BID DOCUMENTS COVER SHEET

CONTRACT DOCUMENTS

FOR

L-636 Physical Education & Student Union Complex

DSA File #7-C1
DSA Application # # 01-115488

AT

LOS MEDANOS COLLEGE
2700 East Leland Road, Pittsburg, California 94565

CONTRA COSTA COMMUNITY COLLEGE DISTRICT

ADDENDUM #1
Drawings & Specification

Architect:
LPA
60 South market Street, Suite 150
San Jose, CA 95113

June 6, 2017
NOTICE TO ALL PRE-QUALIFIED CONTRACTORS ONLY

You are hereby notified of the following changes, clarifications and/or modifications to the original Contract Documents, Project Manual, Drawings, Specifications and/or previous Addenda. This Addendum shall supersede the original Contract Documents and previous Addenda wherein it contradicts the same, and shall take precedence over anything to the contrary therein. All other conditions remain unchanged.

This Addendum forms a part of the Contract Documents and modifies the original Contract Documents dated May 8, 2017. Acknowledge receipt of this Addendum in space provided on the Bid Proposal Form. Failure to acknowledge may subject Bidder to disqualification.

A. ADDITIONS, DELETIONS, REVISIONS, REPLACE SPECIFICATIONS, DIV 0 & 1

1. REPLACE: Table of Content include added sections.

2. REPLACE: SECTION 00100 Notice Inviting Bids.
   Bid Dates revised

3. REPLACE: SECTION 00400 Statement of Bidder's Qualifications.
   (Section 00400 is deleted in its entirety and is being replaced with the attached Section 00400).

4. REPLACE: SECTION 00600 Construction Agreement
   (Section 00600 is deleted in its entirety and is being replaced with the attached Section 00600. Revise Article 7(b) to reflect 5% retention).

5. REVISION: SECTION 01250 Contract Modification Procedures
   Delete Article 1.8.N.3, Insurance and Bond premiums

6. REVISION: SECTION 01321, Photographic Documentation
   Article 2.2.D.2 is revised as follows:
   Lens: 78-105-degree wide field of view”.

7. ADDITION: SECTION 01500 TEMPORARY FACILITIES AND CONTROLS
   A. Add the following to Article 1.3.B.13b:
   “Signs shall include the following: Rendering (to be provided by District), Contra Costa Community College District Board members, Project Name, Architect’s firm name,
B. Add the following to Article 2.1 Temporary Facilities/Field Office.

C. “Provide one color copier/scanner/fax machine, capable of producing at least 30 prints per minute, that will accommodate 8.5’ x 11”, 8.5” x 14”, and 11” x 17” paper. Contractor to provide maintenance, ink and paper supplies. This machine will be for use by District Representative for this project only. Copier/scanner/fax machine will become the District’s property at project completion”.

8. **ADD: SECTION 01568 TEMPORARY TREE AND PLANT PROTECTION**

9. **REVISION: Section 01625, Product Options and Substitutions.**
   The following Articles are revised and are being replaced by the following:

1.5.B.1. Pursuant to Paragraph 3.11.4 of the General Conditions, the apparent lowest responsive and responsible bidder may, within three (3) work days after bid opening offer any material, process, article, etc., which shall be materially equal or better in every respect to that so indicated or specified (“Specified Item”) and will completely accomplish the purpose of the Contract Documents.

1.5.I. Substitution Request Form. All requests for substitutions of products, materials, or processes in place of a Specified Item must be submitted in writing on the District’s Substitution Request Form (“Request Form”) within three (3) work days after bid opening. The Request Form must be accompanied by evidence as to whether the proposed substitution meets the requirements of the Contract Documents as specified herein.

1.5.J. After bids are opened, the apparent lowest responsive and responsible bidder shall provide, within ten (10) days of opening such bids, any and all Drawing, Specifications, samples, performance data, calculations, and other information, as required herein to assist the Architect and the District in determining whether the proposed substitution is acceptable. The burden of establishing these facts shall be upon the bidder.

10. **REPLACE: Section 01810/019113 in its entirety and replace it with the attached Section 01810.**

B. **ADDITIONS, DELETIONS, REVISIONS, REPLACE TECHNICAL SPECIFICATIONS:**
   (All modifications in the specifications are in **bold** or blue text).

1. **ADD: Section 07 41 16 Structural Metal Roof Panels**

2. **REPLACE: The following sections have been deleted and replaced by the corresponding sections attached:**
   a. **Section 08 43 34 Aluminum Folding Panel Storefronts**
      Basis of design clarified for the folding storefront at the servery.
   b. **Section 09 22 16 Non-Structure Metal Framing**
      Acoustic isolators are noted to correspond with the drawings
c. Section 09 81 00 Acoustic Insulation
   Section 1.01 C 2 Reference to Section 098400 Removed.

d. Section 11 40 00 Food Service
   Section 3.5 – Food service equipment model updates to Item #2-05, #2-20, #2-43, #2-47.

e. Section 12 24 13 Roller Window Shades
   Section 2.01 acceptable manufacturers listed as "or equal", with clarification on performance requirements.

f. Section 28 31 00 Fire Detection and Alarm
   1. Section 1.02 – Related requirements section added.
   2. Section 1.04 – Submittal requirements updated.
   3. Section 1.05 – Quality Assurance section added.
   4. Section 2.01 – Basis of Design clarified as “Siemens Building Technology”
   5. Section 2.04 – Components clarified as “Siemens Building Technology”

  g. Section 31 23 16.13 Trenching
     Section 3.06 B1 – add the words “per plans”.

  h. Section 32 13 13 Concrete Paving
     Section 3.08 B, C, D, E – Detectable warning code references clarified.

  i. Section 33 31 11 Site Sanitary Utility Sewerage Piping.
     Section 3.06C – Greenbook Section clarified.

C. REVISION TO DRAWINGS SHEETS:
   All drawing modifications are indicated on the drawings with a cloud graphic and a Delta 1.

  a. AA2.11 – Slab Plan, Level 1 – PE complex (Bldg A)
     Changes include added or removed dimensions, detail callouts added.

  b. AA2.21 – Floor Plan, Level 1 – PE complex (Bldg A)
     Changes include added or removed dimensions, detail callouts added.

  c. AA2.31–Finish Plan, Level 1 – PE complex (Bldg A).
     General note #4 clarified.

  d. AA2.41 – RCP, Level 1 – PE complex (Bldg A)
     Changes include revised clg. access panel locations.

  e. AB2.11 – Slab Plan, Level 1 – SU building (Bldg B)
     Changes include removed, added or changed dimensions & notes.
f. **AB2.12 – Slab Plan, Level 2 – SU bldg. (Bldg B)**  
   Changes include added text.

g. **AB2.21 – Floor Plan, Level 1 – SU bldg. (Bldg B)**  
   Changes include revised plan callout, added wall furring, added partition type callouts and dimension.

h. **AB2.31 – Finish Plan, Level 1 – SU building (Bldg B)**  
   1. Revise Floor finish in Rooms: Dry Storage SU-126 & Walk-in Freezer SU-128 to be Quarry Tile (QT) in lieu of Sealed Concrete (SC).
   2. Provide FRP panel to be 8’ AFF min. throughout in Kitchen Entry SU-129 & Kitchen SU-125.
   3. Delete General Note #4. Replace it with this revised Note #4 to say: “STRUCTURAL STEEL TO BE PAINTED P-1, U.N.O.. ALL EXTERIOR EXPOSED STRUCTURAL STEEL TO BE PAINTED P-4, U.N.O.”

i. **AB2.41 – RCP, Level 1 – SU bldg. (Bldg B)**  
   Changes include added soffit ventilation, added or removed clg. access.

j. **AB2.42 – RCP, Level 2 – SU building. (Bldg B)**  
   Changes include added soffit ventilation, added or removed clg. access, Paint finish information.

k. **AB3.11– Exterior Elevations – SU building (Bldg B)**  
   Changes include legend added, added A.C.M. panel joints, added keynotes identifying location of A.C.M. panels to match other drawings.

l. **AB3.12– Exterior Elevations – SU building (Bldg B)**  
   1. Find clouded areas indicating area of change. Changes include
   2. Added Finish legend added.
   3. Added A.C.M. panel joints & keynotes identifying location of A.C.M. panels to match other drawings.
   4. Revised UHP Conc. panel joints & added dimensions.

m. **AA3.41– Wall sections – PE complex (Bldg A)**  
   Changes include re-wording of exterior wall siding system notes, consistent terminology, references to Structural dwgs

n. **AB3.51– Wall sections – SU building (Bldg B)**  
   Changes include re-wording of exterior wall siding system notes, consistent terminology, references to Structural dwgs, adding of missing callouts.
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o. AB3.52– Wall sections – SU building (Bldg B)
   Changes include re-wording of exterior wall siding system notes, consistent terminology, references to Structural dwgs, adding of missing callouts.

p. AB3.53– Wall sections – SU building (Bldg B)
   Changes include re-wording of exterior wall siding system notes, consistent terminology, references to Structural dwgs, adding of missing callouts.

q. AB3.54– Wall sections – SU building (Bldg B)
   Changes include re-wording of exterior wall siding system notes, consistent terminology, references to Structural dwgs, adding of missing callouts.

r. AB3.55– Wall sections – SU building (Bldg B)
   Changes include re-wording of exterior wall siding system notes, consistent terminology, references to Structural dwgs, adding of missing callouts.

s. AA5.01– Interior Elevations – PE complex (Bldg A)
   Changes include extend of mirror on West Wall of PE 106

t. AB5.12– Interior Elevations – SU building (Bldg B)
   Changes include callout of wall base detail at various elevations of Kitchen / Servery spaces.

u. A6.51– Finish Schedule
   Clarification of finish descriptions.

v. A8.11– Exterior Details
   Find clouded areas indicating area of change, see Detail 12 & 14

w. A8.15 – Exterior Details (Bldg B)
   1. Detail 05, 07,14, 16, 22, 23: Roof Edge framing added dimensions, revised system description notes.
   2. Clarified A.C.M. panel system over window system.

x. A8.31 – Opening details doors
   Added notes to detail 05 & 13 showing extend of conc. curb.

y. A8.32 – Opening details windows
   Added detail 02 to sheet A8.32

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z. A9.12 – Interior details - wall
   1. Detail 03 – clarification on device alignment
   2. Detail 21 – height of Fire Extinguisher signage if required

   Detail 11 – clarification on wall finish alignment with concrete curb.

bb. E1.00
   1. Updated conduit sizes in duct banks.
   2. Updated existing feeder tags.

cc. E5.02
   1. Removed meters from existing switchboard “SSB”.
   3. Provided clarification keynotes.

dd. E5.03
   1. Updated feeder schedules and provided clarification notes.

ee. E5.04
   Updated metering detail.

ff. E7.01
   Updated duct bank detail to be concrete encased.

gg. FS-101 Equipment Floor Plan and Roof Plan
   Equipment clarification

hh. FS-202 Equipment Schedule
   Equipment clarification

D. PRE-BID RFI's

1. Question: RFI 001: Item 2-05, specs specify 359 while equipment schedule specifies model B-35903. Which one is the correct one to price out?
   Response: The correct unit is B-35903. See page 48/ Item #2-05 on spec section 114000 for revised model number.

2. Question: RFI 002: Item 2-20, specs specify Deco-Webb-401 while equipment schedule specifies model ZG9500. Which one is the correct one to price out?
   Response: ZG9500 is the correct model. See page 54/ Item# 2-20 on spec section 114000 for revised model number.
3. **Question:** RFI 003: Item 2-43, specs specify Deco-Webb-403 while equipment schedule specifies model ZG9930. Which one is the correct one to price out?  
   **Response:** ZG9930 is the correct model. See page 61/ Item #2-43 on spec section 114000 for revised model number.

4. **Question:** RFI 004: Item 2-47, specs specify Custom Fabrication while equipment schedule specifies BSI. Which one is the correct one to price out?  
   **Response:** BSI is correct. See page 62 & 63/ Item #2-47 on spec section 114000 for revised model number. See sheet FS-202 for updated model number.

5. **Question:** RFI 005: Item 1-09, equipment schedule specifies quantity 11 while only 9 is shown on floor plans. Which one is the correct one to price out?  
   **Response:** Quantity of 11 is correct. See sheet FS-101 for locations.

6. **Question:** RFI 006: Item 2-47, self-service sneeze guards missing on floor plans. Need dimensions and location to price out.  
   **Response:** Item #2-47 is located below item #2-43. See sheets FS-101 for location. Refer to RFI 004 for dimensions.


F. Pre-Bid Meeting Minutes.

G. Pre-Bid Meeting Sign in Sheet.

If you have any questions regarding this Addendum, please contact:

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Contra Costa Community College District  
500 Court St., Martinez, CA 94553  
Email: jesprit@4cd.edu;  
Facsimile: 925-229-6959

All other terms and conditions of BID are to remain the same.

**Caroline Kwak**  
Project Manager  
LPA, Inc.  
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San Jose, CA 95113

**END OF ADDENDUM #1**
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- **SECTION 321123**   AGGREGATE BASE COURSES
- **SECTION 321216**   ASPHALT PAVING
- **SECTION 321313**   CONCRETE PAVING (ADDENDUM 1)
- **SECTION 321373**   PAVEMENT JOINT SEALERS
- **SECTION 321713**   PARKING BUMPERS
- **SECTION 321723**   PAINTED PAVEMENT MARKINGS
- **SECTION 323113**   CHAIN LINK FENCES AND GATES
- **SECTION 323119**   TUBE STEEL FENCES AND GATES
- **SECTION 323223**   SEGMENTED RETAINING WALLS
- **SECTION 323300 -**   SITE FURNISHINGS
- **SECTION 323310**   ARCHITECTURAL SITE CONCRETE
- **SECTION 323313**   BICYCLE RACKS
- **SECTION 328423**   IRRIGATION SYSTEM
- **SECTION 329119**   LANDSCAPE GRADING
- **SECTION 329300**   LANDSCAPE WORK

### DIVISION 33 – UTILITIES

- **SECTION 330513**   MANHOLES AND STRUCTURES
- **SECTION 331116**   SITE WATER UTILITY DISTRIBUTION PIPING
- **SECTION 331300**   DISINFECTING OF WATER UTILITY DISTRIBUTION
- **SECTION 333111**   SITE SANITARY UTILITY SEWERAGE PIPING (ADDENDUM 1)
- **SECTION 334111**   SITE STORM UTILITY DRAINAGE PIPING
- **SECTION 334600**   SUBDRAINAGE

### DIVISION 34 TO 35 ................................................................. NOT USED

### PROCESS EQUIPMENT SUBGROUP

### DIVISIONS 40 TO 45, & 48 ...................................................... NOT USED

### DRAWINGS PREPARED BY LPA INC.

END OF TABLE
NOTICE IS HEREBY GIVEN that the Governing Board of the Contra Costa Community College District (District), Martinez, California, will receive sealed bid proposals for the furnishing of all labor, materials, equipment, transportation and services for the construction of the project entitled **L-636 Physical Education & Student Union Complex**.

The District has pre-qualified General Contractors for this project, and the list of pre-qualified General Contractors can be found on the District’s web site: [https://insite.4cd.edu/webapps/PurchasingViewbids/](https://insite.4cd.edu/webapps/PurchasingViewbids/) Only Pre-Qualified Contractors are allowed to bid as Prime Contractors on this project. The District does not prequalify Subcontractors.

**Construction Cost Estimate (Range):** $35,000,000.00 to $50,000,000.00;

**License Required:** B - General Building Contractor

In general, the Work consists of the Physical Education building, which is a 30,000 gsf one-story building with weight room, fitness spaces, dance studios, locker rooms, equipment room, faculty offices, trainer’s office, and supporting building spaces and the Student Union building is a 35,400 gsf two-story building with a bookstore, small food services, a large conference room that can be subdivided to smaller rooms, a student activity space, faculty offices, student lounge, and supporting building spaces as well as extensive sitework. Work is to be completed in two phases: Phase II is for the completion of the two buildings plus associated sitework; Phase III is for the completion of the sitework following the removal of the existing portable buildings. (Phase I has been completed)

Hard copies of plans and specifications shall be available for purchase at ARC located at 5753 Pacheco Blvd., Pacheco, California, Phone: (925) 682-6930. Payment for hardcopies shall be the responsibility of the bidder, and shall be made directly to ARC. The District does not provide hardcopies of bid documents or reimburse cost of printing, delivery, or any expenses related to the bidding process.

For information directly from the District, you may also log on to the District Website: [http://www.4cd.edu/webapps/PurchasingViewBids/default.aspx](http://www.4cd.edu/webapps/PurchasingViewBids/default.aspx). Project documents available include, but are not limited to, plans, specifications, addenda, bidders lists, bid results, etc., and can be viewed on this District webpage. Builders Exchanges around Northern California are also notified.

This project is subject to the terms and conditions of a Project Stabilization Agreement (PSA) executed between the Contra Costa Community College District and the Contra Costa County Building & Construction Trades Council ("Council") and its affiliated local signatory unions.

All questions related to this project must be in writing and are directed to:

**Jovan Esprit – Contracts Manager (CCCD)**
Contra Costa Community College District
500 Court St., Martinez, CA 94553
Email: jespirit@4cd.edu
ADDENDUM #1  DSA Appl. # 01-115488

Each bid shall be made on the bid form, which is included in the Bid Documents and when submitted, shall be accompanied by a Bid Bond or Certified Cashier’s Check in the amount of 10% of bid (made payable to the Contra Costa Community College District). The District reserves the right to forfeit Bid Bond submitted for failure of the successful bidder to secure Payment & Performance Bonds.

