.

1.04 SUBMITTALS:

A. Product Data: Describe characteristics and performance for geotextile and associated materials.

B. Samples: Provide samples of geotextile.

C. Manufacturer's Installation Instruction: Indicate special procedures and installation instructions for geotextile. If geotextile units will be sewn together, provide proposed thread type for sewn seams along with data showing physical properties of thread.

1.05 DELIVERY, STORAGE, AND HANDLING:

A. Deliver, store, protect and handle products with adequate protection against damage.

B. Comply with ASTM D4873 for storage and handling geotextiles in rolls.

1.06 ENVIRONMENTAL REQUIREMENTS:

A. Do not install geotextiles during inclement weather.

1.07 COORDINATION:

A. Coordinate work with earthwork, trenching and other work.

PART 2 - PRODUCTS

2.01 PRODUCT:

A. Manufacturers:

1. TenCate; “Mirafi 600x” or approved substitute.

2. Propex Geosynthetics; “Geotex 315ST” or approved substitute.

3. Skaps Industries; “Skaps W300” or approved substitute.

B. Geotextile (Filter Fabric):

1. Pervious sheet of polyester, nylon, or polypropylene, ultraviolet resistant filaments woven, spun bonded, fused or otherwise manufactured into a nonraveling fabric with uniform thickness and strength.

2. Following properties are based on Mirafi “600X” with roll properties as determined by ASTM D4759:

| MECHANICAL PROPERTIES | TEST METHOD | MINIMUM AVERAGE ROLL VALUE |
|---|---|---|
| Wide Width Tensile Strength | ASTM D4595 | 175 lbs |
| Grab Tensile Strength | ASTM D4632 | 315 lbs |
| Grab Tensile Elongation | ASTM D4632 | 15% |
| Trapezoid Tear Strength | ASTM D4533 | 120 lbs |
| Mullen Burst Strength | ASTM D3786 | 600 psi |
| Puncture Strength | ASTM D4833 | 145 lbs |
| Percent Open Area | COE-02215-86 | 1% |
| Apparent Opening Size (AOS) | ASTM D4751 | 40 U.S. Sieve |
| Permittivity | ASTM D4491 | 0.05 $sec^{-1}$ |
| Flow Rate | ASTM D4491 | 4.0 $gal/min/ft^2$ |
| UV Resistance (at 500 hours) | ASTM D4355 | 70% strength retained |

| PHYSICAL PROPERTIES | TEST METHOD | TYPICAL VALUE |
|---|---|---|
| Weight | ASTM D5261 | 6.0 oz/yd$^2$ |
| Thickness | ASTM D5199 | 25 mils |
| Roll Dimensions (width x length) | --- | 17.5 x 258 ft |
| Roll Area | --- | 500 yd$^2$ |
| Estimated Roll Weight | --- | 240 lb |

PART 3 - EXECUTION

3.01 EXAMINATION:

A. Verify that field conditions are acceptable and are ready to receive work.

B. Surface underlying geotextile shall be smooth and free of ruts or protrusions, which could damage geotextile.

C. Beginning of work means Contractor accepts existing surface and substrate conditions.

3.02 INSTALLATION:

A. Install geotextile in accordance with manufacturer's instructions.

B. Lay geotextile smooth and flat in direct contact with subgrade.

C. Geotextile shall be free of tensile stresses, folds, and wrinkles.

D. On slopes steeper than 10 percent, lay geotextile with machine direction of fabric parallel to slope direction.

E. Continuously overlap geotextile units minimum12 inches at longitudinal and transverse joints. Across slopes, overlap upper unit over lower unit.

F. If approved by Officer-in-Charge, sewn seams may be used instead of overlapped seams. Where seams must be oriented across slope, lap upper unit over lower unit.

G. Use adequate ballast to prevent uplift by wind.

H. Construct engineered penetrations of geotextiles by methods recommended by geotextile manufacturer.

I. Do not cover geotextile prior to inspection and approval by Officer-in-Charge.

3.03 PROTECTION:

A. Protect geotextile during installation from clogging, tears, and other damage.

B. Replace or repair damaged geotextile as directed by Officer-in-Charge.

3.04 FIELD QUALITY CONTROL:

A. Retain a Geotechnical Engineer to provide monitoring and testing service.

B. Presence of Geotechnical Engineer or acceptance of work shall not relieve Contractor of his responsibility to perform work in accordance with contract documents.

C. Geotechnical Engineer shall observe installation of geotextile.

END OF SECTION

# DIVISION 2 – SITE CONSTRUCTION

## SECTION 02221 – SELECTIVE SITE DEMOLITION

## PART 1 - 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:

A. Section includes demolition of designated structures, pavement, and removal of debris from site.

1.03 DEFINITIONS:

A. Remove and Salvage: Items indicated to be removed and salvaged remain property of the City.

B. Remove and Reinstall: Remove items indicated; clean, service, and otherwise prepare them for reuse; store and protect against damage. Reinstall items in locations indicated.

C. Preserve Existing: Protect construction indicated to remain against damage and soiling during demolition.

1.04 MATERIAL OWNERSHIP:

A. Demolished Materials: Except for items or material indicated to be reused, salvaged, or otherwise indicated to remain property of the City, demolished materials shall become the property of Contractor and shall be removed from the site and legally disposed of, in accordance with applicable Federal, State and City laws, regulations and ordinances. The City will not be responsible for condition, loss or damage to items to be demolished or salvaged after Notice to Proceed.

1.05 QUALITY ASSURANCE:

A. ANSI A10.6 and HIOSH, Chapter 131.1; for demolition and safety requirements.

B. IBC, Sections 3303 and 3306; for demolition requirements and protection of pedestrians.

C. For existing structures comply with IBC Chapter 34.

D. Maintain a copy of each document on site.

1.06 REGULATORY REQUIREMENTS:

A. Conform to applicable code for demolition of structures, safety of adjacent structures, dust control and disposal.

B. Obtain required permits from authorities.

C. Notify affected utility companies before starting work and comply with their requirements.

D. Do not close or obstruct roadways, sidewalks and hydrants without permits.

E. Conform to applicable regulatory procedures when discovering hazardous or contaminated materials.

1.07 PROJECT CONDITIONS:

A. Disconnecting Services: Notify authorities owning or controlling affected services before starting operations. Refer to General Conditions and other Specifications sections for additional requirements.

B. Damage to Existing Work due to Demolition Work: Be solely responsible for damage resulting from inadequate, improper, or careless construction procedures, or inadequate shoring, bracing, support or protection.

C. Differing Conditions: Should materials, systems, or conditions be encountered that differ from those indicated, immediately notify Officer-in-Charge, and do not proceed without instructions.

1.08 DAMAGE TO EXISTING SHRUBS:

A. Contractor shall compensate the City for trees and shrubs injured and damaged.

B. Injury is defined as bruising, scarring, tearing or breaking of roots, branches or trunk.

C. The City will determine compensation to be paid by Contractor based on extent of damage.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 EXAMINATION:

A. Examine together with Officer-in-Charge existing site at beginning of demolition work to determine extent and nature of work and means, methods, techniques, sequences and procedures to be used.

B. Record existing conditions and possible damages to existing structures affected by this work.

3.02 PREPARATION:

A. Provide, erect, and maintain temporary barriers and security devices.

B. Protect existing appurtenances and structures, which are not to be demolished.

C. Protect adjoining property in accordance with IBC Section 3307.

D. Prevent movement or settlement of adjacent structures.

E. Sawcut pavement prior to demolition.

F. Mark location of utilities.

3.03 HAZARDOUS AND CONTAMINATED MATERIAL:

A. Refer to General Conditions of Construction Contract.

3.04 DEMOLITION REQUIREMENTS:

A. Conduct demolition to minimize interference with adjacent properties and structures.

B. Cease operations immediately if adjacent structures appear to be in danger. Notify authority having jurisdiction. Do not resume operations until directed.

C. Conduct operations with minimum interference to public or private accesses. Maintain protected egress and access at all times.

D. Obtain written permission from Officer-in-Charge when demolition equipment will traverse, infringe upon or limit access to other facilities of campus.

E. Sprinkle Work with water to minimize dust. Provide hoses and water connections for this purpose.

3.05 DEMOLITION:

A. Remove designated structures and pavement as required by project condition.

B. Remove structures to a minimum of two (2) feet below finished grade, unless noted otherwise.

3.06 RELOCATIONS:

A. Provide Perform the removal and reinstallation of relocated items as indicated with workers skilled in trades involved. Repair items to be relocated which are damaged or replace damaged items with new undamaged items as approved by Officer-in-Charge.

3.07 DISPOSITION OF MATERIALS:

A. Remove demolished materials and debris from site.

B. Do not burn or bury materials on site. Leave site in clean condition.

C. Storage or sale of removed items or materials on-site will not be permitted.

END OF SECTION

# DIVISION 2 – SITE CONSTRUCTION

## SECTION 02300 – EARTHWORK

## PART 1 - 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:

A. Section includes:

1. Earthwork, excavation, filling and backfilling.

2. Compaction.

3. Erosion control.

4. Field Quality Control.

1.03 MEASUREMENTS AND PAYMENTS:

A. Contractor shall be responsible for his own takeoffs, based on his own field reconnaissance, not on geotechnical data, drawings and other documents. Required import or export of materials shall be Contractor's responsibility, with no additional compensation by the City.

B. Stockpiling, regardless of location, shall be Contractor's responsibility, with no additional compensation by the City.

C. Excavation shall include excavation and/or removal of materials regardless of their nature. This work shall be included in Bid Price. No additional compensation will be allowed.

1.04 REFERENCES:

A. Department of Public Works, County of Kauai, City and County of Honolulu, County of Maui, County of Hawaii of the State of Hawaii:

1. Standard Specifications for Public Works Construction, September 1986, as applicable to City and County of Honolulu, with exception of paragraph "Measurement and Payment"; referred to as "City Standard Specifications".

2. Standard Details for Public Works Construction, September 1984, as applicable to City and County of Honolulu; referred to as “City Standard Details”.

B. State of Hawaii, Dept. of Labor and Industrial Relations:

1. HIOSH-Chapter 132.2 Excavations, Trenching and Shoring.

C. International Code Council:

1. IBC-06 – International Building Code, as amended.

1.05 DEFINITIONS:

A. Relative Compaction: In place dry density of soils expressed on a percentage of the maximum dry density of the same soil established with ASTM D1557.

B. Optimum Moisture: Is the water content (percentage by dry weight) corresponding to the maximum dry density.

1.06 SUBMITTALS:

A. Samples: Submit samples of fill material.

B. Temporary Erosion Control Procedures: Submit erosion control procedures and measures with construction schedule.

1.07 CLOSEOUT SUBMITTALS:

A. Project Record Documents: Record actual grading elevations, layouts, locations of structures and utilities.

1.08 QUALITY ASSURANCE:

A. Comply with IBC Chapter 18 – Soils and Foundations, Chapter 33 – Safeguards During Construction, and Appendix J – Grading.

B. Comply with following Sections of “City Standard Specifications”:

1. Structure Excavation and Backfill Section 13

2. Subgrade Section 29

3. Select Borrow for Subbase Course Section 30

C. Follow “City Standard Details”.

D. Comply with Soil Erosion Standards and Guidelines, Chapter 23 – Grading, Soil Erosion and Sediment Control.

E. Maintain a copy of each document on site.

1.09 FIELD MEASUREMENTS:

A. Verify that survey benchmarks, other controls indicated, and intended elevations for the work are as shown on drawings.

1.10 COORDINATION:

A. Coordinate work with work of others.

1.11 EQUIPMENT:

A. Be responsible to have suitable and sufficient equipment on site to handle earthwork. Provide sufficient watering apparatus with due consideration for fill material, rate of placement, and time of year.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Provide materials in accordance with "Storm Water Best Management Practice Manual".

PART 3 - EXECUTION

3.01 EXAMINATION:

A. Verify that field conditions are acceptable and are ready to receive work.

B. Verify grading and elevations of base are correct.

C. Beginning of work means Contractor accepts existing conditions.

3.02 PRE-CONSTRUCTION SURVEY:

A. Prior to construction, perform a photograph and video pre-construction survey of existing buildings, structures, slopes and pavement in vicinity of the new work.

B. Contractor shall notify Officer-in-Charge if large movements and/or settlements are observed.

3.03 PREPARATION:

A. Verify locations of underground utilities and other obstructions that may affect work.

B. Identify known underground, above ground and aerial utilities. Stake and flag locations.

C. Identify required lines, levels, contours and datum.

3.04 PROTECTION:

A. Provide barricades, construct fences or other means to fully protect public and adjacent properties from injury.

B. Protect and maintain existing underground utilities.

C. Crib and shore to retain excavations.

D. Underpin adjacent structures and improvements which may be damaged by excavation work, including utilities and pipe chases.

3.05 SOIL EROSION CONTROL:

A. Provide soil erosion control as noted on drawings.

3.06 DEWATERING:

A. Provide dewatering which includes collection and disposal of all forms of surface and subsurface water that are encountered in course of construction. Accomplish water disposal in accordance with Federal, State and City laws, regulations and ordinances.

3.07 INSTALLATION - GENERAL:

A. Install as per applicable sections of “City Standard Specifications”, as noted on drawings, unless indicated otherwise in Geotechnical Report.

B. Construct in accordance with “City Standard Details”, unless shown otherwise on drawings.

C. Provide proper shoring, bracing and support to construction excavation to avoid instability, settlement, ground movement and distress to existing buildings, structures, slope, underground utilities and pavements. Excavations shall be performed and supported in accordance with applicable Federal, State and City safety regulation, including current HIOSH trench safety standards.

D. Notify Officer-in-Charge of unexpected subsurface conditions and discontinue affected work in area until notified to resume work.

E. Correct unauthorized excavation in a manner acceptable to Officer-in-Charge at no extra cost.

3.08 SITE GRADING:

A. Site Preparation:

1. Project site shall be cleared of vegetation, large tree roots, AC pavement, and other deleterious material. Prior to placement of fill, existing ground shall first be scarified to a depth of six (6) inches, moistened to about 2 percent above optimum moisture content, and compacted to minimum 90 percent compaction as determined by ASTM D1557. Soft or loose soils indicated by pumping conditions shall be removed and replaced with either approved onsite material or imported granular structural fill.

B. Structural Excavation:

1. Based on exploratory test borings, excavations into surface soils can be accomplished with conventional excavating equipment.

C. Compaction:

1. Granular soils, such as select borrow, shall be placed in 8-inch loose lifts, but compacted to at least 95 percent compaction as determined by ASTM D1557.

3.09 GRADING CONTROL:

A. Control grading by grade stakes and lines to insure slopes, lines and levels required by finished grade elevations for each item of work.

3.10 UNSUITABLE SOIL MATERIALS:

A. Excavate, replace and dispose of site soil materials determined to be unsuitable.

B. Replace unsuitable soil materials with fill materials specified and backfill, compact and grade replacement materials as specified herein.

3.11 TOLERANCES:

A. Perform earthwork operations to establish required elevations and dimensions within following tolerances, except that no tolerances will be permitted that would allow a lesser size than indicated for footings and foundations or a lesser thickness than indicated for paving, paving base courses and concrete floor slabs-on-grade.

1. Paving Areas: Plus or minus 1/2 inch.

2. General Grading: Plus or minus 3 inch.

3.12 DISPOSAL OF SURPLUS MATERIAL:

A. Remove from site surplus or other soil material not required for suitable filling, backfilling, or grading, in accordance with applicable Federal, State and City laws, regulations and ordinances.

3.13 FIELD QUALITY CONTROL:

A. Retain a Geotechnical Engineer to provide monitoring and testing services of subgrades and aggregate base course.

B. Presence of Geotechnical Engineer or acceptance of earthwork shall not relieve Contractor of his responsibility to perform work in accordance with contract documents.

C. Geotechnical Engineer shall test earthwork as follows:

1. Observation and testing of subgrade preparation and compaction.

2. Observation and testing of select fill placement and compaction.

3. Other items requiring construction monitoring and testing as required for “special Inspection” according to IBC-06, Chapter 17.

D. If tests indicate work does not meet specified requirements, correct deficiency and retest, at no cost to the City. If field density tests performed on subgrade indicate inadequate moisture content and/or compaction, properly moisture condition and re-compact area until adequate moisture content and compaction are achieved. Do not place fill over subgrade until adequate moisture content and compaction are achieved for subgrade.

END OF SECTION

# DIVISION 2 – SITE CONSTRUCTION

## SECTION 02324 – TRENCHING

## PART 1 - 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:

A. Section Includes:

1. Trench excavation.

2. Compacted bedding.

3. Backfilling and compaction.

4. Restoration.

1.03 REFERENCES:

A. American Society for Testing and Materials:

1. ASTM D1557 - test methods for moisture-density relations of soils and soil-aggregate mixtures using 10 lbs (4.54 kg) rammer and 18 inch (457 mm) drop.

B. Departments of Public Works, County of Kauai, City and County of Honolulu, County of Maui, County of Hawaii of the State of Hawaii:

1. Standard Specifications for Public Works Construction, September 1986, as applicable to City and County of Honolulu; with exception of paragraph "Measurement and Payment"; referred to as "City Standard Specifications".

2. Standard Details for Public Works Construction, September 1984, as applicable to City and County of Honolulu; referred to as "City Standard Details".

C. Department of Water, County of Kauai; Board of Water Supply, City and County of Honolulu; Department of Water Supply, County of Maui; Department of Water Supply, County of Hawaii, issued 2002, as applicable to City and County of Honolulu, with exception of items intended only for

contracts with County, including items related to method of measurement and payment, referred to as “Water System Standards” comprising of:

Division 100 - Planning

Division 200 - Materials

Division 300 - Construction

Division 400 – Approved Material List and Standard Details

D. State of Hawaii, Dept. of Labor and Industrial Relations:

1. HIOSH-Chapter 132. 2 Excavations, Trenching and Shoring.

E. International Code Council, Inc.:

1. IPC-06 – International Plumbing Code, as amended.

1.04 REGULATORY REQUIREMENTS AND QUALITY ASSURANCE:

A. Conform to HIOSH and IPC for performing work.

B. Conform to Water System Standards for waterlines and appurtenances.

C. Conform to City Standards Specifications for all other trenching work.

D. Maintain a copy of each document on site.

1.05 FIELD MEASUREMENTS:

A. Verify that survey benchmarks, other controls indicated, and intended elevations for the Work are as shown on Drawings.

1.06 COORDINATION:

A. Coordinate work with geotextiles, earthwork, and other work.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Crushed Rock: Crushed rock for trench shall be No. 67 crushed rock as specified in the City Standard Specifications, Section 15 - Crushed Rock.

B. Pipe Cushion: Pipe cushion shall be crusher screenings (S4C) with a maximum size of 3/8 inch with a minimal amount of fines. Pipe cushion for Site Water Distribution shall comply with Water System Standard, Paragraph 209.02 – Pipe Cushion.

C. Other materials shall be as specified in referenced standards.

2.02 EQUIPMENT:

A. Be responsible to have suitable and sufficient equipment on job site to handle excavating, backfilling and compacting.

PART 3 - EXECUTION

3.01 EXAMINATION:

A. Verify locations of underground utilities and other obstructions that may affect work.

3.02 PREPARATION:

A. Identify required lines, levels, contours, and datum.

B. Identify known underground utilities, stake and flag locations.

C. Maintain and protect existing utilities remaining, which pass through work area.

D. Protect bench marks, existing structures, and paving from excavation equipment.

E. Cut out soft areas of subgrade not capable of insitu compaction. Backfill and compact to density equal to or greater than requirements for subsequent backfill material.

3.03 EXCAVATION AND BACKFILLING:

A. Excavate and backfill in accordance with the referenced standards.

B. Trench excavation and backfill for Sanitary Sewage System shall be in accordance with City Standard Specifications, Section 11 - Trench Excavation and Backfill, and as amended below:

1. Trench Foundation: Where specified and where unsuitable soils are encountered, trench subgrade shall be over excavated and replaced with crushed rock wrapped in non-woven engineering fabric. Crushed rock shall be lapped over top.

2. Pipe Cushion: Where specified, pipe cushion material shall be installed below and around pipe as shown on drawings. Pipe cushion shall be installed in maximum 8" thick compacted lifts. Cushion material shall be compacted to a minimum of 90% maximum density. Voids, especially around bottom of pipe section shall be filled with pipe cushion material.

3. Trench Backfill: trench backfill material shall be installed in maximum 8" thick compacted lifts. Trench backfill shall be compacted to a minimum of 90% of maximum density.

C. Additional Requirements:

1. Trench excavations into surface soils can be accomplished with conventional excavating equipment.

2. Conventional crushed rock cradle may be used to support utility lines. Design of rock cradle shall conform to City Standard Specifications.

3. Onsite soils may be reused as backfill for upper portion of trench backfill, provided rock fragments larger than 3 inches in maximum dimension are removed. If required, imported borrow shall conform to specifications in City Standard Specifications. Backfill shall be placed and compacted in accordance with City Standard Specifications.

3.04 DISPOSAL OF SURPLUS MATERIAL:

A. Remove from site surplus or other soil material not required for suitable backfilling, in accordance with applicable Federal, State and City laws, regulations and ordinances.

3.05 FIELD QUALITY CONTROL:

A. Retain a Geotechnical Engineer and testing laboratory to provide monitoring and testing service.

B. Presence of Geotechnical Engineer or acceptance of trenching work shall not relieve Contractor of his responsibility to perform work in accordance with contract documents.

C. Geotechnical Engineer shall test trenching as follows:

1. Observe and test trench bottoms and backfill.

D. Backfill Testing: Test compaction of backfill as determined by Laboratory Compaction Test ASTM D1557, as directed by Geotechnical Engineer, but not less than one test per backfill lift.

E. If tests indicate work does not meet specified requirements, remove work and replace with conforming work, at no cost to the City.

END OF SECTION

# DIVISION 2 – SITE CONSTRUCTION

## SECTION 02510 – SITE WATER DISTRIBUTION

### PART 1 - 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:

A. Section includes site water distribution system with connection to existing water system.

1.03 REFERENCES:

A. Department of Water, County of Kauai; Board of Water Supply, City and County of Honolulu; Department of Water Supply, County of Maui; Department of Water Supply, County of Hawaii, issued 2002, as applicable to City and County of Honolulu, with exception of items intended only for contracts with City, including items related to method of measurement and payment, referred to as “Water System Standards”, comprising of:

1. Division 100 – Planning

2. Division 200 – Materials

3. Division 300 – Construction

4. Division 400 – Approved Material List and Standard Details

5. Division 500 – Water System External Corrosion Control Standards

B. Department of Health, State of Hawaii (DOH) - Chapter 20 of Title II, Administrative Rules "Potable Water Systems", 1981.

C. American Society for Testing and Materials:

1. ASTM B88 - Seamless Copper Water Tube.

D. American Water Works Association:

1. AWWA C 601 - Disinfecting Water Mains.

E. International Code Council, Inc.:

1. IPC-06 - International Plumbing Code. As amended.

1.04 SUBMITTALS:

A. Product Data: Manufacturer's product data for each item to be incorporated into water distribution system.

B. Manufacturer's Instructions: Indicate special procedures and installation instructions.

C. Test Results: Indicate results comparative to specified requirements for water distribution system.

D. Certificates:

1. Before installation, furnish affidavits from manufacturers or supplier of pipe, pipe coating, fittings, and valves, certifying that such product meet or exceed specified requirements.

2. Provide certificate of Water System Chlorination.

3. All other certificates as required by "Water System Standards".

1.05 CLOSEOUT SUBMITTALS:

A. Project Record Documents: Accurately record actual locations of pipe runs, connections, cleanouts, and invert elevations.

B. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.06 QUALITY ASSURANCE:

A. Comply with "Water System Standards" for installation, materials and workmanship.

B. Maintain a copy of each document on site.

C. Manufacturer's Identifications: Provide products with identification marks and data as required by "Water System Standards".

1.07 DELIVERY, STORAGE AND HANDLING:

A. Deliver, store, protect and handle products with adequate protection against damage.

B. Handle and store products as per manufacturer’s instruction and "Water System Standards".

1.08 COORDINATION:

A. Coordinate work with others affected by work of this section.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Provide materials in accordance with following sections of "Water System Standards":

1. Division 200 – Materials

| | |
|---|---|
| Service laterals and appurtenances, waterlines for 3-inch diameter and smaller shall be copper conforming to ASTM B88, type K. | Section 208 |
| Premolded filler, crushed rock, pipe cushion, backfill material | Section 209 |
| Valve markers | Section 210 |

B. Provide materials in accordance with following sections of "Water System Standards":

1. Division 200 – Materials

C. Provide all other materials not specified herein as specified in references.

PART 3 - EXECUTION

3.01 EXAMINATION:

A. Check work with related trade's shop drawings and make corrections when required.

B. Verify that field conditions are acceptable and are ready to receive work.

C. Beginning of work means installer accepts existing surface and substrate conditions.

3.02 PREPARATION:

A. Be responsible for precisely laying out water distribution lines. Locations shown on drawings of various existing utility lines were determined on basis of best information available; however, no assurance can be provided that actual locations will be precisely as shown on drawings.

B. Exercise due care and caution necessary to avoid damage to and impairment in use of existing utility lines. Repair and restore immediately damage inflicted on existing lines as directed by Officer-in-Charge at no cost to the City.

3.03 INSTALLATION:

A. Install products in accordance with manufacturer's instructions.

B. Install water system in accordance with following items of "Water System Standards" and as noted on drawings:

Division 300 – Construction:

Water Mains and Appurtenances Section 302

Section 302.02 - Trench Excavation
Section 302.03 - Trench Backfill
Section 302.18 - Service Laterals and Connections
Section 302.25 - Existing Water System
Section 302.26 - Water Supply
Section 302.27 - Pipe Cleaning
Section 302.28 - Pipe Pressure Tests
Section 302.29 - Chlorination of Water Pipes
Section 302.30 - Connections, Relocations and Lowering
Section 302.31 - Removing or Demolishing, Reinstalling or Returning Existing Pipes and Appurtenances
Section 302.34 - Cleanouts and Risers
Section 302.35 - Valve Markers
Section 302.37 - Restoring Pavements, Driveways, Sidewalks, Curbs, Gutters, Fences, Walls and Miscellaneous
Section 302.38 - Corrosion Protection
Section 302.39 - Confined Spaces

C. Joints for Copper Service Laterals and Pipes: Make up pipe and fittings with 95-5 solder. For below grade pipes over 50 feet length, make up pipe and fittings with silver solder.

D. Corrosion Control: Follow the requirements of "Water System Standards" Division 500 – Water System External Corrosion Control Standards.

E. Building Water Submeters: Prior to connections to or work on existing water lines, the Contractor shall shutoff the water service to the applicable building and either shutoff or drain the building water.

F. Copper pipe shall be insulated from direct contact with ferrous piping connections by approved insulating (dielectric) unions or couplings, and from

contact with dissimilar metals outside of system by taping at point of contact with 2 layers of plastic electrician's tape.

G. The piping material used for the existing site water system is unknown. Materials specified for the connections to existing water lines are based on best available knowledge. The Contractor shall verify the existing pipe material prior to connection and provide the proper materials for connections to the existing water lines.

3.04 CHLORINATION:

A. Chlorinate entire system in accordance with following:

1. Comply with Chapter 20 of Title II, of the Department Health, State of Hawaii.

2. Comply with Section 302.29 - Chlorination of Water Pipelines of "Water System Standards".

3. Comply with AWWA C-601.

B. Make tests and obtain certificate as required by authorities.

C. Dispose of chlorinated water to safeguard public health and environment in accordance with applicable Department of Health requirements.

3.05 BACKFILLING:

A. Do not backfill until lines have been tested and approved by Officer-in-Charge.

B. Backfill as specified under Section 02324 – Trenching.

3.06 FIELD QUALITY CONTROL:

A. After installation of water system and prior to completion of trench backfilling, test system for leaks and flush under pressure to remove dirt, scale, or other objectionable materials.

B. Conduct field tests in presence of Officer-in-Charge.

C. Test water service laterals and service connections in accordance with Section 302.28 - Pipe Pressure Tests of "Water System Standards".

END OF SECTION

# DIVISION 2 – SITE CONSTRUCTION

## SECTION 02530 – SANITARY SEWERAGE

## PART 1 - 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:

A. Section includes capping of sanitary sewage system.

1.03 REFERENCES:

A. Department of Public Works, County of Kauai, City and County of Honolulu, County of Maui, County of Hawaii of the State of Hawaii:

1. Standard Specifications for Public Works Construction, September 1986, as applicable to City and County of Honolulu, with exception of paragraph "Measurement and Payment"; referred to as "City Standard Specifications".

2. Standard Details for Public Works Construction, September 1984, as applicable to City and County of Honolulu; referred to as "City Standard Details".

1.04 COORDINATION:

A. Coordinate work with work of others affected by work of this section.

B. Coordinate work with termination of sanitary sewer connection to City sewer utility service.

## PART 2 - PRODUCTS

2.01 MATERIALS:

A. Provide other materials not specified herein as specified in references.

## PART 3 - EXECUTION

3.01 EXAMINATION:

A. Verify that field conditions are acceptable and are ready to receive work.

B. Beginning of work means Contractor accepts existing conditions.

3.02 PREPARATION:

A. Locations shown on drawings of various existing utility lines were determined on basis of best information available. However, no assurance can be given that actual locations will be precisely as shown on drawings.

B. Exercise due care and caution necessary to avoid damage to and impairment in use of existing utility lines. Repair and restore immediately damages inflicted on existing lines, as directed by Officer-in-Charge, at no cost to the City.

3.03 BACKFILLING:

A. Do not backfill, until lines have been tested and approved by Office-in-Charge.

B. Backfill as specified under Section 02324 – Trenching.

3.04 FIELD QUALITY CONTROL:

A. Conduct field tests required by “City Standard Specifications” in presence of Officer-in-Charge.

B. Provide hydrostatic pressure and loading test for sewer pipes and appurtenances.

3.05 PROTECTION OF FINISHED WORK:

A. Protect pipe from damage or displacement until backfill operation is in progress.

B. Make repairs, replacements and modifications at no additional cost to the City.

END OF SECTION

# DIVISION 2 – SITE CONSTRUCTION

## SECTION 02630 – STORM DRAINAGE

## PART 1 - 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:

A. Section includes site storm drainage system and connection to existing system.

1.03 REFERENCES:

A. Department of Public Works, County of Kauai, City and County of Honolulu, County of Maui, County of Hawaii of the State of Hawaii:

1. Standard Specifications for Public Works Construction, September 1986, as applicable to City and County of Honolulu, with exception of paragraph "Measurement and Payment"; referred to as "City Standard Specifications".

2. Standard Details for Public Works Construction, September 1984, as applicable to City and County of Honolulu; referred to as "City Standard Details".

1.04 SUBMITTALS:

A. Product Data: Describe pipe and pipe accessories.

B. Test Reports: Submit reports for tests performed.

C. Certificate: Submit certificate of compliance with specified standards for each material item.

D. Manufacturer’s Installation Instructions: Indicate special procedures and installation instructions.

E. Manufacturer’s Certificate: Certify that products meet or exceed specified requirements.

1.05 CLOSEOUT SUBMITTALS:

A. Accurately record actual locations of pipe runs, connections, cleanouts, drain manholes and invert elevations.

B. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.06 QUALITY ASSURANCE:

A. Comply with following Sections of “City Standard Specifications”:

1. Drain Pipes Section 24

2. Drain Manholes Section 25

B. Follow “City Standard Details”.

C. Comply with “City HDPE Standard Specifications”.

D. Maintain a copy of each document on site.

1.07 DELIVERY, STORAGE, AND HANDLING:

A. Deliver, store, protect and handle products with adequate protection against damage.

1.08 COORDINATION:

A. Coordinate work with others affected by work of this section.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Provide materials in accordance with "City Standard Specifications".

B. High Density Polyethylene Pipe for Drainage System: Pipe shall conform to “City HDPE Standard Specifications”

C. Provide other materials not specified herein as specified in references.

PART 3 - EXECUTION

3.01 EXAMINATION:

A. Verify that field conditions are acceptable and are ready to receive work.

B. Verify invert elevations and slopes are correct.

C. Beginning of work means Contractor accepts existing conditions.

3.02 PREPARATION:

A. Be responsible for precisely laying out sewage system. Locations shown on drawings of various existing utility lines were determined on basis of best information available. However, no assurance can be given that actual locations will be precisely as shown on drawings.

B. Exercise due care and caution necessary to avoid damage to and impairment in use of existing utility lines. Repair and restore immediately damages inflicted on existing lines, as directed by Officer-in-Charge, at no cost to the City.

3.03 INSTALLATION:

A. Install as per applicable sections of "City Standard Specifications", and as noted on drawings.

B. Construct in accordance with "City Standard Details", unless shown otherwise on drawings.

C. Install High Density Polyethylene pipe in accordance with “City HDPE Standard Specifications” and manufacturer’s instructions, provide watertight joints with specified gaskets.

D. Connect to existing storm drain system as shown on drawings.

3.04 BACKFILLING:

A. Do not backfill, until lines have been tested and approved by Officer-in-Charge.

B. Backfill as specified under Section 02324 – Trenching.

3.05 FIELD QUALITY CONTROL:

A. Conduct field tests required by “City Standard Specifications” in presence of Officer-in-Charge.

3.06 PROTECTION OF FINISHED WORK:

A. Protect pipe from damage or displacement until backfill operation is in progress.

END OF SECTION

# DIVISION 2 – SITE CONSTRUCTION

## SECTION 02775 – CONCRETE SIDEWALK

## PART 1 - 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:

A. Section includes Portland cement concrete walkway with rock salt finish.

1.03 REFERENCES:

A. Department of Public Works, County of Kauai, City and County of Honolulu, County of Maui, County of Hawaii of the State of Hawaii:

1. Standard Specifications for Public Works Construction, September 1986, as applicable to City and County of Honolulu, with exception of paragraph "Measurement and Payment"; referred to as "City Standard Specifications".

2. Standard Details for Public Works Construction, September 1984, as applicable to City and County of Honolulu; referred to as "City Standard Details".

1.04 SUBMITTALS:

A. Product Data: Submit data on concrete admixtures, reinforcing fibers, and other specialty items.

B. Mix Design: Submit proposed mix design.

C. Samples: Submit approximately 18” x 18” samples of specified floor finish.

D. Any other submittal required by the “City Standard Specifications” and the notes on drawings.

1.05 QUALIFICATIONS:

A. Specializing in performing work of this section with experienced personnel, adequate quality procedures and supervisory capability to successfully execute this work and obtaining a consistent floor finish acceptable to Officer-in-Charge.

1.06 FIELD SAMPLES:

A. Provide field samples for concrete surfaces. Provide samples is sufficient size and numbers to indicate treatment or finishes required. Locate where directed.

B. When accepted, samples will demonstrate minimum standard for the work. Accepted sample may remain part of work.

1.07 QUALITY ASSURANCE:

A. Comply with following Sections of “City Standard Specifications”:

1. Concrete Sidewalk Section 42
And as modified in Engineering and Policy Memorandum No. CEB-1-09.

B. Follow “City Standard Details”.

C. Maintain a copy of each document on site.

D. LEED Requirements: Comply with Section 01300 – Submittals.

1.08 PRE-INSTALLATION MEETING:

A. Prior to work described in this section, hold a meeting on site to review contractor’s means, methods, techniques, sequences and procedures to be used. Representatives of each entity directly concerned with work of this section are to be present including Officer-in-Charge, Contractor, Concrete Producer, and Concrete Subcontractor.

1.09 WARRANTY:

A. Provide the City with two (2) year warranty against defects in material and workmanship, ordinary wear and tear and abuse excepted. Include following:

1. Warrant that concrete pavement will not alter elevation or plane.

2. Warrant against development of depressions in excess of ¼ inch deep and greater than 4 square feet in area.

3. Warrant against change of more than 3/8 inch in any direction between work of this section and adjacent or continuous construction (excluding soils).

4. Warrant against cracks. Cracks may have been caused by improper installation means, methods, techniques and procedures, improper spacing of joints and/or inadequate curing.

B. Defective cement concrete sidewalk shall be removed and replaced at no cost to the City, as determined by Officer-in-Charge.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Provide materials in accordance with "City Standard Specifications":

B. Provide other materials not specified herein as specified in references.

PART 3 - EXECUTION

3.01 EXAMINATION:

A. Verify that field conditions are acceptable and are ready to receive work.

B. Verify grade elevations and slopes are correct.

C. Beginning of work means Contractor accepts existing conditions.

3.02 INSTALLATION:

A. Install as per applicable sections of "City Standard Specifications", and as noted on drawings.

B. Construct in accordance with "City Standard Details", unless shown otherwise on drawings.

3.03 FLOOR FINISHING:

A. Top surfaces such as material finishes and color specifications are specified in the Architectural drawings and Section 03350 – Concrete Finishing.

B. Floor covering such as Quartzite marble tile, shall include control joints saw-cut complying with City and County of Honolulu “Engineering and Policy Memorandum No. CEB-1-09”, dated April 6, 2009, concerning jointing requirements for concrete pavement.

C. Proper curing of the concrete slab will help reduce shrinkage cracking.

3.04 FIELD QUALITY CONTROL:

A. The City shall provide inspection service.

B. Samples, test specimens, and tests shall be considered incidental to Contractor’s performance contract.

C. Testing Agency: Engage a qualified independent testing agency to sample materials, perform tests, and submit test reports during concrete placement according to following requirements.

D. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C172 shall be performed according to following requirements:

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

2. Slump: ASTM C143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.

3. Air Content: ASTM C231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.

4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 80 deg F and above, and one test for each composite sample.

5. Compression Test Specimens: ASTM C31; cast and laboratory cure one set of four (4) standard cylinder specimens for each composite sample.

    a. Cast and field cure one set of four (4) standard cylinder specimens for each composite sample.

6. Compressive-Strength Tests:

    a. ASTM C39; test two (2) laboratory-cured specimens at 7 days and two at 28 days.

    b. A compressive-strength test shall be the average compressive strength from two (2) specimens obtained from same composite sample and tested at age indicated.

END OF SECTION

# DIVISION 2 – SITE CONSTRUCTION

## SECTION 02950 – RESTORING PAVEMENTS AND OTHER IMPROVEMENTS

### PART 1 - 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:

A. Section includes restoring pavements and other improvements.

1.03 REFERENCES:

A. Department of Public Works, County of Kauai, City and County of Honolulu, County of Maui, County of Hawaii of the State of Hawaii:

1. Standard Specifications for Public Works Construction, September 1986, as applicable to City and County of Honolulu, with exception of paragraph "Measurement and Payment"; referred to as "City Standard Specifications".

2. Standard Details for Public Works Construction, September 1984, as applicable to City and County of Honolulu; referred to as "City Standard Details".

1.04 SUBMITTALS: (None required)

1.05 QUALITY ASSURANCE:

A. Comply with following Sections of “City Standard Specifications”:

1. Restoring Pavements and Other Improvements — Section 38

B. Follow “City Standard Details”.

C. Maintain a copy of each document on site.

### PART 2 - PRODUCTS

2.01 MATERIALS:

A. Provide materials in accordance with "City Standard Specifications".

B. Provide other materials not specified herein as specified in references.

## PART 3 - EXECUTION

3.01 EXAMINATION:

A. Verify that field conditions are acceptable and are ready to receive work.

B. Beginning of work means Contractor accepts existing conditions.

3.02 INSTALLATION:

A. Install as per applicable sections of "City Standard Specifications", and as noted on drawings.

B. Construct in accordance with "City Standard Details", unless shown otherwise on drawings.

END OF SECTION

# DIVISION 3 – CONCRETE

## SECTION 03100 – CONCRETE FORMING AND ACCESSORIES

## PART 1 - 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:

A. Section includes:

1. Forms for cast-in-place concrete.

2. Shoring, bracing, accessories, and form coating.

B. Work installed but furnished in other Sections:

1. Inserts, bolts, anchors, and other items furnished by other trades for installation in formed concrete.

C. Related work:

1. Division 3 for concrete.

D. References:

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

2. ACI 347, Guide to Formwork for Concrete.

3. APA Design/Construction Guide, Concrete Forming.

1.03 SYSTEM DESCRIPTION:

A. Design requirements:

1. Engineer, fabricate, assemble, and install concrete formwork to meet or exceed the criteria indicated and specified, to conform to the profiles indicated and to other requirements of the Contract Documents, to satisfy the requirements of the authorities having jurisdiction, and to provide a watertight, structurally sound, self-draining assembly.

2. If required by the authorities having jurisdiction, prepare and submit shop drawings, specifications, calculations, and any other supporting data

required for review and approval, and pay fees incurred, prior to beginning installation.

3. Engineering calculations for these assemblies shall bear the signature and seal of a licensed professional engineer.

1.04 SUBMITTALS:

A. Submit manufacturer's product data, specifications, typical installation details, and other data as necessary to demonstrate compliance with the specified requirements for form facing materials, including coatings, release agents, ties, joint sealant or tape, and accessories.

B. Shop drawings: For concrete permanently exposed to view, submit large scale, dimensioned drawings showing materials, profiles, joints, finishes, methods of fabrication, and anchorage details.

1. Provide elevation drawings of each concrete plane to be remain exposed.

a. Show tie placement, panel layout, construction joint, and other pertinent details.

b. Show locations of openings and control joints.

2. Coordinate shop drawings with the work of other trades that are part of, or will be incorporated into, the work of this section. Indicate work to be performed by other trades, including adjacent and abutting materials to which this work is to be secured, and provide drawings showing all slab penetrations per level on a single plan per level prior to erecting form work.

3. Submit drawings showing all hangers and seismic braces on a single plan per level prior to erecting form work. Indicate magnitude of applied gravity and seismic loads at each location.

4. Drawings shall be complete for each specific area of Project when submitted.

5. Shoring and re-shoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and re-shoring installation and removal.

C. Samples: Submit full-size samples of proposed ties and plugs for concrete permanently exposed to view.

D. Records: Keep an accurate record of the dates of all form removal and furnish copies to the Officer-in-Charge.

1.05 QUALITY ASSURANCE:

A. Grading: Provide lumber and plywood grade-marked by a grading agency acceptable to the authorities having jurisdiction.

B. Qualifications:

1. Professional Engineer qualifications: Hawaii licensed Professional Engineer and experienced in providing engineering services of the kind required.

2. Installer's qualifications: Minimum of 3 consecutive years experience in the fabrication and erection of concrete formwork on projects similar in material, design, complexity, and extent to this Project, and whose work has resulted in applications with a record of successful in-service performance.

C. Mockup: As specified in Section 03300 – Cast-In-Place-Concrete.

1.06 HANDLING:

A. Store materials outdoors, off the ground on pallets, protected with breathing type covers.

B. Handling: Handle form facing materials to prevent damages that could be transferred to finished concrete work.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Forms for exposed concrete surfaces – general: Plywood, metal, metal-framed/plywood-faced, or FRP which will provide continuous, flat, or curved as applicable, smooth exposed concrete surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on Drawings, where indicated.

1. Type:

a. For smooth concrete to remain exposed without further treatment: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

1) Plywood, metal, or other approved panel materials.

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

3) High-density overlay, Class 1 or better.

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

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

b. For concrete surfaces to be sacked and rubbed: DOC PS 1 “B-B (Concrete Form) Plyform,” Class I, Exterior Grade or better, mill-oiled and edge-sealed, with each piece bearing legible inspection trademark.

c. Elsewhere where concrete will remain exposed, with or without a mechanical finish: Overlaid plywood complying with DOC PS 1 “A-C or B-B High Density Overlaid Concrete Form,” Class I, Exterior Grade or better, mill-oiled and edge-sealed, with each piece bearing legible inspection trademark.

B. Forms for concealed concrete surfaces: Plywood, lumber, metal, or other acceptable material. Provide lumber dressed on at least 2 edges and one side for tight fit.

C. Form ties and spreaders:

1. Factory-fabricated, removable, or snap-off metal or glass-fiber-reinforced plastic form ties with plastic cones to provide a minimum 1-inch breakback, designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

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

3. Furnish ties that, when removed, will leave holes no larger than 1-inch in diameter in concrete surface.

4. Furnish ties with integral water-barrier plates to walls indicated to receiving damp-proofing or waterproofing.

5. For concrete to remain exposed to view use “A-3 Standard Snap Tie” with A-2 Plastic Cones by Dayton Superior, “ST-1” Series Snap Ties by Meadow Burke, or Approved Substitute.

6. Do not use wire ties, wood spreaders, or embedded types in which embedded portion is less than 1-1/2-inch from exterior face of concrete.

D. Foam filler: ASTM C578, Type IV, 1.8-lb./cu. feet density.

E. Chamfer strips: Extruded PVC, with a 3/4-inch diagonal faces unless otherwise indicated, by Greensteak Group, Inc., Barker Steel LLC, or Approved Substitute, or oiled softwood shapes with the same profile.

F. Form coatings: Commercial formulation form-coating compounds that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces; one of the following, or Approved Substitute; do not use form oil.

1. Formshield WB by the Euclid Chemical Co.

2. Clean Strip J-1-A by Dayton Superior Construction Chemicals.

3. J-3 Light by Dayton Superior Construction Chemicals.

4. Magic Kote VOC by Dayton Superior Construction Chemicals.

5. Durogard Plus by WR Meadows.

6. Debond by L & M Construction Chemicals Inc.

G. Prefabricated construction joint keyways: Key-Loc by Form-A-Key Products Division of Cardinal Manufacturing Co., BoMetals Inc., or Approved Substitute, complete with all accessories.

2.02 FORMWORK REQUIREMENTS:

A. General:

1. The design and construction of forms and shoring are the contractor's responsibility but shall comply with specified requirements.

2. Form contact surfaces shall be clean, free from dents, holes, and other imperfections.

3. Establish and maintain benchmarks, lines, and controls necessary to achieve specified tolerances.

4. Take an accurate survey of the form location just prior to concrete pour.

5. Coordinate work with all work in other sections to ensure proper placement of all items embedded in forms and furnish proper blockouts wherever required.

B. Earth bank:

1. Except for exterior face of wall footings and grade beams that must be formed, earth banks may be used to form footings and grade beams if

the soil is firm, neatly trimmed, and will retain concrete in the required size and shape.

2. Increase the concrete coverage as required by the authorities having jurisdiction when concrete is cast against earth.

C. Wood forms:

1. Construct with plywood panels as large as practicable where, because of their height, walls and columns have a horizontal form joint, the horizontal joint shall align throughout the floor, or area unless accepted otherwise by Officer-in-Charge.

2. For concrete permanently exposed to view, fill voids and imperfections in form contact surfaces with body putty sanded flush and smooth and seal joints between panels with compound paste specifically designed to seal forms, or other approved material, to prevent concrete leakage.

3. Provide sharp, clean corners at form intersecting planes, without visible edges and offsets. Back joints with additional studs or girts.

4. Form recesses and projections with smooth finish materials and install in forms with sealed joints to prevent displacement.

5. Drill holes accurately in forms to fit ties used. Prevent leakage of concrete around tie holes. Do not drive ties through undersized or improperly prepared holes.

6. Kerf backside of wood inserts used for forming keyways, reglets, recesses, and similar treatments to allow wood to swell without spalling concrete and to assure easy removal.

D. Metal forms:

1. Provide sections of metal forms that fasten tightly and interlock securely.

2. Cut or drill forms for attaching sleeves or other items to be embedded in concrete.

3. Provide precisely cut openings required by trades.

E. Re-use of forms:

1. Form materials may be re-used if they produce finished surfaces Approved Substitute to finished surfaces where new form materials are used.

2. Before reuse, thoroughly clean and recondition in every respect, suitable for their re-use purpose.

F. Tolerances: To obtain cast-in-place concrete not exceeding the tolerances specified in Section 03300 – Cast-In-Place Concrete, except support form facing material to limit deflection to L/360 between supports for concrete exposed to view, and L/270 for all other concrete.

G. High density insulation filler:

1. Use boards of maximum thickness to achieve insulation depth.

2. Where required, apply adhesive to layers of insulation to prevent movement during concrete placement.

3. After boards are installed, protect until concrete topping is prepared and placed.

## PART 3 - EXECUTION

### 3.01 EXAMINATION:

A. Examine conditions and measurements affecting the work of this Section at site.

B. Correct detrimental conditions to the proper and timely completion of this work before proceeding with installation.

### 3.02 FORMWORK INSTALLATION:

A. Construction:

1. Comply with the applicable provisions of ACI 347, Guide to Formwork for Concrete, and APA Design/Construction Guide "Concrete Forming."

2. Rigidly support and construct forms to the lines, surfaces, and profiles necessary to produce concrete to the design indicated.

3. Construct forms to be removable without prying against concrete.

4. Make forms tight, without cracks or holes, to prevent leakage of mortar or loss of fine particles from concrete.

5. Cover or fill holes that are not used and cracks that have opened up, flush with adjacent surfaces.

B. Wales and studs: Provide wales and studs of adequate size and spacing to prevent form failure and to obtain concrete within the tolerances specified.

C. Ties and spreaders: Place ties as indicated on approved shop drawings, spaced and aligned as indicated, in plumb columns and level rows. Do not permit wood, other than built-in treated bucks or nailing blocks, to permanently remain in forms.

D. Form contact surfaces: As specified above, except that the plywood form facing material specified must be used for concrete permanently exposed to view. Forms for all other concrete may be constructed of plywood, fiberglass, plastic, or steel.