IMPORTANT INFORMATION:
Pre-Bid Meeting and Job Walk, Date / Time: Thursday, May 25, 2017 at 1:30 PM (MANDATORY)
Pre-Bid Meeting and Job Walk, Location: Los Medanos College
2700 East Leland Dr. Pittsburg, CA 94565
Meet in Room CC3-336 (See Attached Map)

Last Date / Time for
Bidder’s Requests for Information: Friday, June 9, 2017
Last Day/Time to Issue Addendum: Friday, June 16, 2017
Bids Due No Later Than, Date / Time: Wednesday, June 28, 2017 prior to 2:00 PM

Bids Must Be Received at:
Contra Costa Community College District (Lobby)
500 Court St, Martinez, CA 94553
Attn: Jovan Esprit – Contracts Manager (CCCCCD)

Bids must be received by the District prior to the time and by the date noted above. Bids that are not received by the District prior to the time and by the date noted above will not be accepted, and will be returned to the Bidder unopened.

The successful bidder will be required to furnish a labor and material bond in an amount equal to one hundred percent (100%) of the contract price and a faithful performance bond in an amount equal to one hundred percent (100%) of the contract price, said bonds to be secured from a surety company acceptable to the Contra Costa Community College District and authorized to execute such surety in the State of California.

This project is a public works project and is subject to prevailing wage rate laws. A copy of the prevailing rates of wages is on file with the Contracts & Purchasing Office of the Contra Costa Community College District. Said rates of wages shall be included in the contract for the work by this reference.

Attention is directed to Section 4100 through 4113 of the Public Contract Code concerning Subcontractors, with emphasis on Section 4104, known as the “Subletting and Subcontracting Fair Practices Act, effective July 1, 2014.

Attention is directed to Labor Code Section 1725.5 regarding Department of Industrial Relations (DIR) contractor registration process including registration criteria and implementation of DIR registration requirements. Labor Code Section 1771.7 establishes contractor’s obligation to submit Certified Pay Roll (CPR) to the Department of Labor and Standards Enforcement (DLSE) and public works monitoring and enforcement. Labor Code Section 1773.3 requires the District to submit a PWC-100 to DIR for all public works contract awarded effective January 1, 2015.

Attention is directed to Section 00600, Construction Agreement, Article 5, and GENERAL CONDITIONS, Article 8, paragraphs 8.4.1 and 8.4.2, regarding liquidated damages. Liquidated Damages shall be set for $5000 Dollars for each calendar day the work is delayed beyond the Contract Substantial Completion date. The Governing Board of the Contra Costa Community College District reserves the right to reject any and all bids and/or waive any informality or irregularity in any bid received. No bidder may withdraw their Bid for a period of ninety (90) days after the date set for opening thereof.

END OF SECTION 00100
Contra Costa Community College District (District) in accordance with Public Contract Code Section 20651.5 and Section 20101, solicited Prequalification Applications from General Contracting firms. Submitted qualifications were reviewed by the District and were approved by the Governing Board. This section shall be used by Prequalified Bidders to verify and update any and all information which may have changed since Prequalification Applications were submitted to the District. All information requested must be provided and be current as of the date of the Bid. The attached Section 9 – Prequalification Validation Form, (or page 25 from the Application for Prequalification), must be submitted by prequalified general contractors along with all other required bid documents.

See Section 00400 Attachment – Next

Page END OF SECTION 00400
SECTION 9 –
PREQUALIFICATION
VALIDATION FORM
(ADDENDUM 1)

This Validation Form must be submitted with the Bid. The Validation Form must be completed and signed by at least one General Partner, Owner, Principal or Officer authorized to legally commit the Bidder. An evaluation of the new information could result in the change in Prequalification status of the Bidder and if the Pre-Qualification status is denied, Bidder may be considered nonresponsive.

Bid Name and Number:

DECLARATION

I, (printed full name) , hereby declare that I am the (position or title) of (Bidder), and that I am duly authorized to execute this Validation Statement on behalf of this entity. I acknowledge that any false, deceptive or fraudulent statements on this validation will result in denial of Pre-Qualification. I hereby state:

The Pre-Qualification Application dated on file with District is correct and current as submitted.

☐ OR

The Pre-Qualification Application dated on file with District is correct and current as submitted, except as modified by the attached changed pages and/or attachments to said Application. Bidders shall submit their financial documents in a separate, sealed envelope, clearly marked “Confidential – Do Not Open With Bid”. Contents of the envelopes will be reviewed after the bids are opened, if appropriate. (Addendum 1)

(Applicant may attach additional sheets to describe changes).

Signature of Person Certifying for Bidder

Date Name of Bidder:

Tax ID No. or SSN:

Attachment to Section 00400
This Agreement shall not be enforceable until ratified and approved by the Contra Costa Community College District's Governing Board. The estimated board meeting date is July 27, 2017.

(§1.1) Parties: (Public Agency) CONTRA COSTA COMMUNITY COLLEGE DISTRICT
500 Court St, Martinez, CA 94553

(Contractor) ___________________________
Address: ___________________________

(§1.2) Effective Date: _____________________

(§1.3) The Work: L-636 Physical Education and Student Union

(§1.4) Substantial Completion Time: Phase II and III: 790 Calendar Days from the Notice to Proceed.

(§1.4.1) Phase Completion:
Phase I – Completed under a separate contract
Phase II Substantial Completion Phase II – 730 Calendar Days from Notice to Proceed
Phase III Substantial Completion Phase III – 60 Calendar Days to start 30 calendar days following the completion of Phase II work.
Final Completion 30 Calendar Days from Phase III Substantial Completion

(§1.5) The Bidder acknowledges that this project consists of phases and bidder agrees that each phase of the project must be substantially completed and accepted by the Owner before a written “Notice to Proceed” is issued for the next phase of the Project. Bidder also agrees to pay, as liquidated damages the amounts specified below for each consecutive calendar day after the expiration of the consecutive calendar days allowed for each phase.

(§1.5.1) Liquidated Damages, Substantial Completion by Phase:
Phase II - $5,000 / per calendar day Work is delayed
Phase III - $5,000 / per calendar day Work is delayed

(§1.5.2) Liquidated Damages, Remaining Work, All Phases and Final Completion: $1,000 / per calendar day Remaining Work is delayed

(§1.6) Public Agency's Agent: CONTRA COSTA COMMUNITY COLLEGE DISTRICT (“District”)

(§1.7) Contract Sum: ___________ MILLION ______ THOUSAND, _______ HUNDRED DOLLARS and NO CENTS ($00,000,000.00)
2. **SCOPE OF WORK:**

This project includes a) the Physical Education, a 30,000 gsf one-story building with weight room, fitness spaces, dance studios, locker rooms, equipment room, faculty offices, trainer’s office, and supporting building spaces; and b) the Student Union, a 35,400 gsf two-story building with a bookstore, small food services, a large conference room that can be subdivided to smaller rooms, a student activity space, faculty offices, student lounge, and supporting building spaces.

Phase II consists of the completion of both buildings and associated site work as depicted in the contract documents. Phase III consists of the completion of site work following the removal of the temporary portable buildings as depicted in the contract documents.

3. **WORK CONTRACT, CHANGES**

(a) By their signatures below, effective on the above date, these parties promise and agree as set forth in this Agreement, incorporating by these references labor and materials contained in Section 2, Scope of Work.

(b) Contractor shall, at Contractor’s own cost and expense, and in a workmanlike manner, fully and faithfully perform and complete the work; and will furnish all materials, labor, services, equipment, and transportation necessary, convenient and proper in order fairly to perform the requirements of this contract, all strictly in accordance with the Public Agency’s plans, drawings and specifications.

(c) The work can be changed only with Public Agency’s prior written order specifying such change and its cost agreed to by the parties; and the Public Agency shall never have to pay more than specified in Section 1.7 without such an order.

4. **TIME: NOTICE TO PROCEED AND ACCEPTANCE**

(a) Contractor shall start this work as directed in the specifications or the Notice to Proceed and shall complete it as specified in Section 1, Completion Time.

(b) Partial Acceptance – If at any time during the prosecution of the project, the Contractor substantially completes the Phase of Work of the Project, the Contractor may request the District to make an inspection of the Phase of Work. If the District finds upon inspection that the Phase of Work has been satisfactorily completed in compliance with the contract, the District may accept that Phase of Work as being completed provided that the Contractor shall remain responsible for completion of any Remaining Work of such Phase of the Project. Phases of Work of the project eligible for the Partial Acceptance allowed in this paragraph shall be identified specifically in the Contract Documents as Phases of Work to be eligible for Partial Acceptance. Such Partial Acceptance shall in no way void or alter any of the terms of the Contract.

(c) Remaining Work after Substantial Completion. If the Architect or District determines that the work required by the Contract is Substantially Complete during any inspection conducted pursuant to this Agreement or Specification Section 01770, Contract Closeout Procedures, the Contractor shall be
notified of that determination and the District shall determine if there is Remaining Work. A list of Remaining Work shall be issued only by the District or the Architect and only after the District has certified Substantial Completion. The District or Architect shall give the Contractor the necessary instructions for correction or completion of the Remaining Work, and the Contractor shall immediately comply with and execute such instructions within the Contract Time. Upon completion of the Remaining Work, another inspection shall be made that shall constitute the Final Inspection, provided the Remaining Work has been completed to the satisfaction of the District. If the remaining work has been completed to the satisfaction of the District, the District shall make the final acceptance and notify the Contractor in writing of this acceptance as of the date of Final Inspection.

(d) Final Acceptance – Upon due notice from the Contractor of completion of the entire project, the District shall make an inspection. If all construction provided for and contemplated by the contract is found to be completed to the District’s satisfaction then that inspection shall constitute the Final Inspection and the District shall notify the Contractor in writing of final acceptance effective as of the date of the Final Inspection.

(e) Default for failure to Complete Remaining Work In the event the Contract Time expires before the Remaining Work is completed to the satisfaction of the District, the District may provide notice to the Contractor that the Remaining Work shall be completed by Contractor to the satisfaction of the District within ten consecutive calendar days from the date of such notice. The failure of the Contractor to satisfactorily complete the Remaining Work within the ten days shall entitle to District to declare Contractor in default and thereafter terminate the Contract. The ten-day notice provided under this paragraph shall not be construed as adding any time to the Contract Time and is a time period solely for the purposes of providing notice of default.

(f) Application for Final Payment. After the Contractor has completed all Remaining Work to the satisfaction of the District and delivered all maintenance and operating instructions, schedules, guarantees, warranties, bonds, certificates of inspection, marked-up record documents and other documents as required by the Contract, and after the District or Architect has indicated that the work is acceptable, Contractor may make application for final payment following the Payments Procedures for progress payments. The final application for payment shall be accompanied by all documentation called for in the Contract Documents, together with complete and legally effective releases or waivers (satisfactory to the District) of all liens arising out of or filed in connection with the work on the project.

(g) Final Payment and Acceptance. If the Architect determines that the work has been completed and the Contractor’s other obligations under the Contract have been fulfilled, the Architect shall, within ten working days after receipt of the final application for payment, indicate in writing the Architect’s recommendation of payment and present the application to District for payment. Thereupon the Architect shall prepare a Certificate of Final Completion. Otherwise, Architect shall return the application to Contractor indicating in writing the reasons for refusing to recommend final payment. Contractor shall make the corrections identified in the Architect’s refusal to recommend final payment. Thirty days after presentation to District of the application and accompanying documentation, with the Architect’s recommendation and notice of acceptability of the work, the amount recommended by Architect shall be come due and payable by District to Contractor.
5. LIQUIDATED DAMAGES

5.1 LIQUIDATED DAMAGES - SUBSTANTIAL COMPLETION

If the Contractor fails to complete this contract and this Work or Phase of Work within the time fixed therefore, allowance being made for contingencies as provided herein, Contractor becomes liable to the Public Agency for all its loss and damage there from; and because, from the nature of the case, it is and will be impracticable and extremely difficult to ascertain and fix the Public Agency's actual damage from any delay in performance hereof, it is agreed that Contractor will pay as liquidated damages to the Public Agency the reasonable sum specified in Section 1, the result of the parties' reasonable endeavor to estimate fair average compensation therefore, for each calendar day's delay in finishing said Work or Phase of Work; and if the same be not paid, Public Agency may, in addition to its other remedies, deduct the same from any money due or to become due Contractor under this Contract. If the Public Agency for any cause authorizes or contributes to a delay, suspension of work or extension of time, its duration shall be added to the time allowed for completion, but it shall not be deemed a waiver nor be used to defeat any right of the Agency to damages for non-completion or delay hereunder. Pursuant to Government Code Section 4215, the Contractor shall not be assessed liquidated damages for delay in completion of the work, when such delay was caused by the failure of the Public Agency or the owner of a utility to provide for removal or relocation of existing utility facilities.

5.2 LIQUIDATED DAMAGES - THE REMAINING WORK.

The Remaining Work, as such work is determined by the Public Agency or Public Agency's Representative, shall be completed within the Contract Time or any proper extension thereof granted by Public Agency. If the Contractor shall neglect, fail or refuse to complete the Remaining Work within the Contract Time or any proper extension thereof granted by the Public Agency, then the Contractor does hereby agree, as part consideration for the awarding of this Contract, to pay to the Public Agency the amount specified in the Contract, not as a penalty but as liquidated damages for the Remaining Work for each such breach of Contract set forth herein for each and every consecutive calendar day that the Contractor shall be in default after expiration of the Contract Time.

6. INTEGRATED DOCUMENTS

The plans, drawings and specifications and special provisions of the Public Agency's Notice Inviting Bids, and Contractor's accepted bid for this work are hereby incorporated into this Contract; and they are intended to cooperate, so that anything exhibited in the plans or drawings and not mentioned in the specifications or special provisions, or vice versa, is to be executed as if exhibited, mentioned and set forth in both, to the true intent and meaning thereof when taken all together; and differences of opinion concerning these shall be finally determined by the Public Agency.

7. PAYMENT

(a) For strict and literal fulfillment of these promises and conditions, and full compensation for all this work, the Public Agency shall pay the Contractor the sum specified in Section 1, except that in unit price contracts the payment shall be for finished quantities at unit bid prices.
(b) On or about the first day of each calendar month, the Contractor shall submit to the Public Agency a verified application for payment, supported by a statement showing all materials actually installed during the preceding month, the labor expended thereon, and the cost thereof; whereupon, after checking, the Public Agency shall issue to Contractor a certificate for the amount determined to be due, minus ten (5%) percent thereof pursuant to the Public Agency’s General Terms and Conditions, but not until defective work and materials have been removed, replaced and made good.

8. PAYMENTS WITHHELD

(a) The Public Agency or its agent may withhold any payment, or because of later discovered evidence nullify all or any certificate for payment, to such extent and period of time only as may be necessary to protect the Public Agency from loss because of:

1. Defective work not remedied, or work not completed, or
2. Claims filed or reasonable evidence indicating probable filing, or
3. Failure to properly pay subcontractors or for material or labor, or
4. Reasonable doubt that the work can be completed for the balance then unpaid, or
5. Damage to another contractor, or
6. Damage to the Public Agency, other than damage due to delays.

(b) The Public Agency shall use reasonable diligence to discover and report to the Contractor, as the work progresses, the materials and labor which are not satisfactory to it, so as to avoid unnecessary trouble or cost to the Contractor in making good any defective work or parts.

(c) Thirty-five (35) calendar days after Public Agency files its notice of completion of the entire work, it shall issue a certificate to the Contractor and pay the balance of the contract price after deducting all amounts withheld under this contract, provided the Contractor shows that all claims for labor and materials have been paid, no claims have been presented to the Public Agency based on acts or omissions of the Contractor, and no liens or withhold notices have been filed against the work or site, and provided there are not reasonable indications of defective or missing work or of late-recorded notices of liens or claims against Contractor.

9. INSURANCE

Before the commencement of the Work, the Contractor shall purchase from and maintain in a company or companies lawfully authorized to do business in California as admitted carriers with a financial rating of at least A status as rated in the most recent edition of Best’s Insurance Reports or as amended by the Supplementary General Conditions, such insurance as will protect the Public Agency from claims set forth below, which may arise out of or result from the Contractor’s operations under the Contract and for which the Contractor may be legally liable, whether such operations are by the Contractor, by a Subcontractor, by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable.

a. Claims for damages because of bodily injury, sickness, disease, or death of any person District would require indemnification and coverage for employee claim;

b. Claims for damages insured by usual personal injury liability coverage, which are sustained by a person as a result of an offense directly or indirectly related to employment of such person by the Contractor or by another person;
c. Claims for damages because of injury or destruction of tangible property, including loss of use resulting therefrom, arising from operations under the Contract Documents;
d. Claims for damages because of bodily injury, death of a person, or property damage arising out of the ownership, maintenance, or use of a motor vehicle, all mobile equipment, and vehicles moving under their own power and engaged in the Work;
e. Claims involving contractual liability applicable to the Contractor’s obligations under the Contract Documents, including liability assumed by and the indemnity and defense obligations of the Contractor and the Subcontractors; and
f. Claims involving Completed Operations, Independent Contractors’ coverage, and Broad Form property damage, without any exclusions for collapse, explosion, demolition, underground coverage, and excavating. (XCU)
g. Claims involving sudden or accidental discharge of contaminants or pollutants.