    1. To eliminate joint offsets, block plywood edges that do not occur at bearing points.

    2. Do not expose plywood edges to concrete.

E. Special features:

    1. Corners: Form exposed corners between beams and columns to produce a square, smooth, solid joint without paste leakage.

        a. Except where chamfers are indicated, miter or cope corners accurately and attach securely to the form facing material with adhesive or nails driven flush with the item being fastened. Avoid hammer marks. Provide sharp, clean corners, without visible edges or offsets at intersecting planes. Back joints with extra studs or girts to maintain square intersections.

        b. Install chamfer strips in corners of all other forms, unless otherwise indicated. Miter chamfer strip at changes in direction.

        c. Corners that will be concealed in the Work may be formed either square or chamfered.

    2. Concrete details: Form offsets, keys, reglets, seats, pockets, anchorages, moldings, chamfers, blocking, screeds, drips, bulkheads, and other required features as indicated or as necessary to receive or engage the work of other trades.

    3. Openings, chases, and recesses: Form as indicated or necessary to receive, pass, and clear other work.

        a. Verify sizes and locations with other trades before forming. Closely coordinate the location of boxes, cans, and sleeves furnished by other trades.

        b. Seal edges of cutouts and holes in plywood.

F. Form release agent: Thoroughly clean forms and coat with release agent prior to initial use (except when mill-oiled) and before each reuse.

1. Apply form coating before reinforcement and embeds are placed.

2. Apply form coating in accordance with its manufacturer's instructions and coverage rates. Do not over-apply.

3. Provide a coating of uniform thickness. Do not allow excess form coating material to accumulate in forms or to come into contact with in-place concrete against which fresh concrete will be placed.

4. Coat steel forms with a non-staining rust preventive material. Rust-stained steel formwork is not acceptable.

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

1. Class A, 1/8-inch

2. Class B, 1/4-inch

3. Class C, 1/2-inch

4. Class D, 1-inch

3.03 FORMWORK REMOVAL:

A. Remove forms after concrete has developed sufficient strength to not be damaged by form removal operation and to safely sustain its own weight and superimposed loads, as determined by testing field-cured concrete cylinders, but not sooner than specified in ACI 347.

B. Take care when removing forms that concrete surfaces are not marred or gouged, that corners are true, sharp and unbroken. Do not pry against concrete when removing forms.

C. Cut off nails flush on concealed surfaces. Cut back tie wires and nails in exposed concrete surfaces at least 1-1/2-inches. Remove rod and cone ties and separators or similar devices and pull inward away from finished surfaces.

D. Where used, remove rod and cone ties and separators or similar devices and pull.

3.04 REUSING FORMS:

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

B. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Officer-in-Charge.

3.05 SHORES AND RESHORES:

A. Contractor shall engineer shoring to comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.

1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.

2. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.

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

END OF SECTION

# DIVISION 3 – CONCRETE

## SECTION 03200 – CONCRETE REINFORCING

## PART 1 - 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:

A. Section includes:

1. Reinforcing steel for cast-in-place concrete.

2. Supplementary parts and components, such as clips, fasteners, chairs, tie wires, and other miscellaneous accessories required for a complete installation.

B. References:

1. ACI 117, Standard Tolerances for Concrete Construction and Materials.

2. ACI 315, Details and Detailing of Concrete Reinforcement.

3. CRSI, Manual of Standard Practice.

4. AWS D1.4, Structural Welding Code – Reinforcing Steel.

5. ACI SP-66, ACI Detailing Manual.

1.03 SUBMITTALS:

A. Shop drawings:

1. Submit shop drawings showing fabrication, bending, and placement of concrete reinforcing.

2. Submit bar drawings and schedules with the corresponding placing diagrams.

a. Comply with ACI SP-66.

b. Indicate bar schedules, stirrup spacing, diagrams of bent bars, and arrangement of concrete reinforcing.

c. Include special reinforcing required for openings through concrete structures.

3. Drawings shall be complete for any specific area of Project when submitted.

B. Certificates: Submit copies of mill reports and test data for reinforcing steel sampled prior to starting this work.

1. Mill reports shall contain the steel source, description, heat number, yield point, ultimate tensile strength, elongation percentage, bend test, and chemical analysis.

a. If the reports show material is satisfactory no tests will be required.

b. For foreign steel, perform testing as specified below by a testing laboratory acceptable to the authorities having jurisdiction.

c. Certification from any other sources is not acceptable.

2. Ensure material delivered for use is that represented by mill reports.

3. Obtain copies of mill reports, examine them, certify whether the material represented complies with Specifications requirements, and make distribution of reports as required. Report chemical composition of each heat, as determined by ladle analysis.

C. Test reports: Submit test data for reinforcing steel sampled and tested prior to starting this work.

1. Where materials proposed for use cannot be identified, pay for an approved testing laboratory to make one series of tests (tensile and bend) from each 2.5 tons, or fraction thereof, of each size and kind of reinforcing steel.

2. Include minimum 2 samples of sufficient length to allow tests to be made on the as-rolled bar.

D. Welding qualifications: Qualify procedures and personnel according to AWS D1.4, Structural Welding Code – Reinforcing Steel.

1.04 HANDLING:

A. Delivery:

1. Deliver reinforcing to the site bundled, tagged, and marked; handle to prevent damage to material.

2. Use metal tags indicating size, length, and other markings shown on placement drawings. Maintain tags after bundles are broken.

B. Storage:

1. Electrode storage: Comply with the combined recommendations of AWS and the electrode manufacturer for storage of electrodes. Do not use electrodes that have been wetted.

## PART 2 - PRODUCTS

### 2.01 MATERIALS:

A. Reinforcing Bars: Reinforcing steel shall be deformed duplex stainless steel UNS 32304 reinforcing bars conforming to ASTM A955, Grade 60, ASTM A276 and ASTM A959.

B. Tie wire:

1. Stainless steel, Type 304, 18-gauge minimum.

C. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place that will not puncture the vapor retarder. Use plastic straps or stainless steel tie wires to secure reinforcing. Manufacture bar supports from stainless steel wire, plastic, or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete, and as follows: For concrete surfaces exposed to view where legs of wire bar supports contact forms, use Concrete Reinforcing Steel Institute (CRSI) Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

1. Slabs-on-grade: Provide supports with sand plates or horizontal runners where base material will not support chair legs, or precast concrete block chairs with embedded wire ties.

2. Exposed concrete surfaces: Where legs of supports are in contact with forms, provide supports with legs that are plastic protected (CRSI, Class 1) or stainless steel protected (CRSI, Class 2).

3. Over waterproof membranes and vapor retarder: Provide precast concrete chairs to prevent puncturing of membrane.

D. Splice sleeves:

1. Acceptable manufacturers:

a. Erico, Inc.: Lenton Coupler.

b. Splice Sleeve North America: NMB Splice Sleeve.

c. Dayton Superior: Bar-Lock (MBT) Coupler System.

d. Headed Reinforcement Corp.: HRC Mechanical Coupler System

e. Or approved substitute.

2. Description: Steel sleeves conforming to requirements of ACI 318. Identify each splice sleeve by the size and type imprinted on the sleeve.

2.02 FABRICATION:

A. General: Except as modified by the Contract Documents, comply with Chapter 7 of CRSI Manual of Standard Practice for fabrication of reinforcing steel.

B. Bending and forming:

1. Fabricate steel bars, wire and welded wire mesh to sizes, lengths, and gages indicated.

2. Accurately form to shapes by methods that will not damage the materials.

3. Heating of reinforcing for bending is not permitted.

C. Tolerances: Comply with ACI 117.

PART 3 - EXECUTION

3.01 EXAMINATION:

A. Examine conditions and measurements affecting the work of this Section at site.

B. Correct conditions detrimental to the proper and timely completion of this work before proceeding with installation.

3.02 PREPARATION:

A. Clean reinforcing of loose mill scale, excessive rust, oil, and other coating that might destroy or reduce its bond before placing it.

3.03 PLACING:

A. Place reinforcing under the continuous inspection of the Owner's Testing Agency.

B. Placing: Comply with the listed reference standards as applicable. Do not install bars with unscheduled kinks or bends.

C. Spacing of reinforcing: Space reinforcing to maintain proper distance and clearance between parallel bars and between bars and forms.

D. Floor system reinforcing: Do not place until concrete in walls and columns has been placed and forms and projecting steel have been thoroughly cleaned.

E. Splices:

1. Do not splice reinforcing bars except where indicated.

2. At lapped splices, bars shall be in contact unless noted otherwise on the Drawings and shall be firmly wired together before placing concrete.

3. Extend stubs and dowels required to receive and engage subsequent work a sufficient length to develop the strength of the bar.

4. Place dowel and stub bars in the forms and secure against displacement during placing of concrete.

F. Welded wire mesh reinforcing:

1. Straighten and cut to required size where required and lay flat in place.

a. Lap welded wire mesh one full mesh plus 2-inches.

b. Securely wire together and to other reinforcing at approximately 24-inches on center.

2. In concrete slabs-on-grade, extend welded wire mesh to within one inch of expansion, construction, and contraction joints. Before concrete is placed, chair welded wire mesh to ensure proper embedment at position indicated. As concrete is placed ensure proper embedment of the mesh in the position indicated on the Drawings.

G. Clearance: Maintain clear distances between reinforced steel and face of concrete indicated on the Drawings.

H. Sleeved splices: install spliced sleeves only where indicated in accordance with manufacturer’s instructions.

3.04 WELDING:

A. Welding:

1. Use only ASTM A706 steel where welding is proposed. Perform welding, where shown or approved, by the direct electric arc process in accordance with AWS D1.4 using specified low-hydrogen electrodes.

2. Preheat 6-inches on each side of joint. Protect joints from drafts during the cooling process. Accelerated cooling is prohibited.

3. Do not tack weld bars.

4. Clean metal surfaces to be welded of all scale and foreign material. Clean welds each time electrode is changed and chip burned edges before placing welds. When wire brushed, the completed welds must exhibit uniform section, smooth welded metal, feather edges without undercuts or overlays, freedom from porosity and clinkers, and good fusion and penetration into the base metal.

5. Cut out welds or parts of welds found defective with chisel and replace with proper welding.

6. Prequalification of welds shall be in accordance with Code.

B. Welded splices: Use full penetration butt welds made by the electric-arc method unless indicated otherwise.

1. Use only welders who have passed the AWS standard qualification tests within the previous year.

2. Weld splices shall develop 125 percent of the specified yield strength of the reinforcing bars, or of the smaller bar in transition splices.

3. Clean bars of oil, grease, dirt, and other foreign substances, and flame-dry before welding.

4. Prepare ends of bars in compliance with AWS D1.4.

5. Preheat bars before welding.

C. Welding Inspection: Where welding is done in excess of the maximum permitted by ASTM A775, clean the damaged area and touchup with repair material complying with ASTM A775.

END OF SECTION

# DIVISION 3 – CONCRETE

## SECTION 03300 – CAST-IN-PLACE CONCRETE

## PART 1 - 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:

A. Section includes:

1. Cast-in-place concrete (CIPC).

B. Related work:

1. Division 2 for site concrete work.

2. Division 3 for concrete forms and concrete reinforcing.

1.03 SUBMITTALS:

A. Data:

1. Product data: Submit manufacturer's product data, specifications, typical installation details, and other data as necessary to demonstrate compliance with the specified requirements for all manufactured products.

2. Design data:

a. Submit pit source and characteristics of each type of aggregate to Officer-in-Charge prior to designing mixes.

b. Submit mix designs prepared for review by a testing laboratory acceptable to the authorities having jurisdiction.

c. Submit mix designs on the Mix Design Submittal Form included at the end of this specification.

B. Certificates: Submit cement certificates, admixture certificates (including chloride ion content), and batch plant tickets and non-shrink grout test data.

1.04 QUALITY ASSURANCE:

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

B. Installer's qualifications: Minimum of 3 consecutive years of experience in the installation of cast in place concrete on projects similar in material, design, complexity, and extent to this Project, and whose work has resulted in applications with a record of successful in-service performance.

C. Manufacturer's qualifications:

1. Experienced in manufacturing ready-mixed concrete products and complying with the requirements of ASTM C94 for production facilities and equipment.

2. Certified according to the NRMCA Certification of Ready Mixed Concrete Production Facilities.

D. Testing agency qualifications:

1. Independent testing agency acceptable to authorities having jurisdiction, qualified according to ASTM C1077 and ASTM E329 to conduct the testing indicated, as documented according to ASTM E548.

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

E. Mockup:

1. Before beginning work, cast a 10-foot by 4-foot mockup at a location on the site acceptable to the Officer-in-Charge to demonstrate proposed construction, techniques, installation methods, coordination of the work specified in other relevant sections, testing, operation, training of the trades, color, and finish.

2. Use the same personnel, materials and construction techniques intended to be used for the Project, including the selected cement, admixtures, aggregates, form materials, release agents, concrete inserts, casting, curing, and finishing methods.

3. Officer-in-Charge will review the mockup to determine if the Work falls within acceptable ranges for appearance and workmanship.

4. Make corrections requested by the Officer-in-Charge or remove and replace mockup when corrective work is not acceptable. Repeat mockup(s) until Officer-in-Charge's approval is obtained.

5. Protect approved mockup, which will be used as a standard for all remaining work on the Project, until its removal is authorized. Remove mockup only after completion and final acceptance of concrete work.

6. When properly identified for future reference, and when acceptable to the Officer-in-Charge, the mockup may remain a part of the Work.

7. Work cannot start until a successful test placement of designated mixes has been made.

1.05 PROJECT CONDITIONS:

A. Do not place concrete when the temperatures of the materials in contact with the concrete, the concrete temperature, and the ambient temperature exceed the ranges recommended in ACI 305 and 306, or if it is likely to exceed these temperatures before the concrete has taken its initial set, unless special precautions recommended by ACI 305 and 306 are provided.

1.06 SCHEDULING:

A. Allow sufficient time in the construction schedule for appropriate slab drying, in accordance with the finish manufacturer's recommendations, for slabs to receive a moisture-sensitive deferred finish

B. Quick setting concrete with a maximum w/cm of 0.40 may be required to avoid schedule delays.

PART 2 - PRODUCTS

2.01 CONCRETE MATERIALS:

A. Portland cement: ASTM C150, Type I or II low alkali. Do not change brand or type of cement without Officer-in-Charge's written approval.

B. Aggregates and Supplementary Cementitious Materials:

1. Fly Ash: ASTM C618, Type F may be used up to a maximum of 25% of the total cementitious content.

2. Ground Granulated Blast-Furnace Slag: ASTM C989, Grade 100 or 120 may be used up to a maximum of 40% of the total cementitious content.

3. The exact percentages of supplementary cementitious materials used shall be based on a successful test placement on-site.

4. In mass concrete, more than 2 feet thick, the usage rate may be 50% for fly ash and 80% for slag.

5. Hard rock aggregates: ASTM C33, graded so that coarse aggregate nominal size is not larger than 1/5 of the narrowest dimension between form faces, nor 3/4 of the minimum clear spacing between individual reinforcing bars or bundles of bars, whichever is less, but never greater than 3/4-inch in any dimension for slabs 4-inches thick or less; 1-1/2-inches maximum at all other locations.

6. Combined aggregate gradation for slabs and other designated concrete shall be 8% - 18% for large top size aggregates (1-1/2-inches) or 8% - 22% for smaller top size aggregates (1-inch or 3/4-inch) retained on each sieve below the top size and above the No. 100.

C. Admixtures:

1. Air-Entraining Admixture: ASTM C260, certified by manufacturer to be compatible with other required admixtures. Provide one of the following:

   a. “AEA-92 and Air 40” by The Euclid Chemical Co.

   b. “Sika Aer” by Sika Corp.

   c. “MB-VR or MB-AE” by BASF.

   d. Or approved substitute.

2. Water-Reducing Admixture: ASTM C494, Type A, and containing not more than 0.05 percent chloride ions. Provide one of the following:

   a. “Eucon X15 or Eucon WR 91” by the Euclid Chemical Co.

   b. “Pozzolith 322N” by BASF.

   c. “Plastocrete 160” by Sika Chemical Corp.

   d. Or approved substitute.

3. High-Range Water-Reducing Admixture (Superplasticizer): ASTM C494, Type F or Type G and containing not more than 0.05 percent chloride ions. Provide one of the following:

   a. Plastol Series, Euclid Chemical Co.

   b. ADVA Flow, W.R. Grace & Co.

   c. Glenium Series, BASF, Inc.

   d. Or approved substitute.

4. High-Range, Water-Reducing, and Retarding (Superplasticizer): ASTM C494, Type G.

    a. Eucon 537 by The Euclid Chemical Company.

    b. Daracem 100 by W.R. Grace & Co.

    c. Rheobuild 916 by BASF.

    d. Or approved substitute.

5. Non-Chloride, Non-Corrosive Accelerating Admixture: The admixture shall conform to ASTM C494, Type C or E, and not contain more chloride ions than are present in municipal drinking water. The admixture manufacturer must have long-term non-corrosive test data from an independent testing laboratory (of at least a year's duration) using an acceptable accelerated corrosion test method such as that using electrical potential measures. Provide the following:

    a. "Accelguard 80, 90 or NCA" by The Euclid Chemical Co.

    b. Or approved substitute.

6. Water-Reducing, Retarding Admixture: ASTM C494, Type D, and contain not more than 0.05 percent chloride ions. Provide one of the following:

    a. "Eucon NR or Eucon Retarder 75" by The Euclid Chemical Co.

    b. "Pozzolith Retarder" by BASF.

    c. "Plastiment" by Sika Chemical Co.

    d. Or approved substitute.

7. Hydration Control Admixture:

    a. Eucon Stasis by The Euclid Chemical Co.

    b. MasterSet Delvo by BASF.

    c. SikaRard 440 by Sika Chemical Co.

    d. Or approved substitute.

8. Certification: Written conformance to the above-mentioned requirements and the chloride ion content of admixtures will be required from the admixture manufacturer prior to mix design review by the Engineer.

9. Prohibited Admixtures: Calcium chloride thiocyanates or admixtures containing more than 0.05 percent chloride ions are not permitted.

10. Single Source: All admixtures shall be from the same manufacturer to assure single source responsibility.

D. Water: Fresh, clean, and free of oil and other materials injurious to concrete.

2.02 Related materials:

A. Underlayment Compound: Free flowing, self-leveling, pumpable, cementitious base compound. Subject to compliance with requirements, provide the following:

1. "Flo-Top, Super Flo-Top or Tamms SLU" by The Euclid Chemical Co.

2. "Ardex" by Ardex Co.

3. "Underlayment 110" by BASF.

4. Or approved substitute.

B. Repair topping: Self-leveling, polymer modified high strength topping. Product shall be “Thin-Top Supreme” by The Euclid Chemical Co. or approved substitute. The topping shall exhibit the following properties:

1. Chaplin Abrasion Test - 0.02 mm (0.0079”) maximum @ 28 days (British Standard 8204).

2.03 CURING COMPOUNDS:

A. General: Curing, hardening, and sealing agents to be applied sequentially shall be products of a single manufacturer. Where products of different manufacturers are used including proprietary topping and surfacing materials, confirm their compatibility with respective manufacturers.

1. Compound shall produce a uniform, continuous, adherent film that does not check, crack, or peel and is free from pinholes or other imperfections.

2. Curing compound used on exposed concrete surfaces shall be non-discoloring, fast drying, and shall be conclusively demonstrated not to darken or yellow with age.

3. Curing and sealing compound for use on concrete floors to receive adhered covering shall be specially formulated for such use and shall be certified by the manufacturer not to inhibit the bonding qualities of flooring adhesives. Refer to the Finish Schedule on the Drawings for specific finish materials and areas of application.

4. Strippable Curing Compound will be used on floors receiving a penetrating sealer or adhesive applied finishes.

B. Compatibility: Use compound guaranteed not to affect the appearance of the concrete surfaces, and the bond, adhesion, or effectiveness of finishes or surface treatment specified herein to be applied to concrete.

C. Type I, Strippable Curing Compound: The compound shall conform to ASTM C309 (VOC Compliant, 350 g/l). For use on slabs receiving subsequent applied finishes and where noted on the drawings. Install in strict accordance with the manufacturer's recommendation and supervision.

1. "Atlas Quantum-Cure" by Atlas Tech Products Company.

2. "Crystal Rez" by The SpecChem Company.

3. "Kurez W VOX" by the Euclid Chemical Company.

4. Or approved substitute.

D. Type II, cure only: ASTM C309 Type 1, Class A and B, liquid membrane-forming, non-penetrating, fugitive dyed compound for interior or exterior use.

1. "Horncure 30D" by AC Horn, Inc.

2. "Day-Chem Rez Cure" by Dayton Superior.

3. "Kurez E-100S" by Euclid Chemical Co.

4. "Hydrocide Curing 309 Resin-Base" by Sonneborn-Rexnord.

5. Or approved substitute.

E. Type III, cure and seal: Apply one coat for curing and second coat for sealing. Clear Curing and Sealing Compound (VOC Compliant, 350 g/l): Liquid type membrane-forming curing compound, clear styrene acrylate type, complying with ASTM C1315, Type I, Class A, 25% solids content minimum. Moisture loss shall be not more than 0.40 $Kg/m^2$ when applied at 300 sq. ft./gal. Manufacturer's certification is required. Subject to project requirements provide one of the following products:

1. Super Diamond Clear VOX by The Euclid Chemical Company.

2. Super Aquacure VOX by The Euclid Chemical Company.

3. Lusterseal WB 300 by The Euclid Chemical Company.

4. Masterkure 30W by BASF Construction Products.

5. Or approved substitute.

F. Type IV, Moisture-Retaining Cover Conforming to ASTM C171: A naturally colored, non-woven polypropylene fabric with a 4-mil non-perforated reflective (white) polyethylene coating containing stabilizers to resist degradation from ultraviolet light. Fabric shall exhibit low permeability and high moisture retention.

1. Hydracure S-16 by PNA Construction Technologies, Inc.

2. Transguard 4000 by Reef Industries (Armorlon Division), Incorporated.

3. Or approved substitute.

2.04 LIQUID SEALER DENSIFIER:

A. Liquid Sealer/Densifier: High performance, deeply penetrating concrete densifier; odorless, colorless, VOC compliant, non-yellowing siliconate based solution designed to harden, dustproof, and protect concrete floors subjected to heavy vehicular traffic and to resist black rubber tire marks on concrete surfaces. The compound must contain a minimum solids content of 20% of which 50% is siliconate. Liquid Sealer Densifier shall be applied in strict accordance with the directions of the manufacturer and the project specifications. Provide one of the following:

1. Diamond Hard by The Euclid Chemical Company.

2. SealHard by L&M Construction Chemicals.

3. Or approved substitute.

2.05 MISCELLANEOUS MATERIALS:

A. Evaporation retarder: Eucobar by The Euclid Chemical Company, Sealtight Evapre by WR Meadows, E-Con by L&M Construction Chemicals, Inc., Or approved substitute.

B. Waterstop: Install the water stop where indicated.

1. Place water stop on the exterior face of the outermost dowel line but keep a concrete cover of 2-inches minimum.

2. Butt ends of water stop and nail to concrete to avoid displacement during concrete placing and consolidation.

C. Non-Shrink, Non-Metallic Grout:

1. The non-shrink grout shall be a factory pre-mixed grout and shall conform to ASTM C1107, “Standard Specification for Packaged Dry,

Hydraulic-Cement Grout (Non-Shrink)." In addition, the grout manufacturer shall furnish test data from an independent laboratory indicating that the grout when placed at a fluid consistency shall achieve 95% bearing under a 4' x 4' base plate. Provide:

a. "NS Grout or NC Grout" by The Euclid Chemical Co.

b. "Five Star Grout" by U.S. Grout Corp.

c. "Masterflow 713" by BASF.

d. Or approved substitute.

2. Where high fluidity and/or increased placing time is required, use the specified high flow grout. This grout shall be used for all base plates larger than 10 square feet. Provide:

a. "Hi-flow Grout", by The Euclid Chemical Co.

b. "Tammsgrout Supreme", by Tamms Industries.

c. "Masterflow 928" by BASF.

d. Or approved substitute.

2.06 SOURCE QUALITY CONTROL:

A. Employ a testing laboratory, acceptable to the Officer-in-Charge, to test the materials for conformance with these Specifications before concrete mixes are established, and when source is changed, unless recent test results of materials to be used on the Project, performed by an acceptable testing laboratory, are accepted by the Officer-in-Charge.

B. Testing coarse aggregates:

1. Test aggregates before and after concrete mix is established and whenever the character source of material is changed, but not less than one test for each mix design used.

2. Perform a sieve analysis to determine conformity with limits of gradation. Perform sampling and testing according to ASTM C33, and as follows:

a. Sampling of aggregates: ASTM D75. Take samples of aggregates at source of supply, or if source of supply has been approved, from storage bunkers at ready-mixed concrete plant.

b. Testing of aggregates shall include:

1) Sieve analysis: ASTM C136.

2) Organic impurities: ASTM C40. Fine aggregate shall develop a color not darker than the referenced standard color.

3) Soundness: ASTM C88. Loss after 5 cycles not over 8 percent for coarse aggregate, nor 10 percent for fine aggregate.

4) Abrasion: ASTM C131. Weight loss not over 10-1/2 percent after 100 revolutions, nor 42 percent after 500 revolutions.

5) Deleterious materials: ASTM C33.

6) Materials passing No. 200 sieve: ASTM C117, not over 1 percent for gravel, 1.5 percent for crushed aggregate per ASTM C33.

7) Reactive materials: ASTM C289. Aggregates shall indicate no potential deleterious reactivity.

8) Definitions: ASTM C125.

3. Cement test:

a. The cement mill laboratory will be acceptable as testing laboratory for this purpose when approved by the Building Department. Submit evidence to show that the cement mill laboratory is qualified to perform tests. The laboratory shall make tests for every 500 barrels or fraction thereof of cement used, in compliance with ASTM C150.

b. Make tensile strength test at 7 days. Tag the cement for identification at the location of sampling. A representative of the Testing Agency shall certify that materials being used are taken from the lots sampled and tested for this report.

2.07 MIXES:

A. Mix Design:

1. Structural concrete mixes required for the Project shall provide:

a. Concrete of the compressive strength indicated on the Drawings.

b. Adequate workability and proper consistency to permit concrete to be worked readily into the forms and around reinforcement without segregation and excessive bleeding.

c. Admixture Usage: All concrete must contain the specified water-reducing admixture or the specified high-range water-reducing admixture (superplasticizer). All thin concrete slabs, less than 8-

inches in thickness placed at air temperatures below 50°F shall contain the specified non-corrosive, non-chloride accelerator. All concrete required to be air entrained shall contain an approved air entraining admixture. All pumped concrete with a slump higher than 6-inches, concrete for industrial slabs, synthetic fiber concrete, architectural concrete, self-consolidating concrete, concrete required to be watertight or concrete with a water/cementitious ratio below 0.50 shall contain the specified high-range water-reducing admixture (superplasticizer) as required by the mix design. All concrete slabs placed at air temperatures above 90°F may require the use of a water reducing retarding admixture. All architectural concrete and heavily reinforced members as required on the drawings shall use Self-Consolidating Concrete. Self-Consolidating Concrete shall contain the specified high-range water-reducing admixture and viscosity-modifying admixture where required. Minimum flow of 20" – 30" or as required by the successful test placement. The workability, pumpability, finishability, and setting time of the proposed mix design shall be verified with a successful test placement onsite.

d. Other requirements noted on the Drawings and specified herein.

2. Determine proper proportions for design mixes in compliance with ACI 301.

3. Determine proper water-cement ratio by preliminary test made in compliance with ASTM C192.

   a. All concrete in contact with soil, water, or weather shall have a minimum water/cementitious ratio of 0.50.

   b. Provide maximum water/cementitious ratio of 0.50.

4. Slump: All concrete containing the high-range water-reducing admixture (superplasticizer) shall have a maximum slump of 9" unless otherwise approved by the Engineer of Record. The concrete shall be at a slump of 2" to 3", (3" to 4" for concrete receiving a "shake-on" hardener or lightweight concrete), be verified before the high-range water-reducing admixture is added to increase the slump to the approved level. All Self-Consolidating Concrete shall have a slump/flow of 20" – 30". All other concrete shall have a maximum slump of 4", unless otherwise indicated on the Structural Drawings.

5. Compressive Tests shall be conducted in compliance with ASTM C39.

B. Submit reports showing results of sieve analysis, mix design, results of compression and modulus of elasticity (MOE) tests, including stress-strain diagrams.

1. Make minimum 4 test specimens of each design mix for strength less than or Approved Substitute to 5,000 psi and a minimum of 8 test specimens of each design mix for strength higher than 5,000 psi. One cylinder shall be tested at 7 days for information. Two 6 x 12 in. or three 4 x 8 in. cylinders at 28 days shall be tested for acceptance. Extra Cylinders shall be held in reserve. Make minimum one extra test specimen for post-tensioned concrete, and a specimen shall be tested prior to stressing.

2. If trial batches are used the average critical strength f'cr shall be f'c + 1200 psi. For strengths higher than 5,000 psi at 28 days the f'cr shall Approved Substitute 1.10 f'c + 700 psi.

3. Do not start concrete production until mixes have been reviewed and are acceptable to the Officer-in-Charge.

C. For each batch, weigh the fine and coarse aggregate separately, measure cement and water separately and introduce separately into the mix so that proportions can be accurately controlled and easily checked.

D. Do not change proportions established by the accepted mix design without the Officer-in-Charge's written approval.

1. Cement: If concrete develops less than required minimum strength, adjust mix proportions and decrease w/cm, as necessary.

2. Water Content: Verify water content and w/cm by use of the Microwave Test, AASHTO-T 318 "Standard Method of Test for Water Content of Freshly Mixed Concrete Using Microwave Oven Drying" each time compression test specimens are taken for designated concrete.

3. Aggregates: Reasonable variations in grading will be allowed by the Officer-in-Charge provided the w/cm of the approved mix is not exceeded.

E. Concrete Mixing:

1. Mixing and delivery shall comply with ASTM C94, these Specifications, and Building Code requirements.

2. Owner's Testing Agency will perform check sieve analysis of the aggregates being used, check compliance with mix design and the cement being used against mix design; check that water has been removed from the drum before adding mix ingredients for the following load and shall witness the loading of mixing trucks. The Owner's Testing Agency will send a written report of each inspection to Officer-in-Charge indicating compliance with these Specifications.

3. In addition to the requirements of ASTM C94, provide the following information on delivery tickets signed by an authorized representative of the batching plant with each mixer truck of concrete delivered to the site.

    a. Type and brand of cement.

    b. Cement content per cubic yard of concrete.

    c. Maximum size of aggregate.

    d. Total water content and water/cementitious material ratio.

    e. Time batched.

4. Deliver batch tickets to Inspector at the site when concrete is delivered.

5. Maintain equipment in proper operating condition, with drums cleaned before charging each batch. Schedule rates of delivery to prevent delay of placing the concrete after mixing or holding dry-mixed materials too long in the mixer before the addition of water and admixtures.

6. Remove all materials, including water remaining in the ready-mix truck drum, completely before ingredients for the following loads are introduced in the drum.

7. Do not use concrete that has not been placed 30 minutes after leaving the mixer, or concrete that is not placed within 60 minutes after water is introduced into the mix. Placement time shall not be extended more than 4 hours when hydration control admixtures are used.

## PART 3 - EXECUTION

### 3.01 EXAMINATION:

A. Examine conditions and measurements affecting the work of this Section at site.

B. As applicable for each placing operation, verify accuracy of lines, levels, elevations and dimensions for excavations, subgrade, vapor retarder, and formwork.

C. Verify reinforcing and accessories for proper position, sizes, clearances, fastenings, laps, and splices.

D. Verify that no vapor retarder damage has occurred since the pre-installation conference inspection.

1. Repair damage to achieve complete and continuous vapor barrier membrane.

E. Correct conditions detrimental to the proper and timely completion of this work before proceeding with installation.

3.02 PREPARATION:

A. Place items to be embedded in concrete, including but not limited to, conduits, sleeves, nailers, anchors, and rough hardware, built into concrete as indicated or required.

1. Do not embed piping and conduits, other than steel electrical conduits, in structural concrete. Locate conduits as to reduce strength of the structure the least amount, as approved by the Officer-in-Charge, and as indicated on the Drawings.

2. Embed bolts, inserts and other items in the concrete. Secure accurately so that they are not displaced during concrete placing, compacting, and finishing operations. Wire tie, nail, or bolt embeds securely to forms.

3. Set embedded bolts for materials and equipment attached to concrete to template, layouts, and shop drawings. Verify size, length, and location of electrical conduits with respect to equipment supports.

4. Fill voids in sleeves, inserts, and anchor slots temporarily with readily removable material to prevent entry of concrete in the voids.

5. Install expansion joint fillers where indicated, and as required to isolate concrete slabs-on-grade from other building elements such as walls and equipment pads. Cover filler with plastic joint cap and leave in place until ready to receive sealant.

B. Moisten, do not saturate, earth subgrade and bearing surfaces. Do not place concrete on muddy subgrade.

C. Wet wood forms thoroughly when they are not treated with form release agent. Wet other materials sufficiently to reduce suction and maintain concrete workability.

D. Install the waterstop in all construction joints below grade, and elsewhere as indicated.

1. Place waterstop in a continuous ribbon on the exterior face of the outermost dowel line. Keep a concrete cover of 2-inch minimum.

2. Unless otherwise recommended by the manufacturer, butt ends of water stop and nail to concrete to avoid displacement during concrete placing and consolidation.

E. Mask areas to receive sealants, caulking compounds or special paints/epoxy /waterproofing/coatings before application of curing or sealing agents.

F. Do not proceed with placement of concrete until conditions are satisfactory.

3.03 CONVEYING:

A. Rapid handling: Transport concrete from the mixer to location of placing as rapidly as practical to avoid separation or loss of ingredients.

B. Transporting methods: Use pipes, cranes, carts, buggies, or other approved means to deliver concrete to final locations. Do not use delivery systems (pipe, chutes, etc.) formed of aluminum for transporting concrete.

C. Free fall:

1. As dictated by job conditions at each location, but not more than 4-feet where concrete will be exposed in the Work and 6-feet at all other locations. Self-Consolidating Concrete may be dropped up to 15-feet as approved by the Officer-in-Charge.

2. Avoid large concentration of concrete in one location that would produce unacceptable deflection in supporting formwork.

D. Concrete flow:

1. Keep surface of concrete level during placing with a minimum of concrete allowed to flow from one position to another. Self-Consolidating Concrete may be allowed to flow up to 50-feet.

2. Carry concrete up uniformly for the length of walls being placed to reduce lateral flow of concrete to 5-feet maximum. Flowing concrete, 9-inch slump $\pm$ 1-inch, may be used to place concrete in walls with a uniform elevation, with a maximum lateral flow of 10-feet. Self-Consolidating Concrete may be placed at fewer locations and allowed to flow up to 50-feet.

E. Runways: Construct substantial runways and scaffolding to avoid movement and vibration in the forms and reinforcing steel as a result of transporting and placing concrete.

3.04 PLACING:

A. General: Comply with ACI 304. Do not place concrete in or under water.

B. Comply with ACI 301 for mass concrete placement and temperature control.

C. Do not place slab-on-grade until the vapor retarder or vapor barrier are inspected for damages, proper joint and penetrations seals.

D. Consolidation: Thoroughly consolidate concrete and work it around reinforcement and embedded items and into corners and angles of forms, by spading, rodding, and tamping to exclude rock pockets, air bubbles, and "honeycombs" and to obtain required density and strength.

E. Internal vibration:

1. Use mechanical vibrators to consolidate each layer with that previously placed, to completely embed reinforcement and fixtures, and to bring fine materials to the faces and top surfaces to produce the proper finish.

2. Assign at least one workman at each location where concrete is being placed to vibrate and consolidate the concrete in forms. Do not “over-vibrate” to prevent separation of ingredients.

3. Keep extra standby vibrator at the site.

4. Do not use vibrator to move concrete.

F. Record: Keep records showing location, date, and time of placement and quantity of concrete placed on the Project.

G. Floor slabs: Shape slabs to the levels, slopes and elevations indicated and accurately pitch or grade to drainage fittings and fixtures installed in them. Where indicated, depress slabs to receive other finishes.

H. Wall supported elements:

1. Under normal weather conditions, wait at least 2 hours after depositing concrete in walls and columns before placing concrete in supported floors.

2. Consider beams, girders, capitals, and brackets as part of the floor systems.

3. Self-Consolidating Concrete (SCC) shall be used where indicated on the plans.

I. Construction joints:

1. Location: Locate joints to least impair the strength and appearance of the structure. Obtain the Officer-in-Charge's approval of construction joint locations before casting concrete. In general construction joints shall be located as follows, unless otherwise indicated on the Drawings.

a. In walls locate at the underside of floors or slabs, and at the top of footings or floor slabs.

b. In slabs-on-grade locate joints where shown on the Drawings; offset not less than 5-feet, with a maximum of 2 offsets.

c. In all cases make construction joints perpendicular to the main reinforcement. Continue reinforcement across joints, unless otherwise indicated.

2. Provide keyways at least 1-1/2-inches deep in construction joints in slabs, and between walls and footings; use prefabricated bulkheads specified for slabs. Butt joints with diamond dowels may be used at construction joints in slabs-on-grade subjected to vehicular traffic.

3. Keep exposed face of construction joints continuously moist from time of initial set until subsequent placing of concrete against them, but not to exceed the curing period. When not damp, wet (do not saturate) the contact surface of joints for a minimum of 24 hours before placing adjoining concrete.

a. Before placing adjoining concrete, clean contact surfaces to remove laitance, loosened particles of aggregate or damaged concrete, and expose sound, coarse aggregates solidly embedded in the matrix.

b. To achieve the above, the contact surface may be washed with clean water under pressure (jet blast), may be sandblasted, or in areas which will be concealed from view when the building is completed an approved structural adhesive may be used on clean, structurally sound concrete. Remove wash water entirely from surface.

c. If a contact surface becomes coated with foreign materials of any nature after being cleaned, clean again to suitable condition.

3.05 FINISHING:

A. See Section 03330 for architectural concrete and Section 03350 for concrete slab-on-grade.

B. Exposed Concrete Surfaces: Immediately after removal of forms from concrete to be left exposed, remove fins and rough spots; damaged and irregular surfaces and holes left by form clamps and sleeves shall be patched with grout; tie wires are to be withdrawn and holes pointed up with neat cement paste. Care shall be taken to approach as nearly as possible texture of exposed adjacent concrete surface. After patching, all concrete that is to remain exposed shall be grout cleaned with mixture of 1-part cement and 1-1/2 parts fine sand with sufficient water to produce consistency of thick paint. Apply to concrete surfacing with brush after first wetting concrete.

Immediately after applying, float surface with wood float, scouring vigorously. Keep damp during this period in hot weather. When set, grout shall be scraped from wall with edge of steel trowel, allowed to dry, and wiped or rubbed with dry burlap. Entire cleaning operation of any area shall be completed on the same day started.

3.06 CURING:

A. Formed concrete:

1. Wet the tops and exposed portions of formed concrete and keep moist until forms are removed.

2. If forms are removed before 14 days after concrete is cast, coat concrete with curing compound as specified for flatwork below.

B. Concrete flatwork:

1. For interior slabs scheduled to remain exposed and not receive a penetrating sealer: Curing and Sealing compound Type III.

a. After finishing and as soon as it can be done without marring the finish, spray curing and sealing compound uniformly in compliance with its manufacturer instructions submitted to the Officer-in-Charge, as specified above.

b. When the manufacturer recommends a coverage range, use the heavier application unless otherwise permitted by the Officer-in-Charge.

c. Examine at regular intervals that the compound film is intact. If damaged, moisten the concrete and apply additional compound.

2. For all other concrete flatwork: Curing compound Types I for interior slabs, and III clear, non-yellowing for exterior slabs.

a. Promptly after finishing, apply curing compound uniformly by spray at the rate at which the compound conforms to ASTM C309 requirements.

b. Examine at regular intervals that the compound film is intact. If damaged, moisten the concrete and apply additional compound.

C. Protection: Unless otherwise recommended by the curing compound manufacturer, restrict traffic on treated slabs for a minimum of 8 hours under normal conditions.

3.07 MISCELLANEOUS CONCRETE WORK:

A. Provide all other concrete work indicated or required to complete the Work, even though not specifically specified, including the following.

B. Waterproof membranes:

1. Perform work over waterproof membranes to prevent damage to the membranes.

2. Schedule this work to reduce to a practical minimum the period when the installed membrane is left without protection.

3. Prior to placing concrete, inspect the membrane, and repair damage that may have occurred.

C. Concrete encased columns: When not carried to deck above, stop concrete perpendicular to column axis at the same elevation throughout the garage. Float top neatly to column.

3.08 FIELD QUALITY CONTROL:

A. Site tests: The following will be performed by the Owner's Testing Agency.

1. Samples will be taken during progress of the work to determine slump or slump/flow, water content, compressive strength, aggregate gradation, and grout-mix tests, with assistance furnished by the Contractor.

2. Minimum four 6x12 cylinders (five for 4x8 cylinders) will be made for each day's pour or for each 150 cu. yards, or 5,000 sq. ft. of surface area, whichever is less, for each type of concrete being cast with a concrete strength less than 8,000 psi. For concrete strength 8,000 psi or higher, minimum eight 6x12 cylinders (eleven for 4x8 cylinders) will be made. For post-tensioned concrete, minimum one extra cylinder will be made for a test before stressing.

3. For concrete strength of less than 8,000 psi, one cylinder will be tested at 7 days for information. Two 6x12 or three 4x 8 cylinders at 28 days shall be tested for acceptance. The remaining cylinders will be kept in reserve in case tests are unsatisfactory. For concrete strength of 8,000 psi or higher, provide two additional 6x12 cylinders or three 4x8 cylinders tested at 56 days.

4. Samples will be made in compliance with ASTM C172.

5. Specimens will be made and laboratory cured in compliance with ASTM C31.

6. The 28-day and 56-day values will be the criteria for acceptance of concrete regarding strength only.

a. 7-day tests may be regarded as indicative of compliance or non-compliance with the 28-day and 56-day strength requirements, and the Contractor should be guided accordingly in matter of adjusting proportions, if necessary, and notify the Officer-in-Charge.

b. 7-day tests shall also be a guide to the Contractor regarding time for form removal.

7. Verification and control of water content shall be done by slump testing, review of truck delivery tickets from the batch plant and monitoring the water content by use of the microwave test AASHTO T318, “Standard Method of Test for Water Content of Freshly Mixed Concrete Using the Microwave Oven.” Slump tests will be made for each set of tests cylinders in compliance with ASTM C143/C143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.

B. Tests evaluation:

1. Concrete cylinder test will be evaluated in compliance with ACI 214 and 318.

2. If 28-day and 56-day test results indicate that concrete strength is not as specified, core concrete as directed by the Officer-in-Charge in compliance with ASTM C42.

3. Plug core hole solid with specified non-shrink grout or other material as approved by the Officer-in-Charge.

4. The cost of cores, tests and patching shall be borne by the Contractor.

5. In the event that additional core tests do not show strength required, or as determined by load tests made in compliance with ACI 318, the defective concrete shall be removed and replaced, or shall be reinforced as directed by the Officer-in-Charge, at the Contractor's expense.

6. If core tests results fall below design strength specified, adjust the concrete mix or lower the water cementitious material ratio for future batches, at no additional cost to the Owner.

7. The testing agency shall provide a statistical analysis of all mix designs 8,000 psi or higher strength. The average strength, standard deviation, w/cm and slump or slump flow shall be reported to the Officer-in-Charge, Structural Engineer, General Contractor, and others on the test distribution list each month.

C. Defective concrete:

1. Concrete which does not meet the requirements of the Contract Documents will be deemed defective.

2. Remove defective concrete as directed by Officer-in-Charge and replace with concrete meeting the requirements of the Contract Documents, at no additional cost to the Owner.

3.09 PROTECTING/CLEANING:

A. Take suitable precautions in compliance with applicable ACI requirements to secure satisfactory concrete in either hot or cold weather.

B. Restrict construction vehicular traffic on slabs-on-grade to prevent damage and staining.

C. Protect concrete to prevent damage and staining.

D. Protect work of other trades from damage by work of this Section with heavy Kraft paper securely taped in place.

1. Maintain protection in effective condition for as long as need for protection exists.

2. Control use of water within the building so that no damage to previously installed work or existing structure and finish will occur.

E. Upon completion, wash and clean exposed concrete and leave free of oil, paint, plaster, and foreign substances, ready to receive applied finishes or to be left exposed.

***CONCRETE MIX DESIGN SUBMITTAL FORM***

**Project:** _____
**City:** _____
**General Contractor:** _____
**Concrete Contractor:** _____
**Concrete Strength (Class):** _____
**Use (describe):** _____

***Design Mix Information***

| | *Please check one* |
|---|---|
| Based on Standard Deviation Analysis | |
| Trial Mix Test Data | |

***Design Characteristics:***

| | | |
|---|---|---|
| Equilibrium Density | | Pcf (for lightweight concrete) |
| Strength | | psi (28 day) |
| Modulus of Elasticity | | psi (28 day) |
| Air | | % specified |

| ***MATERIALS*** | ***Type/ Source*** | ***Specific Gravity*** | ***Weight/lb.*** | ***Absolute Vol. cu.ft.*** |
|---|---|---|---|---|
| **Cement** | | | | |
| **Fly Ash** | | | | |
| **Slag** | | | | |
| **Coarse Aggregate** | | | | |
| **Fine Aggregate** | | | | |
| **Water** | | | | |
| **Air** | | | | |
| **Other** | | | | |
| | | ***TOTAL*** | | 27.0 cu. ft. |

* Water/Cementitious Ratio (lbs. water/lbs. cement) = _____%

| ***ADMIXTURES*** | **Manufacturer** | **Dosage oz/cwt** |
|---|---|---|
| **Water Reducer** | | |
| **Air Entraining Agent** | | |
| **High Range Water Reducer** | | |
| **Non-Corrosive Accelerator** | | |
| **Other** | | |

**Slump before HRWR** _____ *inches*
**Slump after HRWR** _____ *inches*

**Standard Deviation Analysis (from experience records):**

| **# of Test Cylinders Evaluated:** | |
|---|---|
| **Standard Deviation:** | |

*USE THE LARGER VALUE:*
*f'cr = f 'c + 1.34s or f 'cr = f 'c + 2.33s – 500 for 5000 PSI or less*
*f'cr = f 'c + 1.34s or f 'cr = 0.90 f'c +2.33s for 5000 PSI or higher*
*(Refer to ACI 301 for increased deviation factor when less than 30 tests are available)*

***LABORATORY TEST DATA***

***Compressive Strength***

| **Age (days)** | **Mix # 1** | **Mix #2** | **Mix #3** |
|---|---|---|---|
| **7** | psi | psi | psi |
| **7** | psi | psi | psi |
| **28** | psi | psi | psi |
| **28** | psi | psi | psi |
| **28 average** | psi | psi | psi |

F'cr = f'c + 1200 psi for 5000 psi or less
Or 1.10 f'c + 700 psi for strengths higher than 5000 psi at 28 days

**REQUIRED ATTACHMENTS:**

| | *Please Check* |
|---|---|
| *Combined Aggregate Gradation Report* | |
| *Standard Deviation Analysis of Compressive Strength Data or Trial Mixture Test Data* | |
| ADMIXTURE COMPATIBILITY CERTIFICATION LETTER | |

| |
|---|
| **Submitted by:** |
| |
| Name: |
| Address: |
| |
| Phone #: |
| Main Plant Location: |
| Miles from Project: |
| Secondary Plant Location: |
| Miles from Project: |
| |
| Date: |

END OF SECTION

# DIVISION 3 – CONCRETE

## SECTION 03330 – ARCHITECTURAL CONCRETE

## PART 1 - 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:

A. Section includes cast-in-place architectural concrete for end cap walls, including formliner-textured surfaces, concrete stain, and sealer, as indicated on the Drawings.

B. Locate panels and formliner pattern breaks as indicated or, if not indicated, as directed by Officer-in-Charge.

C. In presence of Officer-in-Charge, damage part of an exposed-face surface for each finish, color, and texture, and demonstrate materials and techniques proposed for repair of tie holes and surface blemishes to match adjacent undamaged surfaces.

D. Maintain field sample panels during construction in an undisturbed condition as a standard for judging the completed Work.

E. Demolish and remove field sample panels when directed.

1.03 RELATED SECTIONS:

A. Section 03300 – Cast-in-Place Concrete.

B. Section 09900 – Painting and Coatings.

1.04 SUBMITTALS:

A. Product Data: Formliner, form release coating, concrete stain, and sealer manufacturer's data sheets, preparation instructions, and application recommendations.

B. Samples: One sample, minimum 12 by 12 inch (305 by 305 mm), of formliner-textured concrete finished with the specified stain and sealer, prepared using the same materials and procedures proposed for the Work.

C. Mock-Up: Notify Officer-in-Charge not less than 15 working days in advance of constructing mock-up. See Quality Assurance article for mock-up requirements.

1.05 QUALITY ASSURANCE:

A. Mock-Up: In addition to the mock-up requirements of Section 03300, construct the mock-up required therein to also demonstrate the following for the end cap walls, in accordance with the Finish Schedule's requirement to provide a mock-up for review and approval:

1. Formliner pattern impression, alignment, and joint layout.

2. Concrete stain color and application uniformity.

3. Sealer appearance (sheen and color effect).

4. Repair and patching technique for tie holes and surface blemishes.

B. Officer-in-Charge's approval of mock-up is required before casting architectural concrete for the Work.

C. Retention: If accepted by Officer-in-Charge, the mock-up may remain as part of the completed Work if undisturbed at time of Substantial Completion.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. General: Comply with Section 03300 – Cast-in-Place Concrete for the following:

1. Steel reinforcement and other requirements for reinforcement accessories.

2. Cement, aggregates, admixtures, and concrete material requirements.

2.02 CONCRETE MIXTURES:

A. General: Comply with Section 03300 – Cast-in-Place Concrete for concrete mix design, proportioning, and testing requirements. Concrete shall be of the compressive strength indicated on the Drawings.

B. Limit water-soluble, chloride-ion content in hardened concrete to 0.06 percent by weight of cement.

C. Color: Achieved by post-applied concrete stain per the Stain article herein; do not add integral color pigment to the concrete mixture for this Section's work.

2.03 FORMWORK MATERIALS:

A. Joint Sealing Material:

1. Foam gaskets for sealing field erected corner form joints shall be highly compressible foam rubber or neoprene, fully skinned tape, paper backed, with pressure sensitive adhesive on one side, and shall be of sufficient width and thickness for specific use.

2. Sealant for sealing permanent shop or bench fabricated unrevealed joints shall be non-staining, silicone caulking. Clean all sealant from surfaces of formwork so it does not cause discoloration to cast concrete.

B. Formliners:

1. Basis of Design: Symons by Dayton Superior, Wood Pattern Formliner Solutions, “4” Wide Aged Cedar” pattern. Or approved substitute.

2. Reuse: Rated for up to 10 uses, subject to pattern configuration, proper handling, and jobsite conditions.

a. Single-use formliner is not permitted.

3. Care and Handling: Do not expose formliner to temperatures above 140 deg F (60 deg C). Cover formliner with a tarpaulin when not in use to prevent discoloration from sunlight exposure. Formliner is subject to thermal expansion and contraction of plus or minus 1/8 inch at 70 deg F. Keep formliner away from steam, acids, and certain fuels.

C. Form Release Coating for all formwork surfaces, including formliner-faced forms: Colorless, non-staining and having no deleterious effects on the concrete, manufactured specifically for non-absorbent surfaces and for reducing surface voids; compatible with the formliner material per formliner manufacturer's written recommendation. Do not use form release agents on water holding vessels unless specifically approved in writing by waterproofing manufacturers.

D. Construction Joints: Comply with Section 03300 for construction joint requirements. Align construction and control joints in exposed architectural surfaces with rustications or formliner pattern breaks as indicated, and space not more than 12 feet apart unless otherwise indicated on the Drawings.

## PART 3 - EXECUTION

### 3.01 FORMWORK:

A. General: Comply with Section 03300 – Cast-in-Place Concrete for formwork, embedded items, and shoring and reshoring.

B. Limit deflection of form-facing panels to not exceed ACI 303.1 requirements.

1. In addition to ACI 303.1 limits on form-facing panel deflection, limit cast-in-place architectural concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:

    a. Class A, 1/16 in.

C. Fabricate forms to result in cast-in-place architectural concrete that complies with ACI 117, “Specifications for Tolerances for Concrete Construction and Materials.”

D. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast-in-place surfaces. Kerf wood rustications, keyways, reglets, recesses, and the like, for easy removal.

1. Seal form joints and penetrations at form ties with form joint tape or form joint sealant to prevent cement paste leakage.

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

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

F. Coat contact surfaces of wood rustications with sealer before placing reinforcement, anchoring devices, and embedded items.

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

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

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

3.02 REINFORCEMENT AND INSERTS:

A. General: Comply with Section 03300 – Cast-in-Place Concrete for fabricating and installing steel reinforcement. Securely fasten steel reinforcement and wire ties against shifting during concrete placement.

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

3.03 REMOVING FORMS:

A. Formwork for walls may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete, if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.

1. Schedule form removal to maintain surface appearance that matches approved mock-up.

2. Remove formliner carefully to avoid damaging the pattern impression; do not pry or hammer against the concrete surface.

3.04 MIXING AND TRANSPORTING CONCRETE:

A. Comply with Section 03300 – Cast-in-Place Concrete for concrete mixing, delivery, and transporting requirements.

B. All concrete for each placement, or a minimum of two truck loads, shall be on the site prior to starting the placement. Discharge two trucks into the pump at one time in a manner that will enable one truck to be half full and discharging while the other is finished and being replaced with another truck.

3.05 CONCRETE PLACEMENT:

A. Comply with Section 03300 – Cast-in-Place Concrete for concrete placement requirements. Before placing concrete, verify that installation of formwork, form-release agent, reinforcement, and embedded items is complete and that required inspections have been performed.

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

C. Deposit concrete continuously between construction joints. Deposit concrete to avoid segregation.

D. Depositing Concrete:

1. Concrete for walls shall be placed with pump hoses inserted into the form cavity.

2. Deposit concrete as nearly as practical at its final position, but not farther than 5 ft. horizontally from the final position.

3. Do not drop concrete from a height greater than 5 ft.

4. Deposit layers in walls shall not exceed 24 in. in height. Top deposit lift of placement shall not exceed 18 in. in height.

5. Deposits of concrete in walls shall have a subsequent deposit placed on top and/or adjacent to the fresh face and consolidated within 30 minutes. Plan construction joints and placements so that the placing sequence will follow this requirement.

6. Deposit concrete as one lift between construction/control joints.

E. Consolidating Concrete:

1. All concrete shall be consolidated by internal vibration using sufficient vibrators for the scheduled pour; a minimum of two vibrators is required at each placement. Use as many vibrators as necessary to achieve quality matching approved mock-up. Vibrator head shall be inserted rapidly and withdrawn slowly and evenly to remove maximum amount of entrapped air (optimum withdrawal speed approx. 2 to 4 inches per second). Do not jiggle vibrator up and down during consolidation; use continuous and even insertion and withdrawal of vibrator.

2. After top out leveling in walls, the concrete shall be allowed to set 10 to 15 minutes and then shall be given a final vibration of the top 24 inches. Immediately thereafter the top surface shall be finished as required.

3. Caution must be exercised in using vibrators to prevent injury to the formliner or displacement of embedded items.

4. Keep spare working vibrators on site at all times.

5. Vigorously tap form facing panels just below deposit area during consolidation with rubber mallets. Strike in an even and consistent pattern to break up large entrapped air bubbles at the contact form face to minimize bug holes in the formliner impression.

3.06 FINISHES, GENERAL:

A. Architectural Concrete Finish: Match Officer-in-Charge's approved mock-up, to satisfaction of Officer-in-Charge.

B. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces.

1. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

C. Maintain uniformity of special finishes over construction joints, unless otherwise indicated.

3.07 AS-CAST FORMED FINISH:

A. Cast-in-place concrete texture imparted by the Basis of Design formliner, reproducing an aged cedar wood board pattern, arranged in an orderly and symmetrical manner with a minimum of seams as indicated. Remove fins and other projections exceeding specified limits on formed-surface irregularities. Repair and patch tie holes and defects to match approved mock-up.

3.08 STAIN:

A. Concrete Stain: Refer to Finish Schedule in Drawings.

1. Apply stain in accordance with manufacturer's written instructions and the approved mock-up. Allow concrete to cure the minimum duration recommended by the stain manufacturer before application.

2. Apply stain uniformly to achieve color and appearance consistent with the approved mock-up, without blotching, lap marks, or uneven coverage.

3.09 SEALER:

A. Concrete Sealer: Refer to Finish Schedule in Drawings.

1. Apply sealer in accordance with manufacturer's written instructions, over cured and stained concrete, at the coverage rate recommended by the manufacturer.

2. Do not apply sealer until stain has dried and cured per manufacturer's written recommendations.

3.10 COORDINATION WITH PAINTING:

A. Cast-in-place concrete end cap wall surfaces not receiving the formliner texture, stain, and sealer specified herein are field-painted under Section 09900 – Painting and Coatings. Coordinate the limits of formliner-textured/stained surfaces with painted surfaces as indicated on the Drawings.

3.11 CONCRETE PROTECTING AND CURING:

A. Comply with Section 03300 – Cast-in-Place Concrete for curing requirements. Cure cast-in-place architectural concrete by a method that will not mottle, discolor, or stain concrete, and that is compatible with the subsequent stain and sealer application.

B. Begin curing cast-in-place architectural concrete immediately after removing forms from concrete.

3.12 FIELD QUALITY CONTROL:

A. General: Comply with Section 03300 – Cast-in-Place Concrete for field quality-control requirements.

B. Surface Texture:

1. Surface finish is to be an as-formed finish reproducing the Basis of Design formliner's aged cedar wood pattern, with no rubbing or patching except as required to repair tie holes and defects to match approved mock-up.

2. Offsets between form panels will be limited to 1/16 in. for architectural and Class A surfaces.

3. Forms shall be constructed of phenolic resin faced plywood, or other backing panel acceptable to the formliner manufacturer, with the Basis of Design formliner securely attached per manufacturer's written instructions.

4. Form joints and form tie penetrations will be sealed with either caulking or foam tape to minimize water and grout leakage.

C. Surface Porosity: Care will be taken to minimize surface voids or “bug holes.”

D. Color Uniformity:

1. The color of the stained concrete should be generally uniform. Any variations shall be gradual, with no particularly light or dark areas.

2. Procedures used to achieve color uniformity shall include single source of cement and aggregates and consistent stain application technique.

E. Surface Irregularities:

1. For Class A surfaces:

a. Abrupt deviation or gradual deviation over 60 inches is no more than 1/16 in.

b. Formwork face deflection is limited to L/400.

F. Patching and Repair of Surfaces: An acceptable patch and repair procedure shall be established in the mock-up process for those occasions where it is desired to minimize an irregularity. Do not proceed with patching or repair of finished work unless directed by the Officer-in-Charge.

3.13 REPAIRS, PROTECTION, AND CLEANING:

A. Repair and cure damaged finished surfaces of cast-in-place architectural concrete when approved by Officer-in-Charge. Match repairs to color, texture, and uniformity of surrounding surfaces and to repairs on approved mock-up.

    1. Remove and replace cast-in-place architectural concrete that cannot be repaired and cured to Officer-in-Charge's approval.

B. Protect corners, edges, and surfaces of cast-in-place architectural concrete from damage; use guards and barricades.

C. Protect cast-in-place architectural concrete from staining, laitance, and contamination during remainder of construction period.

D. Clean cast-in-place architectural concrete surfaces after finish treatment to remove stains, markings, dust, and debris.

E. Wash and rinse surfaces according to concrete finish applicator's and sealer manufacturer's written recommendations. Protect other Work from staining or damage due to cleaning operations.

    1. Do not use cleaning materials or processes that could change the appearance of cast-in-place architectural concrete finishes.

END OF SECTION

# DIVISION 3 – CONCRETE

## SECTION 03350 – CONCRETE FINISHING

## PART 1 - 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 SECTION INCLUDES:

A. Concrete coloring system, integral, for concrete slab-on-grade.

B. Rock salt finish for integrally colored, concrete slab-on-grade.

C. Sealer for integrally colored, rock salt finished concrete slab-on-grade.

1.03 RELATED SECTIONS:

A. Section 02775 – Concrete Sidewalk

B. Section 02300 – Earthwork

C. Section 02950 – Restoring Pavements and Other Improvements

1.04 REFERENCES:

A. ASTM International (ASTM):

1. ASTM C33 - Standard Specification for Concrete Aggregates.

2. ASTM C94 - Standard Specification for Ready-Mixed Concrete.

3. ASTM C150 - Standard Specification for Portland Cement.

4. ASTM C979 - Standard Specification for Pigments for Integrally Colored Concrete

B. American National Standards Institute (ANSI):

1. ANSI A326.3 - Test Method for Measuring Dynamic Coefficient of Friction (DCOF) of Hard Surface Flooring Materials.

C. American Concrete Institute (ACI):

1. ACI 302.1R - Guide for Concrete Floor and Slab Construction.

1.05 SUBMITTALS:

A. Submit under provisions of Section 01300 – Submittals.

B. Product Data:

1. Manufacturer's data sheets on each product to be used.

2. Preparation instructions and recommendations.

3. Storage and handling requirements and recommendations.

4. Typical installation methods.

C. Shop Drawings: Include details of materials, construction, and finish. Include relationship with adjacent construction.

D. Samples: Two representative samples, minimum 18 by 18 inch of integrally colored concrete finished with the specified rock salt texture and sealer applied, prepared using the same materials, color, and procedures proposed for the Work.

E. Mock-Up: Notify Officer-in-Charge not less than 15 working days in advance of constructing mock-up. See Quality Assurance article for mock-up requirements.

F. Integral Color Mix Data: Manufacturer's or ready-mix supplier's written confirmation of pigment product, color designation, and dosage rate per cubic yard for the specified color, and identification of pigment lot(s) to be used for the Work.

G. DCOF Test Report: Independent testing laboratory report, performed on the mock-up in accordance with ANSI A326.3, verifying a wet Dynamic Coefficient of Friction (DCOF) of not less than 0.60 for the completed, sealed, rock salt finished surface.

1.06 QUALITY ASSURANCE:

A. Manufacturer Qualifications: Specializing in manufacturing products specified in this section with a minimum five years documented experience.

B. Installer Qualifications: Specializing in performing Work of this section with minimum two years documented experience with projects of similar scope and complexity.

C. Source Limitations: Provide each type of product from a single manufacturing source to ensure uniformity.

D. Mock-Up: Construct a mock-up not less than 4 feet by 4 feet, incorporating the specified integrally colored concrete, rock salt finish, and sealer, using actual materials, the same crew, and the same placement, finishing, curing, wash-out, and sealing procedures proposed for the Work, in sufficient time for Officer-in-Charge's review and to not delay construction progress. Locate mock-up at an in-place area of the actual Work, as acceptable to Officer-in-Charge, so that the mock-up may be incorporated into the completed Work if accepted.

1. Intent of mock-up is to demonstrate color uniformity, rock salt texture depth and uniformity, wet slip resistance (DCOF), sealer appearance, and overall quality of workmanship.

2. Retention: If accepted by Officer-in-Charge, the mock-up may remain as part of the completed Work.

3. If mock-up is not acceptable, rebuild mock-up until satisfactory results are achieved.

4. Retain mock-up during construction as a standard for comparison with completed work.

5. Do not alter or remove mock-up until work is completed or removal is authorized.

1.07 PRE-INSTALLATION MEETING:

A. Convene a meeting approximately two weeks before scheduled commencement of the Work. Attendees shall include Officer-in-Charge, Contractor and trades involved. Agenda shall include schedule, responsibilities, critical path items and approvals.

1.08 DELIVERY, STORAGE, AND HANDLING:

A. Store and handle in strict compliance with manufacturer's written instructions and recommendations.

B. Protect from damage due to weather, excessive temperature, and construction operations.

1.09 PROJECT CONDITIONS:

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

B. Do not place, finish, or salt-texture integrally colored concrete during rainfall or when rainfall is forecast prior to final set and embedment of rock salt. Protect freshly placed and finished concrete from rain, foot traffic, staining materials, and other construction operations until initial cure is achieved.

1.10 WARRANTY:

A. Manufacturer's standard limited warranty unless indicated otherwise.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

A. Bases of Design:

1. Integral Color System: Sika Corporation or approved substitute.

2. Sealer: Sika Corporation or approved substitute.

3. Rock Salt: Clean rock salt complying with Part 2 “Rock Salt Finish Materials” of this Section.

2.02 INTEGRAL COLOR SYSTEM (FOR READY-MIX CONCRETE) :

A. Basis of Design: Sika Corporation SikaColor-120 G integral color system, made from UV-resistant synthetic iron oxide pigments complying with ASTM C979, or approved substitute.

1. Streak-free, non-fading, uniform color throughout the full depth and across the full extent of the slab-on-grade.

2. UV Resistant Color.

3. Moisture tolerant and breathable.

B. Color: C12 Mesa Beige, or approved substitute; final color and appearance subject to Officer-in-Charge's approval of mock-up.

C. Dosage: Add integral color to concrete at the ready-mix batch plant per manufacturer's written mix design instructions and at the rate necessary to achieve full, uniform color saturation. Do not add color at the jobsite.

D. Lot Consistency: Provide integral color pigment from a single production lot for the entire quantity required to complete the Work. Where more than one lot is unavoidable, submit samples of each lot for Officer-in-Charge's approval before use and coordinate placement sequencing to minimize visible variation.

E. Mix Consistency: Maintain consistent water-cementitious materials ratio, slump, cement source, and aggregate source throughout the Work, per Section 02775, to avoid color variation between placements. Do not use calcium chloride or other chloride-based accelerating admixtures in integrally colored concrete; where an accelerator is required, use a non-chloride, non-staining type acceptable to the color system manufacturer.

2.03 ROCK SALT FINISH MATERIALS:

A. Rock Salt: Clean, hard, dry, granular rock salt, coarse rock salt of the type sold for use in water softeners, as a deicer, or similar; free of dirt, foreign matter, and fine particles capable of causing blotching or discoloration; gradation 1/8 inch to 3/8 inch unless otherwise indicated.

B. Storage: Store rock salt in a dry, covered location until use. Do not use salt that has become wet, caked, or contaminated.

C. Performance Requirement: Rock salt finish, after wash-out and sealing, shall produce a uniformly textured, non-slip surface with a wet Dynamic Coefficient of Friction (DCOF) of not less than 0.60 when tested in accordance with ANSI A326.3.

2.04 SEALER:

A. Basis of Design: Sika Corporation; SCOFIELD SelectSeal Plus, or approved substitute.

B. Performance: Breathable, non-yellowing, UV stable, compatible with the specified integral color system, and formulated so as not to reduce the wet DCOF of the finished, rock salt textured surface below 0.60. Provide manufacturer's slip-resistant additive, blended into the sealer per manufacturer's written instructions, if needed to maintain this minimum.

C. VOC Compliance: Comply with applicable state and local air quality management district VOC content limits for concrete sealers.

PART 3 - EXECUTION

3.01 EXAMINATION:

A. Do not begin installation until substrates have been properly constructed and prepared.

B. If substrate preparation is the responsibility of another installer, notify the Officer-in-Charge in writing of unsatisfactory preparation before proceeding.

C. Verify concrete slab-on-grade has been placed and floated in accordance with Section 02775 and has reached the proper stage of plastic set to receive

rock salt, per ACI 302.1R and manufacturer's recommendations, before beginning rock salt finish operations.

D. Do not proceed with placement, coloring, or rock salt finishing operations during rainfall or when rainfall is forecast before final set and embedment can be achieved.

3.02 PREPARATION:

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION:

A. Install in accordance with manufacturer's instructions, approved submittals, and in proper relationship with adjacent construction.

1. Rock Salt Finish: Ensure concrete surface has a smooth finish before applying rock salt. Broadcast rock salt uniformly by hand over the floated, still-plastic concrete surface at a rate of approximately 8 pounds per square foot, distributed evenly across the surface without overlap or bare areas. Work crystals into the concrete as it begins to set, embedding each crystal a minimum of 1/8 inch and a maximum of 1/4 inch into the surface by rolling or floating, leaving the balance exposed. Do not depress salt below the surface or force it through to the underlying concrete. Ensure consistency in salt distribution and embedment depth from one concrete pour to another, consistent with the accepted mock-up.

2. Curing: Cure concrete by a method compatible with subsequent salt wash-out, per Section 02775 and manufacturer's recommendations. Do not apply a curing compound that would seal embedded salt into the surface prior to wash-out.

3. Wash-Out: After concrete has cured sufficiently to prevent surface damage (not less than 24 hours, and as recommended by manufacturer and Section 02775), wash and brush the surface with clean water to fully dissolve and remove all embedded rock salt, leaving a clean, uniformly pitted texture free of salt residue, blotching, or discoloration.

4. Protection: Protect finished surface from rain, foot traffic, and other construction operations until wash-out and initial cure are complete.

B. Integral Color: Place, finish, and cure integrally colored concrete in accordance with the color system manufacturer's written instructions, Section 02775, and the approved mock-up. Use the same curing method over the

entire placement and avoid partial or uneven coverage of curing materials, which causes visible color blotching.

C. Sealer: Apply sealer only after rock salt wash-out is complete and the concrete has cured for the minimum period recommended by the sealer manufacturer. Verify surface is clean, dry, and free of salt residue, laitance, efflorescence, and incompatible curing compound residue before application. Apply per manufacturer's written instructions and coverage rate.

3.04 FIELD QUALITY CONTROL:

A. Field Inspection: Coordinate field inspection in accordance with appropriate sections in Division 1.

B. Manufacturer's Services: Coordinate manufacturer's services in accordance with appropriate sections in Division 1.

C. DCOF Testing: Engage an independent testing laboratory to verify, in accordance with ANSI A326.3, that the completed, sealed, rock salt finished surface achieves a wet Dynamic Coefficient of Friction (DCOF) of not less than 0.60 prior to Substantial Completion. Repair or re-treat areas not meeting this minimum as directed by Officer-in-Charge, at no additional cost.

3.05 CLEANING AND PROTECTION:

A. Clean products in accordance with the manufacturer's recommendations.

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

END OF SECTION

# DIVISION 3 – CONCRETE

## SECTION 03620 – NON-SHRINK GROUTING

## PART 1 - 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:

A. Section includes: Grout under column base plates, and elsewhere as shown on the Drawings and required by job conditions.

1.03 SUBMITTALS:

A. Data: Submit manufacturer's product data, specifications, and other data as necessary to demonstrate compliance with the specified requirements for each type of grout proposed for use.

1.04 HANDLING:

A. Delivery:

1. Deliver materials to project site in original unopened packages, clearly labeled with manufacturer's identification labels intact and legible, indicating manufacturer's name, brand, type, source of product, date of manufacture, UL classification, expiration date, and grade.

2. Protect materials from excessive moisture in shipment, storage, and handling.

B. Storage: Store materials indoors, off the ground on pallets, protected with breathing type covers.

1.05 PROJECT CONDITIONS:

A. Do not install grout under adverse weather conditions or when temperature, humidity, or other environmental requirements are beyond manufacturer's recommended limits.

1.06 SEQUENCING:

A. Obtain setting templates from affected trades where the spacing and alignment of anchors, bolts, and similar items is critical.

B. Embed anchors, bolts, inserts, and other items in grout as the Work progresses.

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS:

A. Basis of design is for “Crystex” high flow, non-shrink grout by L & M Construction Chemicals, Inc. Other acceptable materials/manufacturers include the following:

1. “Masterflow 713” by Master Builders.

2. “Five Star Grout” by US Grout Corp.

3. Or approved substitute.

### 2.02 MATERIALS:

A. Grout: Pre-packaged, non-metallic, non-gaseous, non-shrinking when tested in accordance with ASTM C1107 Grade B or C at a fluid consistency (flow cone) of 20 to 30 seconds.

1. 30-minute old grout shall flow through flow cone after slight agitation, in temperatures of 40 to 0 degrees F.

2. Grout shall be bleed-free.

B. Grout strength:

1. Under base plates for steel columns: Minimum 7,500 psi 28-day strength.

2. At non-structural locations: Minimum 4,000 psi 28-day strength.

## PART 3 - EXECUTION

### 3.01 EXAMINATION:

A. Examine substrates and surfaces to receive materials, and conditions under which materials will be applied.

B. Verify surfaces to receive grout are free from dust, construction debris, oil, grease, waxy films, curing compounds, release agents, and other deleterious materials that would negatively affect the quality of installation, durability, and material performance.

C. Correct conditions detrimental to the proper and timely completion of this work before proceeding with installation.

3.02 PREPARATION:

A. Concrete surfaces:

1. Clean concrete and surfaces that will be in contact with grout of dust, construction debris, form oil, curing compound, and other contaminants.

2. Roughen concrete surfaces by chipping or sandblasting to expose coarse aggregate.

3. Presoak concrete surfaces thoroughly for not less than 24 hours prior to grouting to reduce their suction.

B. Steel: Remove loose rust and scale, oil, dirt, and other contaminants.

C. Correct conditions detrimental to the proper and timely completion of this work before proceeding with installation.

3.03 COORDINATION:

A. Obtain setting templates from affected trades where the spacing and alignment of anchors, bolts, and similar items is critical.

B. Embed anchors, bolts, inserts, and other items in grout as the work progresses.

3.04 INSTALLATION:

A. Mix grout with recommended amount of water in a mixer, all in compliance with its manufacturer's instructions. Do not place grout when ambient temperature is not within the range recommended by its manufacturer.

B. Construct watertight forms around base plates to provide an approximately one-inch clearance on 3 sides, and additional clearance on the fourth side as necessary to accommodate the flow box into which the grout will be placed and funneled under the base plates.

C. Grouting under base plates:

1. Place grout under base plates to the thickness indicated on the Drawings, but in no case less than one inch.

2. Wherever possible place grout from one side only to minimize cold joints and air entrapment. Use rods and straps to move grout to its final location. To prevent bleeding and segregation, avoid the use of vibrators.

3. Place grout at least 1/4-inch above the bottom of the base plate to insure complete filling of the grout space.

4. Cut grout shoulders back at a 45 degree angle from the base of the plate to the concrete foundation just before the grout hardens.

D. Railing posts, anchor bolts, frames, sills, and similar items:

1. Roughen inside surfaces of grout pocket before proceeding.

2. Brace items plumb and level and leave bracing in place until grout reaches its full strength. Finish grout flush with adjacent surfaces.

E. Curing: Cure grout in compliance with its manufacturer's printed instructions to prevent rapid evaporation of water and shrinkage cracks.

END OF SECTION

# DIVISION 5 – METALS

## SECTION 05120 – STRUCTURAL STEEL

## PART 1 - 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:

A. Section includes:

1. Extent of structural steel work shown on Drawings including schedules, notes, and details for size and location of members, and type of steel required or as required to complete the work.

2. Structural steel is that work defined in American Institute of Steel Construction (AISC) “Code of Standard Practice”, as required to provide support for exterior cladding shading devices, skylights, interior construction, and as otherwise shown on drawings.

3. Members and Connections: Details shown are typical; similar details apply to similar conditions unless otherwise indicated. Verify dimensions at site without causing delay in work. Where connections to existing steel are required, promptly expose the existing steel and verify dimensions and conditions at site without causing delay in work.

a. Promptly notify Owner’s Representative whenever design of members and connections for any portion of structure are not clearly indicated.

B. Related work:

1. Division 3 – Concrete for non-shrink grout.

2. Division 5 – Metal.

3. Division 9 – Painting and Coating.

1.03 REFERENCES:

A. Codes and Standards: Comply with provisions of following, based on the latest edition, except as otherwise indicated:

1. 2018 International Building Code (IBC).

2. American Institute of Steel Construction (AISC) Manual of Steel Construction (LRFD), Fourteenth Edition, including Specification for Structural Steel Buildings (AISC 360-16).

3. AISC Code of Standard Practice for Steel Buildings and Bridges (2016).

4. American Welding Society (AWS) Structural Welding Code (AWS D1.1).

5. AWS D1.8 Structural Welding Code – Seismic Supplement.

6. Welding Zinc-Coated Steel (AWS D19.0).

7. Research Council on Structural Connections (RCSC) Specification for Structural Joints Using A325 or A490 Bolts.

8. American Society of Civil Engineers (ASCE) Minimum Design Loads for Buildings and other Structures (ASCE 7-16).

9. American Society of Testing Materials (ASTM) General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use (ASTM A6).

10. Steel Structures Painting Council (SSPC) “Steel Structures Painting Manual”.

11. American Concrete Institute (ACI) Building Code and Commentary (ACI 318).

12. AISC “Specifications for Architecturally Exposed Structural Steel”.

1.04 SUBMITTALS:

A. Product Data: Submit for information producer or manufacturer’s specifications and installation instructions for the following products. Include laboratory tests reports and other data to show compliance with specifications (including specified standards).

1. Structural steel (each type), including certified copies of mill reports covering chemical and physical properties.

2. High-strength bolts (each type), including nuts and washers.

3. Structural steel primer paint.

4. Shrinkage-resistant grout.

B. Shop Drawings: Submit for action detailed, coordinated, and checked shop drawings for all structural steel components prior to the start of fabrication and/or erection. Shop drawings shall show:

1. Items as required by AISC 360, AISC 341, and Code of Standard Practice.

2. Shop drawings for structural members requiring penetrations shall contain a statement confirming that the Contractor has coordinated the location and size of all the openings.

3. Shop drawings stamped and signed by licensed Professional Engineer for all back up support steel framing (HSS sections, angles, plates, etc.) as required for exterior cladding systems to be designed and detailed as specified in related sections.

C. Erection Drawings: Submit for action detailed, coordinated, and checked erection drawings for all structural steel for review prior to the start of fabrication and/or erection. Erection drawings shall show:

1. Items as required by AISC 360, AISC 341, and Code of Standard Practice.

D. Test Reports: Submit for information copies of reports of tests conducted on shop and field bolted and welded connections. Include data on type(s) conducted and test results and state either compliance or non-compliance with specifications.

E. Welding Procedure Specifications:

1. Submit for action Welding Procedure Specifications (WPS) for each weld to be used on the Project. Reference WPS on the shop and erection drawings where they are to be used. Submittals consisting of additional WPS not specifically referenced on the shop or erection drawings will be rejected. The Contractor shall also submit the manufacturer's product data sheets for all welding material to be used and shall use the more stringent of AWS and manufacturer tolerances in developing WPS. The data sheets shall describe the product, limitations of use, recommended welding parameters, and storage and exposure requirements, including baking and rebaking, if applicable.

2. Welding Procedure Specifications (WPS) shall specify the items, tolerances and variables required by AWS D1.1 and D1.8.

3. Submit for action Welding Procedure Qualifications when proposed welds are not defined as prequalified by AWS D1.1.

F. Welder Performance Qualification Records (PQR): The Contractor shall submit written PQR for all welding personnel under the Contractor's supervision who will be performing on the Project. The PQR shall document the successful completion of the appropriate welding personnel qualification tests. All welder qualification testing shall be performed in accordance with

the current or a previous version of AWS D1.1. The Contractor shall also submit additional documentation that the welder has passed all designated supplemental welder qualification testing required for the types of welding to be performed, including Supplemental Welder Qualification for Restricted Access Welding in Annex C of AWS D1.8.

G. Contractor's Statement of Responsibility: Each Contractor responsible for the work shall submit a written Statement of Responsibility prior to commencement of the work. The statement shall contain the following:

1. Acknowledgement of awareness of the special requirements contained in the Quality Assurance, Quality Control, and the Submittals Sections of this Specification, special requirements contained in all reinforced codes and standards, and an acknowledgement of the special requirements contained in the statement of special inspection.

2. Acknowledgement that control will be exercised to obtain conformance with the construction documents.

3. Procedures for exercising control within the Contractor's organization, the method and frequency of reporting, and the distribution of reports.

4. Identification and qualifications of the person(s) exercising such control and their position(s) in the organization.

1.05 DELIVERY, STORAGE, AND HANDLING:

A. Deliver materials to site at such intervals to ensure uninterrupted progress of work.

B. Deliver anchor bolts, templates, and anchorage devices, which are to be embedded in cast-in-place concrete or masonry, in ample time to not delay work.

C. Store materials to permit easy access for inspection and identification. Keep steel members off ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.

D. Store weathering steel and galvanized steel above ground, under cover, separated from one another with strip spacers, in a dry, well-ventilated conditions to avoid wet storage stains.

E. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as approved.

1.06 QUALITY ASSURANCE AND QUALITY CONTROL:

A. Source Quality Control: Materials and fabrication procedures are subject to inspection and test in mill, shop, and field, conducted by a qualified inspection agency. Such inspections and tests will not relieve Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements.

1. Promptly remove and replace materials or fabricated components that do not comply.

B. Qualification of Welding: Qualify welding processes and welding operators in accordance with American Welding Society "Structural Welding Code," AWS D1.1 and ASW A4.3 "Standard Qualification Procedure."

1. Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests.

2. Welding personnel shall be qualified in accordance with AWS D1.1, Section 4, Parts A and C. Welders who have not used the given welding process for a period of six or more months shall be re-qualified. Welders whose work routinely exhibits poor workmanship in the opinion of the Owner's Representative shall be re-qualified without additional cost to the Owner before performing further welding.

3. PQR testing performed more than six months prior to the start of the welding by the welder is acceptable, provided written documentation is submitted showing that the welder has continued to use the applicable welding process on an ongoing basis since the test was conducted, with no lapse in service exceeding six months.

C. Inspection and Testing Agency:

1. Owner will select an independent testing and inspection agency to perform the inspections and tests listed in Division-1, Quality Control, as required by AISC 360, AISC 341, or as shown on the Drawings, to inspect high-strength bolted connections and welded connections and to perform tests and prepare test reports.

2. Testing Agency: Conduct and interpret tests and state in written reports whether test specimens comply with requirements and specifically state any deviations there from.

3. Contractor shall provide access for testing agency to places where structural steel work is being fabricated or produced so that required inspection and testing can be accomplished.

4. Testing agency may inspect structural steel at plant before shipment; however, Owner's Representative reserves the right, at any time before final acceptance, to reject material not complying with specified requirements.

5. Contractor shall correct deficiencies in structural steel work which inspections and laboratory test reports have indicated to be not in compliance with requirements. Perform additional tests at Contractor's expense, as may be necessary to reconfirm any non-compliance of original work, and as may be necessary to show compliance of corrected work.

6. Testing Agency shall inspect and test as specified.

    a. Inspector qualifications shall be per AISC 341 Chapter J and AISC 360 Chapter N.

    b. Shop & Field Bolted Connections: Inspect in accordance with the Drawings, AISC 341 Chapter J and AISC 360 Chapter N.

    c. Shop & Field Welding: Inspect and test during fabrication and during field erection of structural steel assemblies per AISC 341 Chapter J and AISC 360 Chapter N.

        1) Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work and report rejectable weld defect rates greater than three percent for any given welder to the Owner's Representative. Record work required and performed to correct deficiencies.

        2) Perform visual inspection of each and all welds during the welding work and confirm use of proper WPS. Welds executed not in conformance with WPS shall be considered rejectable.

1.07 PRE-FABRICATION / PRE-ERECTION CONFERENCES:

A. Prior to performing any fabrication or erection work, the Owner's Representative, Quality Assurance Personnel, Inspectors, and Contractor personnel supervising shop, field, and Quality Control work shall hold a Pre-Fabrication and Pre-Erection Conference to review welding procedures and inspection requirements for all welding and bolting operations.

## PART 2 - PRODUCTS

2.01 MATERIALS:

A. Metal Surfaces, General: For fabrications of work which will be exposed to view, use only materials which are smooth and free of surface blemishes

including pitting, rust and scale seam marks, roller marks, rolled trade names and roughness. Remove such blemishes by grinding and repair as specified in AWS D1.1, prior to cleaning, treating and application of surface finishes.

B. Structural Steel Shapes, Plates and Bars: as indicated on the Drawings.

1. Finish: Shop primed except where indicated to be galvanized or to be

C. left unpainted. Cold-Formed Steel Tubing: ASTM A500, Grade C.

1. Finish: Shop primed except where indicated to be galvanized or to be left unpainted.

D. Steel Pipe: ASTM A53, Type E or S, Grade B.

1. Finish: Shop primed except where indicated to be galvanized or to be left unpainted.

E. Shear Stud-Type Connectors: ASTM A108, Grade 1015 or 1020, cold finished carbon steel; with dimensions complying with AISC Specifications and Type B per AWS D1.1, Sections 7.2 and 7.3. (Nelson Shear Connector Studs or approved substitute); sized as indicated.

F. Provide hexagonal nuts for all connections.

G. Unfinished Threaded Fasteners: ASTM A307, Grade A, regular low-carbon steel bolts and nuts, only where indicated.

1. Provide hexagonal heads and nuts for all connections.

H. High Strength Threaded Fasteners: Heavy hexagon structural bolts, heavy hexagon nuts, and hardened washers as follows:

1. Quenched and tempered medium-carbon steel bolts, nuts, and washers, complying with ASTM A325, unless noted otherwise.

2. [Quenched and tempered steel bolts, nuts, and washers, complying with ASTM A490.

3. Direct tension indicator washer-type bolts per ASTM F959, or twist-off-type tension control bolts per ASTM F1852 shall be used at all pre-tensioned bolts.]

I. Electrodes for Welding: Welding material shall comply with AWS A5.1, A5.5, A5.17, A5.18, A5.20, A5.23, A5.25, A5.26, A5.28, A5.29, and A5.33.

1. The filler metals shall be classified as low hydrogen under the provisions of AWS D1.1.

J. Structural Steel Primer Paint: Fabricator's standard rust-inhibiting primer. Rust-inhibiting, long oil alkyd, Tnemec, or approved substitute and shall be formulated for exterior exposure for extended periods up to 1 year. Rust-inhibiting, long oil alkyd, Tnemec 90-97 Gray, and Tnemec Uni-Bond 115, or approved substitute, for interior exposures.

## PART 3 - EXECUTION

### 3.01 FABRICATION:

A. Fabricate structural steel in accordance with the AISC Specifications with the modifications and additional requirements specified herein and as indicated on the Drawings.

B. Shop Connections: Weld or bolt as indicated on the drawings or as otherwise required.

C. Bolt field connections except where welded connections are indicated. Use high-strength threaded fasteners for all bolted connections, except where unfinished bolts are indicated.

D. Install high strength threaded fasteners in accordance with RCSC Specification for Structural Joints.

E. Welded Construction:

1. Each welder working on the Project shall be assigned an identification symbol or mark. Each welder shall mark or stamp his or her identification symbol at each weldment completed. Stamps, if used, shall be the low-stress type.

2. WPS's shall be available to welders and inspectors prior to and during the welding process. Prior to welding, joint fit-up shall be verified by the welder for conformance with the WPS and AWS D1.1.

3. Welding shall be performed in accordance with the appropriate WPS for the joint.

4. Groove welds shall be complete joint penetration groove welds, unless specifically designated otherwise on the Drawings. Groove preparation details are at the Contractor's selection, subject to qualification, if required, in accordance with AWS D1.1.

5. Weld tabs shall be in accordance with AWS D1.1 Section 5.31 as modified herein. End dams shall not be used.

6. Backing shall be in accordance with AWS D1.1 Section 5.10, AISC 341 or as shown on the Drawings.

7. Faces of fillet and groove welds exposed to view shall have as-welded surfaces that are reasonably smooth and uniform. Unless indicated on the Drawings as required by AISC 341 or AISC 358, or as required for Architecturally Exposed Structural Steel, no finishing or grinding shall be required, except where clearances or fit of other items may so necessitate.

8. For all CJP and PJP groove welds subjected to ultrasonic testing (UT), a visible mark shall be placed as required by AISC 341.

F. Bolted Construction: Store fasteners in a protected place. Except for ASTM F1852 “twist-off” type assemblies, clean and relubricate bolts, nuts and washers that become dry or rusty before use. F1852 fastener components may be relubricated following the manufacturer’s written instructions and must be retested after relubrication and prior to use to verify suitability for installation.

1. Do not use flame cutting to align bolt holes except as permitted by RCSC specification.

2. Ream holes that must be enlarged to admit bolts. Do not enlarge holes by more than 1/32 inch. Should additional reaming beyond 1/32 inch be necessary, drill or ream to the next larger hole size and use the next larger size bolt, with Owner’s Representative approval.

3. Bolt holes may be made by punching or drilling. Bolt holes may also be made by thermal cutting to a smaller diameter, followed by reaming to the required diameter.

3.02 COLUMN BASES, BEARING PLATES & ANCHOR RODS:

A. Provide column base plates, anchor rods, templates and leveling plates as noted in the Drawings.

B. Provide bearing plates under beams resting on footings, piers, or walls.

C. Mill or press level column bases, bearing plates, and leveling plates as required. Provide loose plates for setting.

3.03 MISCELLANEOUS STEEL SUPPORT FRAMING:

A. Select members that are true and straight for fabrication of steel wall framing. Straighten as required to provide uniform, square, and true members in completed wall framing.

3.04 HOLES FOR OTHER WORK:

A. Provide holes where indicated or as required for securing other work to steel framing, and for the passage of such work through steel framing members, as shown on approved shop drawings.

B. Provide threaded nuts welded to framing and other specialty items as indicated to receive other work.

C. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame cut holes or enlarge holes by burning. Drill holes in bearing plates.

3.05 SHOP PAINTING:

A. General: Shop paint structural steel, except those members or portions of members to be embedded in concrete or mortar. Paint embedded steel, which is partially exposed on exposed portions and initial 2-inches of embedded areas only.

1. Do not paint surfaces that are to be welded or high-strength bolted with friction-type connections.

2. Do not paint surfaces that are scheduled to receive sprayed-on fireproofing.

3. Apply 2 coats of paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

4. Interior items: Shop prime with shop primer indicated.

5. Exterior items: Shop prime with shop primer indicated.

B. Surface Preparation: After inspection and before shipping, clean steelwork to be painted. Remove loose rust, loose mill scale, and spatter, slag or flux deposits. Clean steel in accordance with SSPC as follows:

1. SP-1 “Solvent Cleaning.”

2. SP-2 “Hand Tool Cleaning”

3. SP-6 “Commercial Blast Cleaning” when extended field exposure is expected.

C. Painting: Immediately after surface preparation, apply structural steel primer paint in accordance with manufacturer’s instructions and at a rate to provide dry film thickness of not less than 1.5 mils. Use painting methods that result in full coverage of joints, corners, edges and exposed surfaces. Apply two coats of paint to surfaces that are inaccessible after assembly or erection.

3.06 INSTALLATION:

A. Erect structural steel in accordance with the AISC Specifications, AISC 358 and AISC Code of Standard Practice, with the modifications and additional requirements specified herein.

B. Provide suitable and safe erecting equipment for workman. Maintain equipment in a safe and stable condition until the steel structure is fully self-supporting. Conform to the requirements governing safety and health regulations for construction equipment and construction safety.

3.07 ANCHOR RODS:

A. Provide anchor rods, leveling plates, and other connections between the structural steel and foundations for setting as specified in Section 03300 – Cast-in-Place Concrete. Provide templates with the anchor rods as may be required to locate the anchor rods and other connections accurately and correctly. Check and verify vertical and horizontal alignment of anchor rods before setting of structural steel. If any errors are noted, make corrections.

3.08 FIELD ASSEMBLY:

A. Accurately assemble structural steel framing to the lines and elevations indicated. Align and adjust the various members forming parts of a completed frame or structure before permanently fastening. Fasten splices of compression members after the abutting surfaces have been brought completely into contact. Clean all bearing surfaces that will be in permanent contact before the members are assembled.

B. Temporarily connect all members with sufficient bolts to ensure the safety of the structure until permanent connections are made. Provide all temporary guys, braces, etc., necessary to protect the framing against wind and construction loadings and maintain the structure plumb and in proper alignment until such time as the work of other trades is in place and the structure is complete.

C. Level and plumb individual members of structure and the structure as a whole per AISC tolerances or as otherwise detailed on the Drawings, whichever is more stringent. Coordinate tolerances requirements prior to fabricating and erecting steel.

D. Establish required leveling and plumbing measurements on mean operating temperature of structure. Make allowances for difference between temperature at time of erection and mean temperature at which structure will be when completed and in service.

E. If members do not fit properly in the field, drill necessary new holes as approved by the Owner’s Representative. When required by the Owner’s

Representative and without additional cost to the Owner, provide structural calculations stamped and signed by a licensed Professional Engineer demonstrating that the revised connection satisfies the design intent shown on the Drawings.

F. Members that are warped or bent may be rejected if, in the opinion of the Owner's Representative, they are unserviceable. Otherwise, correct bent or warped members to the satisfaction of Owner's Representative before being erected.

G. Splices will be permitted only where indicated. All erection bolts used in welded construction may be tightened securely and left in place; if erection bolts are removed, fill holes with plug welds.

H. The bracing and adequacy of temporary connections, and the removal of paint on surfaces adjacent to field welds shall be as specified in the AISC Specifications.

I. Erect columns and attached base plates using non-shrink grout; verify grout pad levels and construction before proceeding with the work. Securely brace and guy columns and hold them plumb in line until bolting has been completed.

J. Tighten anchor rods after supported members have been positioned and plumbed.

3.09 CONNECTIONS:

A. All shop and field connections to be welded or high-strength bolted unless otherwise indicated.

B. Completely fabricate all items of structural steel that are to be built into or anchored into masonry or concrete, complete with bolts, anchors, clips, stud anchors, etc., to engage with the adjacent construction.

C. Only light drifting will be permitted to draw parts together. Drifting to match unfair holes will not be permitted. Any enlargement of holes necessary to make connections shall be done by reaming and twist drills with the use of proper size bolts.

D. Correct any error in shop or field work which prevents the proper assembling and fitting of parts by the moderate used of drift pins or a moderate amount of reaming and slight clipping or cutting at the expense of the Contractor.

3.10 SURFACE FINISH:

A. Flush Surfaces: Welds in butt joints required to be flush shall be finished so as to not reduce the thicknesses of the thinner base metal or weld metal by

more than 1/32 inch or 5% of the material thickness, whichever is less. Remaining reinforcement shall not exceed 1/32 inch in height. However, all reinforcement shall be removed where the weld forms part of a faying or contact surface. All reinforcement shall blend smoothly into the plate surfaces with the transition areas free from undercut.

B. Finish Methods and Values: Chipping and gouging may be used, provided these methods are followed by grinding. Where surface finishing is required, surface roughness values shall not exceed 250 microinches, unless otherwise noted or specified in this Specification. Regardless of the surface finish required, the direction of grinding marks may be in any direction.

C. Measurement of surface finish values by visual appearance or tactile comparison is acceptable.

3.11 WELD ACCEPTANCE CRITERIA:

A. Owner's Representative's Authority: Welds or portions of welds that fail to meet the acceptance criteria of AWS D1.1 shall be repaired or replaced. The Contractor may request acceptance by the Owner's Representative of a weld discontinuity without repair or replacement when the Contractor can prove that the effect of the discontinuity will not be detrimental to the performance of the structure. The Owner's Representative is the final authority for acceptance of such welds.

B. Regions of welds that cannot be inspected shall be identified and recorded and the Owner's Representative shall be notified in writing.

C. Ultrasonic Testing – Flaw Detection: When ultrasonic testing is required, the joint shall be scanned for flaw detection purposes following the procedures prescribed in AWS D.1.1, Annex S, with exceptions as noted below. Joints that fail the acceptance criteria described below may be inspected using the Ultrasonic Testing – Flaw Sizing methods as prescribed in this Specification or, at the Contractor's option, may be excavated for further investigation and repaired, then reinspected using these Flaw Detection procedures.

D. PJP groove welds joints shall not be rejected on the basis of indication ratings (db values) from the root area of the weld. Notches within the weld, located a distance more than 1.8 inch from the as-welded root, shall be scanned for acceptance using the criteria above.

3.12 GAS CUTTING:

A. The use of a gas cutting torch in the field for correction fabrication errors will not be permitted on any member in the structural framing unless approval of the Owner's Representative has been obtained.

3.13 CORRECTIVE WORK:

A. There shall be no field cutting or alteration of structural steel members or connections without prior review by the Owner's Representative.

B. Structural elements having errors or which do not satisfy tolerance limits shall be repaired. Repairs to structural steel, fasteners and welds shall be as required by AISC Specifications, AISC 358, AWS D1.1, and AWS D1.8.

C. Submit drawings showing reasons for and detail of proposed corrective work for approval by the Owner's Representative prior to performing corrective work. Corrective work shall be performed in accordance with the requirements of the Contract Documents accompanied by a repair procedure and substantiating calculations prepared by a licensed Professional Engineer.

3.14 TOUCH-UP:

A. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint. Apply paint to exposed areas using same material as used for shop painting.

B. Apply by brush or spray to provide minimum dry film thickness of 1.5 mils.

C. Provide cleaning and touch-up painting of field welds, bolted connections, and abraded areas of shop paint on structural steel.

D. For touching-up of galvanized steel, comply with AHDGA "Recommended Practice for Touchup of Damaged Galvanized Coatings", and ASTM A780.

3.15 TEMPORARY PLANKING:

A. Provide temporary planking for the safety of workmen and for the working platforms as required. Such temporary planking to remain in place until approved to be removed from the Project site.

END OF SECTION

# DIVISION 5 – METALS

## SECTION 05500 – METAL FABRICATIONS

## PART 1 - 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:

A. Section Includes: Miscellaneous metal fabrications indicated on Drawings and not specified in other Sections.

B. Related Work:

1. Division 5 – Metals.

2. Division 8 – Doors and Windows.

1.03 REFERENCES:

A. American Society for Testing and Materials (ASTM) Publications:

1. ASTM A36/A36M - Carbon Structural Steel.

2. ASTM A500/A500M - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing.

3. ASTM A123/A123M - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

4. ASTM A153/A153M - Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

5. ASTM A307 - Carbon Steel Bolts, Studs, and Threaded Rod.

6. ASTM A780/A780M - Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.

B. American Welding Society (AWS):

1. AWS D1.1/D1.1M - Structural Welding Code - Steel.

1.04 SUBMITTALS:

A. Submit in accordance with Section 01300 – Submittals.

1. Product Data: Submit product data for manufactured components indicating type, finish, size, accessories, and anchorage details.

2. Shop Drawings: Indicate profiles, dimensions, fabrication and installation details, size and type of fasteners, welds, accessory items, shop finish and method of anchorage. Coordinate with Division 5 and Division 8 sections.

3. Informational Submittals: Certifications specified in Quality Assurance article.

1.05 QUALITY ASSURANCE:

A. Fabricator Qualifications: Specializing in fabrication of products of the type specified in this Section, with a minimum of five (5) years of documented experience.