**Additional Insured Endorsement Requirement:** The Contractor shall name, on any policy of insurance, the District, Architect, Inspector, the State of California, their officers, employees, agents and independent contractors as Additional Insured. Subcontractors shall name the Contractor, the District, Architect, Inspector, the State of California, their officers, employees, agents and independent contractors as Additional Insured.

The Additional Insured Endorsement included on all such insurance policies shall state that coverage is afforded the additional insured with respect to claims arising out of operations performed by or on behalf of the insured. If the Additional Insured have other insurance which is applicable to the loss, such other insurance shall be on an excess or contingent basis. The insurance provided by the Contractor must be designated in the policy as primary to any insurance obtained by the Public Agency. The amount of the insurer’s liability shall not be reduced by the existence of such other insurance.

**Specific Insurance Requirement:** Contractor shall take out and maintain and shall require all subcontractors, if any, whether primary or secondary, to take out and maintain:

a) Comprehensive General Liability Insurance with an aggregate of not less than $10,000,000.00; Per occurrence, $5,000,000.00
b) Automotive (any auto) where operated in amounts $1,000,000.00
c) Workers’ Compensation Insurance: $1,000,000.00; Contractor is aware of and complies with Labor Code Section 3700 and the Worker’s Compensation Law.

**10. BONDS**

**Bond Requirements:** Prior to commencing any portion of the Work, the Contractor shall furnish separate payment and performance bonds for its portion of the Work which shall cover 100% faithful performance of and payment of all obligations arising under the Contract Documents and/or guaranteeing the payment in full of all claims for labor performed and materials supplied for the Work. All bonds shall be provided by a corporate surety authorized and admitted to transact business in California as sureties.

To the extent, if any, that the Contract Price is increased in accordance with the Contract Documents, the Contractor shall, upon request of the Public Agency, cause the amount of the bonds to be increased accordingly and shall promptly deliver satisfactory evidence of such increase to the Public Agency. To the extent available, the bonds shall further provide that no change or alteration of the Contract Documents (including, without limitation, an increase in the Contract Price, as referred to above), extensions of time, or modifications of the time, terms, or conditions of payment to the Contractor will
release the surety. If the Contractor fails to furnish the required bonds, the Public Agency may terminate the Contract for cause.
On signing this contract, Contractor shall deliver to Public Agency for approval good and sufficient bonds with sureties, in amount(s), specified in the specifications or special provisions, guaranteeing faithful performance of this contract and payment for all labor and materials hereunder.

11. FAILURE TO PERFORM

If the Contractor at any time refuses or neglects, without fault of the Public Agency or its agent(s), to supply sufficient materials or workers to complete this agreement and work as provided herein, for a period of ten days or more after written notice thereof by the Public Agency, the Public Agency may furnish same and deduct the reasonable expenses thereof from the contract price.

12. LAWS APPLY: General

Both parties recognize the applicability of various federal, state and local laws and regulations, especially Chapter 1 of Part 7 of the California Labor Code (beginning with Section 1720, and including Sections 1735, 1777.5, 1777.6, forbidding discrimination) and intend that this agreement complies therewith. The parties specifically stipulate that the relevant penalties and forfeitures provided in the Labor Code, especially in Sections 1775, 1776, and 1813, concerning prevailing wages and hours, shall apply to this agreement as though fully stipulated herein.

13. SUBCONTRACTORS

Public Contract Code Sections 4100-4113 are incorporated herein.

14. WAGE RATES

(a) Pursuant to Labor Code Section 1773, the Director of the Department of Industrial Relations has ascertained the general prevailing rates of wages per diem, and for holiday and overtime work, in the locality in which this work is to be performed, for each craft, specified in the call for bids for this work and are on file with the Public Agency, and are hereby incorporated herein.

(b) This schedule of wages is based on a working day of eight (8) hours unless otherwise specified; and the daily rate is the hourly rate multiplied by the number of hours constituting the working day. When less than that number of hours are worked, the daily wage rate is proportionately reduced, but the hourly rate remains as stated.

(c) The Contractor, and all subcontractors, must pay at least these rates to all persons on this work, including all travel, subsistence, and fringe benefit payments provided for by applicable collective bargaining agreements. All skilled labor not listed above must be paid at least the wage scale established by collective bargaining agreement for such labor in the locality where such work is being performed. If it becomes necessary for the Contractor or any subcontractor to employ any person in a craft, classification or type of work (except executive, supervisory, administrative, clerical or other non-manual workers as such) for which no minimum wage rate is specified, the contractor shall immediately notify the Public Agency which shall promptly determine the prevailing wage rate therefore and furnish the Contractor with the minimum rate based thereon, which shall apply from the time of the initial employment of the person affected and during the continuance of such employment.
15. **HOURS OF LABOR**

Eight hours of labor in one calendar day constitutes a legal day's work, and no worker employed at any time on this work by the Contractor or by any subcontractor shall be required or permitted to work longer thereon except as provided in Labor Code Sections 1810-1815.

16. **APPRENTICES**

Properly indentured apprentices may be employed on this work in accordance with Labor Code Sections 1777.5 and 1777.6, forbidding discrimination.

17. **PREFERENCE FOR MATERIALS**

The Public Agency desires to promote the industries and economy of Contra Costa County, and the Contractor therefore promises to use the products, workers, laborers and mechanics of this County in every case where the price, fitness and quality are at least equal.

18. **ASSIGNMENT**

This agreement binds the heirs, successors, assigns, and representatives of the Contractor; but Contractor cannot assign it in whole or in part, nor any monies due or to become due under it, without the prior written consent of the Public Agency and the Contractor's surety or sureties, unless they have waived notice of assignment.

19. **NO WAIVER BY PUBLIC AGENCY**

Inspection of the work and/or materials, or approval of work and/or materials inspected, or statement by any officer, agent or employee of the Public Agency indicating the work or any part thereof complies with the requirements of this contract, or acceptance of the whole or any part of said work and/or materials, or payments therefore, or any combination of these acts, shall not relieve the Contractor of Contractor's obligation to fulfill this contract as prescribed; nor shall the Public Agency be thereby stopped from bringing any action for damages or enforcement arising from the failure to comply with any of the terms and conditions hereof.

20. **HOLD HARMLESS AND INDEMNITY**

(a) Contractor promises to and shall hold harmless and indemnify from the liabilities as defined in this section.

(b) The indemnities benefited and protected by this promise are the Public Agency and its elective and appointive boards, commissions, officers, agents and employees.

(c) The liabilities protected against are any liability or claim for damage of any kind allegedly suffered, incurred or threatened because of actions defined below, including personal injury, death, property damage, inverse condemnation, or any combination of these, regardless of whether or not such liability, claim or damage was unforeseeable at any time before the Public Agency approved the improvement plan or accepted the improvements as completed, and including the defense of any suit(s) or action(s) at law or equity concerning these.
(d) The actions causing liability are any act or omission (negligent or non-negligent) in connection with the matters covered by this contract and attributable to the contractor, subcontractor(s), or any officer(s), agent(s), or employee(s) of one or more of them.

(e) Non-conditions: The promise and agreement in this section is not conditioned or dependent on whether or not any Indemnities has prepared, supplied, or approved any plan(s), drawing(s), specifications(s) or special provision(s) in connection with this work, has insurance or other indemnification covering any of these matters, or that the alleged damage resulted partly from any negligent or willful misconduct of any Indemnities.

21. **EXCAVATION**

Contractor shall comply with the provisions of Labor Code Section 6705, if applicable, by submitting to Public Agency a detailed plan showing the design of shoring, bracing, sloping, or other provisions to be made for worker protection from the hazard of caving ground during trench excavation.

22. **GOVERNMENT CODE SECTION 10532**

Contractor shall be subject to the examination and audit of the Auditor General for a period of three years after final payment under the contract.

23. **WARRANTY**

(a) In addition to any other warranties or guaranties in the Contract Documents, the Contractor warrants, except as provided in paragraph (i) of this clause, that work performed under this contract conforms to the contract requirements and is free of any defect in equipment, material, or design furnished, or workmanship performed by the Contractor or any subcontractor or supplier at any tier.

(b) This warranty shall continue for a period of 1 year from the date of final acceptance of the Work or Phase of Work, unless otherwise provided or extended in the Contract Documents. If the District takes possession of any part of the work before final acceptance, this warranty shall continue for a period of 1 year from the date the District takes possession.

(c) The Contractor shall remedy at the Contractor’s expense any failure to conform, or any defect. In addition, the Contractor shall remedy at the Contractor’s expense any damage to District-owned or controlled real or personal property, when that damage is the result of—

(1) The Contractor’s failure to conform to contract requirements; or

(2) Any defect of equipment, material, workmanship, or design furnished.

(d) The Contractor shall restore any work damaged in fulfilling the terms and conditions of this clause. The Contractor’s warranty with respect to work repaired or replaced will run for 1 year or as otherwise provided or extended from the date of repair or replacement.

(e) The District shall notify the Contractor, in writing, within a reasonable time after the discovery of any failure, defect, or damage.
(f) If the Contractor fails to remedy any failure, defect, or damage within a reasonable time after receipt of notice, the District shall have the right to replace, repair, or otherwise remedy the failure, defect, or damage at the Contractor’s expense.

(g) With respect to all warranties, express or implied, from subcontractors, manufacturers, or suppliers for work performed and materials furnished under this contract, the Contractor shall—

(1) Obtain all warranties that would be given in normal commercial practice;

(2) Require all warranties to be executed, in writing, for the benefit of the District, if directed by the District; and

(3) Enforce all warranties for the benefit of the District, if directed by the District.

(h) In the event the Contractor’s warranty under paragraph (b) of this clause has expired, the District may bring suit at its expense to enforce a subcontractor’s, manufacturer’s, or supplier’s warranty.

(i) Unless a defect is caused by the negligence of the Contractor or subcontractor or supplier at any tier, the Contractor shall not be liable for the repair of any defects of material or design furnished by the District nor for the repair of any damage that results from any defect in District-furnished material or design.

(j) This warranty shall not limit the District’s rights under the Inspection and Acceptance clause of this contract with respect to latent defects, gross mistakes, or fraud.

24. CONSEQUENTIAL DAMAGES

The Contractor and Public Agency waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes:

(a) Damages incurred by the Public Agency for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and

(b) Damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party’s termination. Nothing contained in this subparagraph shall be deemed to preclude an award of liquidated direct damages, when applicable, in accordance with the requirements of the Contract Documents.

25. HAZARDOUS MATERIALS

(a) If reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos, lead or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the
condition, immediately stop Work in the affected area and report the condition to the Public Agency in writing.

(b) The Public Agency shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to verify that it has been rendered harmless. The Public Agency shall furnish in writing to the Contractor the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of such material or substance or who are to perform the task of removal or safe containment of such material or substance. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written notification from the Public Agency and Contractor. The Contract Time shall be extended appropriately.

26. SAFETY

a. Safety Programs. In addition to and as required by other Sections of the Contract Documents, the Contractor shall be solely responsible for initiating, maintaining and supervising all safety programs required by applicable law, ordinance, regulation or governmental orders in connection with the performance of the Contract, or otherwise required by the type or nature of the Work. The Contractor’s safety program shall include all actions and programs necessary for compliance with California or federally statutorily mandated workplace safety programs, including without limitation, compliance with the California Drug Free Workplace Act of 1990 (California Government Code §§8350 et seq.). Without limiting or relieving the Contractor of its obligations hereunder, the Contractor shall require that its Subcontractors similarly initiate and maintain all appropriate or required safety programs. Prior to commencement of Work, the Contractor shall meet with the campus Buildings and Grounds Manager, Project Manager, and Construction Manager to review Contractor’s safety precautions and implementation of safety programs during the Work.

b. Safety Precautions. In addition to and as required by other Sections of the Contract Documents, the Contractor shall be solely responsible for initiating and maintaining reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury or loss to: (i) employees on the Work and other persons who may be affected thereby; (ii) the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody or control of the Contractor or the Contractor's Subcontractors or Sub-subcontractors; and (iii) other property or items at the site of the Work, or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction. The Contractor shall take adequate precautions and measures to protect existing roads, sidewalks, curbs, pavement, utilities, adjoining property and improvements thereon (including without limitation, protection from settlement or loss of lateral support) and to avoid damage thereto. Without adjustment of the Contract Price or the Contract Time, the Contractor shall repair, replace or restore any damage or destruction of the foregoing items as a result of performance or installation of the Work.

c. Safety Signs, Barricades. In addition to and as required by other Sections of the Contract Documents, the Contractor shall erect and maintain, as required by existing conditions and conditions resulting from performance of the Contract, reasonable safeguards for safety and protection of property and persons, including, without limitation, posting danger signs and other warnings against hazards, promulgating safety regulations and notifying Districts and users of adjacent sites and utilities.
d. **Safety Notices.** In addition to and as required by other Sections of the Contract Documents, the Contractor shall give or post all notices required by applicable law and comply with applicable laws, ordinances, rules, regulations and lawful orders of public authorities bearing on safety of persons or property or their protection from damage, injury or loss.

**27. PROJECT STABILIZATION AGREEMENT**

1. Definitions. As used in this clause— “Project Stabilization Agreement” (hereafter PSA) means a pre-hire collective bargaining agreement with one or more labor organizations that establishes the terms and conditions of employment for a specific construction project or set of projects.

2. The Contractor shall maintain in a current status, throughout the life of the Contract, the PSA included in these Construction Documents
   a. Subcontracts. The Contractor and subcontractors at all levels shall include the substance of this Project Stabilization Agreement clause, including this paragraph (c), in all subcontracts with subcontractors engaged in construction on the construction project.
   b. By accepting the award of a construction contract for a Project, whether as Contractor or subcontractor, the Contractor/Employer agrees to be bound by each and every provision of the PSA and agrees that it will evidence its acceptance prior to the commencement of work by executing the PSA Agreement to be Bound in the form attached to the PSA found in these Contract Documents.
   c. At the time that any Contractor/Employer enters into a subcontract with any subcontractor providing for the performance of a Construction Contract, the Contractor/Employer shall provide a copy of the PSA to said subcontractor and shall require the subcontractor as a part of accepting an award of a construction subcontract to agree in writing to be bound by each and every provision of this PSA, and agrees that it will evidence its acceptance prior to the commencement of work by executing the PSA Agreement to be Bound in the form attached to the PSA found in these Contract Documents. If a Contractor/Employer requires a subcontractor to agree in writing to comply with the terms of the PSA as a condition of awarding work to the subcontractor, the Contractor/Employer shall not be liable in any way for the subcontractor’s failure to pay the wages and benefits required by the PSA except as required by the provisions of the California Labor Code.

3. Contractor shall, during each month that laborers are on site, from Notice to Proceed through Notice of Completion, report the following to the District as a monthly administrative submittal.
   a. Each instance during the reporting period of which a union is unable to fill a requisition for qualified employees thereby causing the Contractor to apply Article 8 REFERRAL, Clause 8.3, to obtain qualified employees.
   b. A summary of any and all efforts during the reporting period to comply with the goals of Article 10 LOCAL HIRE, and the results therefrom. Data from certified payroll records shall be summarized by reporting the number of hours worked by all journeymen and apprentices on site, and the subset of the number of hours worked by journeymen and apprentices who are residents of Contra Costa County.
   c. The number of new employees, journeymen and apprentices, during the reporting period which have been referred to the project by the Center for Military Recruitment, Assessment and Veterans Employment in accordance with Article 15 HELMETS TO HARDHATS.
28. SIGNATURES AND ACKNOWLEDGEMENT

Public Agency, By: ________________________________

Note to Contractor: (1) Execute acknowledgement form below, and (2) if a corporation, affix Corporate Seal.

Contractor, hereby also acknowledging awareness of and compliance with Labor Code S1861 concerning Worker’s Compensation Law.

Contractor: By: ________________________________(CORPORATE SEAL)

(Designate Official Capacity – COMPANY NAME)

_____________________________________________________
Print NAME and TITLE

_________________ _____________________
License Number Federal ID Number

NOTARY PUBLIC

State of California ) ss. ACKNOWLEDGEMENT (By Corporation, Partnership or Individual)
County of Contra Costa )

The person(s) signing above for Contractor, known to me in individual and business capacity as stated, personally appeared before me today and acknowledged that he/she/they executed it and that the corporation or partnership named above executed it.

Dated: ________________________________

(.NOTARIAL SEAL)
PSA is attached at the end of Section 00600
END OF SECTION 00600
- SECTION 01568 -

TEMPORARY TREE AND PLANT PROTECTION

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Protection and pruning of existing trees prior to site clearing operations.
   1. Include maintenance recommendations for care and protection of trees affected by construction
      after completing the work.

B. Referenced Sections
   1. Section 013300 - Submittal Procedures.
   3. Section 018113 - Sustainable Design Requirements.
   4. Section 311000 - Site Clearing.
   5. Section 310000 - Earthwork.
   6. Section 320190 - Plant Maintenance.
   7. Section 329000 - Planting.

1.02 REFERENCES

A. ASTM International (ASTM):
   1. D 448-08 - Classification for Sizes of Aggregate for Road and Bridge Construction.
   3. F 567-11a - Practice for Installation of Chain-Link Fence.