B. Welding: Qualify welding procedures and welding personnel in accordance with AWS D1.1/D1.1M.

1.06 DELIVERY, STORAGE AND HANDLING:

A. Store metal products in a dry, well-ventilated and weather-tight place. Deliver and handle in order to avoid any type of damage to metal products.

1.07 WARRANTY:

A. Correct defective work within a one (1) year period after Date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Structural Steel Shapes and Plates: See Section 05120 – Structural Steel.

B. Steel Hollow Structural Sections (HSS): See Section 05120 – Structural Steel.

C. Fasteners: ASTM A307, hot-dip galvanized per ASTM A153/A153M where exposed to weather or in contact with galvanized members.

D. Post-Installed and Embedded Anchors: Torque-controlled expansion or chemical anchors, or wedge-type anchors for embedment in concrete; steel or stainless steel, hot-dip galvanized per ASTM A153/A153M where exposed.

E. Separation Coating: Polyurethane or epoxy-based separator for isolation of dissimilar metals, and for aluminum surfaces in contact with concrete or masonry.

F. Welding Electrodes: Comply with AWS D1.1/D1.1M.

2.02 FABRICATION:

A. Fabricate items to sizes, shapes, and profiles indicated, and as required for accurate fit and attachment to adjoining Work.

B. Form exposed work true to line and level with accurate angles and surfaces.

C. Weld connections continuously unless otherwise indicated; grind welds smooth and flush with adjoining surfaces where exposed to view.

D. Ease exposed edges to a uniform, minimum radius.

E. Coordinate work with Division 5 and Division 8 sections.

2.03 FINISHES:

A. Galvanizing: Hot-dip galvanize items exposed to exterior weather, in accordance with ASTM A123/A123M for fabricated steel shapes and ASTM A153/A153M for hardware and fasteners.

1. Repair damaged or uncoated areas of galvanized surfaces in accordance with ASTM A780/A780M.

B. Corrosion-Protective Coating: Refer to Section 09900 – Painting and Coating for the site-applied corrosion-protective coating system, surface preparation, mock-up, and adhesion testing requirements over galvanized steel members.

PART 3 - EXECUTION

3.01 EXAMINATION:

A. Coordinate and furnish setting drawings, templates, and instructions for installation of anchorages, inserts, and embedded items in concrete.

3.02 INSTALLATION:

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Separate dissimilar metals, and aluminum in contact with concrete or masonry, with separation coating specified in this Section.

C. Fasten work rigidly and securely to supports.

D. Field weld components shown on Drawings in accordance with AWS D1.1/D1.1M.

E. After erection, touch up welds, abrasions, and damaged finishes with touch-up paint specified in Section 09900 – Painting and Coating.

3.03 INSTALLATION TOLERANCES:

A. Plumb: Maximum 1/4 inch deviation per story or for every 12 feet in height, whichever is greater; non-cumulative.

B. Alignment: Maximum 1/8 inch offset.

C. Position: Maximum 1/4 inch deviation.

3.04 FIELD QUALITY CONTROL:

A. Field Weld Inspection: In accordance with AWS D1.1/D1.1M.

B. Non-Conforming Work: Make corrections or replace, and re-test.

3.05 CLEANING:

A. Clean field welds, bolted connections, and abraded areas; touch up damaged finishes to match adjacent surfaces.

END OF SECTION

# DIVISION 5 – METALS

## SECTION 05750 – PERFORATED METAL PANELS

### PART 1 - 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:

A. Section includes: Perforated metal sheet panels used to fabricate aluminum screens.

B. Related Sections:

1. Section 08120 – Sliding Aluminum Doors.

1.03 REFERENCES:

A. American Society for Testing and Materials (ASTM) Publications:

1. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus.

2. ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate.

3. ASTM G85 - Standard Practice for Modified Salt Spray (Fog) Testing.

B. American Architectural Manufacturers Association (AAMA):

1. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.

2. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.

1.04 SUBMITTALS:

A. Provide in accordance with Section 01300 – Submittals.

1. Product Data: Manufacturer's data for perforated aluminum panels and factory finish.

2. Shop Drawings: Panel layout, dimensions, perforation pattern, panel-to-structure attachment and anchorage details, and coordination with adjacent construction.

3. Sample: 8 by 10 inches minimum size sample in selected perforation pattern and finish.

4. Manufacturer's Qualification Statement.

5. Fabricator's Qualification Statement.

6. Installer's Qualification Statement.

1.05 QUALITY ASSURANCE:

A. Qualifications:

1. Manufacturer: Specializing in manufacturing perforated metal panels of the type specified, with not less than ten (10) years of documented experience.

2. Fabricator: Specializing in fabrication of products of the type specified in this Section, with a minimum of eight (8) years of documented experience and sufficient production capacity to produce the required units within the Project schedule.

3. Installer: Specializing in installation of decorative perforated metal panel systems, with a minimum of five (5) years of documented experience, and certified or approved by the manufacturer.

B. Mock-up:

1. Prior to fabrication of Work of this Section, construct a mock-up incorporating a representative section of perforated metal panel, including perforation pattern, panel-to-panel joint, panel attachment to supporting framing, edge condition, and finish, to verify selections made under Sample submittals and to demonstrate aesthetic effects and set the standard of quality for materials and execution.

2. Locate mock-up where directed by Officer-in-Charge.

3. Obtain Officer-in-Charge's written approval of mock-up before commencing fabrication of remaining Work of this Section.

4. Approved mock-up may become part of the completed Work if undisturbed and approved in writing at time of Substantial Completion; otherwise, remove mock-up and dispose of off-site.

C. Pre-Installation Conference:

1. Convene a pre-installation conference minimum one week prior to commencing Work of this Section. Required attendees include the Contractor, panel manufacturer's representative, installer, Officer-in-Charge, Owner's representative, and other subcontractors of adjacent work.

2. Review installation procedures, panel attachment methods, tolerances, sequencing, field-cut edge-sealing requirements, and protection of finished Work.

1.06 DELIVERY, STORAGE, AND HANDLING:

A. Deliver panels in manufacturer's original protective coverings and packaging, with corresponding labels and identifying information.

B. Protect materials against damage during transit, delivery, storage, and installation at the site; protect against bending, warping, twisting, or surface damage. Store in accordance with manufacturer's written instructions and in a dry location.

1. Store panels flat, elevated above the floor or ground on non-staining, non-absorptive supports, and separate individual panels or bundles with interleaving material to prevent abrasion of finish surfaces and perforations.

2. Do not store panels in direct contact with concrete, masonry, or other alkaline or moisture-retaining materials that may cause staining or corrosion.

C. Inspect materials upon delivery for damage. Repair damage to be indistinguishable from undamaged areas; if damage cannot be repaired to be indistinguishable from undamaged parts and finishes, replace damaged items.

1.07 WARRANTY:

A. Correct defective work within a one (1) year period after Date of Substantial Completion.

B. Special Project Warranty: Submit manufacturer's standard warranty, executed by the panel manufacturer and installer, agreeing to repair or replace panels that fail due to defects in materials, fabrication, finishes, or installation within the warranty period.

1. Warranty Period: One (1) year from the date of Substantial Completion.

C. Special Finish Warranty: Submit manufacturer's standard warranty on FEVE and PVDF finishes, executed by the coating manufacturer, covering the factory-applied finish against cracking, checking, blistering, peeling, chalking, and color fade in excess of the finish manufacturer's published limits.

1. Warranty Period: Ten (10) years from the date of Substantial Completion, standard.

2. Extended Warranty Option: Confirm with manufacturer that the color and finish selected qualify for the extended term, as not all colors are eligible.

3. Coastal Exposure Confirmation: Obtain written confirmation from the coating manufacturer that the specified warranty period and coverage apply without reduction or exclusion for this Project's oceanfront location.

D. These special warranties are in addition to, and do not limit, other rights the Owner may have under the Contract Documents.

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS:

A. Manufacturer:

1. BOK Modern (Basis of Design)

2. Or approved substitute.

### 2.02 MATERIALS:

A. Perforated Aluminum Sheet: Aluminum Sheet, ASTM B209, Alloy 5052, Temper H32.

1. Thickness: Refer to Drawings

2. Sheet Size: Refer to Drawings.

B. Panel Shape and Size: Factory-cut perforated sheets into panels as indicated on Drawings.

C. Perforations: Pattern, hole size, and spacing as indicated on Drawings.

### 2.03 FABRICATION:

A. Cut and laser-cut metals cleanly and accurately; remove burrs and ease edges of perforations and panel edges.

B. Fabricate panels true to line and level with accurate dimensions, in accordance with approved shop drawings.

2.04 FINISHES:

A. Fluoropolymer Coating, complying with AAMA 2605:

1. Pretreat in accordance with manufacturer's instructions and AAMA 2605 to withstand not less than 3,000 hours (ASTM B117) or 2,000 hours (ASTM G85) salt-spray testing.

2. Basis of Design: PPG Duranar XL, or approved substitute.

3. Coating System: Provide coat count as required by the coating manufacturer for the color selected; confirm coating system with manufacturer once color is selected under the Finish Schedule.

B. Color: See Finish Schedule.

PART 3 - EXECUTION

3.01 EXAMINATION:

A. Verify structural framing and supporting substrate are complete, properly aligned, and ready to receive panels before beginning installation.

B. Do not proceed with installation until unsatisfactory conditions have been corrected; notify Officer-in-Charge of conditions that would prevent satisfactory installation.

3.02 PREPARATION:

A. Field verify required dimensions prior to panel fabrication.

B. Clean substrate surfaces thoroughly prior to installation.

3.03 INSTALLATION:

A. Install perforated aluminum panels to form the fixed screen wall assembly, attached to structural framing, in accordance with manufacturer's installation instructions and approved shop drawings.

B. Dissimilar Metals: Where perforated aluminum panels attach directly to galvanized steel framing or other dissimilar metals, isolate with bituminous coating, bushings, grommets, or washers to prevent electrolytic corrosion, in accordance with manufacturer's recommendations.

C. Concealed Contact Surfaces: Coat concealed surfaces of aluminum panels, posts, or supports that will be in contact with grout, concrete, masonry, or wood with a heavy coat of bituminous paint to prevent corrosion.

D. Field-Cut Edges: Where field cutting of panels is required, immediately seal exposed edges by removing metal shavings, applying an AAMA 2604 architectural grade primer for a compatible topcoat system, and applying two coats of AAMA 2604 topcoat system, in accordance with manufacturer's written instructions. Failure to seal field-cut edges as specified will void the manufacturer's warranty.

E. Touch-up damaged finish after installation with paint supplied by manufacturer, matching original coating.

3.04 FIELD QUALITY CONTROL:

A. Inspect completed installation for level, plumb, and alignment of panels; verify neat installation free of defects.

3.05 CLEANING:

A. Clean exposed metal finishes with potable water and mild detergent, in accordance with manufacturer's recommendations; do not use abrasive materials, chemicals, or other substances that may damage the finish.

B. Leave work area neat at the end of each work day; remove excess materials and debris from the site.

3.06 ADJUSTING AND PROTECTION:

A. Touch up and repair damage to exposed finishes to be indistinguishable from undamaged areas; if damage cannot be repaired to match, replace damaged items.

B. Protect installed panels and finishes from damage after installation.

END OF SECTION

# DIVISION 6 – WOOD AND PLASTICS

## SECTION 06730 – COMPOSITE DECKING

## PART 1 - 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:

A. Section Includes:

1. Composite wood decking.

2. Fasteners and accessories for composite decking.

1.03 REFERENCES:

A. ASTM D1761 - Standard Test Methods for Mechanical Fasteners in Wood and Wood-Based Materials.

B. ASTM D2394 - Standard Test Methods for Simulated Service Testing of Wood and Wood-Based Finish Flooring.

C. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.

D. ASTM D3345 - Standard Test Method for Laboratory Evaluation of Wood and Other Cellulosic Materials for Resistance to Termites.

E. ASTM D6109 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastic Lumber and Related Products.

F. ASTM D7031 - Standard Guide for Evaluating Mechanical and Physical Properties of Wood-Plastic Composite Products.

G. ASTM D7032 - Standard Specification for Establishing Performance Ratings for Wood-Plastic Composite and Plastic Lumber Deck Boards, Stair Treads, Guards, and Handrails.

H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

I. AWPA E7 - Standard Field Test for Evaluation of Wood Preservatives to be Used Under Ground Contact Conditions; Termite Resistance.

1.04 ACTION SUBMITTALS:

A. Product Data: For decking, metal framing anchors, and fasteners.

B. Samples: For decking materials, not less than 24 inches long, showing range of variation to be expected in appearance of decking, and representing the color, pattern, texture, and finish to be installed.

C. Shop Drawings: Provide shop drawings indicating details of construction, anchorage, and installation. Include statement that anchorage methods comply with applicable building codes and loadings for the type of framing and condition of the supporting construction and details.

D. Evaluation Reports: Current code-compliance evaluation report (e.g., ICC-ES, IAPMO-UES, or other ANAB-accredited approved-agency report) documenting compliance with ASTM D7032 for the product proposed, whether basis-of-design or substitute.

1.05 CLOSEOUT SUBMITTALS:

A. Manufacturer’s warranty documentation.

1.06 QUALITY ASSURANCE:

A. Installer: Minimum 2 years experience installing composite decking of similar type and scale to the work of this Section.

B. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.

1. Finish areas designated by Officer-in-Charge.

2. Do not proceed with remaining work until workmanship and appearance are approved by Officer-in-Charge.

3. Subject to approval by Officer-in-Charge, mock-up may be retained as part of finish work.

C. Pre-Installation Meetings: Conduct pre-installation meetings to verify project requirements, substrate conditions, construction documents, details, and manufacturer's warranty requirements.

PART 2 - PRODUCTS

2.01 COMPOSITE DECKING:

A. Basis of Design: Owens Corning, WearDeck

1. Color: Saddle

2. Size: 5/4" x 6"

B. Or approved substitute complying with the performance requirements specified herein.

C. Performance Requirements:

1. Evaluated in accordance with ASTM D7032 by an approved agency; submit current evaluation report per Article 1.04.D.

2. Flexural Properties: Tested in accordance with ASTM D6109 per ASTM D7032. Submit manufacturer's published flexural design values (Fb, EI, and MOE) for the profile proposed, and demonstrate that the values are adequate for the structural design criteria established for this Project.

3. Span Rating: Submit manufacturer's published span and load ratings, established in accordance with ASTM D7032 at a deflection limit of L/180 or a more restrictive limit if required by the Project's structural design, adjusted for elevated temperature and freeze-thaw effects per ASTM D7032 Section 5.1.1. Ratings shall be sufficient for the joist spacing and design loads applicable to this Project.

4. Creep Recovery: Average percent recovery not less than 75 percent per ASTM D7032 Section 5.4.

5. Fastener Head Pull-Through: Tested in accordance with ASTM D1761 using the fasteners proposed for use.

6. Decay and Termite Resistance: Suitable for exterior use without chemical preservative treatment; demonstrated compliance with IBC and IRC provisions for protection against biodegradation, decay, and termite attack. For products containing wood or other cellulosic material, resistance to decay and termite attack shall additionally be substantiated by testing in accordance with AWPA E7 or ASTM D3345, or by an evaluation report that specifically addresses decay and termite resistance for the product's formulation and intended exterior exposure.

7. Moisture and Mold Resistance: Submit manufacturer's published data for water absorption in accordance with ASTM D7031 and resistance to mold and mildew growth in accordance with ASTM D3273, demonstrating suitability for exterior use in a humid, coastal climate.

8. Surface-Burning Characteristics: Submit manufacturer's published flame spread index in accordance with ASTM E84; product shall comply with the flame-spread classification required by the applicable building code for the application and location indicated.

9. Slip Resistance: Tested in accordance with ASTM D2394; submit test data for wet and dry conditions, both directions of test.

10. Where decking is used as a structural or load-bearing component, design shall be performed by a Registered Design Professional in accordance with the applicable evaluation report and building code.

2.02 ACCESSORIES:

A. Fasteners: Type, material, size, and finish as recommended by the decking manufacturer for the profile and application indicated; corrosion-resistant and compatible with the decking material and supporting framing.

1. Exposed Fasteners: Where face-fastening is indicated, provide fasteners recommended by the manufacturer for the board thickness specified.

2. Concealed Fasteners: Where a concealed fastening system is indicated, provide the manufacturer's standard system compatible with the decking profile specified, producing uniform board spacing per manufacturer's published installation instructions.

B. Starter/Edge Clips: Manufacturer's standard components for terminating decking at exposed edges and locations abutting vertical walls or penetrations, where such components are part of the manufacturer's system for the profile specified.

C. End Caps: Manufacturer's standard closures for exposed board ends, where required by the decking profile.

D. Fascia Board: Same material and color as decking boards, or manufacturer's standard fascia product, for covering exposed support framing.

E. Metal Framing Anchors: Type and size as recommended by the decking manufacturer and applicable building code for the framing condition indicated.

PART 3 - EXECUTION

3.01 EXAMINATION:

A. Do not begin installation until substrates have been properly constructed and prepared.

B. If substrate preparation is the responsibility of another installer, notify Officer-in-Charge in writing of unsatisfactory preparation before proceeding.

3.02 PREPARATION:

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION:

A. Install in accordance with manufacturer's published instructions, the applicable evaluation report, approved submittals, and in proper relationship with adjacent construction.

B. Where a conflict exists between the manufacturer’s installation instructions and the applicable evaluation report, the more restrictive shall govern.

3.04 FIELD QUALITY CONTROL:

A. Field Inspection: Coordinate field inspection in accordance with appropriate sections in Division 1.

3.05 CLEANING AND PROTECTION:

A. Clean products in accordance with the manufacturer's recommendations.

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

END OF SECTION

# DIVISION 7 – THERMAL AND MOISTURE PROTECTION

## SECTION 07242 – DIRECT-APPLIED FINISH SYSTEMS

### PART 1 - 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:

A. Section includes: Direct-applied finish system for application over concrete wall surfaces, as indicated on Drawings.

B. Related Sections:

1. Section 07620 – Sheet Metal Flashing and Trim.

2. Section 07900 – Joint Sealants.

3. Section 08120 – Sliding Aluminum Doors.

1.03 REFERENCES:

A. American Society for Testing and Materials (ASTM):

1. ASTM C920 - Elastomeric Joint Sealants.

2. ASTM E84 - Surface Burning Characteristics of Building Materials.

1.04 ADMINISTRATIVE REQUIREMENTS:

A. Coordination:

1. Coordinate installation of the direct-applied finish system with flashings specified in Section 07620 – Sheet Metal Flashing and Trim, and joint sealants specified in Section 07900 – Joint Sealants.

2. Install copings, flashings, and joint sealants immediately after installation of the finish system, once coatings are dry.

1.05 SUBMITTALS:

A. See Section 01300 – Submittals.

B. Product Data: Manufacturer's product data, installation instructions, and Safety Data Sheets for each material and product used.

C. Samples: For selection of finish coat colors and textures.

D. Installer's Qualifications Statement.

E. Manufacturer's Written Confirmation: Submit manufacturer's written confirmation of base coat and reinforcing mesh compatibility with the substrate indicated, prior to installation.

F. Manufacturer's standard warranty.

1.06 QUALITY ASSURANCE:

A. Manufacturer Qualifications: Regularly engaged in the engineering, fabrication, finishing and installation of similar work, having minimum 10 years documented experience in manufacturing systems similar to those indicated.

B. Installer Qualifications: Not less than five (5) years of experience in specialty finish application, having completed not less than three (3) projects of similar size and complexity.

C. Mock-Up: Install a mock-up of the finished wall for evaluation and approval by the Officer-in-Charge prior to proceeding with the remaining Work.

D. Testing: Verify adhesion to prepared substrates before and during construction, as directed by the Officer-in-Charge.

1.07 DELIVERY, STORAGE, AND HANDLING:

A. Deliver products in original packaging, labeled with product identification, manufacturer, and batch number.

B. Store products in a dry area with temperature maintained between 50 and 85 degrees F. Protect from direct sunlight, freezing, and extreme heat in excess of 90 degrees F.

C. Handle products in accordance with manufacturer's printed instructions.

1.08 WARRANTY:

A. Provide manufacturer's standard limited warranty.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

A. Manufacturer: Sto Corp. (Basis of Design), or approved substitute.

2.02 MATERIALS:

A. General: Provide a complete direct-applied finish system, including base coat, reinforcing mesh, primer, and finish coat, compatible with the substrate indicated, and complying with the manufacturer's current published system requirements. Finishes, primers, and associated materials shall be Class A building materials per ASTM E84, with flame spread less than 25 and smoke developed less than 75; VOC content shall not exceed 50 g/L.

B. Basis of Design: Sto Corp. StoQuik Finish system for concrete, as indicated in the Finish Schedule on Drawings.

C. Substrate Leveler or Skim Coat: As recommended by manufacturer, selected based on wall surface condition, for compatibility

D. Reinforcing Mesh: As recommended by manufacturer, compatible with the base coat and finish system.

E. Compatibility: Base coat and reinforcing mesh shall be confirmed by the manufacturer in writing as compatible with the substrate indicated; refer to Submittals article in Part 1.

F. Primer: As recommended by manufacturer for substrate and finish coat compatibility.

G. Finish Coat: As indicated on Drawings.

H. Color: As indicated on Drawings.

PART 3 - EXECUTION

3.01 EXAMINATION:

A. Verify substrate is fully cured, free of cracks, voids, laitance, and surface contamination that could inhibit adhesion, and ready to receive the finish system.

B. Do not proceed with installation until unsatisfactory conditions are corrected.

3.02 PREPARATION:

A. Concrete: Remove surface contamination such as grease, oil, wax, dust, dirt, salts, algae, mildew, and pollen. Surface shall be absorbent, slightly pitted or scarified, fully cured, and free of voids, cracks, and weak surface conditions such as laitance.

B. Pressure wash substrate and perform a pull test to verify base coat adhesion, as indicated on Drawings.

3.03 INSTALLATION:

A. Install finish system in accordance with manufacturer's published instructions and approved mock-up.

B. All substrates shall be leveled and true to a tolerance of not more than 1/8 inch in 10 feet, except as otherwise determined by an approved mock-up.

C. Apply the selected base coat in one or two coats to level and smooth the prepared wall surface.

D. Reinforcement: Install base coat by trowel; immediately embed the reinforcing mesh into the wet base coat, troweling from the center to the edges. Overlap mesh not less than 2-1/2 inches at seams, and double-wrap inside and outside corners with a minimum 6-inch overlap in each direction. Fully embed mesh so that no mesh color shows through.

E. Allow base coat to dry before applying primer. Apply primer by brush, roller, or spray.

F. When primer is dry, apply the finish coat in accordance with the applicable manufacturer's Product Bulletin.

G. Do not install base coat, reinforcing mesh, primer, or finish coat over joint sealants, cold joints, control joints, or accessories; install over the prepared, leveled substrate only.

3.04 FIELD QUALITY CONTROL:

A. Verify adhesion to prepared substrates before and during construction, as directed by the Officer-in-Charge.

3.05 PROTECTION:

A. Provide protection of installed materials from water infiltration into or behind them, during and after construction.

B. Provide protection of installed materials from dust, dirt, precipitation, freezing, and continuous high humidity until fully dry.

C. Provide coping and/or flashing at sills, projecting features, and similar conditions to prevent water entry into the wall assembly or behind the finish. Seal penetrations through the finished wall surface with backer rod and sealant specified in Section 07900 – Joint Sealants.

END OF SECTION

# DIVISION 7 – THERMAL AND MOISTURE PROTECTION

## SECTION 07620 – SHEET METAL FLASHING AND TRIM

### PART 1 - 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:

A. Section includes: Manufactured and formed sheet metal flashing and trim at locations indicated on Drawings.

B. Related Sections:

1. Section 03330 – Architectural Concrete.

2. Section 05500 – Metal Fabrications.

3. Section 07242 – Direct-Applied Finish Systems.

4. Section 07900 – Joint Sealants.

5. Section 08120 – Sliding Aluminum Doors.

1.03 REFERENCES:

A. American Society for Testing and Materials (ASTM):

1. ASTM A240/A240M - Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.

2. ASTM A666 - Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar for Structural Applications.

3. ASTM B32 - Solder Metal.

4. ASTM C920 - Elastomeric Joint Sealants.

5. ASTM C1311 - Solvent Release Sealants.

6. ASTM D1187 - Asphalt-Base Emulsions for Use as Protective Coatings for Metal.

B. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA):

1. Architectural Sheet Metal Manual, latest edition.

1.04 SUBMITTALS:

A. Provide in accordance with Section 01300 – Submittals.

1. Product Data: Manufacturer's data, material descriptions, dimensions, profiles, and finishes for each type of sheet metal flashing and trim and accessory.

2. Shop Drawings: Include plans, elevations, sections, and attachment details; fabrication and installation layouts; expansion-joint locations; material, thickness, and finish for each item and location; profiles, seams, and dimensions; layout and spacing of fasteners, cleats, and clips; termination points and assemblies; and connections to adjoining work.

3. Qualification Data: For fabricator.

4. Maintenance Data: For sheet metal flashing and trim and accessories, for inclusion in maintenance manuals.

1.05 QUALITY ASSURANCE:

A. Fabricator Qualifications: Skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project, with a record of successful in-service performance.

1.06 DELIVERY, STORAGE, AND HANDLING:

A. Do not store sheet metal flashing and trim in contact with other materials that might cause staining, denting, or other surface damage; store away from uncured concrete and masonry.

B. Protect strippable protective covering from exposure to sunlight and high humidity, except to the extent necessary during installation.

1.07 WARRANTY:

A. Correct defective work within a one (1) year period after Date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.01 PERFORMANCE REQUIREMENTS:

A. General: Sheet metal flashing and trim shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed Work shall not rattle, leak, or loosen, and shall remain watertight.

B. Sheet Metal Standard: Comply with SMACNA's Architectural Sheet Metal Manual for dimensions and profiles unless more stringent requirements are indicated.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: 120 degrees F, ambient; 180 degrees F, material surfaces.

### 2.02 SHEET METALS:

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.

B. Stainless-Steel Sheet: ASTM A240/A240M or ASTM A666, Type 304, dead soft, fully annealed, with smooth, flat surface.

### 2.03 MISCELLANEOUS MATERIALS:

A. General: Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation, as recommended by manufacturer of primary sheet metal, unless otherwise indicated.

B. Fasteners: Series 300 stainless steel; blind fasteners or self-drilling screws, gasketed, with hex-washer head, designed to withstand design loads.

1. Exposed Fasteners: Heads matching color of sheet metal, using plastic caps or factory-applied coating; provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.

2. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.

C. Solder for Stainless Steel: ASTM B32, Grade Sn60 or Grade Sn96, with acid flux of type recommended by stainless-steel sheet manufacturer.

D. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing; permanently elastic, nonsag, nontoxic, nonstaining, 1/2 inch wide and 1/8 inch thick.

E. Elastomeric Sealant: ASTM C920, elastomeric silicone polymer sealant, of type, grade, class, and use classification required to seal joints in sheet metal flashing and trim and remain watertight.

F. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant, polyisobutylene plasticized, heavy bodied for hooked-type expansion joints with limited movement.

G. Bituminous Coating: Cold-applied asphalt emulsion in accordance with ASTM D1187.

2.04 FABRICATION, GENERAL:

A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in the SMACNA standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.

1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.

2. Obtain field measurements for accurate fit before shop fabrication.

3. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.

4. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

B. Fabrication Tolerances: Fabricate sheet metal flashing and trim capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings, and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

1. Hem exposed edges on underside 1/2 inch.

C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.

D. Sealant Joints: Where movable, non-expansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to the SMACNA standard.

E. Fabricate cleats and attachment devices from same material as accessory being anchored, or from compatible, noncorrosive metal, of sizes recommended by the SMACNA standard for application, but not less than thickness of metal being secured.

F. Seams: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.

2.05 WALL SHEET METAL FABRICATIONS:

A. Opening Flashings in Frame Construction: Fabricate head, sill, jamb, and similar flashings as indicated on Drawings. Fabricate from Stainless Steel.

## PART 3 - EXECUTION

3.01 EXAMINATION:

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.

1. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL:

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder and sealant.

2. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

3. Space cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.

4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.

5. Torch cutting of sheet metal flashing and trim is not permitted.

B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood, concrete, or masonry, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation.

1. Coat concealed side of stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.

2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet, with no joints within 24 inches of a corner or intersection.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.

D. Fasteners: Use fastener sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.

E. Conceal fasteners and expansion provisions where possible in exposed work, and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

F. Seal joints as required for watertight construction.

1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 degrees F, set joint members for 50 percent movement each way; adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 degrees F.

2. Prepare joints and apply sealants in accordance with Section 07900 – Joint Sealants.

G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets with solder to a width of 1-1/2 inches; reduce pre-tinning where pre-tinned surface would show in completed Work.

1. Do not use torches for soldering.

2. Heat surfaces to receive solder, and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.

3. Stainless-Steel Soldering: Tin edges of uncoated sheets, using solder for stainless steel and acid flux. Promptly remove acid flux residue from metal after tinning and soldering. Comply with solder manufacturer's recommended methods for cleaning and neutralization.

3.03 WALL FLASHING INSTALLATION:

A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to the SMACNA standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as doors and gates.

B. Opening Flashings in Frame Construction: Install continuous head, sill, jamb, and similar flashings as indicated on Drawings.

3.04 ERECTION TOLERANCES:

A. Shim and align sheet metal flashing and trim to slope and location lines indicated on Drawings, and in alignment with adjoining faces and matching profiles.

3.05 CLEANING AND PROTECTION:

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder.

C. Clean off excess sealants.

D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.

E. Replace sheet metal flashing and trim that has been damaged or that has deteriorated beyond successful repair by finish touch-up or similar minor repair procedures.

END OF SECTION

# DIVISION 7 – THERMAL AND MOISTURE PROTECTION

## SECTION 07900 – JOINT SEALANTS

## PART 1 - 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:

A. Section includes: Joint sealants.

B. Related Sections:

1. Section 03330 – Architectural Concrete.

2. Section 07242 – Direct-Applied Finish Systems.

3. Section 07620 – Sheet Metal Flashing and Trim.

4. Section 08120 – Sliding Aluminum Doors.

1.03 REFERENCES:

A. American Society for Testing and Materials (ASTM):

1. ASTM C920 - Elastomeric Joint Sealants.

2. ASTM C794 - Adhesion and Detachment of Elastomeric Joint Sealants.

3. ASTM C1248 - Staining of Porous Substances by Joint Sealants.

4. ASTM C834 - Latex Sealants.

5. ASTM C1193 - Use of Joint Sealants.

1.04 SUBMITTALS:

A. Provide in accordance with Section 01300 – Submittals.

1. Product Data: Manufacturer's data, including instructions for handling, storage, mixing, priming, installation, curing, and protection for each type of sealant.

2. Samples: For each type and color of exposed joint sealant.

3. Joint Sealant Schedule: Application, joint location, manufacturer and product name, and color for each joint sealant.

4. Installer's Qualification Statement.

1.05 QUALITY ASSURANCE:

A. Installer Qualifications: Specializing in application of joint sealants, with a minimum of three (3) years of documented experience, and a record of successful in-service performance on projects of similar size and scope.

B. Compatibility and Adhesion: Obtain joint sealants and related joint-sealant materials from manufacturers who can document compatibility and adhesion with the substrates and adjoining materials indicated for this Project. Where compatibility or adhesion is in question, perform testing in accordance with ASTM C794 and ASTM C1248, or submit written certification from the sealant manufacturer confirming compatibility with the substrates indicated.

Pre-Installation Conference: Convene a pre-installation conference minimum one week prior to commencing Work of this Section, with installer, representatives of substrate construction and adjacent trades, in attendance, to review substrate conditions, joint preparation, installation procedures, and scheduling.

1.06 DELIVERY, STORAGE, AND HANDLING:

A. Deliver materials in original, unopened containers or packages with labels indicating manufacturer, product name and designation, color, expiration date, shelf life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials in accordance with manufacturer's written instructions to prevent deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.07 PROJECT CONDITIONS:

A. Environmental Limitations: Do not proceed with installation of joint sealants under the following conditions:

1. When ambient or substrate temperature conditions are outside the limits permitted by the joint sealant manufacturer, or are below 40 degrees F.

2. When joint substrates are wet.

B. Joint-Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than permitted by the joint sealant manufacturer for the indicated application.

C. Joint-Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion have been removed from joint substrates.

1.08 WARRANTY:

A. Special Installer Warranty: Written warranty, signed by installer, agreeing to repair or replace joint sealant work that fails to achieve a watertight and airtight seal within the warranty period.

1. Warranty Period: Two (2) years from Date of Substantial Completion.

B. Special Manufacturer's Warranty: Written warranty, signed by manufacturer of elastomeric sealant, agreeing to furnish material to repair or replace joint sealants that fail to remain watertight and airtight, or that exhibit adhesive or cohesive failure, abnormal weathering, or deterioration within the warranty period.

1. Warranty Period: Manufacturer's standard, but not less than ten (10) years from Date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Elastomeric Sealants, General: Chemically curing elastomeric sealants of the types indicated, complying with ASTM C920, including the specific Type, Grade, Class, and Use indicated.

B. High-Movement Silicone Sealant: One- or two-part, non-acid-curing, ASTM C920, Grade NS (Non-Sag), Class 25, Use NT, with movement capability of not less than 50 percent in both extension and compression.

C. Low-Modulus Urethane Sealant: Non-sag, two-part, ASTM C920, Type M, Grade NS, Class 25, Use NT, with movement capability of 50 percent in both extension and compression.

D. Urethane Sealant for Traffic and Paving Joints: Non-sag or self-leveling as indicated, two-part, ASTM C920, Type S or M, Class 25, Use T.

E. Latex Sealant: Acrylic-latex emulsion, one-part, non-sag, mildew-resistant, paintable; complying with ASTM C834; for interior joints.

F. Sealant Backers: Non-staining backer rod, compatible with and recommended or approved by sealant manufacturer for the specific use indicated.

2.02 SCHEDULE OF JOINT SEALANTS:

A. Exterior Joints for Which No Other Sealant Is Indicated: High-movement silicone sealant or two-part non-sag low-modulus urethane sealant, with backer rod, concave joint configuration.

B. Exterior Concrete Control, Expansion, and Paving Joints: Two-part non-sag or self-leveling urethane sealant for Use T, with backer rod, flush joint configuration.

C. Joints around Pipes, Ducts, and Conduit Penetrating Exterior Walls: Same sealant as used for adjacent substrate.

D. Interior Joints for Which No Other Sealant Is Indicated: Acrylic-latex emulsion sealant, with backer rod, concave joint configuration.

PART 3 - EXECUTION

3.01 EXAMINATION:

A. Examine joints to receive sealants, with Installer present, to verify compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION:

A. Joint Surface Cleaning: Clean joints immediately prior to installing joint sealants, in accordance with joint sealant manufacturer's written instructions.

1. Remove foreign material from joint substrates that could interfere with adhesion, including dust, paints (except permanent coatings tested and approved by sealant manufacturer), old sealants, backer rods, water-repellent treatments, oil, grease, and surface dirt.

2. Clean concrete, masonry, and other porous joint substrates by brushing, grinding, or mechanical abrasion to achieve a clean substrate capable of developing adhesion; remove loose particles with oil-free compressed air.

3. Clean metal and other nonporous surfaces with chemical cleaners that do not stain, deteriorate, or leave residue that could interfere with adhesion.

B. Joint Primer: Prime joint substrates where recommended by sealant manufacturer. Confine primer to joint sealant bonding areas; do not allow spillage or migration onto adjacent surfaces.

C. Masking Tape: Use masking tape to prevent contact of sealant or primer with adjacent surfaces that might be permanently stained or damaged; remove tape immediately after tooling sealant, without disturbing the joint seal.

3.03 INSTALLATION OF JOINT SEALANTS:

A. General: Comply with joint sealant manufacturer's written instructions, except where more stringent requirements are indicated, and with ASTM C1193 for use of joint sealants applicable to the materials, applications, and conditions indicated.

B. Sealant Backers: Install backer rod of type indicated to control depth and shape of sealant relative to joint width, providing optimal sealant movement capability.

1. Do not leave gaps between ends of backer rod; trim for a snug fit around penetrations.

2. Do not stretch, twist, puncture, or tear backer rod. Remove and replace absorbent backer rod that becomes wet prior to sealant application.

C. Install sealants using proven techniques that result in the sealant fully contacting and wetting joint substrates, completely filling the joint cavity, and forming a uniform, properly shaped bead relative to joint width.

1. Apply sealant at depths shown or, where not shown, per manufacturer's recommendations, generally not less than 1/4 inch and not more than 1/2 inch, and not exceeding the joint width.

D. Tool sealants immediately after application and before skinning or curing begins, to form a smooth, uniform bead free of air pockets, and to ensure contact and adhesion with the joint substrates. Remove excess sealant from adjacent surfaces. Do not use tooling agents that discolor sealants or adjacent surfaces.

3.04 FIELD QUALITY CONTROL:

A. Field-test adhesion of exterior sealants to joint substrates before proceeding with the remaining installation, at not less than one location for each type of sealant and substrate combination, or as directed by the Officer-in-Charge.

1. Test Method: Cut a small sample of cured sealant from the joint, grasp firmly, and pull away from the substrate to check for adhesive or cohesive failure, per manufacturer's recommended field-testing procedure.

B. Sealants exhibiting adhesive or cohesive failure during testing shall be rejected. Remove and reinstall rejected sealant, after determining and

correcting the cause of failure, and retest until satisfactory results are achieved.

3.05 CLEANING:

A. Clean excess sealant and sealant stains from adjacent surfaces as Work progresses, using cleaning methods and materials approved by the sealant manufacturer.

3.06 PROTECTION:

A. Protect joint sealants from contact with contaminants and from damage during and after the curing period, so that sealants are undamaged at Substantial Completion. Remove and replace damaged or deteriorated sealant so that repaired areas are indistinguishable from the original Work.

END OF SECTION

# DIVISION 8 – DOORS AND WINDOWS

## SECTION 08120 – SLIDING ALUMINUM DOORS

### PART 1 - 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:

A. Section includes: Manually operated, overhead-hung sliding aluminum gate assembly and two-panel aluminum swing gate assembly, complete with aluminum framing, overhead track, hardware, and accessories, as indicated on Drawings.

B. Related Sections:

1. Section 05120 – Structural Steel.

2. Section 05750 – Perforated Metal Panels.

3. Section 07242 – Direct-Applied Finish Systems.

4. Section 07620 – Sheet Metal Flashing and Trim.

5. Section 07900 – Joint Sealants.

6. Section 08710 – Finish Hardware.

1.03 REFERENCES:

A. American Society for Testing and Materials (ASTM) Publications:

1. ASTM B221 - Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

B. International Code Council (ICC):

1. 2018 International Building Code (IBC).

1.04 DEFINITIONS:

A. Sliding Gate Assembly: Manually operated aluminum gate panel suspended from and guided by an overhead track, permitting horizontal sliding movement between open and closed positions.

B. Overhead Track: Galvanized steel box track and roller assembly, mounted overhead or to an adjacent wall as indicated on Drawings, designed to support, guide, and permit smooth horizontal operation of the sliding gate panel.

C. Cane Bolt: Manually operated vertical locking bolt mounted near the bottom of a gate panel and engaging a floor-mounted receiver to secure the panel in a fixed position.

D. Two-Panel Swing Gate Assembly: Pair of hinged aluminum gate panels consisting of Operable Panel and Secured Panel as indicated on Drawings.

E. Operable Panel: Swing gate panel provided for normal passage and required egress, equipped with self-closing hinges and a wall-mounted combination door stop/holder.

F. Secured Panel: Swing gate panel equipped with a storeroom-function lockset and secured in the closed position by a cane bolt engaging a floor-mounted receiver; panel may be released when the full gate opening is required.

G. Storeroom-Function Lockset: ADA-compliant lever lockset, ANSI F86, permitting the gate to be locked or unlocked from the exterior side by key while providing unrestricted egress from the interior side at all times.

H. Floor Receiver: Flush or surface-mounted fitting coordinated with the cane bolt and securely anchored to the supporting substrate to retain the associated gate panel in its intended position.

1.05 ADMINISTRATIVE REQUIREMENTS:

A. Coordination:

1. Coordinate sliding aluminum gate and swing gate details with other work supporting or adjoining the gate assemblies, including structural steel gate posts and framing specified in Section 05120, perforated aluminum infill panels specified in Section 05750, finish hardware specified in Section 08710, and opening flashings and joint sealants specified in Sections 07620 and 07900.

1.06 SUBMITTALS:

A. See Section 01300 – Submittals.

B. Product Data: Manufacturer's catalog data, detail sheets, and specifications.

C. Shop Drawings:

1. Reference each sliding aluminum gate and swing gate assembly using Door Number and hardware group.

2. Show each opening indicating opening criteria, elevation, dimensions of panels, details of construction, machining criteria for hardware, and interface with other products.

D. Samples: Only as requested.

E. Certificates: Installer's certification that meets requirements of this Section.

F. Operating and Maintenance Data: Operating and maintenance instructions and parts lists.

1.07 QUALITY ASSURANCE:

A. Installer Qualifications: Factory-trained, with minimum 3 years of experience.

1.08 DELIVERY, STORAGE, AND HANDLING:

A. Deliver, store, and handle sliding aluminum gate and swing gate assemblies to prevent damage or deformation.

B. Prior to delivery to site, identify each gate assembly with individual Door Number to permit installation at correct location.

C. Pack prefinished components individually in heavy polyethylene bags and then place in corrugated cardboard containers. Provide additional protection for corners and vertical edges.

D. Deliver gate assemblies and frames only after proper facilities are available. Provide clean, dry surfaces or platforms as required, and protect from deterioration and foreign matter.

E. Storage and Protection:

1. Store delivered gate assemblies and frames in clean, safe, dry area.

2. Do not store on ground.

3. Place gate assemblies and frames on at least 4 inch high wood sills or in manner that will prevent rust or damage.

4. Avoid use of non-vented plastic or canvas shelters that can create a humidity chamber.

5. Immediately remove wrappers that become wet.

1.09 WARRANTY:

A. Correct defective work within a one (1) year period after Date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

A. Provide manual sliding aluminum gate and swing gate assemblies, including hardware, from a single manufacturer or fabricator regularly engaged in the manufacture of products of the type specified in this Section.

B. Basis of Design: As indicated on Drawings; products by approved manufacturers meeting the performance, configuration, and hardware requirements specified herein are acceptable.

2.02 SLIDING GATE ASSEMBLY:

A. General:

1. Provide complete manually operated overhead-hung sliding aluminum gate assembly, including gate panel, aluminum framing, overhead track, roller, guides, stops, finish hardware, fasteners, anchors, and accessories required for a complete installation.

2. Number, size, configuration, and direction of operation of gate panels shall be as indicated on Drawings.

3. Maximum Weight: See Structural Drawings.

B. Aluminum Gate Panel:

1. Fabricate from extruded aluminum framing members, ASTM B221, of sizes and profiles appropriate for panel dimensions and intended use.

2. Reinforce framing at hangers, pulls, locks, cane bolts, and other hardware attachment locations.

3. Infill Panel: Perforated aluminum panel specified in Section 05750 – Perforated Metal Panels.

4. Conceal fasteners wherever practicable.

C. Overhead Track System:

1. Provide continuous galvanized steel box track, mounted overhead or to an adjacent wall as indicated on Drawings, capable of supporting the gate panel without reliance upon the floor for vertical support.

2. Mount track brackets at maximum 2 feet on center.

3. Provide stainless steel stay roller with nylon wheel at each hanger location.

4. Provide adjustable hangers to permit field adjustment of gate alignment and elevation.

5. Provide positive stops at fully open and fully closed positions.

6. Provide anti-jump or anti-derailment devices to prevent accidental disengagement of the roller from the track.

7. Provide bottom guide as required to maintain gate alignment during operation without creating an obstruction to passage.

D. Operating Hardware and Cane Bolt: Provide pull handle, cane bolt, and floor receivers specified in Section 08710 – Finish Hardware. Exposed operating hardware located on an accessible route shall comply with applicable accessibility requirements.

E. Operation:

1. Completed gate assembly shall operate smoothly and freely through its entire travel.

2. Gate shall remain stable and properly aligned during operation.

3. Adjust roller, guide, stops, and hardware to prevent binding, scraping, excessive movement, or excessive noise.

F. Basis of Design: As indicated on Drawings; products by approved manufacturers meeting specified performance and configuration requirements are acceptable.

2.03 TWO-PANEL ALUMINUM SWING GATE ASSEMBLY:

A. Description:

1. Provide manually operated two-panel aluminum swing gate assembly of size, configuration, and location indicated on Drawings.

2. Gate assembly shall consist of an Operable Panel and a Secured Panel, as indicated on Drawings.

3. Fabricate gate panels from extruded aluminum framing members, ASTM B221, sized and reinforced as required for panel dimensions, hardware, anticipated use, and installation conditions.

4. Infill Panel: Perforated aluminum panel specified in Section 05750 – Perforated Metal Panels.

B. Operable Panel:

1. Egress panel shall serve as the operable gate panel for normal passage and required egress.

2. Provide hinges and wall-mounted combination door stop/holder specified for the hardware group scheduled on Drawings in Section 08710 – Finish Hardware.

3. Operating hardware shall comply with applicable accessibility and egress requirements.

C. Secured Panel:

1. Provide hinges, storeroom-function lockset, cane bolt, and floor receiver specified for the hardware group scheduled on Drawings in Section 08710 – Finish Hardware.

2. The Secured Panel shall be capable of being released and opened when the full gate opening is required.

D. Gate Operation:

1. The Operable Panel shall operate independently while the Secured Panel remains secured by cane bolt.

2. When the Secured Panel is released, both panels shall be capable of opening to provide the full clear gate opening indicated on Drawings.

3. Adjust hinges, stops, and hardware to provide smooth operation without binding, scraping, sagging, or excessive noise.

4. Provide stops or hold-open devices where indicated on Drawings.

E. Fabrication:

1. Provide welded, mechanically fastened, or reinforced connections suitable for the intended use.

2. Conceal fasteners wherever practicable.

3. Make adequate provisions for attachment of all specified hardware.

4. Fabricate gate panels square, rigid, and free from twist, warp, and visible distortion.

F. Basis of Design:

1. As indicated on Drawings.

2. Products by approved manufacturers meeting specified configuration, performance, hardware, and finish requirements are acceptable.

2.04 FABRICATION:

A. Preparation:

1. Verify frame details; obtain reviewed hardware schedule, templates, and other information.

2. Verify size and design of each opening.

B. Make adequate provisions for attachment of hardware.

C. Conceal fastenings wherever possible.

D. Do not label exposed portions with trade or manufacturer's name.

2.05 FINISHES:

A. Aluminum Framing: Match finish of adjacent perforated aluminum infill panel specified in Section 05750 – Perforated Metal Panels.

B. Overhead Track: Refer to Section 09900 – Painting and Coating for the field-applied touch-up finish over galvanized steel track components, to match adjacent corrosion protection coating color.

C. Finish Hardware: Refer to Section 08710 – Finish Hardware.

PART 3 - EXECUTION

3.01 EXAMINATION:

A. Verify that gate and swing gate openings are plumb, square, and ready for installation of the sliding gate and swing gate assemblies.

B. Verify opening sizes and tolerances are acceptable.

C. Do not start work until unsatisfactory conditions are corrected.

3.02 INSTALLATION:

A. Install gate assemblies, frames, hardware, and accessories in accordance with manufacturer's instructions.

B. Install gate panels and frames plumb and square.

C. Coordinate installation with opening flashings specified in Section 07620 – Sheet Metal Flashing and Trim, and with perimeter joint sealant specified in Section 07900 – Joint Sealants.

3.03 ADJUST AND CLEAN:

A. Adjust sliding gate and swing gate assemblies for smooth, balanced, and proper operation, without binding or scraping and without excessive noise.

END OF SECTION

# DIVISION 8 – DOORS AND WINDOWS

## SECTION 08710 – FINISH HARDWARE

### PART 1 - 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:

A. Section includes: Hinges, locksets, cane bolts, floor receivers, and pull handles for the sliding gate and swing gate assemblies specified in Section 08120 – Sliding Aluminum Doors, organized into Hardware Groups as scheduled on Drawings.

B. Related Sections:

1. Section 08120 – Sliding Aluminum Doors.

1.03 REFERENCES:

A. American National Standards Institute / Builders Hardware Manufacturers Association (ANSI/BHMA):

1. ANSI/BHMA A156.1 - Butts and Hinges.

2. ANSI/BHMA A156.2 - Bored and Preassembled Locks and Latches.

3. ANSI/BHMA A156.16 - Auxiliary Hardware.

4. ANSI/BHMA A156.18 - Materials and Finishes.

B. U.S. Department of Justice:

1. 2010 ADA Standards for Accessible Design.

C. International Code Council (ICC):

1. 2018 International Building Code (IBC).

1.04 SUBMITTALS:

A. See Section 01300 – Submittals.

B. Product Data: Manufacturer's catalog data for each hardware item specified in this Section.

C. Hardware Schedule: Submit schedule coordinating hardware items specified in this Section with the Hardware Group assignments and Door Numbers indicated on Drawings.

D. Keying Schedule: Submit proposed keying arrangement for review prior to ordering hardware.

E. Templates: Furnish hardware templates and physical hardware, as required, to door and gate assembly manufacturer for coordination.

F. Operation and Maintenance Data: Operating and maintenance instructions and parts lists.

1.05 QUALITY ASSURANCE:

A. Installer Qualifications: Factory-trained, with minimum 3 years of experience.

B. Single Source Responsibility: Furnish finish hardware from a single supplier to ensure coordination and compatibility, unless otherwise approved.

C. Coordinate finish hardware with the sliding gate and swing gate assembly manufacturer to ensure compatibility with gate panel framing and overhead track system.

1.06 DELIVERY, STORAGE & HANDLING:

A. Deliver hardware in manufacturer's original packaging, with labels and identifying information intact.

B. Package hardware for each opening separately, tagged with Door Number and Hardware Group designation.

C. Store hardware in a clean, dry area, protected from damage until installation.

1.07 WARRANTY:

A. Correct defective work within a one (1) year period after Date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

A. Provide finish hardware items from manufacturers regularly engaged in the manufacture of products of the types specified in this Section.

B. Basis of Design: As indicated for each hardware item specified in this Section; products by approved manufacturers meeting the specified performance and function requirements are acceptable.

2.02 MATERIALS AND FINISHES:

A. Fabricate exposed finish hardware from stainless steel, or from base metal with a finish resistant to corrosion suitable for the Project's exterior, oceanfront exposure, unless otherwise specified.

B. Finish: Comply with ANSI/BHMA A156.18 materials and finishes designations, or manufacturer's standard corrosion-resistant finish suitable for exterior use.

2.03 HINGES:

A. Provide heavy-duty hinges complying with ANSI/BHMA A156.1, where indicated for the applicable Hardware Group on Drawings.

B. Provide self-closing hinges, ADA compliant, where indicated for the applicable Hardware Group on Drawings.

C. Provide hinges field-adjustable from 90 to 180 degrees where indicated for the applicable Hardware Group on Drawings.

2.04 LOCKSETS:

A. Provide ADA-compliant storeroom-function lever locksets, ANSI F86, complying with ANSI/BHMA A156.2, where indicated for the applicable Hardware Group on Drawings.

B. Locksets shall be lockable from the exterior side only by key, with unrestricted egress from the interior side at all times.

2.05 CANE BOLTS AND FLOOR RECEIVERS:

A. Provide heavy-duty, manually operated, locking cane bolts where indicated for the applicable Hardware Group on Drawings.

B. Provide floor receivers anchored to supporting substrate and installed flush with adjacent finished surface, coordinated with each cane bolt location.

2.06 PULL HANDLES:

A. Provide ADA-compliant straight pull handles at the interior face of gate panels, where indicated for the applicable Hardware Group on Drawings.

2.07 DOORSTOPS/HOLDERS:

A. Provide heavy-duty, wall-mounted, combination doorstop/holders complying with ANSI/BHMA A156.16, where indicated for the applicable Hardware Group on Drawings.

B. Provide units with manual positive hold-open and manual release feature where indicated for the applicable Hardware Group on Drawings.

## PART 3 - EXECUTION

### 3.01 EXAMINATION:

A. Verify that gate panels, frames, and supporting construction are ready to receive finish hardware.

B. Do not proceed with installation until unsatisfactory conditions are corrected.

### 3.02 INSTALLATION:

A. Install finish hardware in accordance with manufacturer's written instructions and the approved Hardware Schedule.

B. Install hardware items plumb, level, and square, at heights and locations indicated on Drawings or, where not indicated, at manufacturer's recommended heights.

C. Coordinate installation with the sliding gate and swing gate assemblies specified in Section 08120.

### 3.03 FIELD QUALITY CONTROL:

A. Test each lockset, hinge, cane bolt, and door stop/holder for proper function prior to Substantial Completion.

B. Non-Conforming Work: Adjust, repair, or replace, and re-test.

### 3.04 ADJUSTING AND CLEANING:

A. Adjust finish hardware for proper operation, free of binding, sticking, or excessive noise.

B. Clean hardware surfaces; remove labels and protective coatings, and touch up damaged finishes to match adjacent surfaces.

END OF SECTION

# DIVISION 9 – FINISHES

## SECTION 09900 – PAINTING AND COATING

### PART 1 - 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:

A. Work Results: Site painting and coating work at locations indicated on Drawings.

1.03 REFERENCES:

A. Definitions:

1. Sheen Levels: ASTM D523.

a. Flat: Five gloss units at 60 degrees and 10 gloss units at 85 degrees, maximum.

b. Eggshell: 10 to 25 gloss units at 60 degrees and 10 to 35 gloss units at 85 degrees.

c. Satin: 20 to 35 gloss units at 60 degrees and 35 gloss units minimum at 85 degrees.

d. Semi-Gloss: 35 to 70 gloss units at 60 degrees.

e. Gloss: 70 gloss units at 60 degrees, minimum.

B. Standards:

1. SSPC-SP1 - Solvent Cleaning.

2. SSPC-SP16 - Brush-Off Blast Cleaning of Coated and Non-Ferrous Metals.

3. SSPC-SP3 - Power Tool Cleaning.

4. SSPC-SP6/NACE No. 3 - Commercial Blast Cleaning.

5. ASTM D3359 - Standard Test Methods for Rating Adhesion by Tape Test.

1.04 ADMINISTRATIVE REQUIREMENTS:

A. Preinstallation Meeting:

1. Conduct meeting one week, minimum, before starting Work of this Section.

1.05 ACTION SUBMITTALS:

A. Product Data:

1. Initial selection color charts.

B. Samples:

1. Draw Down Samples: Each type of paint system and each topcoat color and gloss.

a. Label each sample for paint type, location, and substrate.

1.06 CLOSEOUT SUBMITTALS:

A. Maintenance Data:

1. Cleaning, touch-up, and repair instructions for painted and coated surfaces.

2. Area summary with finish schedule and color samples, designating where each product, color and finish was used.

1.07 MAINTENANCE MATERIAL SUBMITTALS:

A. Extra Stock Materials:

1. Paint from same product run as installed materials.

a. Quantity: 5 percent, but not less than 1 gallon of each material and color.

1.08 QUALITY ASSURANCE:

A. Field Samples: Apply each paint systems to substrates as directed by Officer-in-Charge. Demonstrate texture, color, and pattern.

1. Approved samples establish work results standard.

B. Mock-Up for Coatings Over Galvanized Steel: Before commencing coating application over galvanized steel, install a mock-up or test area of the surface preparation and coating system, as recommended in writing by the coating

manufacturer, to demonstrate final color, appearance, compatibility, and acceptability of performance.

1. Adhesion Testing: After a minimum of one week of exposure, perform adhesion testing in accordance with ASTM D3359, Test Method A (X-Cut Tape Test). A minimum adhesion rating of 4A (on a 0 to 5 scale) is required, without blistering, before proceeding with full-scale application.

1.09 DELIVERY, STORAGE, AND HANDLING:

A. Storage and Handling Requirements:

1. Store paint products in sealed containers until ready for use.

1.10 FIELD CONDITIONS:

A. Apply materials only when surface and ambient temperatures are within temperature ranges required by paint product manufacturer.

B. Apply exterior coatings when rain or snow are not occurring or forecasted, and when relative humidity is inside humidity ranges, and moisture content of surfaces is within acceptable levels required by paint product manufacturer.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

A. Sherwin-Williams Co. (Sherwin-Williams) – Basis of Design

B. Tnemec Company, Inc. (Tnemec) – Basis of Design

C. Benjamin Moore & Co. (Benjamin Moore)

D. PPG Industries, Inc. (PPG Paints)

E. BEHR Process Corporation (BEHR)

F. Or approved substitute.

2.02 PAINT MATERIALS, GENERAL:

A. Material Compatibility: Provide concrete block sealers, primers and topcoats that are compatible with each other and with the indicated substrates, under service and application conditions demonstrated by the manufacturer, based on tests and practical experience.

B. VOC Content of Site-Applied Paints and Coatings: Provide products that meet the following limits for VOC content, excluding colorants added to a stain base, when calculated in accordance with 40 CFR 59, Subpart D

(Method 24 from EPA) (ASTM D 3960) or BS EN ISO 111890-2:2006; these requirements are not applicable to paints and coatings applied in a fabrication or finishing shop:

1. Matte paints for finishing coat: VOC content not greater than 50 g/L.
2. Non-matte paints for finishing coat: VOC content not greater than 150 g/L.
3. Anticorrosive and antioxidant paints applied to ferrous metals: VOC content not greater than 250 g/L.
4. Floor coverings: VOC content not greater than 100 g/L.
5. Lacquers (gum), clear: VOC content not greater than 730 g/L.
6. Lacquers (gum), pigmented: VOC content not greater than 550 g/L.
7. Primers, Sealers and Finishing Base Coats: VOC content no greater than 200 g/L.
8. Dry Fog Coatings: VOC content not greater than 400 g/L.
9. Zinc-rich primers for industrial maintenance: VOC content not greater than 340 g/L.
10. Pretreatment Wash Primers: VOC content not greater than 420 g/L.

C. Chemical Constituents of Site-Applied Paints and Coatings: Provide finishing hand paints and anti-corrosion and anti-rust paints applied to ferrous metals that meet the chemical restrictions below (these requirements are not applicable to shop-applied paints and coatings manufacturing or finishing):

1. Aromatic compounds: Paints and coatings will not contain more than 1%, by weight, of total aromatic compounds (hydrocarbon compounds that contain one or more benzene nuclei).
2. Restricted Compounds: Paints and coatings shall not contain any of the following:
    a. Acrolein.
    b. Acrylonitrile.
    c. Antimony.
    d. Benzene.
    e. Benzylbutylphthalate.

f. Cadmium.

g. Di(2-ethylhexyl) phthalate.

h. Di-n-butylphthalate.

i. Di-n-octylphthalate.

j. 1,2-dichlorobenzene.

k. Diethyl phthalate.

l. Dimethyl phthalate.

m. ethylbenzene.

n. Formaldehyde.

o. Hexavalent chromium.

p. Isophorone.

q. Lead.

r. Mercury.

s. methyl ethyl ketone.

t. Methyl isobutyl ketone.

u. methylene chloride.

v. Naphthalene.

w. Toluene (methylbenzene).

x. 1,1,1-trichloroethane.

y. Vinyl chloride.

D. Materials Quality: Provide the manufacturer's best quality paint material of the various types of specified coatings that are formulated at the factory and that are recommended by the manufacturer for the indicated application. Containers of paint material that do not display the manufacturer's product identification will not be acceptable.

1. Trademarks: The use of the manufacturer's trademark names to designate colors or materials does not imply that it is a requirement to use the named products and exclude equivalent products from other

manufacturers. Provide manufacturer's material data as well as performance certificates for proposed substitutes.

E. Colors: Provide custom colors of finishing paint systems that match Officer-in-Charge's swatches.

2.03 COLOR LIST:

A. References to a particular manufacturer's color number or name are merely a convenience for the Officer-in-Charge to establish project color requirements. These references are not intended to describe the generic paint systems required.

B. The selection of paint colors are indicated on the plans by manufacturer and type of color; designated in the Finish Schedule on the Drawings.

1. Supply the same batches, etc. within the same contiguous areas of the building (i.e. corridors on the same floors, common rooms adjacent to each other, etc.).

C. Color List: The color list is to be considered as a guide to color requirements only, subject to modification or approval by the Officer-in-Charge.

2.04 HANDS OF PREPARATION:

A. Metal Primers:

1. Primer for ferrous metals: Rust inhibiting primer on metals, fast drying.

2. Primer for galvanized metals: Primer for galvanized metals.

3. Where the manufacturer does not recommend a separate primer formulation over the indicated substrate, use the indicated paint for the top coat.

PART 3 - EXECUTION

3.01 EXAMINATION:

A. Verification of Conditions: Verify substrates are ready to receive work.

B. Preinstallation Testing: Test moisture content of substrate does not exceed the following:

1. Concrete: 12 percent.

2. Masonry: 12 percent.

3. Wood: 15 percent.

C. Concrete and Masonry: Verify surface has cured at least 30 days and that the pH of the surface is between 6 and 9.

3.02 PREPARATION:

A. Surface Preparation: Remove and Mask electrical plates, hardware, trim, escutcheons, and fittings. Correct defects in substrates capable of affecting work.

B. Cleaning: Remove substances that could impair paint bond, including dust, oil, grease, and incompatible coatings.

1. Impervious Surfaces: Remove mildew by scrubbing with cleaning solution recommended by finish coating manufacturer. Rinse with clean water and allow surface to dry.

2. Concrete Surfaces: Remove dirt, loose mortar, scale, efflorescence and chalk. Remove oil and grease by scrubbing with cleaning solution recommended by finish coating manufacturer. Rinse with clean water and allow surface to dry.

3. Galvanized Steel Surfaces: Remove visible deposits of oil, grease, or other contaminants per SSPC-SP1 "Solvent Cleaning." Sweep (abrasive) blast per SSPC-SP16 "Brush-Off Blast Cleaning of Coated and Non-Ferrous Metals" to achieve a uniform anchor profile of 1.0 to 2.0 mils. Ensure galvanized surfaces are clean, dry, and free of contaminants immediately prior to application of coatings.

4. Uncoated Steel: Remove rust and loose mill scale. Clean per SSPC- SP 3 "Power Tool Cleaning" and SSPC-SP 6/NACE No. 3 "Commercial Blast Cleaning.

5. Primed Steel: Clean field welds, fasteners, and abraded shop primer.

6. Wood Surfaces:

a. Wipe off dust and grit. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried.

b. Backprime concealed surfaces.

3.03 APPLICATION:

A. Follow manufacturer's instructions for application method, thickness of coatings, and number of coats. Brush or roller application is required for field-applied paints, except that spray application of the Basis of Design corrosion-protective coating system over galvanized steel is permitted where necessary to achieve the specified dry film thickness, subject to Officer-in-

Charge's approval and provision of overspray containment and protection of adjacent surfaces, pedestrians, and the beach environment.

1. Apply finishes when surfaces are dry. Allow applied coats to dry before next coat is applied.

2. Apply each coat of paint slightly darker than preceding coat.

3. Apply coatings to uniform appearance.

4. Sand metal surfaces lightly between coats.

5. Leave testing agency, equipment identification, and performance labels unpainted.

B. Appearance:

1. Apply paints without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, or other imperfections.

2. Edges and Color Breaks: Produce sharp edges.

3.04 PAINTING EQUIPMENT:

A. Paint the following equipment when exposed in equipment rooms, occupied spaces, and exterior areas:

1. Electrical panelboards and switchgear.

2. Piping.

3. Ductwork.

4. Pipe hangers.

5. Conduit.

6. Unfinished tanks.

7. Shop-primed equipment.

B. Paint interior surfaces of air ducts visible through grilles with one coat of flat black paint.

3.05 FIELD QUALITY CONTROL:

A. Field Tests and Inspections: inspectors to perform tests and inspections and prepare reports. Allow inspectors access to work areas.

1. Retesting of Failed Tests: Performed at Contractor's expense.

B. Testing: Dry film thickness.

C. Non-Conforming Work: Remove and replace or apply additional coats, and re-test.

3.06 CLEANING:

A. Cleaning:

1. Remove rubbish, empty cans, rags, and other discarded materials.

2. Remove splattered paints. Protect adjacent surfaces from damage.

3.07 PROTECTION:

A. Protection: Protect painted surfaces from subsequent construction work. Touch up and restore damaged painted surfaces.

3.08 EXTERIOR PAINTING SCHEDULE:

A. Concrete Nontraffic Surfaces:

1. Primer:

a. Sherwin-Williams: Loxon Concrete and Masonry Primer/Sealer.

b. BEHR: Multi-Surface Interior/Exterior Stain-Blocking Primer & Sealer 436.

c. Benjamin Moore: Ultra Spec Int/Ext Masonry sealer (608).

d. PPG Paints: PERMA-CRETE Interior/Exterior Alkali Resistant Primer.

e. Or approved substitute.

2. Exterior Acrylic-Latex Topcoat: Eggshell finish.

a. Sherwin-Williams: Pro Industrial Acrylic B66-600 Series.

b. BEHR: PRO e600 Exterior Paint.

c. Benjamin Moore: Ultra Spec Exterior Enamel.

d. PPG Paints: SPEEDHIDE Exterior Latex.

e. Or approved substitute.

3. Color: Refer to Drawings.

B. CMU Substrates:

1. Latex Block Filler:

a. Sherwin-Williams: Conflex XL Block Filler, CF01W50.

b. BEHR: Behr Pro Block Filler Primer, PR50.

c. Benjamin Moore: Ultra SpecR Masonry Hi-BuiId Block Filler 571.

d. PPG Paints; Perma-Crete Concrète Block & Masonry Surfacer/Filler.

e. Or approved substitute.

2. Exterior Latex Topcoat: Eggshell finish.

a. Sherwin-Williams: A100 Series Exterior Latex.

b. BEHR: PRO e600 Exterior Paint.

c. Benjamin Moore: Ultra Spec Exterior Enamel.

d. PPG Paints: SPEEDHIDE Exterior Latex.

e. Or approved substitute.

C. Unprimed Ferrous Metal:

1. Primer:

a. Products:

1) Tnemec: Series N69 Hi-Build Epoxoline II (Basis of Design).

2) Or approved substitute.

b. Primer Dry Film Thickness: 2.0 to 3.0 mils for the Basis of Design product; alternates shall achieve equivalent film build per manufacturer's data.

2. Topcoat: Semi-gloss finish.

a. Tnemec: Series 1095 Endura-Shield (semigloss) (Basis of Design).

b. Or approved substitute.

3. Color: Refer to Drawings.

D. Galvanized Steel:

1. Primer:

a. Products:

1) Tnemec: Series N69 Hi-Build Epoxoline II (Basis of Design).

2) Or approved substitute.

b. Primer Dry Film Thickness: 2.0 to 3.0 mils for the Basis of Design product; alternates shall achieve equivalent film build per manufacturer's data.

2. Topcoat: Semi-gloss finish.

a. Tnemec: Series 1095 Endura-Shield (Basis of design).

b. Or approved substitute.

3. Color: Refer to Drawings.

E. Wood Trim, Doors, and Windows:

1. Latex Primer:

a. BEHR: PREMIUM PLUS Exterior Multi-Surface Primer & Sealer 436.

b. Benjamin Moore: Fresh Start High Hiding All Purpose Primer 046.

c. PPG Paints: Seal-Grip Interior/Exterior Universal Primer/Sealer 17-921XI.

d. Sherwin-Williams: Exterior Latex Wood Primer B42W08041.

2. Exterior Acrylic Latex Topcoat: Eggshell finish.

a. BEHR: PRO e600 Exterior Paint.

b. Benjamin Moore: Ultra Spec EXT.

c. PPG Paints: SPEEDHIDE Exterior Latex.

d. Sherwin-Williams: A-100 Exterior Acrylic Latex.

e. Or approved substitute.

F. Miscellaneous Paint Touch-Ups:

1. Basis of Design paints, or approved substitute, for incidental items and repair of existing surfaces disturbed by work of this Section.

2. Color matched to the corrosion-protective coating color, for miscellaneous small items such as brackets and hardware.

3. Color matched to the existing concession building, for patching, repair, and repainting of existing surfaces (such as the existing soffit) disturbed by work of this Section.

4. Color Verification: For touch-up paint matched to an existing surface, submit a drawdown sample compared directly against the existing surface for Officer-in-Charge's field verification prior to full application.

END OF SECTION

# DIVISION 13 – SPECIAL CONSTRUCTION

## SECTION 13072 – VIBRATION AND SEISMIC CONTROLS FOR FIRE SUPPRESSION PIPING AND EQUIPMENT

## PART 1 - 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.

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.03 SUMMARY:

A. This Section includes the following:

1. Isolation pads.
2. Isolation mounts.
3. Restrained elastomeric isolation mounts.
4. Restraining braces.
5. Pipes, fittings, and specialties.
6. Fire-protection valves.
7. Fire-department connections.
8. Sprinklers.
9. Alarm devices.
10. Manual control stations.
11. Control panels.
12. Pressure gages.

1.04 DEFINITIONS:

A. IBC: International Building Code.

B. ICC-ES: ICC-Evaluation Service.

1.05 PERFORMANCE REQUIREMENTS:

A. Seismic-Restraint Loading:

1. Site Class as Defined in the IBC: **D**

2. Assigned Seismic Use Group or Building Category as Defined in the IBC: **III**.

a. Component Importance Factor: **1.5**

3. Design Spectral Response Acceleration at Short Periods 0.2 Second:

4. Design Spectral Response Acceleration at 1-Second Period.

1.06 ACTION SUBMITTALS:

A. Product Data: For the following:

1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.

2. Illustrate and indicate style, material, strength, fastening provision, and

a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated the agency acceptable to authorities having jurisdiction.

b. Annotate to indicate application of each product submitted and compliance with requirements.

B. Delegated-Design Submittal: For vibration isolation and seismic-restraint details indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Design Calculations: Calculate static and dynamic loading due to equipment weight and operation, seismic forces required to select vibration isolators, seismic restraints, and for designing vibration isolation bases.

2. Seismic-Restraint Details:

a. Design Analysis: To support selection and arrangement of seismic restraints. Include calculations of combined tensile and shear loads.

b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to the restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.

c. Preapproval and Evaluation Documentation: By an agency acceptable to authorities having jurisdiction, showing maximum ratings of restraint items and the basis for approval (tests or calculations).

1.07 INFORMATIONAL SUBMITTALS:

A. Qualification Data: For professional engineer and testing agency.

B. Welding certificates.

1.08 QUALITY ASSURANCE:

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

B. Comply with seismic-restraint requirements in the IBC and NFPA 13 unless requirements in this Section are more stringent.

C. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

D. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA number from OSHPD, preapproval by ICC-ES, or preapproval by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

## PART 2 - PRODUCTS

### 2.01 VIBRATION ISOLATORS:

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Basis-of-Design Product: Subject to compliance with requirements of one of the following or approved substitute:

a. Isolation Technology, Inc.

b. Kinetics Noise Control.

c. Mason Industries.

B. Pads arranged in single or multiple layers of sufficient stiffness for uniform loading over pad area, molded with a nonslip pattern and galvanized-steel baseplates, and factory cut to sizes that match requirements of supported equipment.

1. Resilient Material: Oil- and water-resistant **neoprene**

C. Mounts Double-deflection type, with molded, oil-resistant rubber, hermetically sealed compressed fiberglass, or neoprene isolator elements with factory-drilled, encapsulated top plate for bolting to equipment and with baseplate for bolting to structure. Color-code or otherwise identify to indicate capacity range.

1. Materials: Cast-ductile-iron or welded steel housing containing two separate and opposing, oil-resistant rubber or neoprene elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.

2. Neoprene: Shock-absorbing materials compounded according to the standard for bridge-bearing neoprene as defined by AASHTO.

D. Restrained Mounts All-directional mountings with seismic restraint.

1. Materials: Galvanized welded steel housing containing two separate and opposing, oil-resistant rubber or neoprene elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.

2. Neoprene: Shock-absorbing materials compounded according to the standard for bridge-bearing neoprene as defined by AASHTO.PIPING MATERIALS

2.02 SEISMIC-RESTRAINT DEVICES:

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Basis-of-Design Product: Subject to compliance with requirements or a comparable product by one of the following:

a. Cooper B-Line, Inc.; a division of Cooper Industries.

b. Hilti, Inc.

c. Kinetics Noise Control.

d. Mason Industries.

e. TOLCO Incorporated; a brand of NIBCO INC.

f. Unistrut; Tyco International, Ltd.

g. Or approved substitute.

B. General Requirements for Restraint Components: Rated strengths, features, and applications shall be as defined in reports by the agency acceptable to authorities having jurisdiction.

1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four (4) times the maximum seismic forces to which they will be subjected.

C. Channel Support System: MFMA-3, shop- or field-fabricated support assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; and rated in tension, compression, and torsion forces.

D. Hanger Rod Stiffener: Reinforcing galvanized steel angle clamped] to hanger rod.

E. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings and matched to type and size of attachment devices used.

F. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

G. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior

applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488. Minimum length of eight times diameter.

2.03 FACTORY FINISHES:

A. Finish: Manufacturer's premium galvanized finish ready for field painting.

B. Paint: Manufacturer's standard paint applied to factory-assembled and -tested equipment before shipping.

1. Powder coating on springs and housings.

2. All hardware shall be galvanized. Hot-dip galvanize metal components for exterior use.

3. Color-code or otherwise mark vibration isolation and seismic-control devices to indicate capacity range.

PART 3 - EXECUTION

3.01 EXAMINATION:

A. Examine areas and equipment to receive vibration isolation and seismic-control devices for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 APPLICATIONS:

A. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application by the agency acceptable to authorities having jurisdiction.

B. Hanger Rod Stiffeners: Install hanger rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to seismic forces.

C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

3.03 VIBRATION-CONTROL AND SEISMIC-RESTRAINT DEVICE INSTALLATION:

A. Equipment Restraints:

1. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch

2. Install seismic-restraint devices using methods approved by the acceptable to authorities having jurisdiction] providing required submittals for component.

B. Piping Restraints:

1. Comply with requirements in MSS SP-127 and NFPA 13.

2. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.

3. Brace a change of direction longer than 12 feet .

C. Install cables so they do not bend across edges of adjacent equipment or building structure.

D. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting to steel structure.

E. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

F. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, to the top of structural steel framing.

G. Drilled-in Anchors at existing Concession Building only:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.

2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.

3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.

4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding

from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.

5. Set anchors to manufacturer's recommended torque, using a torque wrench.

6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.04 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION:

A. Install flexible connections in piping where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where the connections terminate with connection to equipment that is anchored to a different structural element from the one supporting the connections as they approach equipment. Comply with requirements in Division 13 Section “Fire-Suppression Piping” for piping flexible connections.

END OF SECTION

# DIVISION 13 – SPECIAL CONSTRUCTION

## SECTION 13911 – IDENTIFICATION FOR FIRE-SUPPRESSION PIPING AND EQUIPMENT

## PART 1 - 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.

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.03 SUMMARY:

A. This Section includes the following:

1. Isolation pads.
2. Isolation mounts.
3. Restrained elastomeric isolation mounts.
4. Restraining braces.
5. Equipment labels.
6. Warning signs and labels.
7. Pipe labels.
8. Stencils.
9. Valve tags.
10. Warning tags.

1.04 ACTION SUBMITTALS:

A. Product Data: For each type of product.

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

C. Equipment-Label Schedule: Include a listing of all equipment to be labeled and the proposed content for each label.

D. Valve Schedules: Valve numbering scheme.

1.05 CLOSEOUT SUBMITTALS:

A. Maintenance Data: For each piping system to include in maintenance manuals.

PART 2 - PRODUCTS

2.01 EQUIPMENT LABELS:

A. Plastic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, with predrilled holes for attachment hardware.

2. Letter Color: White

3. Background Color: **Red**

4. Maximum Temperature: Able to withstand temperatures up to 160 deg F

5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch

6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

7. Fasteners: Stainless-steel **rivets.**

B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.

C. Equipment-Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.02 WARNING SIGNS AND LABELS:

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, **1/8** inch thick, with predrilled holes for attachment hardware.

B. Letter Color: Black.

C. Background Color: **Yellow.**

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless-steel **rivets**.

H. Label Content: Include caution and warning information, plus emergency notification instructions.

2.03 PIPE LABELS:

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service and showing flow direction.

B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Pipe-Label Contents: Include identification of piping service using same designations or abbreviations per plans; pipe size; and an arrow indicating flow.

1. Flow-Direction Arrows: Integral with piping-system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.

2. Lettering Size: At least 1-1/2 inches high.

D. Pipe-Label Colors:

1. Background Color: Red.

2. Letter Color: White.

2.04 VALVE TAGS:

A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping-system abbreviation and 1/2-inch numbers.

1. Tag Material: Brass, **0.032** inch thick, with predrilled holes for attachment hardware.

2. Fasteners: Brass wire-link chain.

3. Valve-Tag Color: Red.

4. Letter Color: White.

B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-tag schedule shall be included in operation and maintenance data.

2.05 WARNING TAGS:

A. Warning Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with matte finish suitable for writing.

1. Size: **3 by 5-1/4 inches**

2. Fasteners: Brass grommet and wire

3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."

4. Color: Yellow background with black lettering.

PART 3 - EXECUTION

3.01 PREPARATION:

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.02 LABEL INSTALLATION:

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install or permanently fasten labels on each major valve or equipment.

D. Locate equipment labels where accessible and visible.

E. Piping Color-Coding: Painting of piping is specified in architectural specifications with two (2) coats of exterior rated, corrosion-resistant paint.

F. Pipe-Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.

2. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.

3. Near major equipment items and other points of origination and termination.

4. Spaced at maximum intervals of **50 feet** along each run. Reduce intervals to **25 feet** in areas of congested piping and equipment.

3.03 VALVE-TAG INSTALLATION:

A. Install tags on valves and control devices in piping systems. List tagged valves in a valve-tag schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and with captions similar to those indicated in "Valve-Tag Size and Shape" Subparagraph below:

1. Valve-Tag Size and Shape:

a. Wet-Pipe Sprinkler System: **2 inches** round

3.04 WARNING-TAG INSTALLATION:

A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION

# DIVISION 13 – SPECIAL CONSTRUCTION

## SECTION 13930 – WET-PIPE FIRE SUPPRESSION SPRINKLERS

## PART 1 - 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:

A. Section Includes:

1. Pipes, fittings, and specialties.
2. Fire-protection valves.
3. Fire-department connections.
4. Sprinklers.
5. Alarm devices.
6. Manual control stations.
7. Control panels.
8. Pressure gages.

1.03 DEFINITIONS:

A. Standard-Pressure Sprinkler Piping: Wet-pipe sprinkler system piping designed to operate at working pressure of 175 psig maximum.

1.04 SYSTEM DESCRIPTIONS:

A. Wet-Pipe Sprinkler System: Automatic sprinklers are attached to piping containing water and that is connected to water supply through alarm valve. Water discharges immediately from sprinklers when they are opened. Sprinklers open when heat melts fusible link or destroys frangible device. Hose connections are included if indicated.

1.05 PERFORMANCE REQUIREMENTS:

A. Standard-Pressure Piping System Component: Listed for 175-psig minimum working pressure.

B. Delegated Design: Design sprinkler system(s), including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated

C. Sprinkler system design shall be approved by authorities having jurisdiction

1. Margin of Safety for Available Water Flow and Pressure: 10 percent, including losses through water-service piping, valves, and backflow preventers.

2. Sprinkler Occupancy Hazard Classifications

a. Electrical Equipment Rooms: Ordinary Hazard, Group 1.

b. General Storage Areas: Ordinary Hazard, Group 1.

c. High-pile Storage Areas: Ordinary Hazard, Group 2.

3. Minimum Density for Automatic-Sprinkler Piping Design:

a. Ordinary-Hazard, Group 1 Occupancy: 0.15 gpm over 1500-sq. ft. area.

b. Ordinary-Hazard, Group 2 Occupancy: 0.20 gpm over 1500-sq. ft. area.

4. Maximum Protection Area per Sprinkler: Per UL listing.

5. Maximum Protection Area per Sprinkler:

a. Storage Areas: 130 sq. ft..

b. Mechanical Equipment Rooms: 130 sq. ft..

c. Electrical Equipment Rooms: 130 sq. ft..

d. Other Areas: According to NFPA 13 recommendations unless otherwise indicated.

6. Total Combined Hose-Stream Demand Requirement: According to NFPA 13 unless otherwise indicated:

a. Light-Hazard Occupancies: 100 gpm for 30 minutes.

b. Ordinary-Hazard Occupancies: 250 gpm for 60 to 90 minutes.

c. Extra-Hazard Occupancies: 500 gpm for 90 to 120 minutes.

D. Seismic Performance: Sprinkler piping shall withstand the effects of earthquake motions determined according to NFPA 13 and ASCE/SEI 7.

1.06 ACTION SUBMITTALS:

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For wet-pipe sprinkler systems. Include plans, elevations, sections, details, and attachments to other work.

1. Wiring Diagrams: For power, signal, and control wiring.

1.07 INFORMATIONAL SUBMITTALS:

A. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been approved by authorities having jurisdiction, including hydraulic calculations if applicable.

B. Field quality-control reports.

1.08 CLOSEOUT SUBMITTALS:

A. Operation and Maintenance Data: For sprinkler specialties to include in emergency, operation, and maintenance manuals.

1.09 QUALITY ASSURANCE:

A. Installer Qualifications:

1. Installer's responsibilities include designing, fabricating, and installing sprinkler systems and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test.

a. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by a qualified professional engineer.

B. Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. NFPA Standards: Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with the following:

1. NFPA 13, "Installation of Sprinkler Systems."

2. NFPA 13R, "Installation of Sprinkler Systems in Residential Occupancies up to and Including Four Stories in Height."

1.10 PROJECT CONDITIONS:

A. Interruption of Existing Sprinkler Service: Do not interrupt sprinkler service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary sprinkler service according to requirements indicated:

1. Notify Owner no fewer than two days in advance of proposed interruption of sprinkler service.

2. Do not proceed with interruption of sprinkler service without Owner's written permission.

1.11 COORDINATION:

A. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.

1.12 EXTRA MATERIALS:

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Sprinkler Cabinets: Finished, wall-mounted, steel cabinet with hinged cover, and with space for minimum of six spare sprinklers plus sprinkler wrench. Include number of sprinklers required by NFPA 13 and sprinkler wrench. Include separate cabinet with sprinklers and wrench for each type of sprinkler used on Project.

PART 2 - PRODUCTS

2.01 PIPING MATERIALS:

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, and fitting materials, and for joining methods for specific services, service locations, and pipe sizes.

2.02 GALVANIZED STEEL PIPE AND FITTINGS:

A. Galvanized Standard Weight Black-Steel Pipe: ASTM A 53/A 53M, Type E, Grade B. Pipe ends may be factory or field formed to match joining method.

B. Galvanized Black-Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M, standard-weight, seamless steel pipe with threaded ends.

C. Galvanized Steel Couplings: ASTM A 865, threaded.

D. Galvanized Malleable- or Ductile-Iron Unions: UL 860.

E. Galvanized Steel Flanges and Flanged Fittings: ASME B16.5, Class 150.

F. Galvanized Steel Welding Fittings: ASTM A 234/A 234M and ASME B16.9.

G. Galvanized Grooved-Joint, Steel-Pipe Appurtenances:

1. Pressure Rating: 175 psig minimum.

2. Grooved-End Fittings for Steel Piping: ASTM A 47/A 47M, malleable-iron casting or ASTM A 536, ductile-iron casting; with dimensions matching steel pipe.

3. Galvanized Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213, rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.

2.03 PIPING JOINING MATERIALS:

A. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free.

1. Class 125, Cast-Iron Flanges and Class 150, Bronze Flat-Face Flanges: Full-face gaskets.

2. Class 250, Cast-Iron Flanges and Class 300, Steel Raised-Face Flanges: Ring-type gaskets.

B. Galvanized Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.04 LISTED FIRE-PROTECTION VALVES:

A. General Requirements:

1. Valves shall be UL listed or FM approved.

2. Minimum Pressure Rating for Standard-Pressure Piping: 175 psig .

3. Minimum Pressure Rating for High-Pressure Piping: 250 psig.

B. Ball Valves:

1. Standard: UL 1091 except with ball instead of disc.

2. Valves NPS 1-1/2 and Smaller: Bronze body with threaded ends.

3. Valves NPS 2 and NPS 2-1/2 : Bronze body with threaded ends or ductile-iron body with grooved ends.

4. Valves NPS 3 : Ductile-iron body with grooved ends.

C. Bronze Butterfly Valves:

1. Standard: UL 1091.

2. Pressure Rating: 175 psig .

3. Body Material: Bronze or Stainless Steel

4. End Connections: Threaded.

D. Check Valves:

1. Standard: UL 312.

2. Pressure Rating: 250 psig minimum.

3. Type: Swing check.

4. Body Material: Bronze or Stainless Steel

5. End Connections: Flanged or grooved.

E. Indicating-Type Butterfly Valves:

1. Standard: UL 1091.

2. Pressure Rating: 175 psig minimum.

3. Valves NPS 2 and Smaller:

a. Valve Type: Ball or butterfly.

b. Body Material: Bronze.

c. End Connections: Threaded.

4. Valves NPS 2-1/2 and Larger:

    a. Valve Type: Butterfly.

    b. Body Material: Galvanized or 316 Stainless Steel

    c. End Connections: Flanged, grooved, or wafer.

5. Valve Operation: Integral electrical, 115-V ac, prewired, single-circuit, supervisory switch indicating device.

2.05 TRIM AND DRAIN VALVES:

A. General Requirements:

1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.

2. Pressure Rating: 175 psig minimum.

2.06 SPECIALTY VALVES:

A. General Requirements:

1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.

2. Pressure Rating:

    a. Standard-Pressure Piping Specialty Valves: 175 psig minimum.

3. Body Material: Cast or ductile iron.

4. Size: Same as connected piping.

5. End Connections: Flanged or grooved.

B. Alarm Valves:

1. Standard: UL 193.

2. Design: For horizontal or vertical installation.

3. Include trim sets for bypass, drain, electrical sprinkler alarm switch, pressure gages, retarding chamber, and fill-line attachment with strainer.

4. Drip Cup Assembly: Pipe drain without valves and separate from main drain piping.

5. Drip Cup Assembly: Pipe drain with check valve to main drain piping.

2.07 SPRINKLER SPECIALTY PIPE FITTINGS:

A. Branch Outlet Fittings:

1. Standard: UL 213.

2. Pressure Rating: 175 psig minimum.

3. Body Material: Ductile-iron housing with EPDM seals and bolts and nuts.

4. Type: Mechanical-T and -cross fittings.

5. Configurations: Snap-on and strapless, ductile-iron housing with branch outlets.

6. Size: Of dimension to fit onto sprinkler main and with outlet connections as required to match connected branch piping.

7. Branch Outlets: Grooved, plain-end pipe, or threaded.

B. Flow Detection and Test Assemblies:

1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.

2. Pressure Rating: 175 psig minimum.

3. Body Material: Cast- or ductile-iron housing with orifice, sight glass, and integral test valve.

4. Size: Same as connected piping.

5. Inlet and Outlet: Threaded.

C. Branch Line Testers:

1. Standard: UL 199.

2. Pressure Rating: 175 psig .

3. Body Material: Brass.

4. Size: Same as connected piping.

5. Inlet: Threaded.

6. Drain Outlet: Threaded and capped.

7. Branch Outlet: Threaded, for sprinkler.

D. Sprinkler Inspector's Test Fittings:

1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.

2. Pressure Rating: 175 psig minimum.

3. Body Material: Cast- or ductile-iron housing with sight glass.

4. Size: Same as connected piping.

5. Inlet and Outlet: Threaded.

E. Adjustable Drop Nipples:

1. Standard: UL 1474.

2. Pressure Rating: 250 psig minimum.

3. Body Material: Steel pipe with EPDM-rubber O-ring seals.

4. Size: Same as connected piping.

5. Length: Adjustable.

6. Inlet and Outlet: Threaded.

2.08 SPRINKLERS:

A. General Requirements:

1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.

2. Pressure Rating for Automatic Sprinklers: 175 psig minimum.

B. Automatic Sprinklers with Heat-Responsive Element:

1. Early-Suppression, Fast-Response Applications: UL 1767.

2. Characteristics: Nominal 1/2-inch orifice with Discharge Coefficient K of 5.6, and for "Ordinary" temperature classification rating unless otherwise indicated or required by application.

C. Sprinkler Finishes:

1. ENT – Electroless Nickel Plated

2.09 ALARM DEVICES:

A. Alarm-device types shall match piping and equipment connections.

B. Water-Motor-Operated Alarm:

1. Standard: UL 753.

2. Type: Mechanically operated, with Pelton wheel.

3. Alarm Gong: Cast aluminum with red-enamel factory finish.

4. Size: 10-inch diameter.

5. Components: Shaft length, bearings, and sleeve to suit wall construction.

6. Inlet: NPS 3/4 .

7. Outlet: NPS 1 drain connection.

C. Electrically Operated Alarm Bell:

1. Standard: UL 464.

2. Type: Vibrating, metal alarm bell.

3. Size: 8-inch minimum- diameter.

4. Finish: Red-enamel factory finish, suitable for outdoor use.

D. Water-Flow Indicators:

1. Standard: UL 346.

2. Water-Flow Detector: Electrically supervised.

3. Components: Two single-pole, double-throw circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed.

4. Type: Paddle operated.

5. Pressure Rating: 250 psig .

6. Design Installation: Horizontal or vertical.

E. Pressure Switches:

1. Standard: UL 346.

2. Type: Electrically supervised water-flow switch with retard feature.

3. Components: Single-pole, double-throw switch with normally closed contacts.

4. Design Operation: Rising pressure signals water flow.

F. Valve Supervisory Switches:

1. Standard: UL 346.

2. Type: Electrically supervised.

3. Components: Single-pole, double-throw switch with normally closed contacts.

4. Design: Signals that controlled valve is in other than fully open position.

2.10 MANUAL CONTROL STATIONS:

A. Description: UL listed or FM approved, hydraulic operation, with union, NPS 1/2 pipe nipple, and bronze ball valve. Include metal enclosure labeled "MANUAL CONTROL STATION" with operating instructions and cover held closed by breakable strut to prevent accidental opening.

2.11 CONTROL PANELS:

A. Description: Single-area, two-area, or single-area cross-zoned control panel as indicated, including NEMA ICS 6, Type 1 enclosure, detector, alarm, and solenoid-valve circuitry for operation of deluge valves. Panels contain power supply; battery charger; standby batteries; field-wiring terminal strip; electrically supervised solenoid valves and polarized fire-alarm bell; lamp test facility; single-pole, double-throw auxiliary alarm contacts; and rectifier.

1. Panels: UL listed and FM approved when used with thermal detectors and Class A detector circuit wiring. Electrical characteristics are 120-V ac, 60 Hz, with 24-V dc rechargeable batteries.

2. Manual Control Stations: Electric operation, metal enclosure, labeled "MANUAL CONTROL STATION" with operating instructions and cover held closed by breakable strut to prevent accidental opening.

3. Manual Control Stations: Hydraulic operation, with union, NPS 1/2 pipe nipple, and bronze ball valve. Include metal enclosure labeled "MANUAL CONTROL STATION" with operating instructions and cover held closed by breakable strut to prevent accidental opening.

2.12 PRESSURE GAGES:

A. Standard: UL 393.

B. Dial Size: 3-1/2- to 4-1/2-inch diameter.

C. Pressure Gage Range: 0 to 250 psig minimum.

D. Water System Piping Gage: Include "WATER" or "AIR/WATER" label on dial face.

E. Air System Piping Gage: Include retard feature and "AIR" or "AIR/WATER" label on dial face.

PART 3 - EXECUTION

3.01 PREPARATION:

A. Perform fire-hydrant flow test according to NFPA 13 and NFPA 291. Use results for system design calculations required in "Quality Assurance" Article.

B. Report test results promptly and in writing.

3.02 WATER-SUPPLY CONNECTIONS:

A. Connect sprinkler piping to building's interior water-distribution piping.

B. Install shutoff valve, backflow preventer, pressure gage, drain, and other accessories indicated at connection to water-distribution piping.

C. Install shutoff valve, check valve, pressure gage, and drain at connection to water supply.

3.03 PIPING INSTALLATION:

A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical.

1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Officer-in-Charge before deviating from approved working plans.

B. Piping Standard: Comply with requirements for installation of sprinkler piping in NFPA 13.

C. Install seismic restraints on piping. Comply with requirements for seismic-restraint device materials and installation in NFPA 13.

D. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

E. Install unions adjacent to each valve in pipes NPS 2 and smaller.

F. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

G. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, and sized and located according to NFPA 13.

H. Install sprinkler piping with drains for complete system drainage.

I. Install sprinkler control valves, test assemblies, and drain risers adjacent to standpipes when sprinkler piping is connected to standpipes.

J. Install automatic (ball drip) drain valve at each check valve for fire-department connection, to drain piping between fire-department connection and check valve. Install drain piping to and spill over floor drain or to outside building.

K. Install alarm devices in piping systems.

L. Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements for hanger materials in NFPA 13.

M. Install pressure gages on riser or feed main, at each sprinkler test connection, and at top of each standpipe. Include pressure gages with connection not less than NPS 1/4 and with soft metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they will not be subject to freezing.

N. Pressurize and check preaction sprinkler system piping, air-pressure maintenance devices and air compressors.

O. Fill sprinkler system piping with water.

P. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Division 15 Section "Sleeves and Sleeve Seals for Fire-Suppression Piping."

Q. Install sleeve seals for piping penetrations of concrete walls and slabs.

R. Install escutcheons for piping penetrations of walls, ceilings, and floors.

3.04 JOINT CONSTRUCTION:

A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.

B. Install unions adjacent to each valve in pipes NPS 2 and smaller.

C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

D. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.

G. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.

2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

H. Twist-Locked Joints: Insert plain end of steel pipe into plain-end-pipe fitting. Rotate retainer lugs one-quarter turn or tighten retainer pin.

I. Steel-Piping, Pressure-Sealed Joints: Join lightwall steel pipe and steel pressure-seal fittings with tools recommended by fitting manufacturer.

J. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.

1. Shop weld pipe joints where welded piping is indicated. Do not use welded joints for galvanized-steel pipe.

K. Steel-Piping, Cut-Grooved Joints: Cut square-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket,

lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe joints.

L. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.

M. Steel-Piping, Pressure-Sealed Joints: Join Schedule 5 steel pipe and steel pressure-seal fittings with tools recommended by fitting manufacturer.

N. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.05 INSTALLATION OF COVER SYSTEM FOR SPRINKLER PIPING:

A. Install cover system, brackets, and cover components for sprinkler piping according to manufacturer's "Installation Manual" and with NFPA 13 or NFPA 13R for supports.

3.06 VALVE AND SPECIALTIES INSTALLATION:

A. Install listed fire-protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NFPA 13 and authorities having jurisdiction.

B. Install listed fire-protection shutoff valves supervised open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.

C. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water-supply sources.

D. Specialty Valves:

1. General Requirements: Install in vertical position for proper direction of flow, in main supply to system.

2. Alarm Valves: Include bypass check valve and retarding chamber drain-line connection.

3.07 SPRINKLER INSTALLATION:

A. Install sprinklers along top of rack, centered on structure with tee fitting.

3.08 IDENTIFICATION:

A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13.

B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 16 Section "Electrical Identification."

C. Galvanized standard-pressure, wet-pipe sprinkler system, all pipe sizes, shall be one of the following:

1. Standard-weight, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.

2. Standard-weight, black-steel pipe with cut- or roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.

3.09 DEMONSTRATION:

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain specialty valves.

3.10 PIPING SCHEDULE:

A. All piping shall be galvanized, standard-weight steel pipe with grooved ends; grooved-end fittings; grooved-end-pipe couplings; and grooved joints.

B. Sprinkler specialty fittings may be used, downstream of control valves, instead of specified fittings.

3.11 SPRINKLER SCHEDULE:

A. Provide factory applied electroless nickel plated (ENT) corrosion coated upright sprinklers

END OF SECTION

# DIVISION 16 – ELECTRICAL

## SECTION 16011 – REQUIREMENTS FOR ELECTRICAL INSTALLATIONS

## PART 1 - 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:

A. The Section applies to Division 16 - Electrical.

B. Furnish and install electrical wiring, systems, equipment, accessories, tests, adjustments, and provide instructions and documentation in accordance with the specifications and drawings for a proper, complete, satisfactory and operable system.

C. 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 time of final acceptance.

D. All earthwork, concrete, painting, firestopping, and grouting shall conform to the applicable requirements of the detailed equipment specifications as prescribed in appropriate Sections.

E. It is the intent of these Specifications and other Contract Documents to require an installation complete in every detail. Consequently, the Contractor is responsible for minor details or for any special construction which may be found necessary to properly finish, install, adjust, test, and place in successful and continuous operation of the entire electrical system.

F. Capacities and ratings of transformers, cables, distribution panelboards, panelboards, and other electrical items and arrangements shall be of sufficient capacity as shown on drawings, specifications and as required by the applicable National Electrical Code, as well as other applicable codes and standards.

G. The contractor shall be solely responsible for safety on the jobsite.

H. The contractor shall furnish and install all equipment for temporary construction power as required.

1.03 RELATED WORK:

A. Communications equipment and wiring, Division 16.

B. Fire Alarm System equipment and wiring, Division 16.

1.04 RULES, REGULATIONS AND STANDARDS:

A. Comply with local ordinances and building department directives; International Building Code, International Energy Conservation Code, National Fire Protection Association including NFPA 70 National Electrical Code, Uniform Fire Code, statutes and official requirements of the State of Hawaii and City and County of Honolulu; ADA Accessibility Guidelines.

B. Comply with serving utility agency rules and requirements, and pay for service charges levied by such agencies for work performed during the agencies' non-working hours and days.

C. Applicable Documents: Relevant definitions and requirements to current versions of ANSI, UL, NEMA, EEI, IEEE, NFPA, TIA/EIA, ADAAGS references.

D. 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.

1.05 PERMITS AND INSPECTIONS:

A. Apply, obtain and pay for all permits required by local ordinances.

B. After completion of the work, the Contractor shall be furnished a certificate of final inspection and approval from the electrical inspection department of local authority having jurisdiction.

1.06 COORDINATION:

A. Electrical drawings are illustrative and representational. Locations of outlets, devices, raceways, apparatus and other electrical items shown are approximate and shall be installed with the required maintenance and code clearances and to correct inconsistencies with existing conditions, other building systems and trades. Survey existing site conditions to verify lineal footages required and check scales and dimensions shown on construction drawings, verify locations, routing and lineal footages of electrical work required. Study existing civil, architectural, structural and mechanical conditions and install electrical system orderly and coordinated with existing site and building appurtenances.