B. California Code of Regulations (CCR):
   1. Title 24, Part 11 - California Green Building Standards Code (CALGreen Code) (CGC), 2013
      edition.

C. National Arborist Association/American Standards Institute (NAA/ANSI):
   1. A300 (Part 1)-2001 - Tree Pruning.
   2. Z133.1-2000 - Pruning, Trimming, Repairing, Maintaining and Removing Trees, and Cutting
      Brush--Safety Requirements.

D. United States Green Building Council (USGBC):
   1. Leadership in Energy and Environmental Design (LEED):

1.03 DEFINITIONS

A. Caliper: Diameter of a trunk measured by a diameter tape or the average of the smallest and largest
   diameters at 6 inches above the ground for trees up to, and including, 4-inch size; and 12 inches
   above the ground for trees larger than 4-inch size.

B. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation
   to be protected during construction, and indicated on Contract Drawings.

C. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during
   construction, and indicated on Drawings.

D. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.
1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Refer to Section 017419 regarding procedures for implementing construction waste management requirements.

B. Coordination: Refer to Section 018113 regarding procedures for implementing sustainable design requirements.

C. Coordinate with grading operations to stockpile topsoil from location indicated on Contract Drawings.

D. Preinstallation Conference: Conduct conference at the Project site with Architect, as noted below.
   1. Before commencing tree protection and trimming, meet with representatives of authorities having jurisdiction, Owner, Architect, consultants, and other concerned entities. Review tree protection and trimming procedures and responsibilities. Notify participants at least three working days prior to convening conference. Record discussions and agreements and furnish a copy to each participant.
      a. Construction schedule. Verify availability of materials, personnel, and equipment needed to make progress and avoid delays.
      b. Enforcing requirements for protection zones.
      c. Arborist's responsibilities.
      d. Contractor responsibilities
      e. Field quality control.

1.05 SUBMITTALS

A. Product Data: In accordance with Section 013300, submit product data for each type of product specified.

B. Samples for Verification: For each type of the following:
   1. Organic Mulch: 1 quart volume of organic mulch; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch.
   2. Protection-Zone Fencing: Assembled Samples of manufacturer's standard size made from full-size components.
   3. Protection-Zone Signage: Full-size Samples of each size and text, ready for installation.

C. Tree Pruning Schedule: Written schedule detailing scope and extent of pruning of trees to remain that interfere with or are affected by construction.
   1. Species and size of tree.
   2. Location on site plan. Include unique identifier for each.
   3. Reason for pruning.
   4. Description of pruning to be performed.
   5. Description of maintenance following pruning.

D. Qualification Data: For qualified arborist and tree service firm.

E. Certification: From arborist, certifying that trees indicated to remain have been protected during construction according to recognized standards and that trees were promptly and properly treated and repaired when damaged.

F. Maintenance Recommendations: From arborist, for care and protection of trees affected by construction during and after completing the Work.

G. Existing Conditions: Documentation of existing trees and plantings indicated to remain, which establishes preconstruction conditions that might be misconstrued as damage caused by construction activities.
1. Use sufficiently detailed photographs or videotape.
2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain.

1.06 SUSTAINABLE DESIGN SUBMITTALS
A. Material & Resources Submittals: Refer to Section 018113 for additional information on LEED submittals.
   1. Letter Template for MR Credit 2: Letter template, signed by Contractor, tabulating total waste material, quantities diverted and means by which it is diverted, and statement that requirements for the credit have been met.
      a. Comply with Section 017419 Construction Waste Management and Disposal.
   2. Product Data for MR Credit 5: For regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

1.07 QUALITY ASSURANCE
A. Tree Service Qualifications: Engage an experienced tree service firm that has successfully completed tree protection and trimming work similar to that required for this Project and that will maintain an experienced, qualified Arborist on the Project site on a full-time basis during execution of the work.
   1. Arborist Qualifications: An Arborist certified by the International Society of Arboriculture (ISA) and licensed in the jurisdiction where the Project is located.
   2. Qualification data for firms and persons to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
   3. Arborist will be approved by Architect.
B. Certifications: Certification by a qualified Arborist that trees indicated to remain have been protected during construction according to recognized standards and that trees were promptly and properly treated and repaired when damaged.

1.08 PROJECT CONDITIONS
A. The following practices are prohibited within protection zones:
   1. Storage of construction materials, debris, or excavated material.
   2. Parking vehicles or equipment.
   3. Foot traffic.
   4. Erection of sheds or structures.
   5. Impoundment of water.
   6. Excavation or trenching or digging unless otherwise indicated.
   7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
   8. Do not direct vehicle or equipment exhaust toward protection zones.
   9. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones and organic mulch.

PART 2 - PRODUCTS
2.01 REGULATORY REQUIREMENTS
A. Regulatory Requirements:
   1. Tree Pruning Standards: Comply with the NAA/ANSI A300 (Part 1) for pruning standards except where more stringent requirements are indicated.
   2. Comply with NAA/ANSI Z133.1 for safety requirements related to tree protection and trimming.
3. Root pruning shall be done in the presence of an Arborist as noted in Article 3.05.

B. Waste Management: Comply with CALGreen Section 5.408 Construction Waste Reduction, Disposal and Recycling. Establish a construction waste management plan for the diverted material.
   1. Recycle or salvage for reuse a minimum of 50 percent of the non-hazardous construction and demolition waste in accordance with CALGreen 5.408.1.3.
      a. Include carpet, wood, aggregate, paint, shingles, wallboard, and other materials that have recyclable value.
   2. Reuse and recycle 100 percent of trees, stumps, rocks, and associated vegetation and soils resulting primarily from land clearing in accordance with CALGreen 5.408.3.
   3. Submit documentation to enforcing agency which demonstrates compliance with CALGreen 5.408.1.4. Sample compliance forms are available in the CALGreen Guide.

2.02 SUSTAINABILITY REQUIREMENTS

A. LEED Goals for Materials & Resources: For additional information on LEED goal requirements, refer to Section 018113.
   1. MR Credit 2- Construction Waste Management: Divert 75 percent of construction waste from landfill in accordance with County requirements and to achieve LEED certification point as defined by the U.S. Green Building Council.
      a. Note that excavated soils and land-clearing debris (organic material) does not count toward construction waste credits, but all material shall be disposed of responsibly.
   2. MR Credit 5 - Regional Materials: Use Drainage fill and topsoil that have been extracted within 500 miles of the project site for a minimum of 20 percent of the total materials value.

2.03 MATERIALS

A. Topsoil: Natural or cultivated top layer of the soil profile or manufactured topsoil complying with ASTM D 5268; containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 1 inch, and free of weeds, roots, and toxic and other non-soil materials.
   1. Obtain topsoil only from well-drained sites where topsoil is 4 inches deep or more; do not obtain from bogs or marshes.
   2. Refer to Section 329000 for material requirements.

B. Filter Fabric: Manufacturer's standard, non-woven, pervious, geotextile fabric composed of polypropylene, nylon, or polyester fibers.

C. Organic Mulch: Free from deleterious materials and suitable as a top dressing for trees and shrubs, consisting of one of the following:
   1. Type: Wood and bark chips.
   2. Size Range: 1/2" inch minimum, 1" maximum.

D. Protection-Zone Fencing: Fencing fixed in position and meeting one of the following requirements. Previously used materials may be used when approved by Architect.
   1. Chain-Link Protection-Zone Fencing: Galvanized-steel fencing fabricated from minimum 2-inch opening, 0.148-inch diameter wire chain-link fabric; with pipe posts, minimum 2-3/8-inch OD line posts, and 2-7/8-inch OD corner and pull posts; with 1-5/8-inch OD top rails and 0.177-inch diameter bottom tension wire; with tie wires, hog ring ties, and other accessories for a complete fence system.
      a. Height: 6 feet.
      b. Polymer-Coating Color: Black.
2. Gates: Single swing access gates matching material and appearance of fencing, to allow for maintenance activities within protection zones; leaf width 36 inches (914 mm).

E. Protection-Zone Signage: Shop-fabricated, rigid plastic or metal sheet with attachment holes pre-punched and reinforced; legibly printed with nonfading lettering and as follows:
   1. Size: as required
   2. Text: TREE PROTECTION ZONE - KEEP OUT. NO UNAUTHORIZED ENTRY. NO STORAGE OF VEHICLES, MATERIALS, OR DEBRIS. NO DUMPING OF CHEMICALS, SLURRY, PAINT, AND OIL.
   3. Lettering: 3-inch high minimum, black characters on white background.

F. Drainage Fill: Selected crushed stone, or crushed or uncrushed gravel, washed, ASTM D 448, size 24, with 90 to 100 percent passing a 2-1/2-inch sieve and not more than 10 percent passing a 3/4-inch sieve.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Erosion and Sedimentation Control: Examine the site to verify that temporary erosion- and sedimentation-control measures are in place. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

B. For the record, prepare written report, endorsed by arborist, listing conditions detrimental to tree and plant protection.

3.02 PREPARATION

A. Locate and clearly identify trees, shrubs, and other vegetation to remain or to be relocated. Tie a 1-inch blue-vinyl tape around each tree trunk at 54 inches above the ground.

B. Temporary Protection:
   1. Provide temporary fencing, barricades, or other suitable guards located outside the drip line (outer perimeter of branches) to protect remaining trees and other plants from damage.
   2. Install 6-foot high fence to protect trees within the project site that are indicated to be left in place and that might be damaged during site clearing operations. Erect fence outside dripline of branches of individual trees or follow the outer dripline of branches of clumps of trees. Restore trees scarred or damaged by Contractor's equipment or operations to their original condition, or replace, as determined by the Architect. Restoration procedures will be subject to the acceptance of the Architect prior to initiation of those procedures.

C. Protect tree root systems from damage due to noxious materials caused by run-off or spillage while mixing, placing, or storing construction materials. Protect root systems from flooding, eroding, soil compaction, or excessive wetting caused by dewatering operations.

D. Tree-Protection Zones: Mulch areas inside tree-protection zones and other areas indicated.
   1. Apply 3-inch average thickness of organic mulch. Do not place mulch within 6 inches of tree trunks.

E. Do not store construction materials, debris, or excavated material within the drip line of remaining trees. Do not permit vehicles or foot traffic within the drip line, and prevent soil compaction over root systems.

F. Do not allow construction equipment to idle for extended periods of time in vicinity of or upwind of plants to remain.
3.03 TREE- AND PLANT-PROTECTION ZONES

A. Protection-Zone Fencing: Install protection-zone fencing along edges of protection zones before materials or equipment are brought on the site and construction operations begin in a manner that will prevent people and animals from easily entering protected area except by entrance gates. Construct fencing so as not to obstruct safe passage or visibility at vehicle intersections where fencing is located adjacent to pedestrian walkways or in close proximity to street intersections, drives, or other vehicular circulation.

1. Chain-Link Fencing: Install to comply with ASTM F 567 and with manufacturer's written instructions.
2. Posts: Set or drive posts into ground one-third the total height of the fence without concrete footings. Where a post is located on existing paving or concrete to remain, provide appropriate means of post support acceptable to Architect.
3. Access Gates: Install as required; adjust to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

B. Protection-Zone Signage: Install protection-zone signage in visibly prominent locations in a manner approved by Architect. Install one sign spaced approximately every 35 feet on protection-zone fencing, but no fewer than four signs with each facing a different direction.

C. Maintain protection zones free of weeds and trash.

D. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Architect.

E. Maintain protection-zone fencing and signage in good condition as acceptable to Architect and remove when construction operations are complete and equipment has been removed from the site.

1. Do not remove protection-zone fencing, even temporarily, to allow deliveries or equipment access through the protection zone.
2. Temporary access is permitted subject to preapproval in writing by arborist if a root buffer effective against soil compaction is constructed as directed by arborist. Maintain root buffer so long as access is permitted.

3.04 EXCAVATION

A. General: Excavate at edge of protection zones and for trenches indicated within protection zones according to requirements in Section 312000.

B. Install shoring or other protective support systems to minimize sloping or benching of excavations.

C. Do not excavate within tree drip line, unless otherwise indicated.

D. Where excavation for new construction is required within tree drip lines, hand excavate to minimize damage to root systems. Use narrow-tine spading forks and comb soil to expose roots.

1. Redirect roots in backfill areas wherever possible. If encountering large, main lateral roots, expose beyond excavation limits as required to bend and relocate without breaking. If encountered immediately adjacent to location of new construction and relocation is not practical, cut roots approximately 3 inches back from new construction.
2. Do not allow exposed roots to dry out before placing permanent backfill. Provide temporary earth cover or pack with peat moss and wrap with burlap. Water and maintain in a moist condition and temporarily support and protect roots from damage until they are permanently relocated and covered with earth.
E. Where utilities trenches are required within tree drip lines, hand excavate under or around tree roots or tunnel under or around the roots by drilling, auger boring, pipe jacking, or digging by hand.

1. Root Pruning: Do not cut main lateral roots or tap roots; cut only smaller roots that interfere with installation of new work. Cut roots with sharp pruning instruments; do not break or chop.
2. Do not cut roots 2 inches or larger within an area equal to 5 times the tree trunk diameter measured at the base of the tree unless otherwise directed by the Architect or Arborist.

3.05 ROOT PRUNING

A. Prune roots that are affected by temporary and permanent construction. Prune roots as follows:

1. Cut roots manually by digging a trench and cutting exposed roots with sharp pruning instruments; do not break, tear, chop, or slant the cuts. Do not use a backhoe or other equipment that rips, tears, or pulls roots.
2. Cut Ends: Do not paint cut root ends. Coat cut ends of roots more than 1-1/2 inches in diameter with emulsified asphalt or other coating formulated for use on damaged plant tissues as approved by the arborist.
3. Temporarily support and protect roots from damage until they are permanently redirected and covered with soil.
4. Cover exposed roots with burlap and water regularly.
5. Backfill as soon as possible according to requirements in Section 312000.

B. Root Pruning at Edge of Protection Zone: Prune roots 12 inches outside of the protection zone, by cleanly cutting all roots to the depth of the required excavation.

C. Root Pruning within Protection Zone: Clear and excavate by hand to the depth of the required excavation to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible.

3.06 CROWN PRUNING

A. Prune branches that are affected by temporary and permanent construction. Prune branches as follows:

1. Prune trees to remain to compensate for root loss caused by damaging or cutting root system. Provide subsequent maintenance during Contract period as recommended by arborist.
2. Pruning Standards: Prune trees according to ANSI A300 (Part 1) and the following:
   a. Type of Pruning: Cleaning, thinning, and reduction.
3. Cut branches with sharp pruning instruments; do not break or chop.
4. Do not apply pruning paint to wounds.

B. Chip removed branches and dispose of off-site.

3.07 REGRADING

A. Grade Lowering: Where new finish grade is indicated below existing grade around trees, slope grade away from trees as recommended by Arborist.

1. Root Pruning: Prune tree roots exposed during grade lowering. Do not cut main lateral roots or tap roots; cut only smaller roots. Cut roots with sharp pruning instruments; do not break or chop. All root pruning shall be done in the presence of the Arborist.

B. Raising Grade: Where new finish grade is indicated above existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.

C. Minor Fill: Where existing grade is 4 inches or less below elevation of finish grade shown, fill with topsoil. Place topsoil in a single uncompacted layer and hand grade to required finish elevations.
D. Moderate Fill: Where existing grade is more than 6 inches but less than 12 inches below finish grade elevation, place a layer of drainage fill, filter fabric, and a final layer of topsoil on existing grade.
1. Do not place fill against tree trunk. Do not place fill more than 6 inches over the root system and extend not less than 18 inches from tree trunk at all sides. For balance of area within drip-line perimeter, place drainage fill to an elevation 6 inches below grade.
2. Place filter fabric with overlapping edges of 6 inches minimum.
3. Place fill layer of topsoil to finish grade. Do not compact drainage fill or topsoil. Hand grade to required finish elevations.

3.08 FIELD QUALITY CONTROL
A. Inspections: Engage a qualified arborist to direct plant-protection measures in the vicinity of trees, shrubs, and other vegetation indicated to remain and to prepare inspection reports.

3.09 TREE REPAIR AND REPLACEMENT
A. Promptly repair trees damaged by construction operations to prevent progressive deterioration.
1. Submit details of proposed root cutting and tree and shrub repairs.
2. Have arborist perform the root cutting, branch pruning, and damage repair of trees and shrubs.
3. Treat damaged trunks, limbs, and roots according to arborist's written instructions.
4. Perform repairs within 24 hours.
5. Replace vegetation that cannot be repaired and restored to full-growth status, as determined by Architect.

B. Remove and replace trees indicated to remain that are more than 66 percent dead, in an unhealthy condition before the end of the corrections period, or are damaged during construction operations and that the Arborist or Architect determines to be incapable of restoring to a normal growth pattern or acceptable visual appearance.
1. Provide new trees of same size and species as those being replaced for each tree that measures 4 inches or smaller in caliper size.
2. Provide one new tree(s) of 6-inch (150-mm) caliper size for each tree being replaced that measure more than 4 inches (100 mm) in caliper size.
   a. Species: Species selected by Architect.
3. Plant new trees as specified in Section 329000 and maintain in as specified Section 320190.

C. Damages:
1. Contractor shall compensate Owner for trees that cannot be replaced with equal caliper, size, and species. Amount of compensation shall be equal to $1000 per inch difference in caliper size between the original tree and the replacement tree.
2. Contractor shall also be assessed fees based on the International Society of Arboriculture (ISA) recommended rates for:
   a. Injury to trunks, limbs, or root systems.
   b. Value of trees requiring removal subsequent to injury or treatment that varies from these Specifications.