B. Refer to all project Drawings and to all Sections of the project Specification. Coordinate and verify all work accordingly so that all electrical outlets and 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. 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. Provide additional components and wiring not shown or specified herein but that are required for proper control and operation to provide for a complete and operable system with the intent indicated on the drawings and specifications.

D. Thoroughly review the Construction Documents including those of other trades.

E. Relocate devices, apparatus and associated wiring including raceways, from locations shown, for code compliance and to correct inconsistencies with existing conditions, structures, utilities and when directed prior to rough-in and installation.

F. Equipment ratings and wire sizes shall have adequate capacity to serve the required load and be in compliance with the NEC.

G. Verify voltages and other ratings of electrical utilization equipment prior to placing order with factory. Input voltages of equipment shall match serving utility or system voltage available.

H. Where inconsistencies between the drawings, specifications, referenced codes, standards and requirements exist, the more stringent requirement shall govern.

I. Schedule work to avoid delays, interferences, and unnecessary work. If any conflicts occur necessitating departures from the Drawings and Specifications, Contractor must immediately submit details and reasons for departures for consideration to the Officer-in-Charge.

J. The warranty shall be countersigned by the General Contractor as applicable.

1.07 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 installed work; 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 approval of the Officer-in-Charge and at no additional cost to the City.

1.08 SUBMITTALS:

A. See Section 01300 – Submittals, for submittal procedures.

B. Written certification that electrical systems are complete and operational.

C. Test records.

D. Warranty: Submit warranty as stipulated in paragraph entitled “WARRANTY” herein below.

1.09 WARRANTY:

A. The installation shall be complete in every detail as specified and ready for use. Guarantee work against defects in material and workmanship, and faulty or improper installation for a period of one year from the project acceptance date, except where guarantees or warranties for longer terms are specified herein.

B. The Contractor shall correct all deficiencies occurring during the guarantee period including but not limited to replacing with new materials, apparatus or parts as directed by the Officer-in-Charge to make such defective portion(s) of the complete system conform to the true intent of the Contract Documents at no additional cost to the City.

C. The warranty shall be countersigned by the General Contractor as applicable.

PART 2 - PRODCTS

2.01 GENERAL:

A. Equipment and material shall be new and those items listed, labeled or certified for the intended application by a recognized testing organization to meet Underwriters Laboratories, Inc., standards where test standards have been established and in accordance with the National Electrical Code.

B. No products containing asbestos shall be used on this project.

C. Where equipment and material are specified by catalog numbers and names that are of obsolescence, supersedure, or error in identification, the intent implied by the description, application, required performance and features noted shall govern.

D. Brand names, manufacturer's names and catalog numbers referenced within the Contract Documents indicate minimum standard of design and quality required.

E. Electrical equipment shall be supplied through the manufacturer's designated representative.

F. Equipment and materials shall be suitable for intended location and use and include all accessories for proper installation and operation.

G. Where two or more similar type items are furnished, all shall be of the same manufacture, e.g., all receptacles shall be from the same manufacturer, unless otherwise noted.

H. Provide NEMA 3R or 4X housings, as indicated on drawings, where electrical apparatus is to be installed outdoors.

I. Provide all hardware, supports, backing and other accessories necessary to install electrical equipment. Wood materials shall be treated against termite, iron or steel materials shall be galvanized for corrosion protection, and non-ferrous materials shall be brass or bronze. Provide stainless steel materials where indicated.

J. Bolts, nuts, washers, and screws used for exterior or wet locations shall be of high quality stainless steel or brass.

K. Duct Seal: Pliable, non-toxic material used for application around conductors in raceway and in empty conduits to minimize moisture and rodent/insect infiltration. Must be re-enterable material allowing for removal/reapplication after initial installation. Non-drying, non-cracking, non-corrosive material that will not adversely affect raceway and conductors.

## PART 3 - EXECUTION

### 3.01 GENERAL:

A. Comply with manufacturers' instructions and directions pertaining to equipment, practices recommended by latest versions of the American Electricians Handbook, National Electrical Code, National Electrical Safety Code, National Fire Code, Institute of Electrical & Electronics Engineers, ANSI/Telecommunications Industry Association/Electronics Industries Association, Public Utilities Commission General Order No. 10 and the servicing utility agency requirements.

B. Installation shall be appropriate for intended location and use, and be complete and operable within intent indicated on the plans and specifications. Provide all accessories as required for proper installation and operation.

C. For actual fabrication, installation and testing of the work use only certified, trained and experienced workmen familiar with items required and with manufacturers' recommended methods of installation. Rejection of installed work made due to the lack of skill shall be corrected.

D. Factory trained technician shall perform work for electrical items where specifically recommended by the manufacturer.

E. Delivery, Handling and Storage

1. Deliver all materials of this Division in manufacturer’s original unopened packages or containers with label intact and legible.

2. Use means necessary to protect the materials of this Section before, during, and after installation; to protect installed work; and to protect the original structure, work and materials of the City.

3. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Officer-in-Charge and at no additional cost to the City.

F. Cut and Patch: Trench, excavate, cut and core as required to install electrical systems. Backfill, repair and patch walls, floors, ceilings and structure and pavement and replant/regrass as required to restore finished surfaces, grade and landscape to original condition. Paint exposed raceways and boxes to match surrounding finish.

1. Seal all excess openings.

2. Carefully chip concrete to avoid cutting structural steel. Repair any damage to rebars by welding.

G. Equipment Connections: Unless indicated otherwise, provide wiring for all equipment furnished by other trades. Provide disconnect switches for all motorized equipment and water heaters, unless indicated otherwise by mechanical, plumbing, or architectural Construction Documents. Install starters and controllers furnished by other trades. Wiring shown on any drawing is based on basis equipment rating. Verify with the Officer-in-Charge or trade furnishing equipment final equipment selections and adjust wiring and associated protective device as required to accommodate actual size and ratings of equipment to be furnished. Trench, excavate, cut and core as required to install electrical systems.

1. Check and ensure that proper polarity and phase rotation is provided for all outlets and equipment connections.

H. Existing Conditions: Visit the site and become familiarized with existing field conditions.

1. Verify areas of work that traverse of new electrical, signal and telecommunication lines for possible conflicts with existing utilities and obstructions and new construction by other trades prior to earthwork and installation of new lines.

2. Reroute existing electrical and signal/communication lines and relocate equipment as necessary to avoid conflict with new construction.

3. Repair any existing utility lines or structures damaged during construction activities at the contractor's expense. If the lines or structures are owned by a utility company, follow utility company procedures for notification and repair, pay for repairs, and proceed with repair work at utility company's direction.

4. Remove existing wiring and equipment no longer in use. Phase removal and new work as required to allow existing facilities to remain operational as needed.

I. Restrictions:

1. Noisy construction operations which interfere with the usual existing procedures in adjacent areas shall be scheduled with the Officer-in-Charge in advance.

J. Adjustments and Settings:

1. Adjust breaker trip settings and other equipment settings and controls per manufacturer's recommendations and as required unless otherwise directed.

2. Balance feeder loading equally on each phase as closely as practicable. Rearrange feeder and branch circuit connections as necessary to balance loads and update panel schedules and other identification accordingly.

K. Neat appearances in the finished work are required. Only experienced electrical workers shall be employed for the electrical installation.

L. Paint all exposed conduit systems including boxes, hangers, and other supports in accordance with specification Section 09900 – Painting and Coating. Color to be selected by Officer-in-Charge to match adjoining areas. Protect equipment, cabinets, devices, luminaires, conductors, etc. from paint.

M. All work not installed and completed in accordance with the latest rules and regulations of OSHA and all local ordinances shall be removed and reinstalled correctly at the Contractor's expense.

N. Install all electrical materials and equipment in accordance with manufacturer's recommendations for the seismic zone classification at the project site.

O. Coordinate all electrical work to avoid conflicts with work of other trades. Before installing, study adjacent architectural details and make installation in the most logistic manner. Any device may be relocated within 10'-0" before installation at direction of Officer-in-Charge without additional cost to the City.

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

Q. 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.

3.02 OUTAGES:

A. Schedule all work to minimize power outages. Outages will be permitted only after normal operating hours unless approved by the Officer-in-Charge. Contractor shall request for outages in writing at least 14-calendar days in advance of proposed outage. Contractor shall pay for charges for work required after normal operating hours and provide temporary power and wiring as necessary.

END OF SECTION

# DIVISION 16 – ELECTRICAL

## SECTION 16063 – GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

### PART 1 - 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:

A. Section Includes: Grounding systems and equipment.

1.03 SUBMITTALS:

A. See Section 01300 – Submittals, for submittal procedures.

B. Product Data: For each type of product indicated.

C. Field quality-control reports.

1.04 QUALITY ASSURANCE:

A. Comply with UL 467 for grounding and bonding materials and equipment.

### PART 2 - PRODUCTS

2.01 CONDUCTORS:

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.

2. Stranded Conductors: ASTM B 8.

3. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.

4. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.

5. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

2.02 CONNECTORS:

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, pressure type with at least two bolts.

1. Pipe Connectors: Clamp type, sized for pipe.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

D. Bus-bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

PART 3 - EXECUTION

3.01 APPLICATIONS:

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Underground Grounding Conductors: Install bare copper conductor, No. 2/0 AWG minimum.

1. Bury at least 24 inches below grade.

2. Duct-Bank Grounding Conductor: Bury 12 inches to top of duct bank when indicated as part of duct-bank installation.

C. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.

2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.

3. Connections to Structural Steel: Welded connectors.

3.02 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS:

A. Comply with IEEE C2 grounding requirements.

B. Grounding Manholes and Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inches will extend above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches above to 6 inches below concrete. Seal floor opening with waterproof, non-shrink grout.

C. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper bonding conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields according to written instructions by manufacturer of splicing and termination kits.

3.03 EQUIPMENT GROUNDING:

A. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

1. Feeder circuits.

2. Branch circuits.

3. Flexible raceway runs.

4. Armored and metal-clad cable runs.

5. Computer and Rack-Mounted Electronic Equipment Circuits: Install insulated equipment grounding conductor in branch-circuit runs from equipment-area power panels and power-distribution units.

B. Signal and Communication Equipment: In addition to grounding and bonding required by NFPA 70, provide a separate grounding system complying with requirements in TIA 607-D

1. For telephone, alarm, voice and data, and other communication equipment, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.

2. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-4-by-12-inch grounding bus.

3. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

C. Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

3.04 INSTALLATION:

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.

2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

C. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.

2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.

3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

D. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water

fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.

2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.

3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

E. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install bonding jumper to bond across flexible duct connections to achieve continuity.

F. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet apart.

3.05 LABELING:

A. Comply with requirements in Section 16075 – Identification for Electrical Systems for instruction signs. The label or its text shall be green.

B. Install labels at the telecommunications bonding conductor and grounding equalizer and at the grounding electrode conductor where exposed.

1. Label Text: "If this connector or cable is loose or if it must be removed for any reason, notify the facility manager."

3.06 FIELD QUALITY CONTROL:

A. Tests and Inspections:

1. Testing Agency: Officer-in-Charge will engage a qualified testing agency to perform tests and inspections.

2. Perform tests and inspections.

a. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

b. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.

c. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.

d. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal and at individual ground rods. Make tests at ground rods before any conductors are connected.

1) Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.

2) Perform tests by fall-of-potential method according to IEEE 81.

3. Prepare dimensioned Drawings locating each ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

4. Prepare test and inspection reports.

B. Grounding system will be considered defective if it does not pass tests and inspections.

C. Report measured ground resistances that exceed the following values:

1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.

D. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Officer-in-Charge promptly and include recommendations to reduce ground resistance.

END OF SECTION

# DIVISION 16 – ELECTRICAL

## SECTION 16073 – HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

## PART 1 - 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:

A. This Section includes the following:

1. Grounding systems and equipment.

2. Construction requirements for concrete bases.

1.03 DEFINITIONS:

A. EMT: Electrical metallic tubing.

B. IMC: Intermediate metal conduit.

C. RMC: Rigid metal conduit.

1.04 PERFORMANCE REQUIREMENTS:

A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified Structural Engineer, using performance requirements and design criteria indicated.

B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

D. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.05 SUBMITTALS:

A. See Section 01300 – Submittals, for submittal procedures.

B. Product Data: For the following:

1. Steel slotted support systems.

C. Shop Drawings: Show fabrication and installation details and include calculations for the following:

1. Steel slotted channel systems. Include Product Data for components.

2. Equipment supports.

D. Welding certificates.

1.06 QUALITY ASSURANCE:

A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Comply with NFPA 70.

1.07 COORDINATION:

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified together with concrete Specifications.

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations.

PART 2 - PRODUCTS

2.01 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS:

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Allied Tube & Conduit.

b. Cooper B-Line, Inc.; a division of Cooper Industries.

c. ERICO International Corporation.

d. GS Metals Corp.

e. Thomas & Betts Corporation.

f. Unistrut; Tyco International, Ltd.

g. Wesanco, Inc.

h. Or Approved Substitute.

2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.

3. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.

4. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.

5. Channel Dimensions: Selected for applicable load criteria.

B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

C. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened Portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.

a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1) Cooper B-Line, Inc.; a division of Cooper Industries.

2) Empire Tool and Manufacturing Co., Inc.

3) Hilti Inc.

4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.

5) MKT Fastening, LLC.

6) Or Approved Substitute.

2. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.

3. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.

4. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.

5. Toggle Bolts: All-steel springhead type.

2.02 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES:

A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements in Section 05500 – Metal Fabrications for steel shapes and plates.

PART 3 - EXECUTION

3.01 APPLICATION:

A. Support work in accordance with the best industry practice. Provide supports, hangers, auxiliary structural members and supplemental hardware required for support of the work.

B. Provide supporting frames or racks extending from floor slab to ceiling slab for work indicated as being supported from walls where the walls are incapable of supporting the weight. In particular, provide such frames or racks in electric closets and mechanical equipment rooms.

C. Provide supporting frames or racks for equipment which is to be installed in a freestanding position.

D. Supporting frames or racks shall be of standard angle, standard channel or specialty support system steel members, rigidly bolted or welded together and adequately braced to form a substantial structure. Racks shall be of ample size to assure a workmanlike arrangement of all equipment mounted on them.

E. Adequate support of equipment (including outlet, pull and junction boxes and fittings) shall not depend on electric conduits, raceways, or cables for support.

F. Electrical equipment shall not rest on or depend for support on suspended ceiling media (tiles, lath, plaster, as well as splines, runners, bars and the like in the plane of the ceiling). Provide independent support of electrical equipment. Do not attach to supports provided for ductwork, piping or work of other trades.

G. Provide required supports and hangers for conduit, equipment, etc., so that loading will not exceed allowable loadings of structure. Electrical equipment and supports shall not come in contact with work of other trades.

H. For items, which are shown, as being ceiling-mounted at locations where fastening to the building construction element above is not possible, provide suitable auxiliary channel or angle iron bridging tying to the building structural elements.

I. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

J. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.

K. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

    1. Secure raceways and cables to these supports with single-bolt conduit clamps using spring friction action for retention in support channel.

3.02 SUPPORT INSTALLATION:

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.

2. To New Concrete: Bolt to concrete inserts.

3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.

4. To Existing Concrete: Expansion anchor fasteners.

5. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts.

6. To Light Steel: Sheet metal screws.

7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.03 INSTALLATION OF FABRICATED METAL SUPPORTS:

A. Comply with installation requirements in Section 05500 – Metal Fabrications for site-fabricated metal supports.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

3.04 CONCRETE BASES:

A. Construct concrete bases of dimensions indicated but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Use 3000-psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Section 03300 – Cast-In-Place Concrete.

C. Anchor equipment to concrete base.

1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

2. Install anchor bolts to elevations required for proper attachment to supported equipment.

3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.05 PAINTING:

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Touchup: Comply with requirements in Section 09901 – Paint Restoration for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

# DIVISION 16 – ELECTRICAL

## SECTION 16075 – IDENTIFICATION FOR ELECTRICAL SYSTEMS

## PART 1 - 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:

A. This Section includes the following:

1. Identification for raceways.
2. Identification of power and control cables.
3. Identification for conductors.
4. Underground-line warning tape.
5. Warning labels and signs.
6. Instruction signs.
7. Equipment identification labels.
8. Miscellaneous identification products.

1.03 SUBMITTALS:

A. See Section 01300 – Submittals, for submittal procedures.

B. Product Data: For each electrical identification product indicated.

C. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.

1.04 QUALITY ASSURANCE:

A. Comply with ANSI A13.1 and IEEE C2.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

D. Comply with ANSI Z535.4 for safety signs and labels.

E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

1.05 COORDINATION:

A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

C. Coordinate installation of identifying devices with location of access panels and doors.

PART 2 - PRODUCTS

2.01 POWER AND CONTORL CABLE IDENTIFICATION MATERIALS:

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each cable size.

B. Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing ends of legend label.

C. Self-Adhesive, Self-Laminating Polyester Labels: Preprinted, 3-mil- thick flexible label with acrylic pressure-sensitive adhesive that provides a clear, weather- and chemical-resistant, self-laminating, protective shield over the legend. Labels sized to fit the cable diameter such that the clear shield overlaps the entire printed legend.

2.02 CONDUCTOR IDENTIFICATION MATERIALS:

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

2.03 UNDERGROUND-LINE WARNING TAPE:

A. Tape:

1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.

2. Printing on tape shall be permanent and shall not be damaged by burial operations.

3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.

4. Reinforced, detectable three-layer laminate, consisting of a printed pigmented woven scrim, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core, bright-colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.

5. Overall Thickness: 8 mils.

6. Foil Core Thickness: 0.35 mil.

7. Weight: 34 lb/1000 sq. ft.

8. 3-InchTensile According to ASTM D 882: 300 lbf, and 12,500 psi.

B. Color and Printing:

1. Comply with ANSI Z535.1 through ANSI Z535.5.

2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE, HIGH VOLTAGE.

3. Inscriptions for Orange-Colored Tapes: TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE.

2.04 WARNING LABELS AND SIGNS:

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.

C. Warning label and sign shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."

2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."

3. Arc flash warning per NFPA 70E.

2.05 EQUIPMENT IDENTIFICATION LABELS:

A. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch.

B. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch.

2.06 CABLE TIES:

A. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, Type 6/6 nylon.

1. Minimum Width: 3/16 inch.

2. Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.

3. Temperature Range: Minus 40 to plus 185 deg F.

4. Color: Black except where used for color-coding.

B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, Type 6/6 nylon.

1. Minimum Width: 3/16 inch.

2. Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.

3. Temperature Range: Minus 40 to plus 185 deg F.

4. Color: Black.

C. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, self-locking.

1. Minimum Width: 3/16 inch.

2. Tensile Strength at 73 deg F, According to ASTM D 638: 7000 psi.

3. UL 94 Flame Rating: 94V-0.

4. Temperature Range: Minus 50 to plus 284 deg F.

5. Color: Black.

2.07 MISCELLANEOUS IDENTIFICATION PRODUCTS:

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

E. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

F. Attach plastic raceway and cable labels that are not self-adhesive type with clear vinyl tape with adhesive appropriate to the location and substrate.

G. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

H. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.

I. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:

1. Outdoors: UV-stabilized nylon.

2. In Spaces Handling Environmental Air: Plenum rated.

J. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.

3.02 IDENTIFICATION SCHEDULE:

A. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:

1. Power

B. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase

1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded service feeder and branch-circuit conductors. Color-coding for factory-assembled cable must match colors listed below.

a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG.

b. Colors for 208/120-V Circuits:

1) Phase A: Black.

2) Phase B: Red.

3) Phase C: Blue.

4) Neutral: White.

5) Ground: Green.

c. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

C. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use self-adhesive, self-laminating polyester labels or self-adhesive vinyl labels with the conductor or cable designation, origin, and destination.

D. Control-Circuit Conductor Termination Identification: For identification at terminations provide self-adhesive, self-laminating polyester labels or self-adhesive vinyl labels with the conductor designation.

E. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.

2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.

3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.

F. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.

1. Install underground-line warning tape for both direct-buried cables and cables in raceway.

G. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels.

1. Comply with 29 CFR 1910.145.

2. Identify system voltage with black letters on an orange background.

3. Apply to exterior of door, cover, or other access.

H. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:

a. Indoor Equipment: Self-adhesive, engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of

text with 1/2-inch- high letters on 1-1/2-inch- high label; where two lines of text are required, use labels 2 inches high.

b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.

c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.

d. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

2. Equipment to Be Labeled:

a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be engraved, laminated acrylic or melamine label. Label to include upstream source of panelboard feeder.

b. Enclosures and electrical cabinets.

c. Access doors and panels for concealed electrical items.

d. Enclosed controllers.

e. Remote-controlled switches, dimmer modules, and control devices.

END OF SECTION

# DIVISION 16 – ELECTRICAL

## SECTION 16091 – SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLES

## PART 1 - 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:

A. This Section includes the following:

1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.

2. Sleeve-seal systems.

3. Sleeve-seal fittings.

4. Grout.

1.03 SUBMTTALS:

A. See Section 01300 – Submittals, for submittal procedures.

B. Product Data: For each type of product.

## PART 2 - PRODUCTS

2.01 SLEEVES:

A. Wall Sleeves:

1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.

2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

C. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

D. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.

E. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

F. Sleeves for Rectangular Openings:

1. Material: Galvanized sheet steel.

2. Minimum Metal Thickness:

a. For sleeve cross-section rectangle perimeter less than 50 inches and with no side larger than 16 inches, thickness shall be 0.052 inch.

b. For sleeve cross-section rectangle perimeter 50 inches or more and one or more sides larger than 16 inches, thickness shall be 0.138 inches.

2.02 SLEEVE-SEAL SYSTEMS:

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Advance Products & Systems, Inc.

b. CALPICO, Inc.

c. Metraflex Company (The).

d. Pipeline Seal and Insulator, Inc.

e. Proco Products, Inc.

f. Or approved substitute.

2. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.

3. Pressure Plates: Carbon steel or stainless steel.

4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.03 SLEEVE-SEAL FITTINGS:

A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Presealed Systems.

b. Or approved substitute.

2.04 GROUT:

A. Description: Non-shrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.01 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS:

A. Comply with NECA 1.

B. Comply with NEMA VE 2 for cable tray and cable penetrations.

C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:

1. Interior Penetrations of Non-Fire-Rated Walls and Floors:

a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint.

b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.

2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed or unless seismic criteria require different clearance.

4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.

5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches above finished floor level. Install sleeves during erection of floors.

D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:

1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.

2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.

E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using cast-iron pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

G. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

3.02 SLEEVE-SEAL-SYSTEM INSTALLATION:

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.

B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.03 SLEEVE-SEAL-FITTING INSTALLATION:

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal the space around outside of sleeve-seal fittings.

END OF SECTION

# DIVISION 16 – ELECTRICAL

## SECTION 16120 – LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

## PART 1 - 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:

A. This Section includes the following:

1. Building wires and cables rated 600 V and less.

2. Connectors, splices, and terminations rated 600 V and less.

1.03 SUBMITTALS:

A. See Section 01300 – Submittals, for submittal procedures.

B. Product Data: For each type of product indicated.

C. Qualifications Data: For testing agency.

D. Field quality-control test reports.

1.04 QUALITY ASSURANCE:

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Testing Agency Qualifications: Member of NETA or and NRTL.

C. Comply with NFPA 70.

## PART 2 - PRODUCTS

2.01 CONDUCTORS AND CABLES:

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. American Insulated Wire Corp.; a Leviton Company.

2. Belden Inc.

3. Encore Wire Corporation.

4. General Cable Corporation.

5. Southwire Company.

6. Or approved substitute.

B. Copper Conductors: Comply with NEMA WC 70.

C. Conductor Insulation: Comply with NEMA WC 70 for Types THHN-THWN-2, XHHW-2 and SOW.

D. Multiconductor Cable: Comply with NEMA WC 70 for Type SOW with ground wire.

2.02 CONNECTORS AND SPLICES:

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. AFC Cable Systems, Inc.

2. Hubbell Power Systems, Inc.

3. NSI Industries LLC.

4. O-Z/Gedney; EGS Electrical Group LLC.

5. 3M; Electrical Products Division.

6. Tyco Electronics Corp.

7. Or approved substitute.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.01 CONDUCTOR MATERIAL APPLICATIONS:

A. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.02 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS:

A. Exposed Branch Circuits, Including in Crawlspaces: Type THHN-THWN-2, single conductors in raceway.

B. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN-2, single conductors in raceway.

C. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN-2, single conductors in raceway or Type XHHW-2, single conductors in raceway.

D. Class 1 Control Circuits: Type THHN-THWN-2, in raceway.

E. Class 2 Control Circuits: Type THHN-THWN-2, in raceway.

3.03 INSTALLATION OF CONDUCTORS AND CABLES:

A. Complete raceway installation between conductor and cable termination points according to Section 16130 – Raceways and Boxes for Electrical Systems prior to pulling conductors and cables.

B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

E. Support cables according to Section 16073 – Hangers and Supports for Electrical Systems.

3.04 CONNECTIONS:

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

3.05 IDENTIFICATION:

A. Identify and color-code conductors and cables according to Section 16075 – Identification for Electrical Systems.

B. Identify each spare conductor at each end with identity number, location of other end of conductor, and that it is spare.

3.06 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS:

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 16091 – Sleeves and Sleeve Seals for Electrical Raceways and Cables.

3.07 FIELD QUALITY CONTROL:

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

C. Tests and Inspections:

1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.

2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

3. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each splice in cables and conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner.

a. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each splice 11 months after date of Substantial Completion.

b. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

c. Record of Infrared Scanning: Prepare a certified report that identifies splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

D. Test Reports: Prepare a written report to record the following:

1. Test procedures used.

2. Test results that comply with requirements.

3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

E. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION

# DIVISION 16 – ELECTRICAL

## SECTION 16130 – RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

## PART 1 - 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:

A. This Section includes the following:

1. Metal conduits, tubing, and fittings.

2. Nonmetal conduits, tubing, and fittings.

3. Boxes, enclosures, and cabinets.

4. Handholes and boxes for exterior underground cabling.

1.03 DEFINITIONS:

A. EMT: Electrical metallic tubing.

B. GRC: Galvanized rigid steel conduit.

C. IMC: Intermediate metal conduit.

1.04 SUBMITTALS:

A. See Section 01300 – Submittals, for submittal procedures.

B. Product Data: For wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

C. Shop Drawings: For custom enclosures and cabinets. Include scaled plans, elevations, sections, and attachment details.

D. Coordination Drawings: Conduit routing plans for conduits 2-inches and larger, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:

1. Structural members in paths of conduit groups with common supports.

2. HVAC and plumbing items and structural features in paths of conduit groups with common supports.

E. Source quality-control reports.

PART 2 - PRODUCTS

2.01 METAL CONDUITS, TUBING, AND FITTINGS:

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. AFC Cable Systems, Inc.
2. Allied Tube & Conduit; a Tyco International Ltd. Co.
3. Anamet Electrical, Inc.
4. Electri-Flex Company.
5. O-Z/Gedney; a brand of EGS Electrical Group.
6. Picoma Industries, a subsidiary of Mueller Water Products, Inc.
7. Republic Conduit.
8. Robroy Industries.
9. Southwire Company.
10. Thomas & Betts Corporation.
11. Western Tube and Conduit Corporation.
12. Wheatland Tube Company; a division of John Maneely Company.
13. Or approved substitute.

B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. GRC: Comply with ANSI C80.1 and UL 6.

D. IMC: Comply with ANSI C80.6 and UL 1242.

E. EMT: Comply with ANSI C80.3 and UL 797.

F. FMC: Comply with UL 1; zinc-coated steel.

G. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

H. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.

1. Fittings for EMT:

a. Material: Steel or die cast.

b. Type: Setscrew or compression.

2. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.

3. Provide insulated throat type connector and bushing fittings.

I. Joint Compound for IMC or GRC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.02 NONMETALLIC CONDUITS, TUBING, AND FITTINGS:

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. AFC Cable Systems, Inc

2. Anamet Electrical, Inc.

3. Arnco Corporation.

4. CANTEX Inc.

5. CertainTeed Corp.

6. Condux International, Inc.

7. Electri-Flex Company.

8. Kraloy.

9. Lamson & Sessions; Carlon Electrical Products.

10. Niedax-Kleinhuis USA, Inc.

11. RACO; a Hubbell company.

12. Thomas & Betts Corporation.

13. Or approved substitute.

B. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.

D. Fittings for RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.

2.03 BOXES, ENCLOSURES, AND CABINETS:

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Adalet.
2. Cooper Technologies Company; Cooper Crouse-Hinds.
3. EGS/Appleton Electric.
4. Erickson Electrical Equipment Company.
5. FSR Inc.
6. Hoffman; a Pentair company.
7. Hubbell Incorporated; Killark Division.
8. Kraloy.
9. Milbank Manufacturing Co.
10. Mono-Systems, Inc.
11. O-Z/Gedney; a brand of EGS Electrical Group.
12. RACO; a Hubbell Company.
13. Robroy Industries.
14. Spring City Electrical Manufacturing Company.
15. Stahlin Non-Metallic Enclosures; a division of Robroy Industries.
16. Thomas & Betts Corporation.

17. Wiremold / Legrand.

18. Or approved substitute.

B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

E. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb. Outlet boxes designed for attachment of luminaires weighing more than 50 lb shall be listed and marked for the maximum allowable weight.

F. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

G. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, galvanized, cast iron with gasketed cover.

H. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

I. Device Box Dimensions: 4 inches square by 2-1/8 inches deep or 4 inches by 2-1/8 inches by 2-1/8 inches deep.

J. Gangable boxes are prohibited.

K. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 galvanized steel and Type 4X stainless steel with continuous-hinge cover with flush latch unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.

2. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

L. Cabinets:

1. NEMA 250, Type 1 galvanized steel and Type 4X stainless steel, box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.

2. Hinged door in front cover with flush latch and concealed hinge.

3. Key latch to match panelboards.

4. Metal barriers to separate wiring of different systems and voltage.

5. Accessory feet where required for freestanding equipment.

2.04 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING:

A. General Requirements for Handholes and Boxes:

1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.

2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

3. Utility Company handholes and boxes shall be subject to the respective Utility Company requirements and are not covered herein.

B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Armorcast Products Company.

b. Carson Industries LLC.

c. CDR Systems Corporation; Hubbell Power Systems.

d. NewBasis.

e. Oldcastle Precast, Inc.; Christy Concrete Products.

f. Synertech Moulded Products; a division of Oldcastle Precast, Inc.

g. Or approved substitute.

2. Standard: Comply with SCTE 77.

3. Configuration: Designed for flush burial with closed bottom with sump hole unless otherwise indicated.

4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.

5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.

6. Cover Legend: Molded lettering, “ELECTRIC”, “FIRE ALARM”, or “COMM” based on the system served.

7. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.

8. Handholes 24 Inches Wide by 48 Inches Long and Larger: Have inserts for cable racks and pulling-in irons installed before concrete is poured.

2.05 SOURCE QUALITY CONTROL FOR UNDERGROUND ENCLOSURE:

A. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012 and traceable to NIST standards.

PART 3 - EXECUTION

3.01 RACEWAY APPLICATION:

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed Conduit: GRC or IMC.

2. Concealed Conduit, Aboveground: EMT.

3. Underground Conduit: Type EPC-40-PVC, concrete encased.

4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.

5. Boxes and Enclosures, Aboveground: NEMA 250, Type 4X stainless steel.

B. Indoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT.

2. Exposed, Not Subject to Severe Physical Damage: EMT.

3. Exposed and Subject to Severe Physical Damage: GRC or IMC. Example locations include the following but are not limited to:

   a. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.

   b. Mechanical rooms or spaces.

4. Concealed in Ceilings and Interior Walls and Partitions: EMT.

5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.

6. Damp or Wet Locations: GRC or IMC.

7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4X stainless steel in damp or wet locations.

C. Minimum Raceway Size: 3/4-inch trade size; 1/2-inch for lighting.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.

2. EMT: Use setscrew or compression, steel or cast-metal fittings. Comply with NEMA FB 2.10.

3. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

E. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.

3.02 INSTALLATION:

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Comply with requirements in Section 16073 - Hangers and Supports for Electrical Systems for hangers and supports.

E. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

F. Support conduit within 12 inches of enclosures to which attached.

G. Stub-ups to Above Recessed Ceilings:

    1. Use EMT, IMC, or GRC for raceways.

    2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

H. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

I. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.

J. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.

K. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

L. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

M. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

N. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

O. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

P. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.

Q. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.

2. Where an underground service raceway enters a building or structure.

3. Where otherwise required by NFPA 70.

R. Comply with manufacturer's written instructions for solvent welding RNC and fittings.

S. Expansion-Joint Fittings:

1. Install in each run of aboveground GRC, IMC and EMT conduit that is located where environmental temperature change may exceed 100 deg F and that has straight-run length that exceeds 100 feet.

2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:

a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.

b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.

c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.

3. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.

4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.

5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for

conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

T. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for recessed and semi-recessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.

2. Use LFMC in damp or wet locations not subject to severe physical damage.

U. Wall Mounted Boxes:

1. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.

2. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.

3. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel. Do not install boxes back to back.

4. Locate boxes so that cover or plate will not span different building finishes.

5. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

V. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

W. Set metal floor boxes level and flush with finished floor surface. Install carpet, tile or other flooring insert where floor box cover is capable of accepting an insert.

3.03 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES:

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.

B. Unless otherwise indicated, support units on a level bed of crushed stone o gravel, graded from 1/2-inch (12.5-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch (25 mm) above finished grade.

D. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors. Select arm lengths to be long enough to provide spare space for future cables but short enough to preserve adequate working clearances in enclosure.

E. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.04 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS:

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 16091 - Sleeves and Sleeve Seals for Electrical Raceways and Cabling.

3.05 FIRESTOPPING:

A. Provide UL listed firestopping for all holes at conduit penetrations through floor slabs, fire rated walls, partitions with fire rated doors, corridor walls, and vertical service shafts.

3.06 PROTECTION:

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION

# DIVISION 16 – ELECTRICAL

## SECTION 16145 – LIGHTING CONTROL DEVICES

## PART 1 - 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:

A. Section Includes:

1. Time Switches

1.03 SUBMITTALS:

A. See Section 01300 – Submittals, for submittal procedures.

B. Product Data: For each type of product.

C. Shop Drawings:

1. Indicate installation details for the following:

a. Time switches.

2. Include typical diagrams for power, signal, and control wiring.

3. To-scale drawings indicating location of lighting control devices and interconnection between components with field-installed wiring.

D. Field quality-control reports.

E. Warranty: Sample of manufacturer standard warranties.

F. Operation and Maintenance Data: For each type of lighting control device to include in emergency, operation, and maintenance manuals.

1.04 WARRANTY:

A. Manufacturer Standard Warranty:

1. Switches: 1 year.

## PART 2 - PRODUCTS

### 2.01 TIME SWITCHES:

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cooper Industries, Inc.
2. Intermatic, Inc.
3. Leviton Manufacturing Co., Inc.
4. Invesys Controls.
5. Or approved substitute.

B. Electronic time switches: solid state, programmable, with alphanumeric display; complying with UL 917.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Contact Configuration: SPST.
3. Contact Rating: 20A, 120v-277v.
4. Programs: 2 channels; each channel is individually programmable with eight on-off set points on a 24-hour schedule.
5. Circuitry: Allow connection of a photoelectric relay as substitute for on-off function of a program on selected channels.
6. Astronomic Time: All channels.
7. Battery Backup: Not less than seven days reserve, to maintain schedules and time clock.

C. Electromechanical-Dial Time Switches: Comply with UL 917.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Contact Configuration: SPST.
3. Contact Rating: 20A, 120v-277v.

4. Circuitry: Allows connection of a photoelectric relay as a substitute for the on-off function of a program.

5. Astronomic time dial.

6. Eight-Day Program: Uniquely programmable for each weekday and holidays.

7. Skip-a-day mode.

8. Wound-spring reserve carryover mechanism to keep time during power failures, minimum of 16 hours.

2.02 CONDUCTORS AND CABLES:

A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Section 16120 – Low-Voltage Electrical Power Conductors and Cables.

B. Class 2 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Section 16120 – Low-Voltage Electrical Power Conductors and Cables.

C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 14 AWG. Comply with requirements in Section 16120 – Low-Voltage Electrical Power Conductors and Cables.

PART 3 - EXECUTION

3.01 EXAMINATION:

A. Examine lighting control devices before installation. Reject lighting control devices that are wet, moisture damaged, or mold damaged.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION OF WIRING:

A. Wiring Method: Comply with Section 16120 – Low-Voltage Electrical Power Conductors and Cables. Minimum conduit size is 1/2 inch for lighting circuits.

B. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.

C. Size conductors according to lighting control device manufacturer's written instructions unless otherwise indicated.

D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.03 IDENTIFICATION:

A. Identify components and power and control wiring in accordance with Section 16075 – Identification for Electrical Systems.

3.04 FIELD QUALITY CONTROL:

A. Testing Agency: Engage a qualified testing agency to evaluate lighting control devices and perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

C. Perform the following tests and inspections:

1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.

2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Nonconforming Work:

1. Lighting control devices will be considered defective if they do not pass tests and inspections.

2. Remove and replace defective units and retest.

E. Prepare test and inspection reports.

3.05 DEMONSTRATION:

A. Train Owner’s maintenance personnel to adjust, operate, and maintain lighting control devices.

END OF SECTION

# DIVISION 16 – ELECTRICAL

## SECTION 16521 – EXTERIOR LIGHTING

## PART 1 - 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:

A. This Section includes the following:

1. Exterior luminaires.

1.03 DEFINITIONS:

A. CCT: Correlated color temperature.

B. CRI: Color-rendering index.

C. LED: Light emitting diode.

D. LER: Luminaire efficacy rating.

E. Luminaire: Complete lighting fixture, including ballast housing if provide

1.04 SUBMITTALS:

A. See Section 01300 – Submittals, for submittal procedures.

B. Product Data: For each luminaire, and support component, arranged in order of lighting unit designation. Include data on features, accessories, finishes, and the following:

1. Physical description of luminaire, including materials, dimensions, effective projected area, and verification of indicated parameters.

2. Details of attaching luminaires and accessories.

3. Details of installation and construction.

4. Luminaire materials.

5. Photometric data based on laboratory tests of each luminaire type, complete with indicated lamps and accessories.

a. Manufacturer Certified Data: Photometric data shall be certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.

6. LEDs, including life, output, CCT, CRI, lumens, and energy-efficiency data.

7. Means of attaching luminaires to supports, and indication that attachment is suitable for components involved.

C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

2. Wiring Diagrams: For power, signal, and control wiring.

D. Qualification Data: For qualified agencies providing photometric data for lighting fixtures.

E. Field quality-control reports.

F. Warranty: Sample of manufacturer standard and special warranties.

G. Operation and Maintenance Data: For luminaires and poles to include in emergency, operation, and maintenance manuals.

H. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1.05 QUALITY ASSURANCE:

A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by manufacturers' laboratories that are accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.

B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with IEEE C2, "National Electrical Safety Code."

E. Comply with NFPA 70.

1.06 WARRANTY:

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace products that fail in materials or workmanship; that corrode; or that fade, stain, perforate, erode, or chalk due to effects of weather or solar radiation within specified warranty period. Manufacturer may exclude lightning damage, hail damage, vandalism, abuse, or unauthorized repairs or alterations from special warranty coverage.

1. Warranty Period for Luminaires: Five years from the project acceptance date.

2. Warranty Period for Metal Corrosion: Five years from the project acceptance date.

3. Warranty Period for Color Retention: Five years from the project acceptance date.

B. The surety shall not be held liable beyond two years from the project acceptance date.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, product(s) indicated on Drawings or approved substitutes.

2.02 GENERAL REQUIREMENTS FOR LUMINAIRES:

A. Luminaires shall comply with UL 1598 and be listed and labeled for installation in wet locations by an NRTL acceptable to authorities having jurisdiction.

B. Lateral Light Distribution Patterns: Comply with IESNA RP-8 for parameters of lateral light distribution patterns indicated for luminaires.

C. Metal Parts: Free of burrs and sharp corners and edges.

D. Sheet Metal Components: Corrosion-resistant aluminum unless otherwise indicated. Form and support to prevent warping and sagging.

E. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed luminaires.

F. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses. Designed to disconnect driver when door opens.

G. Exposed Hardware Material: Stainless steel.

H. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

I. Light Shields: Metal baffles, factory installed and field adjustable, arranged to block light distribution to indicated portion of normally illuminated area or field.

J. Reflecting surfaces shall have minimum reflectance as follows unless otherwise indicated:

    1. White Surfaces: 85 percent.

    2. Specular Surfaces: 83 percent.

    3. Diffusing Specular Surfaces: 75 percent.

K. Lenses and Refractors Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.

L. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Match finish process and color of pole and support materials.

M. Factory-Applied Finish for Aluminum Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

    1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

    2. Class I, Color Anodic Finish: AA-M32C22A42/A44 (Mechanical Finish: medium satin; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker) complying with AAMA 611.

        a. Color: Dark bronze.

N. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps and ballasts. Labels shall be located where they will be readily visible

to service personnel, but not seen from normal viewing angles when lamps are in place.

1. Label shall include the following lamp and ballast characteristics:

    a. "USES ONLY" and include specific lamp type.

    b. Lamp/module code configuration type, and nominal wattage for luminaires.

    c. Driver type (dim, non-dim, etc.) for LED luminaires.

    d. CCT and CRI for all luminaires.

2.03 SOLID STATE LIGHTING FIXTURES:

A. Light Emitting Diode (LED) requirements:

1. Correlated color temperature (CCT) for phosphor-coated white LEDs must have one of the following designated CCT's and fall within the following binning standards:

    a. 2700K defined as 2725 +/- 145K

    b. 3000K defined as 3045 +/- 175K

    c. 3500K defined as 3465 +/- 245K

    d. 4000K defined as 3985 +/- 275K

    e. 4500K defined as 4503 +/- 243K

    f. 5000K defined as 5028 +/- 283K

    g. 5700K defined as 5665 +/- 355K

    h. 6500K defined as 6530 +/- 510K

2. Color consistency and stability shall be limited to a maximum change in chromaticity of a 4-step MacAdam ellipse.

3. Color spatial uniformity shall be limited to variations in chromaticity for different directions (i.e. changes in viewing angle) within 0.004 from the weighted average point on the CIE 1976 (u',v') diagram.

4. Color rendering index

a. Color rendering index (CRI) to be determined using ANSI C78.377-2008 and applicable IESNA standards. Minimum CRI value shall be 80.

5. Lumen Depreciation:

a. Lumen depreciation to be measured using IESNA LM-80-08 standard for IES approved method of measuring lumen maintenance of LED light sources. Projected long term lumen maintenance shall be per IESNA TM-21.

b. Phosphor coated white LED module(s)/array(s) shall deliver at least 70% of initial lumens for a minimum of 60,000 hours when installed in-situ and operated at 100% output and the maximum specified operating temperature.

6. Acceptable LED chip manufacturers shall be as follows:

a. Bridgelux

b. CREE

c. Nichia

d. Osram Opto Semiconductors

e. Philips Lumileds

f. Seoul Semiconductors

g. Xicato

h. Or approved substitute.

7. All LED arrays / modules and power supplies shall be field serviceable. All internal connections between LED array / module shall utilize quick disconnects, no pigtail or soldered connections shall be used for field serviceable components.

B. Luminaire Efficacy:

1. Luminaire efficiency shall be measured using IESNA LM-79-08 standard for electrical and photometric measurements of solid state lighting products.

C. Thermal Management:

1. Solid state light fixture shall not exceed LED manufacturer's maximum junction temperature requirements when operated in-situ at fixture

manufacturer's maximum ambient operating temperature and 100% light output.

2. Solid state light fixtures shall be thermally protected using one of more of the following thermal management techniques:

    a. Metal core board

    b. Gap pad

    c. Internal monitoring firmware

3. Solid state lighting fixture housing shall be designed to transfer heat from the LED board to the outside environment.

D. Power Supplies/Drivers:

1. Power supply shall have a power factor of 0.90 or greater for primary application.

2. Power supply input current shall have Total Harmonic Distortion (THD) of less than 20%.

3. Power supply inrush current shall meet or exceed NEMA 410 performance testing for lighting controls and switching devices with electronic drivers and discharge ballasts.

4. Power supply shall have a minimum case temperature of minus 4 degrees F or below and a maximum case temperature of 176 degrees F when used in luminaires intended for outdoor applications.

5. Power supply output operating frequency to be equal to or greater than 120 Hz.

6. Power supply shall operate with sustained input variations of +/- 10% (voltage and frequency) with no damage to the driver or change in light output.

7. Power supply shall tolerate sustained open circuit and short circuit output conditions without damage and without need for external fuses or trip devices.

8. Power supply output shall be regulated to +/- 5% across published load range.

9. Power supply shall have a Class A sound rating.

10. Power supply outputs shall have current limiting protection.

11. Power supply shall have a mean time between failure (MTBF) of 150,000 hours.

12. Power supply to have maximum case temperature of 149 degrees F.

13. Power supply shall operate LEDs at constant and regulated current levels. LEDs shall not be overdriven beyond the diode manufacturer's specified nominal voltage and current.

E. System Installation:

1. The Contractor shall furnish a complete solid state lighting system as described in the luminaire schedule.

2. All hardwired connections to solid state lighting fixtures shall be reverse polarity protected and provide high voltage protection in the event connections are reversed or shorted during the installation process.

3. All solid state lighting fixtures (100% of each lot) shall undergo a minimum one-hour burn-in test during manufacturing.

4. In addition to requirements identified in the luminaire schedule, solid state lighting installations shall be UL Listed as a low-voltage lighting system including, but not limited to, luminaire, power supply, controller, keypad, and wiring.

2.04 GENERAL REQUIREMENTS FOR SUPPORT COMPONENTS:

A. Luminaire Attachment Provisions: Comply with luminaire manufacturers' mounting requirements. Use stainless-steel fasteners and mounting bolts unless otherwise indicated.

B. Mountings, Fasteners, and Appurtenances: Corrosion-resistant items compatible with support components.

1. Materials: Shall not cause galvanic action at contact points.

2. Anchor Bolts, Leveling Nuts, Bolt Caps, and Washers: Hot-dip galvanized after fabrication unless otherwise indicated.

3. Anchor-Bolt Template: Plywood or steel.

PART 3 - EXECUTION

3.01 LUMINAIRE INSTALLATION:

A. Install lamps in each luminaire.

B. Fasten luminaire to indicated structural supports.

1. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.

C. Adjust luminaires that require field adjustment or aiming. Include adjustment of photoelectric device to prevent false operation of relay by artificial light sources.

3.02 CORROSION PREVENTION:

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.

B. Steel Conduits: Comply with Section 16130 – Raceways and Boxes For Electrical Systems. In concrete foundations, wrap conduit with 0.010-inch-thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.03 GROUNDING:

A. Ground metal support structures according to Section 16063 - Grounding and Bonding For Electrical Systems.

1. Install grounding electrode for each pole unless otherwise indicated.

2. Install grounding conductor pigtail in the base for connecting luminaire to grounding system.

3.04 FIELD QUALITY CONTROL:

A. Inspect each installed fixture for damage. Replace damaged fixtures and components.

B. Illumination Observations: Verify normal operation of lighting units after installing luminaires and energizing circuits with normal power source.

C. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

END OF SECTION

# DIVISION 16 – ELECTRICAL

## SECTION 16700 – COMMUNICATIONS SYSTEMS

## PART 1 - 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 REFERENCES:

A. ANSI/TIA-492.CAAB – Detail Specification for Class IVa Dispersion-Unshifted Single-Mode Optical Fibers with Low Water Peak. Current Edition

B. ANSI/TIA-568.0-D – Generic Communications Cabling for Customer Premises

C. ANSI/TIA-568.1-D-1 – Commercial Building Communications Cabling Standard

D. ANSI/TIA-568.2-D – Balanced Twisted-Pair Telecommunications Cabling and Components Standard

E. ANSI/TIA-568.3-D – Optical Fiber Cabling and Components Standard

F. ANSI/TIA-569-D-2 – Telecommunications Pathways and Spaces: Addendum 2 – Guidelines for Supporting Remote Powering

G. ANSI/TIA-570-D – Residential Telecommunications Infrastructure Standard

H. ANSI/TIA-606-C – Administration Standard for the Commercial Telecommunications Infrastructure.

I. ANSI/TIA-607-C – Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises

J. ANSI/TIA-758-B – Customer-Owned Outside Plant Telecommunications Infrastructure Standard

K. ANSI/TIA-862-B-1 – Structured Cabling Infrastructure Standard for Intelligent Building Systems

L. ANSI/TIA-942-B – Telecommunications Infrastructure Standard for Data Centers

M. ASTM D 4566-05, Standard Test Methods for Electrical Performance Properties of Insulations and Jackets for Telecommunications Wire and Cable, 2005

N. BICSI Telecommunications Distribution Methods Manual (TDMM) 12th Edition

O. BICSI Information Transport Installation Manual (ITSM) 5th Edition

P. ISO/IEC 11801 – Information Technology – Generic Cabling for Customer Premise

Q. IEEE 802.3 Standard for Information technology -Telecommunications and information exchange between systems - Local and metropolitan area networks – Specific requirements Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications

R. IEC 61156-1, Multicore and Symmetrical Pair/Quad Cables for Digital Communications – Part 1: Generic Specification, 2005

S. NFPA-70 National Electrical Code 2008 edition

T. NECA/BICSI-568-A Standard for Installing Commercial Building Telecommunications Cabling

U. Federal Communications Commission Part 15 and Part 68

V. UL 444 – Standard for Safety of Communications Cable

W. UL 1666 – Standard for Safety of Flame Propagation Height

X. NFPA 262 – Flame Travel and Smoke of Wires and CablesLocal Authority Having Jurisdiction

1.03 INDUSTRY DEFINITIONS / TERMS / ACRONYMS:

A. Acronyms:

1. AHJ – Authority Having Jurisdiction

2. ANSI – American Northern Standards Institute

3. AWG – American Wire Gauge

4. BICSI – Building Industry Consulting Service International

5. EIA – Electronics Industry Alliance

6. ETL – Intertek Semko Labs
7. FCC – Federal Communications Commission
8. IEC – International Electrotechnical Commission
9. IEEE – Institute of Electrical and Electronic Engineers
10. IDC – Insulation displacement contact
11. ISO – International Standards Organization
12. J-STD – Joint Standard
13. NECA – National Electrical Contractors Association
14. NFPA – National Fire Protection Agency
15. SC – Subscriber Channel
16. TIA – Telecommunications Industry Association
17. UL – Underwriters Laboratory

B. Terms and Definitions:

1. 1000Base-T, 1GBase-T – networking protocol capable of transmitting 1 billion bits of information per second over copper twisted pair
2. 10GBase-T – networking protocol capable of transmitting 10 billion bits of information per second over copper twisted pair
3. 10GBase-SX – networking protocol capable of transmitting 10 billion bits of information per second over optical fiber at 850 nanometers
4. Furnish: The term "furnish" is used to mean "purchase, supply, provide and deliver to the Project site, protect and provide interim storage and be ready for unloading, unpacking, assembly, installation, and similar operations in accordance with Manufacturer’s specifications."
5. Provide: The terms “provide" means to "furnish and install, complete and ready for the intended use".
6. Install: The term "install" is used to describe operations at project site including the actual "unloading, unpacking, rigging in place, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations".