D. Soil Aeration: Where directed by Architect, aerate surface soil compacted during construction. Aerate 10 feet beyond drip line and no closer than 36 inches to tree trunk. Drill 2-inch diameter holes a minimum of 12 inches deep at 24 inches o.c. Backfill holes with an equal mix of native soil and sand.

3.10 DISPOSAL OF WASTE MATERIALS
A. Burning is not permitted on Owner's property.
B. Disposal: Remove excess excavated material, displaced trees, trash, wood chips, and other debris from Project.

END OF SECTION
SECTION 01810
GENERAL COMMISSIONING REQUIREMENTS

Part 1 - GENERAL

1.1 SUMMARY

A. Commissioning is a systematic process of verifying that the building systems perform interactively according to the construction documents and the Owner's operational needs. The commissioning process shall encompass and coordinate the system documentation, equipment startup, control system calibration, testing and balancing, performance testing and training. Commissioning during the construction and post-occupancy phases is intended to achieve the following specific objectives according to the contract documents:

1. Verify that the applicable equipment and systems are installed in accordance with the contact documents and according to the manufacturer's recommendations.
2. Verify and document proper integrated performance of equipment and systems.
3. Verify that Operations & Maintenance documentation is complete.
4. Verify that all components requiring servicing can be accessed, serviced and removed without disturbing nearby components including ducts, piping, cabling or wiring.
5. Verify that the Owner's operating personnel are adequately trained to enable them to operate, monitor, adjust, maintain, and repair building systems in an effective and energy-efficient manner.
6. Document the successful achievement of the commissioning objectives listed above.

B. Various sections of the project specifications require equipment startup, testing, and adjusting services. Requirements for startup, testing, and adjusting services specified in the technical sections of these specifications are intended to be provided in coordination with the commissioning services and are not intended to duplicate services. The Contractor shall coordinate the work required by individual specification sections with the commissioning services requirements specified herein.

C. The commissioning process does not take away from or reduce the responsibility of the Contractor to provide a finished and fully functioning product.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division Specification Sections, apply to this Section.
B. Owner's Project Requirements and Basis of Design Documentation.
C. Related Divisions and sections include the following:

1. Section 011100 – Summary of Work
2. Section 013113 – Project Coordination
3. Section 013216 – Construction Progress Schedule
4. Section 013300 – Submittal Procedures
5. Section 014500 – Quality Control
6. Section 017500 – Starting and Adjusting
7. Section 017700 – Closeout Procedures
8. Section 017823 – Operation and Maintenance Data
9. Section 017836 - Warranties
10. Section 017900 – Demonstration and Training
11. Section 018113 – Sustainable Design Requirements
12. Division 3 - Concrete
13. Division 7 – Thermal and Moisture Protection
14. Division 8 – Openings
15. Division 22 - Plumbing
16. Division 23 – Heating, Ventilating and Air Conditioning (HVAC)
17. Division 26 – Electrical
18. Section 328423 – Underground Sprinklers

1.3 DEFINITIONS

A. Approval: Acceptance that a piece of equipment or system has been properly installed and is functioning in the tested modes according to the contract documents.

B. Basis of Design (BoD) document: A document that records concepts, calculations, decisions, and product selections used to meet the OPR and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process.

C. Building Envelope: All parts for the exterior shell of a building that provide insulation and air and water resistance such as roofing, windows, doors, flashing, exterior water proofing, ground contact water proofing, etc.

D. Building Envelope Commissioning: A systematic process of ensuring that all building envelope systems perform interactively according to the Designer’s Basis of Design (BOD) and Owner’s Project Requirements (OPR).

E. Commissioning Plan: An overall plan developed by the CxA that provides the structure, schedule and coordination for the commissioning process.

F. Commissioning Observation: An issue identified by the Commissioning Agent or other member of the Commissioning Team that does not conform to the project OPR, contract documents or standard industry best practices. (See also Deficiency or Commissioning Issue)

G. Commissioning Process: A quality-focused process for enhancing the delivery of a project. The process focuses upon verifying and documenting that the facility and all of its systems and assemblies are planned, designed, installed, tested, operated and maintained to meet the Owner’s Project Requirements.

1. Commissioning shall:
2. Verify that the applicable equipment and systems are installed according to the contract documents, manufacturer’s recommendations and industry accepted standards and they receive adequate operational checkout by installing contractors.
3. Verify and document proper performance of equipment and systems.
4. Verify O&M documentation is complete.
5. Verify that Owner’s operations and maintenance personnel are adequately trained.

H. Construction Checklist: A form used by the contractor to verify that appropriate components are on-site, ready for installation, correctly installed and functional. Also see prefunctional and functional checklists.

I. Control System: A component of environmental, HVAC, security and fire systems for reporting, monitoring and issuing of commands.

J. CxA: Commissioning Authority. The entity identified by the Owner who leads, plans, and schedules and coordinates the commissioning team to implement the commissioning process.

K. Deficiency or Commissioning Issue: A condition identified by the Commissioning Agent or other member of the Commissioning Team that adversely affects the commissionability, operability, maintainability, or functionality of a system, equipment, or component. A condition that is in conflict with the Contract Documents and/or performance requirements of the installed systems and components.

L. Factory Testing: Testing of equipment on-site or at the factory by factory personnel with or without owner’s representative present.

M. Functional Performance Testing (FPT): Generally refers to testing of a complete system and demonstrates control of equipment and the interaction of equipment or systems. Performed by the contractor and witnessed by the CxA.
N. Installation Verification: Observations or inspections that confirm the system or component has been installed in accordance with the contract documents and to industry accepted best practices.

O. Integrated System Testing: Integrated Systems Testing procedures entail testing of multiple integrated systems performance to verify proper functional interface between systems. Typical Integrated Systems Testing includes verifying that building systems respond properly to loss of utility, transfer to emergency power sources, re-transfer from emergency power source to normal utility source; interface between HVAC controls and Fire Alarm systems for equipment shutdown, interface between Fire Alarm system and elevator control systems for elevator recall and shutdown; interface between Fire Alarm System and Security Access Control Systems to control access to spaces during fire alarm conditions; and other similar tests as determined for each specific project.

P. Master Issues Log: A formal and ongoing record of problems or concerns and their resolution that have been raised by members of the commissioning team during the course of the commissioning process. Maintained by the CxA.

Q. Owner’s Project Requirements (OPR): A collection of documents that details the functional requirements of Project and expectations of how it will be used and operated. This document includes Project and design goals, measurable performance criteria, budgets, schedules, success criteria, and supporting information.

R. Owner: Project Owner or designated representative.

S. Pre-functional Checklists (PFC): Refers to checklists prepared by the CxA and provided to the contractor to document the complete installation of equipment or systems. Pre-functional checklists are completed by the contractors prior to start-up.

T. Pre-Functional Test (PFT): An inspection or test that is done before functional testing. PFT’s include installation verification and system and component start up tests.

U. Sampling: Functionally testing only a fraction of the total number of identical or near identical pieces of equipment.

V. Seasonal Performance Tests: Functional Tests that are deferred until the system(s) will experience conditions closer to their design conditions.

W. Site Observation Visit: On-site inspections and observations made by the Commissioning Agent for the purpose of verifying component, equipment, and system installation, to observe contractor testing, equipment start-up procedures, or other purposes.

X. Site Observation Reports (SO): Reports of site inspections and observations made by the Commissioning Agent. Observation reports are intended to provide early indication of an installation issue which will need correction or analysis.

Y. Start-up: The initial starting or activating of dynamic equipment.

Z. Systems, Subsystems, and Equipment: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, and equipment.

AA. TAB: A systematic process or service applied to heating, ventilating and air-conditioning (HVAC) systems and other environmental systems to achieve and document air and hydronic flow rates. The standards and procedures for providing these services are referred to as “Testing, Adjusting, and Balancing” and are described in the Procedural Standards for the Testing, Adjusting and Balancing of Environmental Systems, published by NEBB or AABC.

BB. Training Plan: A written document that details the expectations, schedule and deliverables of commissioning process activities related to training of project operating and maintenance personnel, users and occupants.

CC. Trending: The monitoring by a building management system or other electronic data gathering equipment and analyzing of the data gathered over a period of time to verify proper equipment or systems sequence of operations.

DD. Verification: The process by which specific documents, components, equipment, assemblies, systems and interfaces among systems are confirmed to comply with the criteria described in the contract documents. Verification testing is performed by the contractor and witnessed by the CxA.
EE. Warranty Phase Commissioning: Commissioning efforts executed after a project has been completed and accepted by the Owner. Warranty Phase Commissioning includes follow-up on verification of seasonal system performance, assistance in identifying warranty issues and enforcing warranty provisions of the construction contract.

FF. Warranty Visit: A commissioning meeting and site review where all outstanding warranty issues and deferred testing is reviewed and discussed.

1.4 COMMISSIONING TEAM

A. Building Commissioning is a process that relies upon frequent and direct communications, as well as collaboration between all parties to the construction process. By its nature, a high level of communication and cooperation between the Commissioning Agent and all other parties (Architects, Engineers, Construction Managers, General Contractor, Subcontractors, Vendors, third party testing agencies, etc.) is essential to the success of the Commissioning effort.

B. The members of the commissioning team consist of the contracted commissioning agent (CxA), the owner’s representative/construction manager (PM/CM), the general contractor (GC), the general contractor’s commissioning coordinator (CxC), the architect and design engineers (AE), the mechanical contractor (MC), the electrical contractor (EC), the controls contractor (CC), the testing and balancing contractor (TAB), the facility operating staff and any other installing subcontractors, suppliers of equipment or specialists. The contracted CxA is hired by the owner directly. The CxA directs and coordinates the project commissioning activities and the reports to the owner. All team members work together to fulfill their contracted responsibilities and meet the objectives of the contract documents.

C. The prime contractor shall in addition to their representative also appoint a representative from each subcontractor involved in commissioned systems including mechanical, electrical, controls, test and balance and plumbing.

D. With these fundamental practices in mind, the commissioning process described herein has been developed to recognize that, in the execution of the Commissioning Process, the Commissioning Agent must develop effective methods to communicate with every member of the construction team involved in delivering commissioned systems while simultaneously respecting the exclusive contract authority of the Construction Project Manager (PM/CM). Thus, the procedures outlined in this specification must be executed within the following limitations:

1. No communications (verbal or written) from the Commissioning Agent shall be deemed to constitute direction that modifies the terms of any contract between the District (Contra Costa County Community College District) and the Contractor.

2. Commissioning Issues identified by the Commissioning Agent will be delivered to the Construction Manager and copied to the designated Commissioning Representatives for the Contractor and subcontractors on the Commissioning Team for information only in order to expedite the communication process. These issues must be understood as the professional opinion of the Commissioning Agent and as suggestions for resolution.

3. In the event that any Commissioning Issues and suggested resolutions are deemed by the Construction Manager to require either an official interpretation of the construction documents or require a modification of the contract documents, the Construction Manager will issue an official directive to this effect.

4. All parties to the Commissioning Process shall be individually responsible for alerting the Construction Manager of any issues that they deem to constitute a potential contract change prior to acting on these issues.

5. Authority for resolution or modification of design and construction issues rests solely with the Construction Manager, with appropriate technical guidance from the Architect/Engineer and/or Commissioning Agent.

1.5 OWNER’S RESPONSIBILITIES
A. Participate in resolution of issues that may occur as a result of the commissioning process.

B. Assign operation and maintenance personnel and schedule them to participate in commissioning team activities including, but not limited to, the following:
   1. Coordination meetings.
   2. Training in operation and maintenance of systems, subsystems, and equipment.
   3. Testing meetings.
   4. Demonstration of operation of systems, subsystems, and equipment.

1.6 CONTRACTOR’S AND SUBCONTACTOR’S RESPONSIBILITIES

A. Provide utility services required for the commissioning process.

B. Contractor is responsible for construction means, methods, job safety, or management function related to commissioning on the job site.

C. Contractor shall assign representatives with expertise and authority to act on behalf of the Contractor and schedule them to participate in and perform commissioning team activities including, but not limited to, the following:
   1. Attend a commissioning kick-off/scoping meeting and other necessary meetings scheduled by the CxA to facilitate the Cx process.
   2. Participate in construction-phase commissioning meetings including controls coordination meeting to review and resolve any issues with the sequence of operations.
   3. Provide detailed start-up procedures.
   4. Participate in maintenance orientation and inspection.
   5. Participate in operation and maintenance training sessions.
   6. Certify that Work is complete and systems are operational according to the Contract Documents, including calibration of instrumentation and controls.
   7. Perform quality control of all work and certify it is complete prior to request for inspection.
   8. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.

D. The GC will be required to maintain a commissioning schedule that is updated periodically during the commissioning process and is presented and discussed at the commissioning meetings.

E. Subcontractors shall assign representatives with expertise and authority to act on behalf of subcontractors and schedule them to participate in and perform commissioning team activities including, but not limited to, the following:
   1. Participate in construction-phase coordination meetings.
   2. Participate in maintenance orientation and inspection.
   3. Complete pre-functional checklists for all equipment. Submit completed forms with start-up reports immediately after start up. The CxA may request further documentation necessary for the commissioning process.
   4. Participate in procedures meeting for testing.
   5. Participate in final review at acceptance meeting.
   6. Provide schedule for operation and maintenance data submittals, equipment startup, and testing to CxA for incorporation into the commissioning plan. Update schedule on a weekly basis throughout the construction period.
   7. Provide a copy of the O&M manual submittals of commissioned equipment, through normal channels, to the CxA for review and approval. O&Ms are required to be submitted and approved at least one month prior to training.
   8. Provide information to the CxA for developing construction-phase commissioning plan.
   9. Participate in training sessions for operation and maintenance personnel.
10. Verify that all systems function correctly by testing each mode of operation, alarm and system function.
11. Gather and submit operation and maintenance data for systems, subsystems, and equipment to the CxA, as specified.
12. Perform quality control of all work and certify it is complete prior to request for inspection.
13. Provide technicians who are familiar with the construction and operation of installed systems and who shall develop specific test procedures and participate in testing of installed systems, subsystems, and equipment.
14. Provide updated Project Record Documents or Shop Drawings to the CxA.

1.7 MECHANICAL CONTRACTOR’S RESPONSIBILITIES

A. Responsibilities listed in Section 1.06 above.
B. Completely install and thoroughly inspect, startup, test, adjust, balance, and document all systems and equipment.
C. Assist CxA in verification and performance testing. Assistance will generally include the following:
   1. Review CxA provided prefunctional and functional performance test documents and provide written comments.
   2. Demonstrate system operation.
   3. Manipulate systems and equipment to facilitate testing.
   4. Provide specialized instrumentation necessary for verification and performance testing.
D. Perform seasonal testing, at the direction of the CxA, to prove functional performance of the HVAC and controls in the opposite season.
E. Schedule and perform duct air leakage testing as specified in the technical specification sections with CxA as witness.
F. Provide flushing plans, disinfection reports and water treatment reports to the CxA for review.
G. Participate in pre-TAB meeting and jobsite inspections to verify TAB readiness.
H. Provide draft completed TAB report to CxA for review. CxA will identify up to 20% of TAB report for TAB contractor to demonstrate compliance to the completed TAB report.
I. Provide a copy of the O&M manual submittals of commissioned equipment, through normal channels, to the CxA for review and approval. O&Ms are required to be submitted and approved at least one month prior to training.

1.8 CONTROLS CONTRACTOR’S RESPONSIBILITIES

A. Responsibilities listed in Section 1.06 above.
B. Completely install and thoroughly inspect, startup, test, adjust, balance, and document all systems and equipment.
C. Assist CxA in verification and performance testing. Assistance will generally include the following:
   1. Establish trend logs of system operation as specified herein.
   2. Demonstrate system operation.
   3. Manipulate systems and equipment to facilitate testing.
   4. Provide specialized instrumentation necessary for verification and performance testing.
   5. Manipulate control systems to facilitate verification and performance testing.
   6. Provide trend reports of all points designated by the CxA for 1 week following successful performance testing at 15 minute maximum intervals.
D. Sequences of Operation and Control Logic Submittals: The Controls Contractor’s submittals of control drawings shall include complete detailed sequences of operation for
each piece of equipment, regardless of the completeness and clarity of the sequences in the Specifications. They shall include:

1. An overview narrative of the system (1 or 2 paragraphs) generally describing its purpose, components and function.
2. All interactions and interlocks with other systems.
3. Detailed delineation of control between any packaged controls and the Building Automation System (BAS), listing what points the BAS monitors only and what BAS points are control points and are adjustable.
4. Written sequences of control for packaged controlled equipment. (Equipment manufacturers’ stock sequences may be included, but will generally require additional narrative).
5. Start-up sequences.
6. Warm-up mode sequences.
7. Normal operating mode sequences.
8. Unoccupied mode sequences.
10. Capacity control sequences and equipment staging.
11. Temperature and pressure control: setbacks, setups, resets, etc.
12. Detailed sequences for all control strategies, e.g., economizer control, optimum start/stop, staging, optimization, demand limiting, etc.
13. Effects of power or equipment failure with all standby component functions.
15. Seasonal operational differences and recommendations.
16. Initial and recommended values for all adjustable settings, setpoints and parameters that are typically set or adjusted by operating staff; and any other control settings or fixed values, delays, etc. that will be useful during testing and operating the equipment.
17. Schedules.
18. To facilitate referencing in testing procedures, all sequences shall be written in small statements, each with a number for reference. For a given system, numbers will not repeat for different sequence sections, unless the sections are numbered

19. Provide documentation of all site specific programming as well as programming manual to CxA for review. Logic shall include all line code, function block templates with associated logic, graphical logic diagrams, etc. as applicable to the control system

E. Control Drawings Submittal

1. The control drawings shall have a key to all abbreviations.
2. The control drawings shall contain graphic schematic depictions of the systems and each component.
3. The schematics will include the system and component layout of any equipment that the control system monitors, enables or controls, even if the equipment is primarily controlled by packaged or integral controls.
4. Provide a full points list with at least the following included for each point:
   a. Controlled system
   b. Point abbreviation
   c. Point description DB temp, airflow, etc
   d. Display unit
   e. Control point or Setpoint: Point that controls equipment and can have its setpoint changed (OSA, SAT, etc.).
   f. Monitoring point: Point that does not control or contribute to the control of equipment, but is used for operation, maintenance, or performance verification.
g. Intermediate point: Point whose value is used to make a calculation which then controls equipment (space temperatures that are averaged to a virtual point to control reset).

h. Calculated point: “Virtual” point generated from calculations of other point values.