7. Installer: To perform all construction activity related to their specified responsibilities, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform, and the "Installers" must be an authorized Manufacturers representative, certified, experienced and qualified to provide, install, program, troubleshoot, train, warrant and service all the systems in this section in their entirety.

8. If Applicable: The term “if applicable” will be that work which may be required for completed construction at applicable locations but is not necessarily shown or described in the Contract Documents.

9. As Necessary: The term “as necessary” will be that work which is required for completed construction but is not necessarily shown or described in the Contract Documents.

10. As Required: The term “as required” will be that work which is required for completed construction and is shown on the drawings or described in the project Specification.

11. Concealed: The Term “concealed” means hidden from sight, buried as in chases, furred spaces, shafts, fixed ceiling or embedded in construction.

12. Exposed: The term “exposed” means bare, open to the elements, out in the open, uncovered. FF. Product: The term “product” will mean any item of equipment, material, fixture, apparatus, appliance or accessory installed under this Division.

13. “Substantial Completion” is deemed that the project is sufficiently complete to be utilized for its intended use as stated in the body of this written Specification.

14. Governmental: The term “governmental” means all municipal, state and federal government agencies.

15. Words in the singular will also mean and include the plural, wherever the context so indicates, and words in the plural will mean the singular, wherever the context so indicates.

16. Cabling: The term “cabling” will mean cable assembly, raceway, conductors, fittings and any other necessary accessories to make a complete wiring system.

17. Backbone: A facility (e.g., pathway, cable or conductors) between telecommunications rooms, or floor distribution terminals, the entrance facilities and equipment rooms within or between buildings.

18. Backbone Cabling: Cabling and connecting hardware that provides interconnections between telecommunications rooms, equipment rooms, and entrance facilities.

19. Horizontal Cabling: The cabling between and including the work area outlet/connector and the horizontal cross-connect/patch cord in the telecommunications room.

20. Telecommunications: A branch of technology concerned with the transmission, emission, and reception of signs, signals, writing, images, and sounds; that is, information, of any nature by cable, radio, optical, or other electromagnetic systems.

21. Pull Point: A Pull Point is a space used to transition between floors for backbone and horizontal cabling within a building riser system.

22. Telecommunications Outlet/Connector: A Connecting device or outlet such as an F Connector (for coaxial cable) or 8P8C connector (twisted-pair cable) in the work area.

23. Equipment Outlet (EO): A device also known as the outlet or information outlet placed at the user workstation for termination using connectors (jacks) of horizontal media for connectivity of data and voice at teacher work area outlet or multimedia equipment. These outlets provide the connection point to voice, data, and other media services.

24. 8P8C Connector (Jack): A female connector that has eight positions and eight conductors, commonly referred to as RJ45. Jacks are typically used to terminate eight conductor category rated cable at the user end and are inserted into faceplates to create a connection point for the user's equipment cord.

25. 6P6C Connector (Jack): A female connector that has six positions and six conductors, commonly referred to as RJ11, typically used to terminate eight conductor category rated cable at the user end and are inserted into faceplates to create a connection point for the user's equipment cord. Only the Blue, Orange and Green pairs are terminated; the remaining Brown pair is left un-terminated. 6P6C outlets are used for PBX voice connections.

1.04 SUBMITTAL REQUIREMENTS:

A. Submit copies of the certification of an individual that will be performing the installation and termination of the installation to provide proof of compliance of this spec.

B. Submit proof from Manufacturer of an individual's good standing in Manufacturer's certification program.

C. Submit appropriate cut sheets and samples for all products, hardware and cabling not specifically called out by part number in this Specification.

D. Refer to other applicable sections for additional submittals requirements.

1.05 WARRANTY:

A. A limited lifetime warranty for the structured cabling system shall be provided for an end-to- end permanent link model installation which covers the performance of the cable, connecting hardware and the labor cost for the repair or replacement of the link.

B. The warranty period shall commence from the project acceptance date. The Surety shall not be held liable beyond two years from the project acceptance date.

1.06 INSTALLER QUALIFICATIONS:

A. The Installer will be experienced in the operations they are engaged to perform. Demonstrate at least five years of continuous recent experience on similar projects. The Installer will hold recent, up-to-date licenses, certifications and training certificates in the area the project is located and for the equipment to be installed.

B. Qualified Structured Cabling System Installers will have demonstrable design and installation training with certifications of competence. Certified training will be industry recognized and at least equal to:

1. Building Industry Consulting Service International, Inc. (BISCI) Registered Installer.

2. Registered Communications Distribution Designer (RCDD).

3. Certified Structured Cabling System Installer at either a Leviton Premier or Authorized level.

C. Provide a full time, on site foreman who personally has been certified as described above. Submit all documentation under this Section.

D. Provide an on-call Project Manager to supervise the project.

E. Each Foreman and Installer working on this project will be trained to the qualified level as specified by the Manufacturer(s) for installation and maintenance of equipment being provided on this project. The training will consist of at least a minimum of proper installation techniques of their specific equipment in order to have a complete operating system meeting or exceeding the requirements as specified herein.

F. Individual Qualifications Requirements:

1. Personnel trained and certified in fiber optic cabling, splicing, termination and testing techniques. Personnel must have experience using a light meter and OTDR.

2. Personnel trained in the installation of pathways and support for housing horizontal and backbone cabling.

3. Personnel knowledgeable in local, state, province and national codes, and regulations. All work shall comply with the latest revision of the codes or regulations. When conflict exists between local or national codes or regulations, the most stringent codes or regulations shall be followed.

G. Maintain at the site an updated copy of the Manufacturer Trained Installers list including a copy of their training documentation from the Manufacturer. This documentation will be made available to the Officer-in-Charge upon request.

1.07 DELIVERY, STORAGE, AND PROTECTION:

A. Contractor shall ensure that materials delivery to work area shall be coordinated with construction site manager responsible for materials distribution to all trades.

B. Contractor is responsible for all materials, tools and vehicles left on the job site.

C. Contractor shall coordinate a disposal bin for the removal of all trash produced by the Contractor's associated personnel during the project.

D. Contractor shall ensure materials are stored in an environmental area where:

1. Temperature does not exceed 120 degrees Fahrenheit nor below 32 degrees Fahrenheit.

2. Humidity does not exceed 80% in a continuous manner, to the best ability of the regional climate.

3. No direct exposure to sunlight.

E. Cable shall be stored according to Manufacturer's recommendations as a minimum. In addition, cable must be stored in a dry location protected from vandalism and weather. If cable is stored outside, it must be covered with opaque plastic or canvas with provision for ventilation to prevent condensation and for protection from weather. If air temperature at cable storage location will be below 40 degrees F., the cable shall be moved to a

heated (50 degrees F. minimum) location. If necessary, cable will be stored off site at the Contractor's expense.

F. Deliver equipment in individual shipping splits for ease of handling, mount on shipping skids and wrap for protection.

G. Inspect and report concealed damage to carrier within specified time.

H. Store in a clean, dry space. Maintain factory protection or cover with heavy canvas or plastic to keep out dirt, water, construction debris, and traffic. Heat enclosures to prevent condensation. Meet the requirements and recommendations of NFPA 70B and the Manufacturer. Location will be protected to prevent moisture from entering enclosures and material.

I. Handle in accordance with NEMA and the Manufacturer's recommendations and instructions to avoid damaging equipment, installed devices and finish.

J. The equipment will be kept upright at all times. When equipment has to be tilted for ease of passage through restricted areas during transportation, the Manufacturer will be required to brace the equipment suitably to ensure that the tilting does not impair the functional integrity of the equipment.

1.08 PROJECT CONDITIONS:

A. Environmental Requirements:

1. Contractor shall ensure that any pollutant produced during the work is disposed off according to local, state or national regulations. Follow the most stringent guidelines.

2. It is preferred that the Contractor recycle any used or un-used components during the course of the construction project.

B. Existing Conditions:

1. Work being conducted in retrofitting existing buildings shall be assumed to have existing conditions which may require accommodation. Pathways, finished materials, and older construction techniques may hinder an effortless cabling installation. Contractor will be expected to work with ITSS working through existing conditions will affect the work product.

C. Field Measurements:

1. Contractor shall coordinate with electrical engineer on project that the main electrical service ground has a resistance to earth of less than 5 ohms.

2. Contractor shall ensure that all grounding busbars for all equipment network rooms shall have a resistance of less than 1 ohm back to the main electrical service ground.

3. Contractor shall ensure that all field testers have been calibrated from the Manufacturer within 1 year.

1.09 SEQUENCING:

A. Cooperation and coordination with other trades.

1. The work will be so performed that the progress of the entire building construction, including all other trades, will not be delayed and not interfered with. Materials and apparatus will be installed as fast as conditions of the building will permit and must be installed promptly when and as directed.

2. Keep fully informed as to the shape, size and position of all openings required for all apparatus and give information in advance to build openings into the work. Furnish and set in place all sleeves, pockets, supports and incidentals.

3. Coordinate exact locations and roughing in dimensions of all work before installation and make all final connections as required. Any changes required to avoid interferences or to provide adequate clearances for Code and maintenance requirements will be made at no additional costs.

4. Obtain a complete set of Project Drawings and Specifications for coordination and to determine the full scope of work.

5. Attend project coordination meetings to coordinate work of this Section, pathways, work of other trades phasing and other project requirements.

1.10 CONTINUITY OF SERVICE AND SCHEDULING OF WORK:

A. Refer to the overall scheduling of the work of the project. Schedule work, process Submittals and order materials and equipment to neither conform to this schedule and install work to not delay nor interfere with the progress of the project.

B. Inform Officer-in-Charge immediately of any delays or potential delays. Furnish Manufacturer's letter to verify order date, equipment delays, expected shipment date, order number, and potential remedies to speed up delivery. Any costs to speed up delivery will be implemented at no cost to the project if the equipment or material was not ordered as soon as possible after Contract award or within the time frames indicated with the Submittals.

C. Include premium time required to comply with the project scheduling and phasing.

D. Demolition of existing systems being updated will take place only after the new or replacement system is completely installed, operational, tested and certified. This work may be required on a "per-phase" basis.

1.11 PROTECTION OF WORK AND PROPERTY:

A. Be responsible for the care and protection of all work included under this Section until it has been tested and accepted.

B. Materials and equipment stored for this project will be protected and maintained according to the Manufacturer's recommendations and requirements and according to the applicable requirements of NFPA 70B.

C. Protect all equipment, outlets and openings with temporary plugs, caps and covers. Protect work and materials of other trades from damage that might be caused by work or workmen and make good any damage caused.

D. Use caution to avoid damage to existing work, and to prevent harm to personnel working in all areas.

E. Observe all safety precautions and requirements for the construction. The Contractor is responsible for initiating, maintaining, and supervising all safety precautions and requirements during construction.

PART 2 - PRODUCTS

2.01 PRODUCTS:

A. Refer to Section 16705 – Common Work Results for Communication Systems

PART 3 - EXECUTION

3.01 GENERAL:

A. Verify the exact location of all items including electrical items that are not indicated on the Drawings.

B. Include the cost of all work including sub-letting of any work that may be required to complete the work indicated in order to avoid work stoppages and jurisdictional disputes. The work to be sublet will conform to precedent agreements and decisions of record. Jurisdictional assignment will be a responsibility under this Section's contractual obligation.

C. Do not install equipment and materials that have not been reviewed by the Officer-in-Charge. Equipment and materials which are installed without the Officer-in-Charge's review or without complying to comments issued with the review will be removed from the project when so instructed by the Officer-in-Charge. No payment will be made for unapproved or removal if it is ordered removed. The Installer will be responsible for any ancillary costs incurred because of its removal and the installation of the correct equipment and materials.

D. Obtain detailed information on installation requirements from the Manufacturers of all equipment to be furnished, installed or provided. At the start of construction, check all Contract Documents include all Drawings and all Sections of the specifications for equipment requiring electrical connections and service and verify electrical characteristics of equipment prior to rough-in.

E. Equipment and systems will not be installed without first coordinating the location and installation of equipment and systems with the General Contractor and all other Trades.

F. Any and all material installed, or work performed in violation of above requirements will be re- adjusted and corrected by the Installer without charge.

G. Refer to all Drawings associated with the project, prior to the installation or roughing-in of the electrical outlets, conduit and equipment, to determine the exact location of all outlets.

H. After installation, equipment will be protected to prevent damage during the construction period. Openings in conduits and boxes will be closed to prevent the entrance of foreign materials.

I. Home runs indicated are not to be combined or reduced without written consent from the Officer-in-Charge.

J. All connections to equipment will be made as required, if applicable, and in accordance with the approved submittal and setting drawings.

K. Change Orders, Modifications, Revisions and Directives:

    1. When change orders, modifications, revisions or Officer-in-Charge's Directives are issued or authorized, provide the required additional material, equipment, personnel and workers to prevent delays in the work, and to complete the work within the time limit of the Contract unless a specific time extension is requested with the change and accepted. Include costs for expediting deliveries where required.

2. Requests for additional compensation will be submitted broken down and associated by item, tasks and Drawing or sketch number with material and labor costs, so quantities can be easily verified.

3. Requests will be properly and adequately identified so the scope of work can be clearly determined. Indicate who originated change in work.

4. Submit on all credits broken down as requested for adds. Credits will be separately identified and accounted for. Do not indicate as net changes with adds.

5. Unit costs for labor and material will be equal for adds, deletes and credits.

L. Protect existing spaces where work is being performed; protect it from damage and from the accumulation of dirt and debris.

M. Work includes field survey of existing conditions, systems, equipment and tracing of existing circuits in order to determine scope of work.

N. Clean and touch up all equipment, materials and work sites at the completion of work in each area.

O. Certain portions of the work area may be occupied during construction. Determine which areas and schedule work accordingly and include necessary premium time.

P. Make sure necessary provisions to provide continuous service of all existing systems throughout all occupied areas.

3.02 CABLE PATHWAYS:

A. Install cables in pathways provided or added as a scope of this project.

B. Provide all equipment and cabling for a complete installed operating system. Pathways, outlet boxes and grounding are provided by the Electrical Subcontractor.

C. All pathways provided under this Section will comply with fill capacities as per Code, ANSI/TIA 569 and BICSI.

D. Cable bending radius will not be less than minimum required by ANSI/TIA and BICSI.

E. Cabling installed concealed will be supported from the building structure (e.g. cable trays, J- Hooks, etc.).

F. Cables will be installed no closer than 12 inches (305mm) to electrical equipment and wiring. When cables are required to cross power wiring, they will only do so perpendicular to the power wiring. Cable and power wiring will only cross each other the minimal number of times as required due to building design limitations. Follow guidelines in 3.04.F.3 and standards cited above.

G. Clearances between cabling and other building systems as required by ANSI/TIA 569 and BICSI will be maintained throughout the building.

H. All cables will be installed in a neat and workman-like manner. Cables will be installed parallel and perpendicular to building elements. Exposed cables will be combed and bundled into symmetrical groups not larger than 24 cables per bundle. Multiple bundles should be grouped together and secured with Velcro straps.

I. Provide expansion fittings and adequate cable slack at all building expansion joints.

J. Fire/smoke seal all conduits, raceways, sleeves, slots, etc. where cables pass from one location to another.

K. Cables shall not be stapled, nailed, screwed or secured to building infrastructure except as allowed through the use of conforming cable supports. Nylon tie-wraps are not to be used for Category-rated structured cabling. Velcro or other hook-and-loop straps only will be allowed for securing cable.

3.03 WORK AREA OUTLETS (EQUIPMENT OUTLETS):

A. All work area outlet locations will be as indicated on the Drawings. Uniquely label each work area outlet and jack within the outlet according to the numbering convention outlined in the section on labeling.

B. Labeling shall be sequential in order. Do not reuse any number throughout the entire infrastructure.

C. Work area outlets installed in casework will have their cables installed within the conduit or raceway provided.

D. Install jack and connector modules as indicated in the details and on the Drawings.

E. Work area outlets will be seated properly and will be installed level on walls and parallel to building elements as required.

3.04 INSTALLATION PRACTICES:

A. Follow and adhere to installation practices specified by the applicable Telecommunications Industry Association standards.

B. Follow and adhere to installation practices specified by BICSI Information Transport System Installation Manual 5th Edition or latest.

C. Follow and adhere to installation practices specified by BICSI Telecommunications Distribution Methods Manual 12th Edition or latest.

D. Follow and adhere to installation practices specified by NFPA-70 National Electric Code, Edition 2008 or latest.

E. Follow and adhere to installation practices specified by the Manufacturers.

F. The general topology will be a "hierarchal star" configuration. All segments will originate in NRTL listed patch panels located in the telecommunication equipment racks/cabinets and end at the work area outlets.

G. Routing:

1. All cabling will be installed in conduit where indicated on plans or will be installed open using “J" hooks and routed on cable trays located as shown on plans.

2. Cables will be routed, in large groups, down main cable pathways, until a direct path to the point of access to the workstation outlet can be taken. At that point, cables will be routed, above all building systems, to the outlet location in accordance with standard installation practices, as described herein.

3. Multiple cables to individual rooms will be pulled as a bundle and terminated at each end in sequential order so that labeling within a room location is in sequence.

4. When not in conduit or tray, cables will be supported to the deck and/or beams, every five feet throughout the length of their installed run. Hangers, clips, and other methods of grouping the cables and keeping them away from other systems installed in the building are to be provided and installed. Ensure that hangers and other methods of securing cable do not compress cable or damage insulation.

5. Cable supports attached to beams will be with minimal disruption of the fireproofing. Care should be taken to assure that fireproofing removal is not excessive. The Contractor will be responsible of restoring the fireproofing to appropriate levels. Restoration will be verified by the Contractor.

6. Cable routes will be with 90-degree angles whenever possible. Cables will not be installed randomly or diagonally through the building.

7. Cables installed partially or fully within the telecommunications room will be routed through and secured in the cable tray wherever possible. No cables are to be routed across the rooms at angles, nor are the cables to be run from one portion of the room or tray to another. Cables placed in the cable tray are to be laced frequently to keep them neatly bundled and not permitted to shift from one side of the tray to the other as they are routed in the tray.

8. Station cables will be routed to fixed wall locations through EMT to back box. Secure and store four feet of slack cable above ceiling at cable entrance to EMT.

H. Separation from EMI Sources:

1. Comply with BICSI TDMM and TIA-569-B recommendations for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.

2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment will be as follows:

   a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches (127 mm).

   b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches (300 mm).

   c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches (610 mm).

3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment will be as follows:

   a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches (64 mm).

   b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches (150 mm).

   c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches (300 mm).

4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures will be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: No requirement.

    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches (76 mm).

    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches (150 mm).

5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches (1200 mm).

6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches (127 mm).

I. All cables will have both ends completely terminated at their respective patch panel and work area outlet. Individual conductors will be trimmed flush with IDC block. Cables indicated to be “spare" will be labeled as such at both ends. Such cables shall have one end terminated at their respective patch panel or cross-connect block and the other end will be hermetically sealed with a polyolefin heat-shrinkable cap. Provide RayChem Co. or approved substitute after testing. Tape will not be approved.

J. The total length of permanently installed cable for any complete segment will not exceed 295 feet (90m). Do not splice or otherwise re-terminate any cable used, terminate only at the patch panels, cross connect blocks and work area outlets. Route cables [minimum of 12 inches (305mm) away] to avoid light ballasts, transformers, power wiring and other electrical devices so that there is no EMI or RFI interference with data transmission. Permanently label all cables six inches from the connector at each end, according to the numbering convention outlined in the section on labeling. All cables will be terminated at outlets, patch panels or cross connect blocks ONLY.

K. Maximum pulling tension will not exceed 25 lbs/ft. when installing cables.

3.05 CABLE SUPPORTS:

A. Provide hook and loop (Velcro) cable wraps at all panels, equipment racks and cabinets. Nylon tie wraps are specifically prohibited.

B. Provide J-Hook supports from the building structure as required for cable runs to the cable drop location. Maximum distance between supports will be five feet (1500mm) depending on the structural elements of the building. Maximum number of cables per support will be thirty. Provide additional

supports as required when cable quantities exceed thirty and to maintain required bending radius of cables. Cables installed exposed or in areas subject to abuse {below 10 feet (3m) above finished floor} or in accessible areas will be installed in conduit.

C. All cables will be supported directly from building structure. Under no circumstance will cable be installed using cross bracing, plumbing/sprinkler pipes, ceiling systems or any other system that is not a specifically approved method to independently support cables. Cables will not be allowed to rest on ceiling tiles, duct work, piping, etc. Supports will be provided as required in order for cables to avoid contact with any other building system. Bundle cables in groups by Room.

3.06 CABLE PROTECTION:

A. Provide bushings in all metal studs and the like where cables will pass through. Bushings will be of two (2)-piece construction with one piece inserted through the opening and the second piece locking it into place. Single piece bushings with locking tabs or friction fit are specifically prohibited.

B. Cables to be installed in existing enclosed open bays or furred spaces where conduit stubs are not provided, will be protected from chafing or any damage. The Installer will verify that the warranty will not be violated before installing any cabling in these locations.

C. Provide cutting, coring, sleeves and bushings and seal as required at all penetrations.

3.07 GROUNDING & BONDING:

A. Refer to Section 16063 – Grounding and Bonding for Electrical Systems.

B. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.

C. Comply with ANSI/TIA-607.

D. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least 2-inch (50-mm) clearance behind the grounding bus bar. Connect grounding bus bar with a minimum No. 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground.

E. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

F. Retain subparagraph below if screened twisted-pair cables and coaxial cables are in communications equipment rooms.

G. Bond the shield of shielded cable to the grounding bus bar in communications rooms and spaces.

3.08 DOCUMENTATION:

A. Label all equipment as herein specified.

B. Provide:

1. Provide Building Structured Cabling Systems Administration Report indicating TIA/EIA- 606 required information.

2. Hard copy documentation of test results for every cable segment and link in 3-ring binder. Documents will include measured values as well as whether or not the test passed. "Record" drawings indicating location of all equipment including but not limited to work area outlets, patch panels, cross connect blocks, on each segment and cable routing. Indicate labeling for each piece of equipment.

3. Record drawings indicating actual cable routes and outlet identifiers. Provide respective copies mounted in each telecommunications room, and the main cross connect.

C. Submit NRTL certification that the structured cabling system meets the transmission requirements of TIA-568-C.0.

D. Drawings/Distribution

1. Label each telecom outlet with unique identifier with corresponding locations labeled on floor plans and site plans. Provide graphic scale on site plans.

2. Backbone layouts showing conduit runs, handholes, cable types, product numbers, lengths, and test results

3. Horizontal layouts including conduit or tray system layouts, cable types, product numbers, lengths, and test results

3.09 TRAINING:

A. At a minimum, training sessions will consist of the following:

1. General project information and review will be by the General Foreman or Superintendent of the Trade.

2. Specific system training will be by a Factory Trained Representative.

3. Provide a complete review of the project and systems including, but not limited to, the following:

    a. Review each Record Drawing (use of “typical” is acceptable).

    b. Note equipment layouts, locations and control points.

    c. Review each system.

    d. Review system design operation and philosophy.

    e. Review alarms and necessary responses.

    f. Review standard troubleshooting techniques for each system.

    g. Review areas served by equipment.

    h. Identify color codes used.

    i. Review features and special functions.

    j. Review maintenance requirements.

    k. Review operation and maintenance manuals.

    l. Respond to questions (record questions and answers).

4. After training, walk the entire project, review each equipment room and typical locations. Explain equipment and proper operation.

B. During the instruction period the Owner and Maintenance Manual will be used and explained.

C. The Owner and Maintenance Manual material will be bound in 3-ring binders and indexed. On the edge of the binder provide a clear see-through plastic holder with a typed card indicating the Project name, the Officer-in-Charge's name, the installer's name and the Volume number (e.g., Vol. No.1 of 2).

D. Provide name, address and telephone number of the Manufacturer’s representative and Service Company for all items supplied so that the source of replacement parts and service can be readily obtained.

1. Include copies of Manufacturer’s and installer's warranties and maintenance contracts and performance bonds properly executed and signed by an authorized representative.

2. Include copies of all test reports and certifications.

3.10 CLEANING:

A. In all telecom room spaces - a thorough sweeping, vacuuming and wet mopping shall be performed on a weekly basis or more frequently as directed by the Officer-in-Charge. Cleaning shall include floors, rafters, floor joists, exposed structural members, exposed mechanical/electrical equipment and ductwork/piping/conduits, walls, ladder trays, tops of cabinets/racks, existing/new passive and active components, or per manufacturer recommendations.

B. All non-metallic cable managers and snap covers shall be wiped clean, both inside and outside of front, including rear channels. All clear covers and doors shall be cleaned, both front and rear per manufacturer recommendations.

C. Inside of fiber optic enclosure and patch panels shall be blown clean of settled dust. Cleaning shall be performed for all new construction projects or where gypsum sanding has been performed.

D. All scraps, boxes, spools, pull-line and trash shall be removed and properly disposed of.

E. All residual cable lubricant shall be cleaned from floors and walls with an appropriate degreaser.

3.11 PROJECT CLOSEOUT:

A. Provide close out submittals as required herein and include the following close out submittals.

1. Operation and Maintenance Manuals

2. Record Drawings

3. Test Reports

4. Warranty certification form Manufacturer’s

5. Extra Materials

6. Provide factory calibration report of field test equipment

B. Provide record drawings indicating actual cable routing and cable terminations including all required identifiers.

C. Provide a half size laminated set of drawings mounted in the Main Equipment Room.

D. All sketches, drawings, and charts herein are for the purpose of providing for specifications in a simplified format. Errors and omissions in such do not relieve the Contractor of the responsibility for providing a fully complete, secure and properly operating structured cabling system suitable for the intended use. Contractor must obtain a complete set of Project Drawings and Specifications to determine the full scope of work. In case of conflict, the Project Drawings and Specifications will prevail.

END OF SECTION

# DIVISION 16 – ELECTRICAL

## SECTION 16705 – COMMON WORK RESULTS FOR COMMUNICATION SYSTEMS

## PART 1 - 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 ADDITIONAL INFORMATION:

A. Refer to Section 16011 – Requirements for Electrical Installations, Part 1 General Information:

1. References / Definitions / Terms / Acronyms
2. Submittal Requirements
3. Manufacturer Qualifications
4. Testing Agency Qualifications
5. Delivery, Storage and Protection
6. Project conditions
7. Sequencing
8. Continuity of Service and Scheduling of Work
9. Protection of Work and Property
10. Warranty

1.03 SUMMARY:

A. This Section includes the following:

1. Communications Services
2. Grounding and Bonding for Communications Systems
3. Pathways for Communications Systems
4. Hangers and Supports for Communications Systems
5. Conduits and Backboxes for Communications Systems

6. Surface Raceways for Communications Systems

7. Underground Ducts and Raceways for Communications Systems

8. Identification for Communications Systems

1.04 ADDITIONAL REFERENCES:

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

B. Specific reference in specifications to codes, rules, regulations, standards, manufacturer's instructions, or requirements of regulatory agencies will mean the latest printed edition of each in effect at the date of contract unless the document is shown dated.

C. Conflicts:

1. Between referenced requirements: Comply with the authority having jurisdiction.

2. Between referenced requirements and contract documents: Comply with the authority having jurisdiction.

D. Standards and Specifications:

1. American National Standards Institute (ANSI):

a. C80.1 Rigid Steel Conduit – Zinc Coated.

b. C80.4 Fittings for Rigid Metal Conduit.

2. National Electrical Manufacturers Association (NEMA):

a. RN1 Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Electrical metallic Tubing.

b. TC2 Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80).

c. TC3 PVC Fittings for Use with Rigid PVC Conduit and Tubing.

d. NEMA VE 1 – Metal Cable Tray Systems.

e. NEMA VE 2 – Metal Cable Tray Installation Guidelines.

3. American Society for Testing and Materials International (ASTM):

a. ASTM A123 – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

b. ASTM A653 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc- Iron Alloy-Coated (Galvanized) by the Hot-Dip Process.

c. ASTM B633 – Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.

4. Underwriters Laboratories Inc. (UL):

a. 6 Rigid Metal Electrical Conduit.

b. 514 B Fittings for Conduit and Outlet Boxes.

c. 651 Schedule 40 and 80 Rigid PVC Conduit.

d. 651A Type EB and A Rigid PVC Conduit and HDPE Conduit.

e. 1666 Standard for Riser Application for Optical Fiber Raceway.

5. National Fire Protection Association, Inc. (NFPA) ANSI/NFPA 70 National Electrical Code (NEC).

6. National Electrical Safety Code (NESC).

7. Building Industry Consulting Service International (BICSI) Telecommunications Distribution Methods Manual (TDMM).

8. Building Industry Consulting Service International (BICSI) Customer Owned Outside Design Manual.

9. Local, county, state and federal regulations and codes in effect as of date of purchase.

10. Equipment of foreign manufacture must meet U.S. Codes and standards. It will be indicated in the proposal the components that may be of foreign manufacture, if any, and the country of origin.

1.05 SUBMITTALS:

A. Proposed product data sheets: The Contractor will submit catalog cut-sheets that include manufacturer, trade name, and complete model number for each product specified. Model number will be handwritten and/or highlighted to indicate exact selection. Identify applicable specification section reference for each product.

1.06 COORDINATION:

A. Field coordinate installation of conduit and cable with other trades to ensure clearance requirements are met.

B. Coordinate with all contractors providing equipment outside the scope of this contract.

C. Field coordinate installation of conduit and cable with other trades to ensure clearance requirements are met.

D. Coordinate with all contractors providing equipment outside the scope of this contract.

1.07 DESIGN GUIDELINES:

A. Follow NEC specifications where applicable.

B. Coordinate locations with other trades prior to installation.

C. Install work following drawings, manufacturer's instructions and approved submittal data.

D. Installation plans and requests for information (RFIs) will be reviewed by contractor's on-site RCDD.

E. All work will be supervised and reviewed by contractor's on-site RCDD.

1.08 HORIZONTAL PATHWAYS:

A. No PVC or PVC sleeves are to be used for telecommunication conduit within the confines of the building

B. All horizontal conduit stubs shall be neatly arranged and fitted with proper plastic bushing to prevent damage to cabling during installation. (Note: electrical subcontractor or telecom subcontractor shall NOT install cabling unless conduit ends have been properly finished with end bushings)

C. All horizontal conduit shall have a plastic or nylon pull cord installed with a minimum test rating of 90Kg. (200 lb).

D. All horizontal conduit (data, TV, WAP, Telephone, etc.) should be 1" minimum and shall not exceed two 90-degree bends without a pull box.

E. Horizontal conduit should end at the telecom outlet side in a 5" square electrical box with a double gang trim ring

F. All conduit shall be properly grounded per electrical code

G. Conduit bodies (e.g., LBs) are not allowed in telecom conduit systems

H. Exposed conduit should be painted to match adjacent surface. Color to be selected by Officer-in-Charge to match adjoining areas.

I. All conduit penetrations should be patched/sealed/fire stopped appropriately

J. J-Hooks :

1. J-hooks should not be more than 5 feet apart and are installed above finish ceilings.

2. J-hooks shall be accessible with a minimum clearance of 6” on all sides.

3. J-hooks shall be independently supported per code.

1.09 COORDINATION:

A. Contractor shall furnish and install the following including, but not limited to:

1. Telecommunications raceways within the building.

2. Telecommunications duct banks

3. Telecommunications racks, jacks, pathways, conduit, backboxes, and associated equipment to support cabling throughout the building.

PART 2 - PRODUCTS

2.01 CONDUITS:

A. All conduits, fittings, junction and pull boxes will be UL rated.

B. All conduits, fittings, junction and pull boxes will comply with the NEC.

C. PVC-Coated Rigid Steel Conduit and Fittings: Follow NEMA RN1 (Type A).

D. Non-metallic Conduit and Fittings: Pass NEMA TC2, UL 651 and 651A and FS W-C- 1094A. EMT fittings will be formed steel compression ring type. Die cast fittings are not allowed.

E. Rigid Steel Galvanized Conduit and Fittings Before Coating

1. Follow FS WW-C-581d, ANSI C80.1, and UL 6.

2. Pass bending, ductility, and thickness of zinc coating in ANSI C80.1.

F. Electrical Metallic Tubing (EMT):

1. EMT fittings will be formed steel compression ring type. Die cast fittings are not allowed.

2. EMT will be UL listed and conform to NEC Article 300.22.

3. Will be used inside buildings only.

4. Only manufacturer's fittings, transition adapters, terminators and fixed bends will be used.

5. All transition junction and pull boxes, fittings terminators and adapters will be a metallic material.

6. Minimum average tensile strength will be 1250 lbs. For 1½-inch and smaller conduits and innerduct.

7. Minimum average tensile strength will be 1800 lbs. For conduits larger than 1½ inch.

G. Conduit Bodies: Follow UL 514B and FS W-C-58C. Furnish sufficient coating for touch up after installation.

H. Conduit Fittings:

1. All fittings will be compression or threaded.

2. Fittings will provide a secure connection for pulling communications cables.

3. Setscrew fittings are not permitted.

4. Conduit LBs or "condulets" are NOT permitted.

5. Smart LB fittings with built in cable bend radii of greater than 1-1/2 » are permitted.

I. Flexible conduit is not permitted.

J. Non-metallic conduits are not permitted in above ground installations. Conversion fittings are required for non-metallic (below ground) to metallic (above ground) transitions.

K. Pull Boxes, Junction Boxes and Gutters

1. All junction boxes, gutters and pull boxes will comply with NEC Article 314.

2. All junction boxes, gutters and pull boxes will meet the following minimum material requirements:

a. 16-gauge steel or heavier.

b. Seams will be continuously welded and grounded smooth.

c. External screws and clamps.

d. External mounting feet (where possible).

e. Oil-resistant gasket and adhesive.

f. ANSI 61 gray polyester powder coating inside and out over phosphatized surface.

g. UL 50 type 12.

3. All junction boxes, gutters and pull boxes will be provided with bushings for conduits and/or cabling.

4. All junction boxes, gutters and pull boxes will be securely installed.

5. All junction boxes, gutters and pull box sizes for single and multiple conduit runs will comply with BICSI TDMM.

2.02 BONDING AND GROUNDING:

A. Telecommunications Horizontal Rack Bonding Busbar

1. The rack bonding bus bar shall be an electrical grade listed copper bar with predrilled holes for use with standard sized one whole lugs. Shall mount in standard 19” rack.

2. Approved Products:

a. Chatsworth #10610-019

b. Or approved substitute.

B. All bonding conductors and connectors will be listed for the purpose intended and approved by a Nationally Recognized Testing Laboratory (NRTL).

C. All bonding conductors will be insulated and copper. The minimum bonding conductor size will be a No. 6 AWG.

D. Use 2-hole, irreversible-crimp grounding lugs for all connections to IDF metals, rack, busbar and cable tray. Bond and ground all IDF metals, rack, busbar, cable tray and shielded or armored cable.

2.03 FIRESTOPPING:

A. Fire rated pathway devices are the preferred product and shall be installed in all locations where frequent cable moves, add-ons and changes will occur. Such devices shall:

1. Meet the hourly rating of the floor or wall penetrated.

2. Permit the allowable cable load to range from 0% to 100% visual fill thereby eliminating the need to calculate allowable fill ratios.

3. Permit multiple devices to be ganged together to increase overall cable capacity.

4. Allow for retrofit to install around existing cables.

5. Include an optional means to lengthen the device to facilitate installation in thicker barriers without degrading fire or smoke sealing properties or inhibiting ability of device to permit cable moves, add-ons, or changes

6. Not require any additional action on the part of the installer to open or close the pathway device or activate the internal smoke and fire seal, such as, but not limited to:

a. Opening or closing of doors.

b. Twisting an inner liner.

c. Removal or replacement of any material such as sealant, caulk, putty, pillows, bags, foam plugs, foam blocks, or any other material.

7. Where single cables (up to 0.27 in. (7 mm) diameter) penetrate gypsum board/stud wall assemblies, a fire-rated cable grommet may be used instead. Acceptable products shall be molded from plenum-grade polymer and conform to the outer diameter of the cable forming a tight seal for fire and smoke. Additionally, acceptable products shall lock into the barrier to secure cable penetration.

8. Approved Products:

a. Specified Technologies, Inc. EZ-PATH series 44+ fire-rated pathway devices

b. Specified Technologies, Inc. EZ-PATH GROMMET

c. Or approved substitute.

B. Where non-mechanical products are utilized, provide products that upon curing do no re-emulsify, dissolve, leach, breakdown or otherwise deteriorate

over time from exposure to atmospheric moisture, sweating pipes, ponding water or other forms of moisture characteristic during or after construction.

1. Where it is not practical to use a mechanical device, openings within floors and walls designed to accommodate telecommunications and data cabling shall be provided with re-enterable products that do not cure or dry.

2. Utilize an EMT sleeve as a stub through a rated wall

3. Surround annular space between EMT sleeve and wall material with a hardening intumescent caulk.

4. Utilize re-enterable, non-hardening putty around cables inside a metal sleeve. Do not exceed 40% fill capacity of sleeve and follow all rated assembly requirements per Manufacturer, local codes, and AHJ.

5. Approved Products:

    a. Specified Technologies, Inc. SSS Intumescent Caulk

    b. Specified Technologies, Inc. SSP Intumescent Putty

    c. Or approved substitute.

2.04 LABELING:

A. Provide machine-generated labels appropriate for all components supplied and installed. Under no circumstances shall hand written labels be used.

B. The labeling scheme shall not include duplicates of any new or existing cable identification across the entire cable plant.

C. Labeling procedure will meet TIA-568, TIA-606 (Class 2 Administration) and BICSI Standards.

D. The labeling scheme will be provided at all locations within the cable infrastructure:

1. Use clear tape with black lettering on ivory or stainless steel surfaces (3/8”)

2. Use white (or clear) tape with black letters on white faceplates and surfaces (3/8”)

3. Use black tape with white letters on black surfaces (as appropriate)

4. Use Flexible ID, white tape with black letters on cables (1” wide), with several lines of repeating cable ID’s for any-angle viewing.

5. Use High-Strength tape for exterior locations and equipment identification

E. Cable Labels:

1. Horizontal cables shall be labeled at each end according to State labeling standards (see below). The cable or its label shall be marked with its identifier.

2. Cable labels shall be machine-generated wrap-around labels with multiple cable ID's printed such that it can be viewable in place without turning the cable.

3. Label cables within 6" of termination point at both ends.

F. Faceplate Labels:

1. A unique location identifier shall be marked on each faceplate to identify its location in the cable plant.

2. Each port in the faceplate shall be labeled with its own unique identifier.

G. Racks, Panels, and Block Labels

1. A unique identifier shall be marked on each piece of connecting hardware to identify it as connecting hardware.

2. Each port on the connecting hardware shall be labeled with its own identifier to match the other end of the cable.

H. Approved Products:

1. Brother P-Touch Labelers or approved substitute

2. Brother P-Touch TZe Polyester labels or approved substitute

a. TZe-S221, 3/8" (9mm), High Strength black print on clear tape

b. TZe-S251, 1" High Strength Black text on White background

c. Other sizes and colors as specified

2.05 PATHWAYS:

A. General Requirements: Comply with ANSI/TIA-569.

B. Cable Support: NRTL labeled. Cable support brackets will be designed to prevent degradation of cable performance and pinch points that could damage cable. Cable tie slots fasten cable ties to brackets.

1. Comply with NFPA 70 and UL 2043 for fire-resistant and low-smoke-producing characteristics.

2. Support brackets with cable tie slots for fastening cable ties to brackets.

3. Lacing bars, spools, J-hooks, and D-rings.

4. Straps and other devices.

2.06 CABLE MANAGEMENT:

A. The equipment rack shall be equipped with wire management panels to allow for routing of patch cords and future cables

B. Vertical cable managers shall be used at each side and between adjacent racks to facilitate routing cables in front and behind panels

C. Vertical Wire managers shall be 1 or 2U, duct-style, dual-sided (front and rear) and include removable covers. Vertical wire managers shall be openable on one side only or fully removable.

D. Horizontal wire managers shall be front-only, duct-style, and include removable covers. An optional hinge cover bracket shall be available.

E. Approved Products:

1. Leviton Versi-Duct 8” Channel Vertical Cable Manager, 80” length 8”W X 8”D channel with black covers front & rear, 8980L-VFR or approved substitute.

2. Leviton Vertical center mounting bracket, 8” channel front & rear, 89265-BKT or approved substitute.

3. Leviton Vertical wire retainer, 8” channel, front & rear, 89265-WR1 or approved substitute.

4. Leviton Vertical slack loop organizer, 8” channel, front & rear, 89265-SL1 or approved substitute.

5. Leviton Versi-Duct Horizontal Manager, 1U, Front Only, 491RU-HFO or approved substitute.

6. Leviton Versi-Duct Horizontal Manager, 2U, Front Only, 492RU-HFO or approved substitute.

7. Leviton Horizontal Cover Hinge (4 per package), 49265-HNG or approved substitute.

## PART 3 - EXECUTION

### 3.01 PREPARATION:

A. Contractor's on-site RCDD supervisor will review, approve and stamp all shop drawings, coordination drawings and record drawings.

B. Verify conduit system is properly sized for cables (minimum one inch, unless otherwise noted in Drawings).

C. Verify general conduit route following Drawings.

D. Verify substrates to which work is connected and determine detail requirements for proper support.

E. Verify proper location and type of rough-in for conduit, cable terminations, and ground bus bar.

### 3.02 INSTALLATION:

A. Junction Boxes (JB):

1. Normally provided in conduit runs of more than 100 feet in length, and if containing more than the equivalent of two 90 degree bends.

2. Provide detail drawing of JB with conduits entering/exiting JB.

3. Should be installed on straight runs and not at turns.

4. If used at turns JB must have minimum depth of 12 inches.

5. Typical JB size on riser with pull thru: for 2-3"c - 12"W x 12"H x 8"D.

6. Typical JB size on riser with turn: for 2-3"c -18"W x 18"W x 10"D.

7. Provide stainless steel, fiberglass, cast aluminum, or PVC JBs in areas with corrosive environment and for all exposed environments.

8. Limit junction box installation at 10 feet or less off the ground; bottom of JB must be above 6'-8" minimum in walkway locations.

B. Conduits from Building to Building:

1. Underground ducts to be concrete encased.

2. Provide adequate separation between electrical conduits and telecom conduits if side by side.

C. Sidewalk Repair:

1. Include typical sidewalk restoration detail.

2. Install dowels into existing sidewalk.

3. Fill sidewalk joint with sealer (between old and new concrete).

D. Conduit Risers:

1. Secure conduits on exterior walls with two hole “U” clamps at walkway locations.

2. Provide nylon pull strings in all conduits.

3. Paint all new work to match the surrounding finish except for stainless steel JBs. Color to be selected by Officer-in-Charge to match adjoining areas.

4. Conduit bodies (e.g. LB, LR, etc.) are not permitted in telecommunications raceway systems.

5. Smart LB fittings with built in cable bend radii of greater than 1-1/2". are permitted.

6. Provide insulated bushings at all telecommunications conduit terminations at all boxes and conduit stubs.

7. All Installation of telecommunication infrastructure shall comply with TIA/EIA-569-B unless otherwise noted.

E. Design Considerations:

1. Install PVC coated conduits in outdoor above-ground locations, inside valve vaults and wet wells, and in corrosive and wet environments.

2. Install PVC conduits in buried duct banks or encased in concrete. Use PVC coated rigid steel elbows for stub-outs.

3. Install exposed conduit parallel or perpendicular to lines of existing construction and grouped together where possible, without interfering with use of premises or working areas. Prevent safety hazards and interference with operating and maintenance procedures.

4. Conduit may pass through areas with temperature differential of 20 degrees F or more. Seal with proper fitting at barrier between areas of differing temperature.

5. Do not install conduit in interference with equipment placement or operation; piping; structural members; maintenance access; indicated future equipment.

6. Contractor's RCDD supervisor will coordinate with drawings of other disciplines to determine availability of space for installation.

7. Conduit fill will comply with ANSI/TIA-569.

8. The minimum bend radius is six times the conduit inside diameter (ID) for a two inch conduit or less.

9. The minimum bend radius is ten times the conduit ID for a conduit greater than two inches.

10. Below grade conduit will extend three inches above finished floor (AFF) with a bushing.

11. Ceiling conduit or sleeves will extend six inches below finished ceiling with a bushing.

12. All stubbed conduit ends will be provided with a ground bushing.

13. All conduit penetrations will comply with all applicable fire codes. All conduit penetrations in fire-rated walls or floors will be sealed and fire proofed to at least the rating of the penetration area.

14. Conduits will be routed in the most direct route, with the fewest number of bends possible.

15. There will be no continuous conduit sections longer than 100 feet. For runs that total more than 100 feet, insert junction or pull boxes (or gutters if appropriate) so that no continuous run between pull boxes is greater than 100 feet.

16. There will be no more than two 90-degree bends (180 degrees total) between conduit pull boxes.

17. Changes in direction will be accomplished with sweeping bends observing minimum bend radius requirements above. Do not use pull boxes for direction changes unless specifically designated otherwise in the Drawings.

18. Unless otherwise noted in the Drawings, conduits entering pull boxes will be aligned with exiting conduits.

3.03 EQUIPMENT RACKS AND CABINETS:

A. Securely mount equipment cabinet and racks to the building structure. Proper supports such as 3/8" lag screws and expansion anchors will be used. Proper quantity of supports will be utilized. Drywall screws and other types of supports not specifically approved to support equipment are

specifically prohibited. Submit mounting supports for approval before installation.

B. Equipment cabinet mounted on or against walls will have 3-foot clearance in front of deepest component.

C. Patch Panels: Mount patch panels into the cabinet/rack in top-to-bottom fashion with the first patch panel (Fiber) mounted at the top of the “Active” equipment rack. Uniquely label each patch panel according to the numbering convention outlined in the SECTION on labeling. Each port will also have color-coded identifiers.

D. Cable Management: Secure the cable bundle(s) to the rack strain relief and cable management behind the patch panels and cross connect block panels. Maintain TIA/EIA and BICSI standards on bundling, supporting and bend radii.

3.04 TESTING COPPER CABLES:

A. General:

1. All terminations shall be tested end-to-end by the Contractor using commonly accepted industry procedures and equipment. The Contractor shall conduct and provide all test equipment required.

2. Cable segments and links will be tested from both ends of the cable for each of the construction phases. (Verify that cable labeling matches at both ends).

3. The system will not be considered certified until the test operator has acknowledged that the performance of the physical layer of the system has been fully tested and is operational at the completion of the installation phase.

4. If the City or its representative discovers any errors, the Contractor, at his own expense, shall go over all similar portions of the entire job taking the necessary or directed remedial action.

B. Unshielded Twisted Pair Test Equipment:

1. Cable tester will be Level IIIe or better, and NRTL certified for ANSI/TIA TSB 95.

2. The cable tester will have a wide variety of preprogrammed cable types as an integral part of its testing system and have the ability to test cables less than 6 feet (6ft.) from the test point.

3. All balanced twisted-pair field testers will be factory calibrated each calendar year by the field test equipment manufacturer as stipulated by the manuals provided with the field test unit. The calibration certificate will be provided for review prior to the start of testing.

4. Testing will be accomplished using level III or higher field tester that is loaded with the most current version of test software by the manufacturer of the test equipment.

5. Provide factory calibration report of field test equipment.

C. Test results – Unshielded Twisted Pair Cables:

1. The test results information for each link will be recorded in the memory of the field tester upon completion of the test. The tester will be capable of storing test data in either internal or external memory. The external media used will be left to the discretion of the user.