F. The Controls Contractor shall keep the CxA informed of all changes to this list during programming and setup.

G. An updated as-built version of the control drawings and sequences of operation shall be included in the final controls O&M manual submittal.

H. Controls point to point checkout will require documentation of specific set up and calibration parameters for each point and controller such as measured value versus displayed value at various ranges, stroke and range adjustments, adjusted and actual trip points of switches, alarm thresholds, etc. A simple binary indication that a point-to-point checkout has been accomplished is not acceptable to document the point checkout.

I. Assist and cooperate with the TAB contractor in the following manner:
   1. Meet with the TAB contractor prior to beginning TAB and review the TAB plan to determine the capabilities of the control system toward completing TAB. Provide the TAB any needed unique instruments for setting terminal unit boxes and instruct TAB in their use (handheld control system interface for use around the building during TAB, etc.).
   2. For a given area, have all required prefunctional checklists, calibrations, start-up and selected functional tests of the system completed and approved by the CxA prior to TAB.
   3. Provide a qualified technician to operate the controls to assist the TAB contractor in performing TAB, or provide sufficient training for TAB to operate the system without assistance.

J. The Controls Contractor shall expand on the prefunctional and functional testing plans to incorporate a comprehensive checkout of the control system.

K. Provide a signed and dated certification to the CxA and CM/CxC upon completion of the checkout of each controlled device, equipment and system prior to functional testing for each piece of equipment or system, that all system programming is complete as to all respects of the Contract Documents, except functional testing requirements.

L. List and clearly identify on the as-built duct and piping drawings the locations of all static and differential pressure sensors (air, water and building pressure).

M. Provide building automation systems controls trend reports as requested by the CxA as part of functional testing.

N. Warranty Period
   1. Execute seasonal or deferred functional performance testing, witnessed by the CxA, according to these specifications.
   2. Correct deficiencies and make necessary adjustments to O&M manuals and as-built drawings for applicable issues identified in any seasonal testing.

1.9 ELECTRICAL CONTRACTOR’S RESPONSIBILITIES

A. Responsibilities listed in Section 1.06 above.

B. Construction and Acceptance Phases
   1. Contractors shall provide normal cut sheets and shop drawing submittals to the CxA of commissioned equipment.
   2. Provide additional requested documentation, prior to normal O&M manual submittals, to the CxA for development of start-up and functional testing procedures.
      a. Typically this will include detailed manufacturer installation and start-up, operating, troubleshooting and maintenance procedures, full details of any
Owner-contracted tests, full factory testing reports, if any, and full warranty information, including all responsibilities of the Owner to keep the warranty in force clearly identified. In addition, the installation, start-up, and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the CxA.

b. The CxA may request further documentation necessary for the commissioning process.

c. This data request may be made prior to normal submittals.

3. Contractors shall assist (along with the design engineers) in clarifying the operation and control of commissioned equipment in areas where the Specifications, control drawings or equipment documentation are not sufficient for writing detailed testing procedures.

4. Provide assistance to the CxA in preparation of the specific functional performance test procedures. Subs shall review test procedures to ensure feasibility, safety and equipment protection and provide necessary written alarm limits to be used during the tests.

5. Develop a full start-up and initial checkout plan using manufacturer’s start-up procedures and the prefunctional checklists from the CxA. Submit manufacturer’s detailed start-up procedures and the full start-up plan and procedures and other requested equipment documentation to CxA for review.

6. During the start-up and initial checkout process, execute and document the electrical-related portions of the prefunctional checklists provided by the CxA for all commissioned equipment.

7. Perform and clearly document all completed start-up and system operational checkout procedures, providing a copy to the CxA.

8. Address current A/E punch list and Cx Issues Log items before performing functional performance testing.

9. Provide skilled technicians to execute starting of systems and equipment and to assist in the functional performance tests. Ensure that they are available and present during the agreed-upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem solving.

10. Correct deficiencies (differences between specified and observed performance) as interpreted by the CxA, CxC and A/E and retest the equipment.

11. Prepare O&M manuals according to the Contract Documents, including clarifying and updating the original sequences of operation to as-built conditions.

12. During construction, maintain as-built red-line drawings for all drawings and final CAD as-builts for contractor-generated coordination drawings. Update after completion of commissioning (include deferred testing).

13. Provide training of the Owner’s operating personnel as specified.

14. Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty.

1.10 EQUIPMENT SUPPLIER’S RESPONSIBILITIES

A. The equipment suppliers shall assign representatives with expertise and authority to act on its behalf and shall schedule them to participate in and perform commissioning process activities including, but not limited to, the following:

1. Assist in equipment testing per agreements with Subcontractors.

2. Provide information requested by CxA regarding equipment sequence of operation and testing procedures.

3. Review test procedures for equipment installed by factory representatives.

4. Attend commissioning kickoff meetings and additional meetings as necessary.

5. Contracted to General or Subcontractor.
1.11 ARCHITECT AND DESIGN ENGINEER’S RESPONSIBILITIES

A. Responsible for developing the construction contract documents and clarifying the design intent during the construction phase of the project.
B. Provides the Basis of Design document.
C. Performs construction observation.
D. Contracted directly to OWNER.

1.12 CxA's RESPONSIBILITIES

A. Organize and lead the commissioning team.
B. Prepare a Commissioning Plan. Collaborate with design team, owner, contractor and subcontractors to develop test procedures. Identify commissioning team member responsibilities, by name, firm, and trade specialty, for performance of each commissioning task.
C. Work with the Contractor to schedule commissioning activities. The Contractor shall integrate all commissioning activities into the master construction schedule. All parties will address scheduling issues in a timely manner in order to expedite the commissioning process.
D. Review and comment on submittals for compliance with the approved project documents and identify any potential conflicts.
E. Conduct commissioning team meetings for the purpose of coordination, communication, and conflict resolution; discuss progress of the commissioning processes. The CxA shall prepare and distribute minutes to commissioning team members and attendees within five (5) workdays of the commissioning meeting.
F. At the beginning of the construction phase, conduct an initial construction-phase coordination meeting for the purpose of reviewing the commissioning activities and establishing tentative schedules for permanent power; operation and maintenance data submittals; operation and maintenance training sessions; TAB Work; and Project completion.
G. Develop an enhanced start-up and initial systems checkout plan with contractors.
H. Periodically observe and inspect construction and report progress and deficiencies. In addition to compliance with the Contract Documents, inspect systems and equipment installation for adequate accessibility for maintenance and component replacement or repair.
I. Prepare Project-specific pre-functional checklists and functional test procedures checklists.
J. Witness HVAC piping pressure testing and flushing, ductwork pressure testing and final cleaning and major systems start-up.
K. Witness and document functional performance testing.
L. Compile test data, inspection reports, and certificates and include them in the Systems Manual and Commissioning Report.
M. Review and comment on operation and maintenance documentation for compliance with the Contract Documents and adequacy for Owner training.
N. Review Contractor’s operation and maintenance training program.
O. Prepare commissioning status reports.
P. Assemble the final commissioning documentation, including the Commissioning Report and Systems Manual including applicable Project Record Documents.

1.13 COMMISSIONING DOCUMENTATION

A. Commissioning Plan: A document, prepared by CxA, that outlines the process, schedule, allocation of resources, and documentation requirements of the commissioning effort, and shall include, but is not limited to the following:
   1. Description of the organization, layout, and content of commissioning documentation to be provided along with identification of responsible parties.
   2. Identification of systems and equipment to be commissioned.
3. Description of the level of commissioning for each system
4. Description of schedules for testing procedures along with identification of parties involved in performing and verifying tests.
5. Identification of items that must be completed before the next operation can proceed.
6. Description of responsibilities of commissioning team members.
7. Description of observations to be made.
8. Description of requirements for operation and maintenance training, including required training materials.
9. Provide a schedule for key commissioning activities with specific dates coordinated with overall construction schedule.
10. Define the process for completing prefunctional and startup checklists for systems, subsystems, and list of specific equipment requiring these checklists.
11. Include Step-by-step procedures for Functional testing systems, subsystems, and equipment with descriptions for methods of verifying relevant data, recording the results obtained, and listing parties involved in performing and verifying tests.

B. Pre-Functional Checklists: The Commissioning Agent will prepare Pre-Functional Checklists. Pre-Functional Checklists shall be completed and signed by the Contractor, verifying that systems, subsystems, equipment, and associated controls are ready for testing. The Commissioning Agent will review Pre-Functional Checklists to verify accuracy and readiness for testing. Inaccurate or incomplete Pre-Functional Checklists shall be returned to the Contractor for correction and resubmission.

C. Start-Up Reports: Contractor/Manufacture created forms that document that factory start-up procedures have been followed for all equipment and systems to be commissioned. Provided by sub-contractors and included as part of the Cx Plan.

D. Functional Performance Testing: CxA shall develop functional performance test procedures for all equipment and systems to be commissioned with input from installing contractors.

E. Site Visit Reports: CxA shall record test data, observations, and measurements on site visit forms. Photographs and other means appropriate for the application shall be included with data.

F. Test and Inspection Reports: CxA shall compile relevant test and inspection reports and test and inspection certificates and include them in Systems Manual and Commissioning Report.

G. Commissioning Schedule: CxA shall review and provide input to the master project and construction schedules for commissioning activities. Contractor shall incorporate all commissioning activities into the construction schedule.

H. Cx Issues Log: CxA shall prepare and maintain an issues log that describes installation, and performance issues that are at variance with the Contract Documents. CxA will identify and track issues as they are encountered, documenting the status of unresolved and resolved issues.

1. Creating a Cx Issues Log Entry:
   a. Identify the issue with a unique numeric identifier by which the issue may be tracked.
   b. Assign a descriptive title of the issue.
   c. Identify issue date and author
   d. Identify test number of test being performed at the time of the observation, if applicable, for cross-reference.
   e. Identify system, subsystem, and equipment to which the issue applies.
   f. Identify location of system, subsystem, and equipment.
   g. Include information that may be helpful in diagnosing or evaluating the issue.
   h. Note recommended corrective action.
   i. Identify commissioning team member responsible for corrective action.
j. Identify persons responding to the issue.

2. Documenting Issue Resolution:
   a. Log date issue is closed; issue may be closed and unresolved.
   b. Describe corrective action or resolution taken. Include description of diagnostic steps taken to determine root cause of the issue, if any.
   c. Identify changes to the Contract Documents that may require action, if any.
   d. State that correction was completed and system, subsystem, and equipment are ready for retest, if applicable.
   e. Identify person(s) who corrected or resolved the issue.
   f. Identify person(s) documenting the issue resolution.

I. Commissioning Report: CxA shall document results of the commissioning process including performance of systems, subsystems, equipment and issues. The commissioning report shall indicate whether systems, subsystems, and equipment have been completed and are performing according to the Owner’s Design Intent and Contract Documents. The commissioning report shall include, but is not limited to, the following:

1. Discussion of performance of commissioned systems including any variance from the design intent and the Contract Documents; record of conditions; and, if appropriate, recommendations for resolution. This report shall be used to evaluate systems, subsystems, and equipment and shall serve as a future reference document during Owner occupancy and operation. It may also include a recommendation for accepting or rejecting systems, subsystems, and equipment.
   1. Test plans and reports.
   2. Submittal Review Comments
   3. Cx Issues log.
   5. Completed start-up reports
   6. Listing of off-season test(s) not performed and a schedule for their completion.
   8. Training Records

J. Systems Manual: CxA shall gather required information and compile systems manual. Systems manual shall include, but is not limited to, the following:

1. Owner’s Project Requirements
2. Basis of Design or Design Narrative
3. As-built system narratives, schematics, and list of installed equipment.
4. Operation and maintenance data.
5. Re-commissioning forms and schedule for each Cx system.

1.14 SUBMITTALS

A. Commissioning Plan: CxA shall submit a draft commissioning plan. Deliver one copy to Contractor and one to Owner. Present submittal in sufficient detail to evaluate data collection and arrangement process. One copy, with review comments, will be returned to the CxA for preparation of the final commissioning plan.

B. Prefunctional Checklists: CxA shall submit sample checklists and forms to Contractor and subcontractors for review and comment.

C. Construction Checklists for Enclosure Commissioning: CxA shall submit sample Construction Checklists to Contractor for review. Contractor will complete the Construction Checklists prior to requesting CxA witnessing of Contractor provided tests.

D. Start-Up Forms: Contractor shall submit start up forms to be used during construction for all equipment and systems to be commissioned for CxC and CxA Review.

E. Functional Test Plan: CxA shall submit draft Functional Test Plan for comment. The final Functional Test Plan will be submitted and used for functional testing.
F. Site Observation Reports: CxA shall submit site visit reports within two days of the site visit documenting areas observed and any deficiencies noted.

G. Final Commissioning Report: CxA shall submit the draft commissioning report. One copy, with review comments, will be returned to the CxA for preparation of final submittal. The final report submittal must address previous review comments.

H. The CxA will provide appropriate contractors with a specific request for the type of submittal documentation the CxA requires facilitating the commissioning work. These requests will be integrated into the normal submittal process and protocol of the construction team. At minimum the request will include the manufacturer and model number, the manufacturer printed installation and detailed start-up procedures, sequences of operation, O&M data, performance data, any performance test procedures, control drawings and details. In addition, the factory checkout sheets or field technicians shall be submitted for review.

I. The CxA will review submittals related to the commissioned equipment and systems for conformance with the contract documents as it relates to commissioning process, to the performance of the equipment and adequacy for developing test procedures. This review is intended primarily to aid in the development of functional test performance procedures. The CxA will notify the PM/CM and CxC of items missing or areas that are not in conformance with contract documents and which require resubmission.

J. BAS Trend Reports: The controls subcontractor shall submit 1 week of trend reports with the control system in “auto” without alarms after functional performance testing is completed and all issues are resolved to demonstrate stability and proper control sequences. Trended points and time intervals to be determined by the CxA.

K. Test and Inspection Reports: Contractor shall submit test and inspection reports and start-up reports for review by the CxA. This includes, but is not limited to, controls calibration report, point to point report and checkout reports.

1.15 QUALITY ASSURANCE

A. Training Instructor Qualifications: Factory-authorized service representatives experienced in training, operation, and maintenance procedures for installed systems, subsystems, and equipment.

B. Test Equipment Calibration:
   1. Comply with test equipment manufacturer's calibration procedures and intervals. Recalibrate test instruments immediately whenever instruments have been repaired following damage or dropping. Affix calibration tags to test instruments. Instruments shall have been calibrated within six months prior to use.
   2. All test equipment required to perform start-up and initial checkout and required performance testing shall be provided by the contractor for the equipment being tested.
   3. The following minimum requirements apply if not noted in the specifications: temperature sensors and digital thermometers shall carry a current certified calibration to an accuracy of .5 degrees F and resolution of +/- .1 degree F; pressure sensors shall have an accuracy of +/- 2% of the value range being measured and have been calibrated within the last year. All equipment shall be calibrated per the manufacturer’s recommended intervals. Calibration tags shall be affixed or certificates readily available.

C. TAB Verification: TAB contractor shall use same equipment used to perform testing, adjusting and balancing for demonstrating up to 20% of the TAB report for CxA verification. Calibration certificates will be reviewed for each piece of test equipment.

1.16 COORDINATION

A. Scheduling: The Contractor shall work with the Commissioning Agent and the PM/CM to incorporate the commissioning activities into the construction schedule. The Commissioning Agent will provide sufficient information (including, but not limited to, tasks,
durations and predecessors) on commissioning activities to allow the Contractor and the
CM to schedule commissioning activities. All parties shall address scheduling issues and
make necessary notifications in a timely manner in order to expedite the project and the
commissioning process. The Contractor shall update the Master Construction schedule
as directed by the CM.

B. Coordinating Meetings: CxA shall conduct coordination meetings with the commissioning
team as needed to review progress on the commissioning plan, to discuss scheduling
conflicts, and to discuss upcoming commissioning process activities.

C. Pretesting Meetings: CxA shall conduct pretest meetings with the commissioning team
to review startup reports, coordinate controls sequence of operations, review pretest
inspection results, review testing and balancing procedures, review testing personnel and
instrumentation requirements, and manufacturers’ authorized service representative
services for each system, subsystem, equipment, and component to be tested.

D. Testing Coordination: CxA shall coordinate with the Owner and Contractor to plan the
sequence of testing activities to accommodate required quality assurance and control
services with a minimum of delay and to avoid necessity of removing and replacing
construction to accommodate testing and inspecting.

1. Contractor shall schedule times for tests, inspections, obtaining samples, and
similar activities.

Part 2 - PRODUCTS

2.1 INSTRUMENTATION AND TEST EQUIPMENT

A. Instrumentation required to verify readings and test system and equipment performance
shall be provided by Contractor and made available to Commissioning Authority.
Generally, no testing equipment will be required beyond that required to perform
Contractors work under these Contract Documents. All equipment used for testing and
calibration shall be NIST/NBS traceable and calibrated within the preceding 1 year period.
Certificates of calibration shall be submitted to CxA for review.

2.2 TAB & Cx OPERATORS TERMINAL AND SOFTWARE

A. Contractor shall provide a portable operators terminal or hand held device and all software
required to facilitate TAB and calibration and functional testing to TAB contractor. This
device shall support all functions and allow querying and editing of all parameters required
for proper calibration and start up, viewing real time point information, set up and view
trends, view program logic, etc..

B. BAS Temporary Graphical User Interfaces for Commissioning: Provide fully featured
graphical user interfaces in all major mechanical rooms to facilitate Cx. Interfaces to
eventually be relocated may be used. Contractor shall secure hardware from damage and
theft as applicable. CxA shall be provided required hardware and software access.

1. BAS shall ensure that all real time point information for HVAC zones, including
those that include multiple controllers (such as tracking zones) can be accessed
by provided tools within the zone through one communication port in that zone.

2. The system shall be capable of recording and storing historical trend data at the
time of functional testing for use in evaluating performance of the system.
### Part 3 - EXECUTION

#### 3.1 COMMISSIONED SYSTEMS

<table>
<thead>
<tr>
<th>System</th>
<th>Equipment</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct Digital Control System</td>
<td>Sequences of operation, monitored points, and alarms, Metering/monitoring devices and equipment, Software commissioning, GUI presentation commissioning, system access performance criteria, software tools/source code commissioning, instrument data sheets, middleware commissioning, Internet Protocol commissioning</td>
<td>5</td>
</tr>
<tr>
<td>Building Enclosure</td>
<td>Foundations/Slabs, Wall Systems, Roof Systems</td>
<td>3</td>
</tr>
<tr>
<td>Plumbing</td>
<td>Gas Water Heaters, Recirculation Pump &amp; Controls, Temperature Mixing Valves, Plumbing Fixtures, Emergency Plumbing Fixtures</td>
<td>5</td>
</tr>
<tr>
<td>Electrical</td>
<td>Daylighting Controls, Occupancy Sensors, Scheduled Lighting Controls, Exterior Lighting Controls</td>
<td>3</td>
</tr>
</tbody>
</table>

**General Commissioning Requirements**

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General Commissioning Requirements

3.2 STARTUP, INITIAL CHECKOUT, AND PRE-FUNCTIONAL CHECKLISTS

A. The following procedures apply to all equipment and systems to be commissioned.
B. Prefunctional Checklists are developed by the CxA and completed by the appropriate installing contractors for all major equipment and systems being commissioned before functional testing can begin. The checklist captures equipment nameplate and characteristics data, location & service areas, and confirms the as-built status of the equipment or system. These checklists also ensure that the systems are complete and operational, so that the functional performance testing can be scheduled. The Contractor and vendors shall execute factory startup and provide the CxA with a copy of the signed and dated completed start-up checklists which will be submitted with the Prefunctional checklists.
C. Startup and Initial Checkout Plan: The Contractor shall develop detailed startup plans for all equipment. The primary role of the Contractor in this process is to ensure that there is written documentation that each of the manufacturer recommended procedures have been completed. Parties responsible for startup shall be identified in the Startup Plan and in the checklist forms.
D. The Contractor shall develop the full startup plan by combining (or adding to) the checklists with the manufacturer's detailed startup and checkout procedures from the O&M manual data and the field checkout sheets normally used by the Contractor. The plan shall include checklists and procedures with specific boxes or lines for recording and documenting the checking and inspections of each procedure and a summary statement with a signature block at the end of the plan.
1. The full startup plan shall at a minimum consist of the following items:
   a. The Pre-Functional Checklists.
   b. The manufacturer's standard written startup procedures copied from the installation manuals with check boxes by each procedure and a signature block added by hand at the end.
   c. The manufacturer's normally used field checkout sheets.
E. The Commissioning Agent will review/approve the full start-up plan.
F. The Contractor shall review and evaluate the procedures and the format for documenting them, noting any procedures that need to be revised or added.
G. Execution of Prefunctional Checklists and Startup.

<table>
<thead>
<tr>
<th>System</th>
<th>Equipment</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landscape</td>
<td>Landscape Irrigation Control</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Irrigation Zone Coverage</td>
<td>3</td>
</tr>
</tbody>
</table>

Level 1 The CxA will periodically observe and inspect the installation of building systems and may review project documentation to verify operational requirements meet the design intent/OPR.

Level 2 The CxA will perform Level 1 activities and inspect, test or operate portions of the system to verify operational requirements are met. These activities may be performed independently of the contractor.

Level 3 The CxA will perform Level 2 activities and will witness contractor performance testing of up to 20% of the system to prove operational requirements are met. The test sections shall be chosen at random by the CxA to ensure uniformity of system.

Level 4 The CxA will perform Level 2 activities and will witness contractor performance testing of up to 50% of the system to prove operational requirements are met. The test sections shall be chosen at random by the CxA to ensure uniformity of system.

Level 5 The CxA will perform Level 2 activities and will witness contractor performance testing of up to 100% of the system to prove operational requirements are met.
1. 2 weeks prior to start-up, sub-contractors and vendors schedule startup and checkout with the PM/CM, CxC, and CxA. The performance of the startup and checkout shall be directed and executed by the CxC.

2. The contractor shall maintain a master copy of signed checklists.

3. The installing contractors shall update the checklists as work is completed. Only individuals that have direct knowledge and witnessed that a line item task on the pre-functional checklist was actually performed shall initial or check that item off.

4. The CxA shall observe, at minimum, the procedures for each piece of primary equipment, unless there are repetitive multiple units, (in which case a sampling strategy may be used as approved by the Owner).

5. The CxA will periodically review the checklists for completeness and report on progress at the Cx meetings.

H. BAS (and other similar control systems) Startup Testing, Adjusting, and Calibration

1. Work and/or systems installed under this Division shall be fully functioning prior to Demonstration and Acceptance Phase. Contractor shall start, test, adjust, and calibrate all work and/or systems under this Contract, as described below:

   a. Inspect the installation of all devices. Review the manufacturer's installation instructions and validate that the device is installed in accordance.

   b. Verify proper electrical voltages and amperages, and verify that all circuits are free from faults.

   c. Verify integrity/safety of all electrical connections.

   d. Coordinate with TAB subcontractor to obtain and CxA to fine tune control settings that are determined from balancing and testing procedures. Record the following control settings as obtained from TAB contractor, and note any TAB deficiencies in the BAS, Pre-functional checklists and initiate an associated Action Item:

      i. Optimum duct static pressure setpoints for VAV air handling units.

      ii. Minimum outside air damper settings for air handling units.

      iii. Optimum differential pressure setpoints for variable speed pumping systems.

      iv. Calibration parameters for flow control devices such as VAV boxes and flow measuring stations.

      v. BAS contractor shall provide hand held device as a minimum to the TAB and CxA to facilitate calibration. Connection for any given device shall local to it (i.e: at the VAV box or at the thermostat). HHD or portable operator's terminal shall allow querying and editing of parameters required for proper calibration and start up.

   e. Test, calibrate, and set all digital and analog sensing, and actuating devices. Calibrate each instrumentation device by making a comparison between the BAS display and the reading at the device, using an instrument traceable to the National Bureau of Standards, which shall be at least twice as accurate as the device to be calibrated (e.g., if field device is +/-0.5% accurate, test equipment shall be +/-0.25% accurate over same range). Record the measured value and displayed value for each device in the BAS Pre-functional Report.

   f. Check and set zero and span adjustments for all transducers and transmitters.

   g. For dampers and valves:

      i. Check for adequate installation including free travel throughout range and adequate seal
ii. Where loops are sequenced, check for proper control without overlap

h. For actuators:
   i. Check to insure that device seals tightly when the appropriate signal is applied to the operator.
   ii. Check for appropriate fail position, and that the stroke and range is as required at operating pressures/conditions.
   iii. For sequenced electronic actuators, calibrate per manufacturer’s instructions to required ranges.

i. Check each digital control point by making a comparison between the control command at the controller and the status of the controlled device. Check each digital input point by making a comparison of the state of the sensing device and the OI display. Record the results for each device in the BAS Pre-functional checklists.

j. For outputs to reset other manufacturers’ devices (VSDs) and feedback from them, calibrate ranges to establish proper parameters. Coordinate with representative of the respective manufacturer and obtain their approval of the installation.

k. Verify proper sequences by using the approved checklists to record results and submit with BAS Pre-functional checklists. Verify proper sequence and operation of all specified functions. There is inherent duplication between the functional performance testing of the Testing Contractor, and the thorough checking testing of the sequences by the BAS. Generally the sequence checkouts indicated as the responsibility of the Testing Contractor under functional testing, must first be tested by the BAS under prefunctional testing.

l. Verify proper systems operation under emergency power. Cooperate and coordinate with Testing Contractor and CxA for comprehensive building power outage tests.

m. Verify all safety devices trip at appropriate conditions. Adjust setpoints accordingly.

n. Verify that all alarm thresholds for all analog devices are entered. Request direction from Owner as to alarm threshold parameters.

o. Tune all control loops to obtain the fastest stable response without hunting, offset or overshoot. Record tuning parameters and response test results for each control loop in the BAS Prefunctional Report. Except from a startup, maximum allowable variance from set point for controlled variables under normal load fluctuations shall be as follows. Within 2 minutes of any upset (for which the system has the capability to respond to) in the control loop, tolerances shall be maintained (exceptions noted):
   i. Duct air temperature: ±1°F.
   ii. Space Temperature: ±2°F
   iii. Chilled Water: ±1°F
   iv. Hot water temperature: ±2°F.
   v. Duct pressure: ±0.25” w.g.
   vi. Water pressure: ±1 psid
   vii. Duct or space Humidity: ±5%
   viii. Air flow control: ±5% of setpoint velocity. For min OA flow loops being reset from CO2, response to upset max time is one hour.
   ix. Space Pressurization (on active control systems): ±0.02” wg with no door or window movements

p. For interface and DDC control panels:
i. Ensure devices are properly installed with adequate clearance for maintenance and clearly labeled in accordance with the record drawings.

ii. Ensure terminations are safe, secure and labeled in accordance with the record drawings.

iii. Check power supplies for proper voltage ranges and loading.

iv. Ensure wiring and tubing are run in a neat and workman-like manner, either bound or enclosed in trough.

v. Check for adequate signal strength on communication networks.

vi. Check for stand-alone performance of controllers by disconnecting the controller from the LAN. Verify the event is enunciated at OIs. Verify that the controlling LAN reconfigures as specified in the event of a LAN disconnection.

vii. Ensure that controller memory and control network throughput are adequate to support the extensive trending requirements. Reconfigure the system to provide a reliable and robust system as necessary.

viii. Ensure all outputs and devices fail to their proper positions/states.

ix. Ensure buffered and/or volatile information is held through power outage.

x. With all system and communications operating normally, sample and record update/enunciation times for critical alarms fed from the panel to the OI.

xi. Check for adequate grounding of all DDC panels and devices.

q. For Operator Interfaces:

i. Verify all elements on the graphics are functional and properly bound to physical devices and/or virtual points and that hot links or page jumps are functional and logical.

ii. Output all specified system reports for review and approval.

iii. Verify the alarm printing and logging is functional and per requirements.

iv. Verify trend archiving to disk and provide a sample to the CxA for review.

v. Verify paging/dial out alarm enunciation is functional.

vi. Verify functionality of remote OIs and that a robust connection can be established consistently.

vii. Verify that required third party software applications required with the bid are installed and functional.

viii. Start up and check out control air compressors and air drying and filtering systems in accordance with the appropriate section and manufacturer’s instructions.

ix. Verify proper interface with fire alarm system.

r. Submit Start-Up Test Report. Report shall be completed, submitted and approved prior to functional testing.

I. Sensor and Actuator Calibration. All field-installed temperature, relative humidity, CO, CO2, refrigerant, O2, and/or pressure sensors and gages, and all actuators (dampers and valves) on all equipment shall be calibrated. Verify that all locations are appropriate and away from causes of erratic operation. Submit to the CxA through the PM/CM the calibration methods and results. All test instruments shall have had a current certified calibration record. Sensors installed in the unit at the factory with calibration certification provided need not be field calibrated. Contractor to field verify all installed sensors.

1. Sensor Calibration Methods
a. All Sensors: Verify that all sensor locations are appropriate and away from causes of erratic operation. Verify that sensors with shielded cable, are grounded only at one end. For sensor pairs that are used to determine a temperature or pressure difference, make sure they are reading within specifications of each other for temperature and for pressure. Tolerances for critical applications may be tighter.

b. Sensors without Transmitters: Standard Application. Make a reading with a calibrated test instrument within 6 inches of the site sensor. Verify that the sensor reading (via the permanent thermostat, gage or building automation system (BAS)) is within the tolerances of the instrument-measured value. If not, install offset in BAS, calibrate or replace sensor.

c. Sensors with Transmitters: Standard Application. Make a reading with a calibrated test instrument within 6 inches of the site sensor. Verify that the sensor reading (via the permanent thermostat, gage or building automation system (BAS)) is within the tolerances of the instrument-measured value. If not, install offset in BAS, calibrate or replace sensor.

2. Tolerances, Standard Applications (if not stated in the specifications):

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Required Tolerance (+/-)</th>
<th>Sensor</th>
<th>Required Tolerance (+/-)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooling coil, chilled and condenser water temps</td>
<td>0.4F</td>
<td>Flow rates, water Relative humidity</td>
<td>4% of design</td>
</tr>
<tr>
<td>AHU wet bulb or dew point</td>
<td>2.0F</td>
<td>Combustion flue temps</td>
<td>5.0F</td>
</tr>
<tr>
<td>Hot water coil and boiler water temp</td>
<td>1.5F</td>
<td>Oxygen or CO₂ monitor</td>
<td>0.1 % pts</td>
</tr>
<tr>
<td>Outside air, space air, duct air temps</td>
<td>0.4F</td>
<td>CO monitor</td>
<td>0.01 % pts</td>
</tr>
<tr>
<td>Watthour, voltage &amp; amperage</td>
<td>1% of design</td>
<td>Natural gas and oil flow rate</td>
<td>1% of design</td>
</tr>
<tr>
<td>Pressures, air, water and gas</td>
<td>3% of design</td>
<td>Barometric pressure</td>
<td>0.1 in. of Hg</td>
</tr>
<tr>
<td>Flow rates, air, water</td>
<td>10% of design</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. Valve and Damper Stroke Setup and Check BAS Readout: For all valve and damper actuator positions checked, verify the actual position against the BAS readout. Set pumps or fans to normal operating mode. Command valve or damper closed, visually verify that valve or damper is closed and adjust output zero signal as required. Command valve or damper open, verify position is full open and adjust output signal as required. Command valve or damper to a few intermediate positions. If actual valve or damper position doesn’t reasonably correspond, repair or replace actuator.

4. Closure for heating coil valves (NO): Set heating setpoint 20°F above room temperature. Observe valve open. Remove control air or power from the valve and verify that the valve stem and actuator position are as specified. Restore to normal. Set heating setpoint to 20°F below room temperature. Observe the valve close. Restore setpoints to normal.

5. Closure for cooling coil valves (NC): Set cooling setpoint 20°F above room temperature. Observe the valve close. Remove control air or power from the valve and verify that the valve stem and actuator position are as specified. Restore to normal. Set cooling setpoint to 20°F below room temperature. Observe valve open. Restore setpoints to normal.

J. Loop Tuning
1. For all control loops, contractor shall tune the loops to ensure the fastest stable response without hunting, offset or overshoot within tolerances specified above. Contractor shall introduce upsets to the load when possible to affect response. Otherwise, setpoints can be changed to affect the response.
2. Generally tune loops during periods of high gain.
3. Document all parameters either by capturing text, short interval trends, or screen shots of trend graph documenting the final response.

K. Valve Stroke Setup and Check
1. For all valve and actuator positions checked, verify the actual position against the OI readout.
2. Set pumps or fans to normal operating mode. Command valve or damper closed, verify that device is closed and adjust output zero signal as required. Command device open, verify position is full open and adjust output signal as required. Command valve to a few intermediate positions. If actual valve position doesn't reasonably correspond, adjust spring tension, replace actuator or add pilot positioner (for pneumatics).