2. Test results saved by the tester will be transferred into a Windows based database utility that allows for maintenance, inspection and archiving of these test records in their native format. A guarantee must be made that the measurement results are transferred to the PC unaltered as well as any printed reports generated from the software application.

3. Provide report indicating failures and what actions were taken to ensure a passing horizontal cable and its terminations. Any cable failing the certification test (Fail, Fail* or, Pass*) must have remedial work done to provide a full pass test result; Remediation may include re-termination or replacement of the cable, which fails. No cables passing within tolerance only (Conditional Pass*) will be accepted.

4. Optional formats of data reporting are: comma separated variable (.csv), Portable Document File (.pdf) or compatible, plain text (.txt), or hypertext markup language (.html/.htm).

5. Test Results for CAT6 shall include the following:

a. Applicable room number of jack location (room number per Contract Documents)

b. Applicable Telecommunications Room number

c. Circuit I.D. number with corresponding jack identifier

d. Wire Map – shall include the following:

1) Continuity to the remote end

2) Shorts between any two or more conductors

3) Crossed pairs

4) Reversed pairs

5) Split pairs

6) Any other mis-wiring

e. Length

f. Insertion Loss

g. Near-end Crosstalk (NEXT) Loss

h. PS-NEXT (Power Sum Near End Cross Talk)

i. FEXT (Far End Crosstalk)

j. ELFEXT (Equal Level Far End Cross Talk)

k. PS-ELFEXT (Power Sum Equal Level Far End Cross Talk)

l. Propagation Delay

m. Delay Skew

n. Return loss

o. PSFEXT (Power Sum Far End Crosstalk)

p. PSACRF (Power Sum Attenuation to Crosstalk Ratio, Far End)

6. Test Results for CAT6A shall include all of the above, plus the following:

a. AACRF (Alien Attenuation to Crosstalk Ratio, Far End)

b. AFEXT (Alien Far End Crosstalk)

c. ANEXT (Alien Near End Crosstalk)

d. PSANEXT (Power Sum Alien Near End Crosstalk)

e. PSAACRF (Power Sum Alien Attenuation to Crosstalk Ratio, Far End)

3.05 BONDING AND GROUNDING:

A. Bonding Conductor for Telecommunications (BCT)

1. The BCT conductor will bond the TMGB to the service equipment (power) ground. The BCT shall be a continuous copper conductor sized according to length (see TBB conductor requirements)

B. Structural Steel Framed Structures

1. In structural steel frame buildings, where the steel framework is accessible within the room, the TMGB and each TGB shall be bonded to the structural steel frame using a minimum No. 6 AWG conductor.

2. Connections to the structural steel shall be by exothermically welding or with an electro tin-plated bonding plate.

3.06 FIRESTOPPING:

A. Work, in general, includes furnishing and installing fire and smoke barrier penetration seals for openings in floor, walls, and other elements of construction.

B. Comply with ANSI/TIA-569, "Firestopping."

C. Comply with BICSI TDMM, "Firestopping Systems" Article.

D. Applicator Qualifications: Two years' experience installing UL classified firestopping.

E. Performance of materials will have been tested to provide fire rating equal to that of the construction.

F. Shop Drawings:

1. Submit shop drawings showing each condition requiring penetration seals indicating proposed UL systems materials, anchorage, methods of installation, and actual adjacent construction.

2. Submit a copy of UL illustration of each proposed system indicating Manufacturer approved modifications.

G. Manufacturer's Data: Submit copies of Manufacturer's specifications, recommendations, installation instructions, and maintenance data for each type of material required. Include letter indicating that each material complies with the requirements and is recommended for the applications shown.

H. Existing Project Conditions:

1. Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding.

2. Proceed with installation only after penetrations of the substrate and supporting brackets have been installed.

I. Environmental Requirements:

1. Furnish adequate ventilation if using solvent.

2. Furnish forced air ventilation during installation if required by Manufacturer.

3. Keep flammable materials away from sparks or flame.

4. Provide masking and drop cloths to prevent contamination of adjacent surfaces by firestopping materials.

J. Preparation: Clean surfaces to be in contact with penetration seal materials of dirt, grease, oil, loose materials, rust, or other substances that may affect proper fitting, adhesion, or the required fire resistance.

K. Installation:

1. Install penetration seal materials in accordance with printed instructions of the UL Building Materials Directory and in accordance with Manufacturer's instructions.

2. Seal holes or voids made by penetration to ensure an effective smoke barrier.

3. Where floor openings without penetrating items are more than four inches in width and subject to traffic or loading, install firestopping materials capable of supporting same loading as floor.

4. Protect materials from damage on surfaces subject to traffic.

L. Field Quality Control:

1. Examine penetration sealed areas to ensure proper installation before concealing or enclosing areas.

2. Keep areas of work accessible until inspection by applicable code authorities.

3. Perform under this section patching and repairing of firestopping caused by cutting or penetration by other trades.

M. Adjusting and Cleaning:

1. Clean up spills of liquid components.

2. Neatly cut and trim materials as required.

3. Remove equipment, materials and debris, leaving area in undamaged clean condition.

3.07 SEALING OF PENETRATIONS AND OPENINGS:

A. All firestop systems will be installed in accordance with the Manufacturer's recommendations and will be completely installed and available for inspection by the local inspection authorities prior to cable system acceptance.

B. Provide a seal around raceways or cables penetrating full height walls (slab to slab), floors or ventilation or air handling ducts so that the spread of fire or products of combustion will not be substantially increased.

C. Penetrations through fire-resistant-rated walls, partitions, floors or ceilings will be fire stopped

D. using approved methods and NRTL listed products to maintain the fire resistance rating.

E. Installation restrictions of the listing agencies will be strictly adhered to {e.g. 24 inch (610 mm) minimum horizontal separation between boxes on opposite sides of the wall, maximum square inch opening in wall}.

F. Fire stopping in sleeves or in areas having small openings that may require the addition or modification of installed cables or raceways will be soft, pliable, non-hardening fire stop putty. Putty will be water resistant and intumescent.

G. Fire stopping in locations not likely to require frequent modification will be NRTL listed putty or caulk to meet the required fire resistance rating.

H. Box penetrations into a fire rated wall or shaft will have a fire-stopping pad installed on the back of the box.

I. Fire stopping of cable trays through walls will be with NRTL listed bags to meet the required fire resistive rating and that will not allow products of combustion to pass through the protected opening. The NRTL listed bags will be installed inside and on both sides of the opening as required to meet the required resistive fire rating of the wall.

J. Fire stopping materials will be NRTL listed to UL 1479 (ASTM E814). Installation methods will conform to a UL fire stopping system. Submit specifications and installation drawings for the assembly to be used.

3.08 LABELING:

A. The labeling scheme will be provided as follows at all locations within the cable infrastructure.

B. Conduits

1. All media system conduits shall be identified by sleeves or labels at all terminations of each conduit. The pre-construction submittal shall include a complete product description of the sleeve/label system including, styles, types, and accessories furnished by a brand name manufacturer. The conduits shall include a suitable sleeve/label system which will meet the following requirements.

2. Conduit identification shall be made by using vinyl sleeves or vinyl adhesive labels applied at the conduit terminations, and junction box interiors. The sleeves and labels shall be stamped or factory printed with information to identify the system and location of the termination and its destination except at room outlets where only the system and destination shall be identified. Handwritten tags or labels will not be accepted. Labeling procedure will meet EIA/TIA 568A, 606-A (Class 2 Administration) and BICSI Standards.

3. Where above ground metal conduits or raceways are specified they shall be clearly marked with factory printed adhesive labels having 1/4 inch letters on a contrasting background, attached to the conduit or raceway on 10 foot centers, readily visible, and indicating the system cabling contained therein.

C. Horizontal (Intrabuilding) Cables

1. Cables shall be labeled using computer generated or typewritten wrap-around stick-on labels at both ends.

2. For All buildings, label cables with the following format:

a. Data Cables

1) BldgRM-DX where “Bldg” represents the building letter, “RM” represents the Room the jack is located in, “DX” represents the data jack number (e.g. A101-D1, A101-D2, A101-D3 etc.).

D. Labeling shall be sequential in order, do not reuse a number throughout the entire infrastructure.

E. Hand-written and embossed type labels are specifically prohibited. In addition, provide the following:

1. Label each outlet with permanent self-adhesive label with minimum 3/16 in. high characters.

2. Label each cable with permanent self-adhesive label with minimum, 1/8 in. high characters, in the following locations:

    a. Inside receptacle box at the work area.

    b. Behind the communication room patch panel or punch block.

3. Use labels on face of data patch panels. Provide facility assignment records in a protective cover at each telecommunications room location that is specific to the facilities terminated therein.

4. Use color-coded labels for each termination field that conforms to ANSI/TIA-606 standard color codes for termination blocks

5. Mount termination blocks on color-coded backboards wherever possible.

6. Labels will be machine-printed. Hand-lettered labels will not be acceptable.

7. Use industry standard EIA/TIA and BICSI color codes as specified herein and maintain consistent color-coding throughout the building.

3.09 ACCEPTANCE:

A. Acceptance will be subject to completion of all work and submittal and approval of complete as-built documentation as described above, and MAA final inspection of the work for compliance with the approved as-built documentation.

END OF SECTION

# DIVISION 16 – ELECTRICAL

## SECTION 16721 – FIRE ALARM SYSTEMS

### PART 1 - 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:

A. This Section includes the following:

1. Existing fire alarm system to be modified.

2. Addressable fire alarm system.

3. Fire alarm control panel (FACP).

4. Fire alarm addressable interface devices.

5. Heat detectors.

6. Fire alarm notification appliances.

7. Fire alarm wiring.

B. Related Requirements:

1. Section 16120 - Low-Voltage Electrical Power Conductors and Cables.

1.03 DEFINITIONS:

A. EMT: Electrical metallic tubing.

B. FACU: Fire alarm control unit. Term may be used interchangeably with FACP.

C. FACP: Fire alarm control panel. Term may be used interchangeably with FACP.

D. HVLS: High Volume, Low Speed (Fans).

E. Mode: The terms "Active Mode," "Off Mode," and "Standby Mode" are used as defined in the 2007 Energy Independence and Security Act (EISA).

F. NICET: National Institute for Certification in Engineering Technologies.

G. Voltage Class: For specified circuits and equipment, voltage classes are defined as follows:

1. Control Voltage: Listed and labeled for use in remote-control, signaling, and power-limited circuits supplied by a Class 2 or Class 3 power supply having rated output not greater than 150 V and 5 A, allowing use of alternate wiring methods complying with NFPA 70, Article 725.

2. Low Voltage: Listed and labeled for use in circuits supplied by a Class 1 or other power supply having rated output not greater than 1000 V, requiring use of wiring methods complying with NFPA 70, Article 300, Part I.

1.04 SUBMITTALS:

A. See Section 01300 – Submittals, for submittal procedures.

B. General Submittal Requirements:

1. Partial submittals will not be acceptable.

2. Annotate descriptive data to show the specific model, type, and size of each item the Contractor proposes to furnish.

3. Do not commence work until the design of the system and the various components have been approved by the Officer-in-Charge.

4. Submittals shall be approved by authorities having jurisdiction for construction permit.

5. Shop Drawings shall be prepared by persons with the following qualifications:

a. Trained and certified by manufacturer in fire alarm system design.

b. NICET-certified, fire alarm technician; Level III minimum.

c. Licensed or certified by authorities having jurisdiction.

C. Product Data:

1. Include construction details, material descriptions, dimensions, profiles, and finishes.

2. Include rated capacities, operating characteristics, and electrical characteristics.

D. Shop Drawings:

1. Comply with recommendations and requirements in "Documentation" section of "Fundamentals" chapter in NFPA 72.

2. Include plans, elevations, sections, and details, including details of attachments to other Work.

3. Point-To-Point Wiring Diagrams: Drawings shall be job-specific. "Typical" or "generic" drawings are not acceptable. The diagrams shall include but not be limited to the following:

    a. Locations Of All System's Elements: Indicate all devices, junction boxes, handholes, and pass-through devices and entities where the cables and conductors can be accessed by personnel. Indicate the number of devices provided.

    b. Also indicate the locations of all cable and conductor terminations and intermediate connections showing where they pass through without terminations/connections from and to equipment panels and/or devices.

    c. Labeling Of All Elements: All devices junction boxes, etc. shall be labeled by functional designations, locations and numbers such as building alphabet, room function and room number, and handhole number.

    d. Fire Alarm Wiring and Color Codes: All cable and conductor color codes, the wire marking system and marker designation shall be shown.

4. Equipment and/or Modular Systems Wiring Diagram: Wiring diagrams showing all equipment modules, components and key internal cabinet wiring that should be accessed for tests and maintenance. Drawings shall include but not be limited to the following:

    a. Equipment Modules and Components: The equipment modules and components layout (relative locations in proportion to the modules, components and cabinet/enclosure sizes) including the fire alarm control panel(s), battery cabinets, etc. The drawings shall also show the arrangement of modules, components, wiring and expansion space within the FACP cabinet.

    b. Input and Output Circuits Labeling: Label the input and output circuits by circuit designations specified herein.

    c. Internal - External Circuits Interface Information: Only information that interfaces with external circuits and internal equipment wiring need be shown. All external wiring and circuits shall be shown in the

riser diagram and the Contractor furnished Point-To-Point Wiring Diagrams.

5. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and locations. Indicate conductor sizes, indicate termination locations and requirements, and distinguish between factory and field wiring.

6. Detail assembly and support requirements.

7. Include detailed voltage drop calculations for notification-appliance circuits and releasing device circuits.

8. Include data for each circuit to indicate that there is at least 25 percent spare capacity for notification appliances, and 25 percent spare capacity for initiating devices.

9. Include battery-size calculations.

    a. Standby battery capacity calculations shall list the type of devices and modules, quantities, unit amperage draw for standby and alarm conditions, total amperage draw and battery amp/hour rating.

10. Include input/output matrix.

11. Include written statement from manufacturer that equipment and components have been tested as a system and comply with requirements in this Section and in NFPA 72.

12. Include performance parameters and installation details for each detector.

13. Include floor plans to indicate final outlet locations indicating address of each addressable device. Indicate size and route of cable and conduits and point-to-point wiring diagrams.

E. Field quality-control reports.

F. Qualification Statements: For Installer and System Technician.

G. Warranty.

H. As-Built Drawings: Drawings shall provide a detailed description of system operation during alarm, supervisory, and trouble modes and shall include a complete list of all system addresses including input/output logic. Upon completion and before final acceptance of the work, submit complete set of as-built drawings of the system for record purposes. Drawings shall include all components and circuit diagrams complete with conductor color codes

and a listing of initiating devices. Submit 24 by 36 inch drawings on reproducible vellum with title block similar to full size contract drawings.

1.05 QUALITY ASSURANCE:

A. Qualification of Installer: Minimum of five years of experience in the installation of fire alarm systems in the State of Hawaii. The services of a technician provided by the control equipment manufacturer shall be provided to supervise installation, adjustments, and tests of the system. Prior to installation, submit data for approval by the Officer-in-Charge showing that the Installer has successfully installed addressable, programmable digital intelligent interior fire alarm systems of the same type as specified herein. Include the names and locations of at least two installations where the Installer has installed such systems. Indicate the type and design of each system and certify that each system has performed satisfactorily in the manner intended for a period of not less than 18 months. Submit names and phone numbers of points of contact at each site.

B. Qualifications of System Technician: Installation drawings, shop drawings, and "as-built" drawings shall be prepared by, or under the supervision of, a qualified technician. Qualified technician shall be an individual who is experienced with the types of work specified herein, and is currently certified by the National Institute for Certification in Engineering Technologies (NICET) as an engineering technician with minimum Level-III certification in Fire Alarm Systems program. Contractor shall submit data showing the name and certification of the technician at or prior to submittal of drawings.

C. Regulatory Requirements: Devices and equipment for fire alarm service shall be listed by Underwriters Laboratories, Inc. or approved by the Factory Mutual System or listed by other nationally recognized testing laboratories.

D. Requirements for Fire Protection Service: Equipment and material shall have been tested by Underwriters Laboratories, Inc. and listed in UL FPED or approved by Factory Mutual and listed in FM P7825. Where the terms "listed" or "approved" appear in this specification, they shall mean listed in UL FPED or FM P7825. The omission of these terms under the description of any item of equipment described shall not be construed as waiving this requirement.

E. Standard Products: Materials and equipment shall be standard new products of a manufacturer regularly engaged in the manufacture of such products and shall essentially duplicate items that have been in satisfactory use for at least one year prior to bid opening. Select material from one manufacturer, where possible, and not a combination of manufacturers, for any particular classification of materials.

F. Modification of References: In NFPA publications referred to herein, consider advisory provisions to be mandatory, as though the word "shall" had been substituted for "should" wherever it appears; interpret reference to "authority having jurisdiction" to mean the County Building and Fire Departments.

1.06 WARRANTY AND CERTIFICATE:

A. The Contractor shall warranty and certify in writing all work in this Section for period of two (2) years. Any repair due to defective equipment, material or workmanship within this period, shall be repaired or replaced at no cost to the City.

B. The two (2) year warranty period shall commence at the end of thirty (30) consecutive days of trouble free operation after certification by the Fire Department and project acceptance date by the City, whichever date is the latest.

1.07 MAINTENANCE:

A. During the two (2) year warranty period, the Contractor shall, upon the receipt of notice from the City's representative, promptly make all repairs arising out of defective material, workmanship or equipment. The Contractor shall respond to such notices within 12 hours after receipt of the notice.

1. The local representative or supplier shall have direct access to replacement parts and a fire alarm repairman, either on his own staff or in a manufacturer's service center, to ensure the system can be restored to normal operation within two (2) days of system or component failure. All costs including air-fare, car rental, travel time, etc. shall be borne by the Contractor.

2. It is understood that the City will undertake repairs if, following two (2) working days after receipt of such notice, the Contractor fails to make or undertake the repairs with due diligence. The expense in connection therewith shall be charged to the Contractor.

PART 2 - PRODUCTS

2.01 MANUFACTURER QUALIFICATIONS:

A. All components of each new system shall be furnished by a single manufacturer, shall be of current design and shall be in regular and recurrent production. Provide design, materials and devices for a protected premises fire alarm system, complete, conforming to NFPA 72, except as otherwise or additionally specified herein.

2.02 SYSTEM DESIGN:

A. System Operation: System shall be a complete, supervised, addressable fire alarm system conforming to NFPA 72. The system shall operate in the alarm mode upon actuation of any alarm initiating device. The system shall remain in the alarm mode until all initiating device(s) are reset and the fire alarm control panel is manually reset and restored to normal. The system shall provide the functions and operating features described in the following sections.

1. The FACP and fire alarm control units, if used, shall provide power, annunciation, supervision and control for the system.

2. Provide Class B, initiating device circuits.

3. Provide Class B, signaling line circuits.

4. Provide Class B, notification appliance circuits.

5. Provide electrical supervision for solenoid valves. Electrical supervision of wiring external to control panel for mechanical equipment shutdown and magnetic door holding circuits will not be required.

6. Provide electrical supervision of the primary power (AC) supply, presence of the battery, battery voltage, and placement of system modules within the control panel.

7. Provide a notification appliance silencing switch which, when activated, will cause the notification appliances to cease operating, but not affect the liquid crystal display. This switch shall be overridden upon activation of a subsequent alarm.

8. Provide program capability via switches in a locked portion of the FACP to bypass the automatic notification appliance circuits, elevator recall features. Operation of a switch shall indicate a trouble condition on the FACP display.

9. All alarm, supervisory, or trouble signals shall be automatically transmitted to other networked panels.

10. Alarm functions shall override trouble or supervisory functions. Supervisory functions shall override trouble functions.

11. The system shall be capable of operating, supervising, and/or monitoring both addressable and non-addressable alarm and supervisory devices.

12. The system shall sustain the maximum system capacity on the number of addressable devices which may be in alarm simultaneously.

13. Fire alarm signal initiation must be by one or more of the following devices and systems:

    a. Heat detectors.

    b. Automatic sprinkler system water flow.

    c. Preaction system.

    d. Fire-extinguishing system operation.

    e. Fire standpipe system.

14. An alarm signal shall automatically initiate the following functions:

    a. Visual indication of the device operated on the fire alarm control panel (FACP) and remote annunciators.

    b. Continuous actuation of all alarm notification appliances, including voice evacuation notices.

    c. Activate voice/alarm communication system.

    d. Activate emergency lighting control.

    e. Record events in system memory.

15. Supervisory signal initiation must be by one or more of the following devices and actions:

    a. Valve supervisory switch.

    b. Independent fire-detection and suppression systems.

    c. Zones or individual devices have been disabled.

    d. FACP has lost communication with network.

16. A supervisory signal shall automatically initiate the following functions:

    a. Visual indication of the device operated on the FACP and remote annunciators.

    b. Record events in system memory.

17. System trouble signal initiation must be by one or more of the following devices and actions:

    a. Open circuits, shorts, and grounds in designated circuits.

b. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.

c. Loss of communication with addressable sensor, input module, relay, control module, remote annunciator, printer interface, or Ethernet module.

d. Loss of primary power at FACP.

e. Ground or single break in internal circuits of FACP.

f. Abnormal ac voltage at FACP.

g. Break in standby battery circuitry.

h. Failure of battery charging.

i. Abnormal position of switch at FACP or annunciator.

j. Initiating devices approaching end of useful life.

18. A trouble condition shall automatically initiate the following functions:

    a. Visual indication of the device operated on the FACP and remote annunciators.

    b. Record events in system memory.

19. System Monitoring:

    a. Valves: Each valve affecting the proper operation of a fire protection system, including automatic sprinkler control valves, standpipe control valves, sprinkler service entrance valve, valves at fire pumps, and valves at backflow preventers, whether supplied under this contract or existing, shall be monitored to ensure its proper position. Each tamper switch shall be provided with a separate address.

20. Overvoltage and Surge Protection: Provide a factory approved surge suppressor at power inputs to control panels, if any, and on all signaling line circuits that leave the building conforming to UL 1449. Suppressor shall be hybrid MOV type providing a maximum clamping voltage of 500 volts and a 150 joule minimum energy dissipation capacity.

21. Network Communications:

    a. Provide network communications for fire alarm system in accordance with fire alarm manufacturer's written instructions.

b. Provide network communications pathway per manufacturer's written instructions and requirements in NFPA 72 and NFPA 70.

22. Document Storage Box:

a. Description: Enclosure to accommodate standard 8-1/2-by-11 inch manuals and loose document records. Legend sheet will be permanently attached to door for system required documentation, key contacts, and system information. Provide two key ring holders with location to mount standard business cards for key contact personnel.

b. Material and Finish: 18-gauge cold-rolled steel; four mounting holes.

c. Color: Red powder-coat epoxy finish.

d. Labeling: Permanently screened with 1 inch high lettering "SYSTEM RECORD DOCUMENTS" with white indelible ink.

e. Security: Locked with 3/4 inch barrel lock. Provide solid 12 inch stainless steel piano hinge.

f. Install document storage box at fire alarm control panel location or approved location.

B. Fire Alarm Control Panel (FACP): Provide a complete control panel fully enclosed in a lockable steel enclosure as specified herein. All operations required for testing or for normal care and maintenance of the systems shall be performed from the front of the enclosure. If more than a single unit is required at a location to form a complete control panel, the unit enclosures shall match exactly. Each control unit shall provide power, supervision, control and logic for the entire system, utilizing solid state, modular components, internally mounted and arranged for easy access. Each control unit shall be suitable for operation on a 120 volt, 60 hertz, normal building power supply. Provide each panel with supervisory functions for power failure, internal component placement, and operation. Visual indication of alarm, supervisory or trouble initiation on the fire alarm control panel shall be by liquid crystal display with a minimum of 40 characters.

The control panel for a preaction sprinkler system shall be listed in UL FPED or FM P7825 for "Releasing Device Service". The control panel and the solenoid valve which activates the water control valves shall be compatible with each other. Compatibility shall be per specific UL listing or FM approval of the control equipment.

1. Cabinet: Install control panel components in cabinets large enough to accommodate all components and also to allow ample gutter space for interconnection of all panels as well as all field wiring. The enclosure

shall be identified by an engraved laminated phenolic resin nameplate. Lettering on the nameplate shall say "Fire Alarm Control Panel" and shall not be less than 0.75 inch high. Provide prominent rigid plastic or metal identification plates for all lamps, circuits, meters, fuses and switches. The cabinet shall be provided in a sturdy steel housing, complete with backbox, hinged steel door with cylinder lock, and surface mounting provisions. The cabinet shall be painted beige.

2. Control Panel Modules: Provide power and control modules to perform all functions of the FACP. Provide audible signals to indicate any alarm, supervisory or trouble condition. The alarm signals shall be different from the trouble signal. Connect all circuit conductors entering or leaving the panel to screw-type terminals with each terminal marked for identification.

3. Silencing Switches: Provide an alarm silence switch at the FACP which will silence the audible signal but not affect the visual alarm indicator. Provide trouble and supervisory silencing switch which will silence the audible trouble and supervisory signal, but not extinguish the visual indicator. This switch shall be overridden upon activation of a subsequent alarm.

4. Memory: The control panel shall have the ability to store a minimum of two hundred (200) events in a log stored in a battery-protected memory.

5. Service Mode: The FACP shall have a service mode to permit the arming and disarming of individual detection or output devices as well as the manual operation of output devices. Status of these devices shall be displayed upon command or printed on a printer. FACP shall remain 100 percent operational and capable of responding to an alarm condition while in the routine maintenance mode. The FACP shall automatically return to the normal mode after a predetermined time (1 hour) in the event the panel remains unattended in the service mode.

6. Field Programmability: Provide control units and control panels that are fully field programmable for control, initiation, notification, supervisory and trouble functions of both input and output. The system program configuration shall be menu driven. All system changes shall be password protected.

7. Input/Output Modifications: The FACP shall contain features which allow the bypassing of input devices from the system or the modification of system outputs. These control features shall consist of a panel mounted keypad. Any bypass or modification to the system shall indicate a trouble condition on the FACP and remote annunciator.

8. Resetting: Provide the necessary controls to prevent the resetting of any alarm, supervisory, or trouble signal while the alarm, supervisory or trouble condition on the system still exists.

9. Walk Test: The FACP shall have a walk test feature. When using this feature, operation of initiating devices shall result in limited system outputs, so that the notification appliances operate for only a few seconds and the event is indicated on the system printer, but no other outputs occur.

C. Electric Power:

1. Primary Power: Provide primary power for the FACP from the normal AC service to the building where shown on the drawings. Make the 120 VAC service connection for the FACP at the location indicated. Provide a red and white engraved plastic sign permanently affixed to the FACP identifying the power service location, panel, and breaker.

2. Emergency Power Supply: Provide for system operation in the event of primary power source failure. Transfer from normal to auxiliary (secondary) power or restoration from auxiliary to normal power shall be automatic and shall not cause transmission of a false alarm.

a. Batteries: Provide rechargeable, maintenance-free, lead-acid gelled electrolyte sealed batteries as the source for emergency power to the FACP. Batteries shall contain suspended electrolyte. House batteries in a separate battery cabinet located adjacent to FACP. Batteries shall be marked with the month and year of manufacture.

b. Capacity: Provide the batteries with sufficient capacity to operate the system under supervisory and trouble conditions, including audible trouble signal devices for 24 hours and audible and visual signal devices under alarm conditions for an additional 15 minutes.

c. Battery Charger: Provide a solid state, fully automatic, variable charging rate battery charger. The charger shall be capable of providing 150 percent of the connected system load and shall maintain the batteries at full charge. In the event the batteries are fully discharged the charger shall recharge them back to full charge within 48 hours. Provide pilot light to indicate when batteries are manually placed on a high rate of charge as part of the unit assembly if a high rate switch is provided.

D. Addressable Interface Devices: The addressable monitor device shall provide an addressable input interface to the FACP for monitoring normally-open or normally-closed contact devices such as, waterflow switches, valve supervisory switches, etc. The addressable control device shall provide an

addressable output interface to the FACP for control of elevator recall, solenoid activation, etc.

1. Addressable Monitor Modules: Addressable Monitor Module shall be provided to connect supervised conventional initiating device or zone of supervised conventional initiating devices, including but not limited to water flow and alarm pressure switches, valve tamper switches, low pressure switches, heat detectors, and other such devices. Monitor module shall be mounted in a 4inch square, 2-1/8 inch deep electrical box and shall be capable of Class B supervised wiring to the initiating device. Monitor module shall contain an integral LED that flashes each time the monitor module is polled.

2. Addressable Control Modules: Addressable Control Module shall be provided to connect supervised conventional notification device or zone of notification devices that require an external power supply, such as audio-visual alarms. The control module shall be capable of operating as a relay (dry contact Form C), to control auxiliary functions. The module shall be mounted in a 4 inch square, 2-1/8 inch deep electrical box and shall be capable of Class B supervised wiring to the indicating or control device. Module shall contain an integral LED that flashes each time the module is polled.

3. Isolation Modules: Provide isolation modules to isolate wire-to-wire short circuits on a loop and limit the number of other modules or sensors that are incapacitated by the short circuit fault. Place isolator modules at signaling line circuit T-taps where the T-tap will contain more than 5 addressable devices, and located such that not more than 30 addressable devices are connected between isolation modules. If a wire-to-wire short occurs, the module shall automatically open the circuit. On repair of the short, the module shall automatically reconnect the isolated section of the signaling line circuit. The module shall be mounted in a 4 inch square, 2-1/8 inch deep electrical box. Module shall contain an integral LED that flashes each time the module is polled and illuminates steadily to indicate that a short has been detected and isolated.

E. System Heat Detectors:

1. Thermal Sensors: Provide addressable rate of rise with fixed temperature heat detectors as follows:

    a. Provide detectors designed for the rate of rise principal with an independent fixed temperature element. Temperature rating of detectors shall be 135 degrees F, unless ceiling temperatures require a higher temperature rating in accordance with NFPA 72. Rate of rise shall be selectable at FACP for 15 or 20 degrees F.

b. Provide detectors with a visual indicator to show that the detector has operated.

2. Rate Compensation Heat Detectors: Provide rate compensation heat detectors with addressable monitor modules as follows:

a. Provide detectors designed for detection of fire by rate compensation principal. Temperature rating of detectors shall be settable at FACP to operate at 135 or 155 degrees F, unless ceiling temperatures require a higher temperature rating in accordance with NFPA 72. Detectors shall be hermetically sealed and of the automatically resetting type which will operate when ambient air temperature reaches detector setting regardless of rate of temperature rise. Detector operation shall not be subject to thermal lag.

b. Provide detectors with a visual indicator to show that the detector has operated.

3. Connections: Provide screw terminals for each notification appliance. Terminals shall be designed to accept the size conductors used in this project without modification.

F. Provide wiring materials under this Section as specified in Division 16 Sections with the additions and modifications specified herein.

1. Wiring Within Cabinets, Enclosures, Boxes, Etc.: Provide wiring installed in a neat and workmanlike manner and installed parallel with or at right angles to the sides and back of any box, enclosure or cabinet. All conductors which are terminated, spliced, or otherwise interrupted in any enclosure, cabinet, mounting or junction box shall be connected to terminal blocks. Mark each terminal in accordance with the wiring diagrams of the system. Make all connections with approved pressure type terminal blocks, which are securely mounted.

2. Terminal Cabinets: Provide at minimum, one terminal cabinet at the base of any circuit riser. Terminal size shall be appropriate for the size of the wiring to be connected. All conductor terminations shall be labeled and a drawing containing all conductors, their labels, their circuits and their interconnection shall be permanently mounted in the terminal cabinet. Minimum size is 8 inches high by 8 inches wide.

3. Above Grade Alarm Wiring: Conductors shall be Type THHN/THWN. Type TW is not permitted. Signaling line circuits and initiating device circuit field wiring shall be twisted pair No. 18 to No. 12 AWG, depending on distance and per manufacturer's recommendations. Wire size shall be sufficient to prevent voltage drop problems. Power wiring, operating at 120 VAC minimum, shall be No. 12 AWG solid copper having similar insulation. Provide wiring in electrical metallic tubing in dry locations not

enclosed in concrete or where not subject to mechanical damage. Provide rigid metal conduit in all other locations. Conceal conduit in finished areas of new construction and wherever practicable in existing construction. The use of flexible conduit not exceeding a 6 foot length shall be permitted in initiating device circuits. The minimum conduit size shall be 0.75 inch. Shielded wiring shall be utilized where recommended by the manufacturer. For shielded wiring, the shield shall be grounded at only one point, which shall be in or adjacent to the FACP. T-taps are permitted in Class B circuits with interconnections occurring on terminal strips. Circuits to fan shutdown systems, elevator controls, and other electronics systems shall terminate in terminal cabinets within 3 feet of the controllers for those systems. The completion of those circuits from the terminal cabinets to the appropriate system shall be provided under the appropriate Division.

4. Conductor Terminations: Labeling of any circuit at terminal blocks in terminal cabinets, FACP, and remote fire alarm control units shall be provided at each conductor connection. Each conductor or cable shall have a shrink-wrap label to provide a unique and specific designation. Each terminal cabinet, FACP and remote fire alarm control unit shall contain a laminated drawing which indicates each conductor, its label, circuit and terminal. The laminated drawing shall be neat, use a minimum 12point font size for lettering, and be mounted within each cabinet, panel or unit so that it does not interfere with the wiring or terminals. Maintain existing color code scheme where connecting to existing equipment.

5. Cable Markers:

    a. Rectangular, commercially available polyethylene cable tags with pre-punched holes at each corner for the attachment with self-locking ties.

    b. Minimum 0.035-inch thick.

    c. Average Tensile Strength: 4500 pounds p.s.i.

    d. Non-corrosive, non-conductive, resistant to acids, alkalis, organic solvents, saltwater and distortion-resistant in temperatures up to 300 degrees F.

    e. White or yellow and machine printed with the phrase "Fire Alarm Cable – Building B" in black block letters 1/8" or larger in vertical height. Handwritten markers are not acceptable.

        1) The preprinting shall be permanent and shall not fade or dissolve.

2) The tags shall be suitable for marking with black permanent markers. There shall also be space available for additional notes (for maintenance / service contractor use only).

6. Cable and Conductor Ties: One-piece, self-locking nylon ties having a minimum loop tensile strength of 175 pounds and resistance to the same conditions as cable marker.

7. Nameplates: Provide metallic and/or phenolic noncorrosive and non-heat sensitive nameplates for:

   a. Fire Alarm Control Panel: The nameplates shall be factory installed, securely mounted inside the fire alarm panel with machine screws or glue, and shall also be accessible and visible. Information on the nameplates shall be 1/8" or larger lettering stamped or engraved with the following:

      1) Manufacturer's name and address.

      2) Model Number.

      3) Serial Number.

      4) Date of Manufacture.

      5) Manufacturer's drawing number (if available).

8. Corrosion and Fungus Protection: Metallic equipment shall be coated with a rust inhibiting treatment and standard finish per the manufacturer's standard. Components shall be protected against corrosion and fungus (e.g. circuit boards shall be epoxy coated).

## PART 3 - EXECUTION

### 3.01 EXAMINATION OF THE DRAWINGS AND SPECIFICATIONS:

A. Confirm and coordinate voltages and requirements of equipment furnished by other trades which will be connected to the fire alarm system, such as detectors and dampers. Include the above information on the field-post as-built drawings.

### 3.02 EXAMINATION OF SITE CONDITIONS:

A. Cabinets, panels, outlets, pull stations, audio / visual devices and other equipment and devices shall be installed in the locations and heights shown on the drawings and/or as specified herein.

1. The location of the equipment and devices shown on the plans are approximate. Before installing, the Contractor shall study adjacent construction, verify all dimensions and sizes of equipment at the job site and perform installation in what he considers the most logical manner.

2. Any changes from the locations shown on the drawings must be approved by the Officer-in-Charge and shown on the "field-posted as-built" drawings.

3. Any device may be relocated within 10'-0" before installation at the direction of Officer-in-Charge without additional charge to State.

B. The Contractor shall determine the location of existing cables and record their route on the field-posted as-built drawings.

C. Examine areas and conditions for compliance with requirements for ventilation, temperature, humidity, and other conditions affecting performance of the Work.

1. Verify that manufacturer's written instructions for environmental conditions have been permanently established in spaces where equipment and wiring are installed, before installation begins.

D. Examine roughing-in for electrical connections to verify actual locations of connections before installation.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.03 PREPARATION:

A. Interruption of Existing Fire-Alarm Service: Do not interrupt fire alarm service to facilities occupied by State or others unless permitted under the following conditions and then only after arranging to provide temporary guard service in accordance with requirements indicated:

1. Notify Officer-in-Charge no fewer than 14 days in advance of proposed interruption of fire alarm service.

2. Do not proceed with interruption of fire alarm service without Officer-in-Charge's written permission.

B. Protection of In-Place Conditions: Protect devices during construction unless devices are placed in service to protect facility during construction.

3.04 INSTALLATION:

A. Comply with NECA 305, NFPA 72, NFPA 101, and requirements of authorities having jurisdiction for installation and testing of fire alarm equipment. Install electrical wiring to comply with requirements in NFPA 70 including, but not limited to, Article 760, "Fire Alarm Systems."

1. Devices placed in service before other trades have completed cleanup must be replaced.

2. Devices installed, but not yet placed, in service must be protected from construction dust, debris, dirt, moisture, and damage in accordance with manufacturer's written storage instructions.

B. Connecting to Existing Equipment: Verify that existing fire alarm system is operational before making changes or connections.

1. Connect new equipment to existing monitoring equipment at supervising station.

2. Expand, modify, and supplement existing control and monitoring equipment as necessary to extend existing control and monitoring functions to new points. New components must be capable of merging with existing configuration without degrading performance of either system.

C. Protect dissimilar metals with approved fittings and treatment.

D. Equipment Installation: Equipment, materials, installation, workmanship, inspection, and testing shall be in accordance with NFPA 70, NFPA 72, and as modified herein.

1. FACP: Locate the FACP where indicated on the drawings. Surface mount the enclosure with the top of the cabinet 6 feet above the finished floor. All conductor terminations shall be labeled and a drawing containing all conductors, their labels, their circuits and their interconnection shall be permanently mounted in the FACP.

2. Notification Appliance Devices: Locate notification appliance devices where shown on the drawings. Install devices on flush-mounted back boxes. Install devices at same height unless otherwise indicated.

E. Cables and Conductors:

1. Connect wiring in accordance with Section 16120 - Low-Voltage Electrical Power Conductors and Cables.

2. Install electrical devices furnished by manufacturer, but not factory mounted, in accordance with NFPA 70 and NECA 1.

3. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit number feeding connection.

    a. Nameplate must be laminated acrylic or melamine plastic signs, as specified in Section 16075 – Identification for Electrical Systems.

4. Below Grade Cable Installation: Cable shall be installed as indicated on the drawings.

    a. Conduits shall be sloped as noted on the drawings to provide drainage at handholes and manholes.

    b. Cables shall not be installed in the same conduits, handholes, etc. with non-fire alarm circuits.

5. Above Grade Conductor Installation:

    a. Conductors shall not be installed in the same conduits, junction boxes, etc. with non-fire alarm circuits. 120 volt AC fire alarm circuit conductors shall not be contained within the same multi-conductor cable nor installed with cables and other conductors in the same conduits, enclosures, junction boxes, etc. with 24 volt DC fire alarm circuits.

    b. Conductors shall be installed in continuous lengths. Splices shall be made in above ground junction boxes by terminating wires with terminal blocks.

    c. Cable pulling tensions shall not exceed manufacturers' recommended pulling tensions.

    d. Wire-nut connectors: Not permitted.

6. Conductor Color Code: Conductors shall be provided with color coding. Color coding shall be maintained throughout the circuit and documented on the as-built drawings.

F. Cable and Conductor Terminations and Dress. The following requirements shall apply to terminal cabinets, junction and outlet boxes larger than 12" x 12":

    1. Electric equipment shall be installed in a neat and workmanlike manner in accordance with NEC 373-7, Space in Enclosures.

2. Cable conductors or individual conductors shall be bundled, dressed and held together with cable straps, ties or lace and fanned in a manner that equipment terminals are visible and accessible, and allow the connections to be removed and reconnected without moving a large number of wires.

    a. Conductors to screw type connectors shall be terminated with wire lugs or with approved cable termination connectors compatible with the specific termination.

    b. A minimum of 6 inch excess length shall be provided for conductors from the bundles to the connectors using a vibration loop as described by NEC 300-14.

    c. Conductors shall be labeled as specified herein.

3. Cross-connected conductor pairs in junction and device outlet boxes or cabinets will not require bundling and cable straps, ties or lace but shall be neatly installed with a minimum of 6 inches of excess length so conductors can be easily traced between terminals. Label all conductors as specified herein.

4. Cabinets, junction boxes, outlet boxes, other boxes, shall have sufficient space to accommodate all conductors installed in them without crowding.

5. Completed work shall be uncrowded and uncluttered and shall allow accessibility without cutting and/or removing of any straps, ties, laces, cables, components, devices, brackets, modules, equipment and like items.

6. Cables shall be secured to junction boxes, equipment cabinet backboards, console members or to other system components using cable clamps and wraps. Provide cable support posts as required to facilitate system installation.

G. Cable and Conductor Identification System:

1. Underground Cable Markers:

    a. Provide markers at both ends of the cables and at all intermediate locations where the cables are accessible and visible.

    b. Each marker shall be secured with two (2) nylon ties.

2. Conductor Markers:

    a. Provide markers at ends of each conductor connected to the control panels and terminal cabinets at each building.

b. Attach markers a minimum of four (4) inches from the ends of conductors in a manner that will not permit accidental detachment.

3. Signaling Line Circuits: Signaling line circuits shall be labeled by circuit number as shown on the drawings. Conductors shall be labeled in the fire alarm panel(s), the building's main fire alarm junction box and termination cabinet.

H. Pathways:

1. Pathways must be installed in conduit appropriate for the location.

2. Fire alarm system conduit shall be painted white.

I. Framed Operating Instructions: A framed set of operating instruction printed on a white background Main Fire Alarm Panel Operating Instructions shall be provided. The framed instructions shall be permanently mounted adjacent to the main fire alarm annunciator-control panel.

J. Field Touch-up Painting: Touch-up painted surfaces and fire alarm system components damaged during installation to match the existing or specified paint and color.

K. Grounding:

1. Ground equipment in accordance with Section 16063 - Grounding and Bonding for Electrical Systems.

2. Ground FACP and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire alarm control unit.

3. Ground shielded cables at control panel location only. Insulate shield at device location.

4. All metallic conduits and boxes shall be grounded with a green wire ground conductor.

3.05 TESTING:

A. Administrant for Tests and Inspections:

1. Engage factory-authorized service representative to administer and perform tests and inspections on components, assemblies, and equipment installations, including connections.

B. Testing of the New Fire Alarm System:

1. After completion of the fire alarm system's installation, turn on and leave the system on for a minimum of three (3) consecutive weeks to

demonstrate that the new work done by the contractor operates, meets the requirements of the specifications and does not affect the operation of the entire fire alarm system.

2. Upon successful completion of the three (3) week operational period, arrange with the Officer-in-Charge for a pre-final fire alarm system test and inspection. The test and inspection shall demonstrate that all the Contractor installed fire alarm system equipment, devices cables and conductors are operating acceptably and have been installed in accordance with this specification.

   Accordingly, the test demonstrates that the system is ready for a final test of the overall fire alarm system.

   Representatives at the prefinal test shall include the Contractor, fire alarm system manufacturer's representative, user, the user's facility maintenance agency personnel, F.A. system design consultant, and the Officer-in-Charge. Representatives at the Final test shall include all the foregoing representatives and the County Fire Department Inspector.

3. Preliminary Test Results: Include the control panel and initiating and indicating devices, a unique identifier for each device with an indication of test results, and signature of the factory-trained technician of the control panel manufacturer and equipment installer. With reports on preliminary tests, include a hard copy of printer output information from preliminary testing, i.e. download historical file so that all test data is available for State review.

   a. Tests:

      1) Dielectric Strength and Insulation Resistance Tests: Test the dielectric strength and the insulation resistance of the system interconnecting wiring by means of an instrument capable of generating 500 volts dc and equipped to indicate leakage current in 1000 megohms. For the purpose of this test, the instrument shall be connected between each conductor on the line and between each conductor and ground at the control panel end of the line, with the other extremity open circuited and all series-connected devices in place. The system shall withstand the test without breakdown and shall indicate a resistance of not less than 500,000 ohms, the measurement being taken after an electrification of not more than 1.0 minute with a dc potential of not less than 100 volts nor more than 550 volts. The tests shall be witnessed by the Inspector and test results recorded for use at the final acceptance test.

2) Loop Resistance Tests: Measure and record the resistance of each circuit with each pair of conductors in the circuit short-circuited at the farthest point from the circuit origin. The tests shall be witnessed by the Inspector and test results recorded for use at the final acceptance test. Loop Resistance Tests: Measure and record the resistance of each circuit with each pair of conductors in the circuit short-circuited at the farthest point from the circuit origin. The tests shall be witnessed by the Inspector and test results recorded for use at the final acceptance test.

3) Ground Resistance Tests: Measure the resistance of each connection to ground. Ground resistance shall not exceed 5 ohms. The tests shall be witnessed by the Inspector and test results recorded for use at the final acceptance test.

4) Preliminary Testing: Conduct preliminary tests to ensure that ll devices and circuits are functioning properly. Tests shall meet the requirements of paragraph entitled "Minimum System Tests" of this section. After preliminary testing is complete, provide a letter certifying that the installation is complete and fully operable to the City a minimum of 7 calendar days before the formal acceptance test date required in the paragraph below. Without the submission of this report, the final acceptance test is automatically canceled.

b. Formal Acceptance Testing: Notify the City in writing when the system is ready for final acceptance testing. Submit request for test at least 15 calendar days prior to the test date. A final acceptance test will not be scheduled until the O&M Manuals are submitted and the following are provided at the job site:

1) Marked-up red line drawings of the system as actually installed

2) Dielectric strength and insulation resistance test results

3) Loop resistance test results

4) Complete program printout including all input/output addresses

5) An electronic copy of the entire software program for the system

6) A list of passwords permitting access by designated State employees to all levels of the software programs(s).

The final tests shall be witnessed by the City Fire Department or the Authority Having Jurisdiction (AHJ). At this time, any and all required tests shall be repeated according to the AHJ. Following acceptance

of the system, as-built drawings and Operation and Maintenance (O&M) Manuals shall be submitted for review and acceptance. In existing buildings, the transfer of devices from the existing system to the new system and the permission to begin demolition of the old fire alarm system will not be permitted until the as-built drawings and O&M Manuals are received.

c. Minimum System Tests: Test the system in accordance with the procedures outlined in NFPA 72, Chapter 14. The required tests are as follows:

1) Verify the absence of unwanted voltages between circuit conductors and ground. The tests shall be accomplished at the preliminary test with results available at the final system test.

2) Verify that the control unit is in the normal condition as detailed in the manufacturer's operating and maintenance manual.

3) Test each initiating and indicating device and circuit for proper operation and response at the control unit.

4) Test the system for all specified functions in accordance with the contract drawings and specifications and the manufacturer's operating and maintenance manual.

5) Test both primary power and secondary power. Verify, by test, that the secondary power system is capable of operating the system for the time period and in the manner specified.

6) Determine that the system is operable under trouble conditions as specified.

7) Visually inspect all wiring.

8) Test the battery charger and batteries.

9) Verify that all software control and data files have been entered or programmed into the FACP. Hard copy records and two identical diskette copies of the software and data files shall be provided to the Officer-in-Charge.

10) Verify that red-line drawings are accurate.

11) Measure the current in circuits to assure there is the calculated spare capacity for the circuits.

12) Measure the voltage drop at the most remote appliance on each notification appliance circuit.

13) For existing systems that are altered, all new devices shall be tested and a minimum of 10 percent of the existing devices must be tested to confirm the existing functions were not altered. If the system executive software was altered, a minimum of 10 percent of all devices including one of each input and output type must be tested.

4. Contractor shall be responsible for notifying the AHJ and Fire Department of formal acceptance testing

5. In addition to satisfactory acceptance tests of the Contractor's new work, the entire fire alarm system must be accepted and certified by the City Fire Department or AHJ before commencement of the specified system warranty period with full maintenance responsibility.

   The tests must demonstrate that the entire fire alarm system is operating in order to receive the Fire Department Certification.

6. If requested by the Officer-in-Charge, isolate the Contractor's new work from the overall system and demonstrate that the new work does not affect the operation of the overall fire alarm system and shall repeat tests at no additional cost to the City.

C. Concealed Work: Concealed work re-opened and re-closed at random during the formal inspection as requested by the Officer-in-Charge shall be done at no additional cost to the City.

D. Testing Tools and Equipment: The Contractor shall provide the tools and equipment, including handheld radios, etc. necessary to accomplish the testing.

3.06 DEMONSTRATION:

A. Conduct training and instruction for the operating and maintenance staff, as designated by the Officer-in-Charge, on the operation of the fire alarm panel and system.

B. The training session shall be conducted during normal business hours, and shall last as long as necessary to properly instruct the staff, but not less than 1-hour.

C. Instruction shall include hands-on training in routine operations and queries (reading of normal status and trouble status) of the fire alarm system.

D. Training shall be provided for the new fire alarm system and additional circuits and devices.

E. Instruction shall include operations and query of system status, etc.; and hands-on training in the procedures and process for operations and obtaining system status, trouble and other functional information to determine when to call for repairs and how to report the type of trouble encountered.

F. Training materials. Provide manuals and tools necessary to accomplish training, in quantity and medium as directed by the Officer-in-Charge.

END OF SECTION