L. Coil Valve Leak Check
1. Verify proper close off of the valves. Ensure the valve seats properly by simulating the maximum anticipated pressure difference across the circuit. Calibrate air temperature sensors on each side of coil to be within 0.5°F of each other. Via the OI, command the valve to close. Energize fans. After 5 minutes observe air temperature difference across coil. If a temperature difference is indicated, and the piping surface temperature entering the coil is within 3°F of the water supply temp, leakage is probably occurring. If it appears that it is occurring, close the isolation valves to the coil to ensure the conditions change. If they do, this validates the valve is not closing. Remedy the condition by adjusting the stroke and range, increasing the actuator size/torque, replacing the seat or replacing the valve as applicable.

M. Deficiencies, Non-Conformance and Approval in Checklists and Startup.
1. The Contractor shall clearly list any outstanding items of the initial start-up and pre-functional procedures that were not completed successfully, at the bottom of the procedures form or on an attached sheet. The procedures form and any outstanding deficiencies are provided to the CxA within two days of test completion.
2. The Commissioning Agent will review the report and submit comments to the CM. The Commissioning Agent will work with the Contractor to correct and verify deficiencies or uncompleted items. The Commissioning Agent will involve the CM and others as necessary. The Contractor shall correct all areas that are noncompliant or incomplete in the checklists in a timely manner, and shall notify the PM/CM and Commissioning Agent as soon as outstanding items have been corrected. The Contractor shall submit an updated startup report and a Statement of Correction on the original noncompliance report. When satisfactorily completed, the Commissioning Agent will recommend approval of the checklists and startup of each system to the PM/CM.
3. The Contractor shall be responsible for resolution of deficiencies as directed the PM/CM.

3.3 TEST AND BALANCE VERIFICATION
A. Objective & Scope: The objective of TAB verification is to verify that air and water testing and balancing has been completed and all issues have been resolved prior to functional performance testing. A TAB report is required to be submitted to the CxA for review prior to scheduling verification. The CxA and the TAB contractor will meet on-site to discuss the
report and walk the building to verify 20% of the total amount tested using a random sample, utilizing the same equipment that was used to perform the test and balance. Any portions that fail the testing require an additional test. Acceptable results include those that are within specified tolerance of the design values (5-10%). If more than 20% fail the testing, the report is rejected and additional balancing must be completed and a revised report submitted before this portion of functional testing is considered complete.

3.4 DDC SYSTEM TRENDING FOR COMMISSIONING

A. Trending is a method of testing as a standalone method or to augment manual testing. The Contractor shall trend any and all points of the system or systems at intervals specified below.

B. Alarms are a means to notify the system operator that abnormal conditions are present in the system. Alarms shall be structured into three tiers – Critical, Priority, and Maintenance.

1. Critical alarms are intended to be alarms that require the immediate attention of and action by the Operator. These alarms shall be displayed on the Operator Workstation in a popup style window that is graphically linked to the associated unit’s graphical display. The popup style window shall be displayed on top of any active window within the screen, including non DDC system software.

2. Priority level alarms are to be printed to a printer which is connected to the Operator’s Work Station located within the engineer’s office. Additionally Priority level alarms shall be able to be monitored and viewed through an active alarm application. Priority level alarms are alarms which shall require reaction from the operator or maintenance personnel within a normal work shift, and not immediate action.

3. Maintenance alarms are intended to be minor issues which would require examination by maintenance personnel within the following shift. These alarms shall be generated in a scheduled report automatically by the DDC system at the start of each shift. The generated maintenance report will be printed to a printer located within the engineer’s office.

C. The Contractor shall provide a wireless internet network in the building for use during controls programming, checkout, and commissioning. This network will allow project team members to more effectively program, view, manipulate and test control devices while being in the same room as the controlled device.

D. The Contractor shall provide graphical trending through the DDC control system of systems being commissioned. Trending requirements are indicated below and included with the Systems Functional Performance Test Procedures. Trending shall occur before, during and after Systems Functional Performance Testing. The Contractor shall be responsible for producing graphical representations of the trended DDC points that show each system operating properly during steady state conditions as well as during the System Functional Testing. These graphical reports shall be submitted to the Commissioning Agent for review and analysis before, during dynamic operation, and after Systems Functional Performance Testing. The Contractor shall provide, but not limited to, the following trend requirements and trend submissions:

1. Pre-testing, Testing, and Post-testing – Trend reports of trend logs and graphical trend plots are required as defined by the Commissioning Agent. The trend log points, sampling rate, graphical plot configuration, and duration will be dictated by the Commissioning Agent. At any time during the Commissioning Process the Commissioning Agent may recommend changes to aspects of trending as deemed necessary for proper system analysis. The Contractor shall implement any changes as directed by the CxA. Any pre-test trend analysis comments generated by the Commissioning Team should be addressed and resolved by the Contractor, as directed by the PM/CM, prior to the execution of Systems Functional Performance Testing.
2. Dynamic plotting – The Contractor shall also provide dynamic plotting during Systems Functional Performance testing at frequent intervals for points determined by the Systems Functional Performance Test Procedure. The graphical plots will be formatted and plotted at durations listed in the Systems Functional Performance Test Procedure.

3. Graphical plotting - The graphical plots shall be provided with a dual y-axis allowing 15 or more trend points (series) plotted simultaneously on the graph with each series in distinct color. The plots will further require title, axis naming, legend etc. all described by the Systems Functional Performance Test Procedure. If this cannot be sufficiently accomplished directly in the Direct Digital Control System then it is the responsibility of the Contractor to plot these trend logs in Microsoft Excel.

4. The points to be trended are identified in the Functional Test Checklist by equipment.

E. The Contractor shall provide the following information prior to Systems Functional Performance Testing. Any documentation that is modified after submission shall be recorded and resubmitted to the CM and Commissioning Agent.

1. Point-to-Point checkout documentation;
2. Sensor field calibration documentation including system name, sensor/point name, measured value, DDC value, and Correction Factor.
3. A sensor calibration table listing the referencing of procedures to following in the O&M manuals, and the frequency at which calibration should be performed for all sensors, separated by system, subsystem, and type. The calibration requirements shall be submitted both in the O&M manuals and separately in a standalone document containing all sensors for inclusion in the commissioning documentation. The following table is a sample that can be used as a template for submission.

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Calibration Frequency</th>
<th>O&amp;M Calibration Procedure Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discharge air temperature</td>
<td>Once a year</td>
<td>Volume I Section D.3.aa</td>
</tr>
<tr>
<td>Discharge static pressure</td>
<td>Every 6 months</td>
<td>Volume II Section A.1.c</td>
</tr>
</tbody>
</table>

4. Loop tuning documentation and constants for each loop of the building systems. The documentation shall be submitted in outline or table separated by system, control type (e.g. heating valve temperature control); proportional, integral and derivative constants, interval (and bias if used) for each loop. The following table is a sample that can be used as a template for submission.

<table>
<thead>
<tr>
<th>AIR HANDLING UNIT AHU-1</th>
<th>Proportional Constant</th>
<th>Integral Constant</th>
<th>Derivative Constant</th>
<th>Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heating Valve Output</td>
<td>1000</td>
<td>20</td>
<td>10</td>
<td>2 sec.</td>
</tr>
</tbody>
</table>

3.5 FUNCTIONAL PERFORMANCE TESTING

A. Objectives and Scope. The objective of functional performance testing is to demonstrate that each system is operating according to the Contract Documents. Each system will be tested to verify that the system response is as designed. Commissioned systems will be
checked for conformance to the design sequences of operation and stable control. Proper system responses to such conditions as power failure, out of limit condition, equipment failure, etc. shall also be tested.

B. Development of Test Procedures: Before Systems Functional Performance Test procedures are written, the Contractor shall submit all requested documentation and a current list of change orders affecting equipment or systems, including an updated points list, program code, control sequences and parameters. The test procedures are written by the CxA based upon the final operational sequences from available project documentation. The CxA shall develop specific test procedures and forms to verify and document proper operation of each system. Prior to execution, the CxA shall provide a copy of the test procedures to the Contractor who shall review the tests for feasibility, safety, equipment and warranty protection. The test procedure checklists developed by the CxA shall include the following information:

1. System and equipment or component name(s).
2. Equipment location and ID number.
3. Date.
4. Project name.
5. Participating parties.
6. Reference to the specification section describing the test requirements, if applicable.
7. Identification of control points
8. Identification of specific control points to be trended as part of the testing
9. A summary of the specific sequence of operations.
10. Prerequisites for the test.
11. Special cautions, alarm limits, etc.
13. Acceptance criteria of proper performance with a Yes / No/NA check box.
14. A section for comments.

C. Test Methods.

1. Systems Functional Performance Testing shall be achieved by manual testing (i.e. persons manipulate the equipment and observe performance) and/or by monitoring the performance and analyzing the results using the control system's trend log capabilities or by standalone data loggers. The Contractor and Commissioning Agent shall determine which method is most appropriate for tests that do not have a method specified.

   a. **Simulated Conditions**: Simulating conditions (not by an overwritten value) shall be allowed, although timing the testing to experience actual conditions is encouraged wherever practical.

   b. **Overwritten Values**: Overwriting sensor values to simulate a condition, such as overwriting the outside air temperature reading in a control system to be something other than it really is, shall be allowed, but shall be used with caution and avoided when possible. Such testing methods often can only test a part of a system, as the interactions and responses of other systems will be erroneous or not applicable. Simulating a condition is preferable. e.g., for the above case, by heating the outside air sensor with a hair blower rather than overwriting the value or by altering the appropriate setpoint to see the desired response. Before simulating conditions or overwriting values, sensors, transducers and devices shall have been calibrated.

   c. **Simulated Signals**: Using a signal generator which creates a simulated signal to test and calibrate transducers and DDC constants is generally recommended over using the sensor to act as the signal generator via simulated conditions or overwritten values.
d. **Alteration Setpoints**: Rather than overwriting sensor values, and when simulating conditions is difficult, altering setpoints to test a sequence is acceptable. For example, to see the Air Conditioning compressor lockout initiate at an outside air temperature below 12 C (54 F), when the outside air temperature is above 12 C (54 F), temporarily change the lockout setpoint to be 2 C (4 F) above the current outside air temperature.

e. **Indirect Indicators**: Relying on indirect indicators for responses or performance shall be allowed only after visually and directly verifying and documenting, over the range of the tested parameters, that the indirect readings through the control system represent actual conditions and responses. Much of this verification shall be completed during systems startup and initial checkout.

D. **Setup**: Each function and test shall be performed under conditions that simulate actual conditions as closely as is practically possible. The Contractor shall provide all necessary materials, system modifications, etc. to produce the necessary flows, pressures, temperatures, etc. necessary to execute the test according to the specified conditions. At completion of the test, the Contractor shall return all affected building equipment and systems, due to these temporary modifications, to their pretest condition.

E. **Sampling**: No sampling is allowed in completing Pre-Functional Checklists. Sampling is allowed for Systems Functional Performance Test Procedures execution. The sampling rate is specified in Section 3.01. If at any point, frequent failures are occurring and testing is becoming more troubleshooting than verification, the Commissioning Agent may stop the testing and require the Contractor to perform and document a checkout of the remaining units, prior to continuing with Systems Functional Performance Testing of the remaining units.

F. **Cost of Retesting**: The cost associated with expanded sample System Functional Performance Tests shall be solely the responsibility of the Contractor. Any required retesting by the Contractor shall not be considered a justified reason for a claim of delay or for a time extension by the Contractor.

G. **Coordination and Scheduling**: The Contractor shall provide a minimum of 7 days’ notice to the Commissioning Agent and the PM/CM regarding the completion schedule for the Pre-Functional Checklists and startup of all equipment and systems. The Commissioning Agent will schedule Systems Functional Performance Tests with the Contractor and CM. The Commissioning Agent will witness and document the Systems Functional Performance Testing of systems. The Contractor shall execute the tests in accordance with the Systems Functional Performance Test Procedure.

H. **Testing Prerequisites**: In general, Systems Functional Performance Testing will be conducted only after Pre-Functional Checklists have been satisfactorily completed. The control system shall be sufficiently tested and approved by the Commissioning Agent and the PM/CM before it is used to verify performance of other components or systems. The air balancing and water balancing shall be completed before Systems Functional Performance Testing of air-related or water-related equipment or systems are scheduled. Systems Functional Performance Testing will proceed from components to subsystems to systems. When the proper performance of all interacting individual systems has been achieved, the interface or coordinated responses between systems will be checked.

I. **Problem Solving**: The Commissioning Agent will recommend solutions to problems found, however the burden of responsibility to solve, correct and retest problems is with the Contractor.

3.6 **Common Elements For All Systems**

A. **Have the required submitted documentation convenient to testing area**: Validate that all required documentation has been submitted and is per the contract requirements (very cursory review). CxA shall review the content of the documentation and validate that it is per contract documents.
B. CxA shall review the startup documentation at the start of functional performance testing. Review the startup tests and checklist documentation. CxA shall validate that startup is acceptably executed and complete. CxA shall ensure that any items indicated as outstanding in the checklists is entered as an Action Item and enter one if it is not. The checklists and start up tests/measurements shall be spot checked at the beginning of FPT to ensure accuracy. CxA shall complete a test that indicates he has reviewed the prefunctional checklists and finds them acceptable and note any outstanding items.

C. CxA shall check for and as applicable direct Contractor to demonstrate that access is sufficient to perform required maintenance.

D. CxA shall validate that all prerequisite work is complete and confirm via a test record that he feels it is.

E. Specifically check labeling and ensure conformance to contract requirements.

F. Check proof indication, alarming on failure and restart/acknowledgement as applicable.

G. CxA shall observe operating conditions encountered at the start of FPT. CxA shall examine for normal functionality and record parameters as a test.

H. All dynamic systems powered by electricity shall be tested to simulate a power outage to ensure proper sequencing. Those on emergency power or uninterruptible power shall be tested on all sources.

I. CxA shall inspect the installation and compare it to contract requirements. Record the inspection as a test.

J. Capacities and adjusted and balanced conditions as applicable will generally be checked.

K. Verify all sequence modes and sequences of operation. CxA must initiate all modes and may not refer to or rely on a prefunctional test done by the BAS. Some examples of generic modes that apply to most systems include:

1. Off Mode
2. Failed Mode: Proof, safeties, power outage etc. See below for crash testing.
3. Start Sequence in various modes
4. Stop sequences in various modes

L. All adjusted, balanced, controlled systems shall be assessed to determine the optimal setting for the system as applicable. The optimal settings should be determined to establish reliable, efficient, safe and stable operation. CxA is responsible for placing systems in optimal condition for occupancy and not simply relying on initial design estimated settings.

M. Dynamic Graphics: The graphic for all components, systems, and areas sampled and required to be represented by a graphic shall be checked for adequacy and accuracy. Furthermore, when setpoints are required to be adjustable, verify that they can be adjusted directly from the graphic screen.

N. All interfaces between two systems or equipment of different manufacturers must be checked for accuracy and functionality.

O. CxA shall to the extent possible, load the heating and cooling systems during initial FPT to check the capacity of the building central systems and initially optimize system settings. This will typically be done using the preheat system to false load the cooling system. This test will incorporate varying the load to check central systems response.

P. “Crash Testing”: CxA shall analyze systems to identify possible conditions where functionality may be compromised. CxA shall design non-destructive tests that will demonstrate either the automated response to the conditions or so that team can identify the best method for responding or fixing the condition. All tests and finding shall be documented.

Q. Building Enclosure Systems Functional Performance Testing

1. Participants shall include CxA, GC and water-proofing subcontractors
2. Sample 50%; failure 0%
3. CxA shall review construction checklists and perform site inspections during installation to verify completeness per specification.
4. The CxA may witness testing performed by contractor and will review all test reports.

5. Foundation: Upon completion of the under-slab vapor retarder installation, the contractor will perform a field inspection to ensure that the installation was performed in accordance with manufacturer’s instructions, construction documents, ASTM E1745-11 and ASTM E1643-11. CxA will observe and inspect the installation of the under-slab vapor retarders.

6. Walls:
   a. Upon completion of the wall insulation installation and prior to installation of wall sheathing, e.g. gypsum board, the contractor will field verify to ensure that the insulation installation was performed in accordance with the construction documents.
   b. After wall sheathing installation and in accordance with ASTM C 1060-90, Standard Practice for Thermographic Inspection of Insulation Installations in Envelope Cavities of Framed Buildings, the CxA will perform a thermographic insulation inspection. A FLIR Systems B20 thermal imaging camera will be used to perform the imaging. Up to 20% of the insulation within envelope cavities will be inspected for thermal anomalies. The contractor will be responsible to correct any identified anomalies.

7. Windows: Upon completion of exterior windows and prior to installation of insulation and wall sheathing, the contractor will perform a field water spray test to 20% of the exterior windows. Using a hand held spray assemble employing a Type B2 #6.030 nozzle, pressure gauge, control valve and a ¾” garden hose apply water to the windows at 30 psi. Direct the water at joints and perpendicular to the face of the window frame. Slowly move the nozzle back and forth above the window joints at a distance of 1'-0" for a period of five minutes for each 5'-0" of joint. At the same time have an observer on the inside of the building to check for water leakage. The contractor will be responsible to repair any identified leaks and retest repaired joints.

8. Doors - The contractor will perform visual inspections of all exterior doors with weatherstripping. The contractor will be responsible to adjust doors for proper operation and weather seal. CxA will inspect, test or operate a random sampling of exterior doors to verify proper seal.

9. Roof – Contractor shall perform infrared roof survey in addition to the water test outlined in Section 07 54 00-13 of the specifications. The infrared roof survey will be performed in accordance with ASTM C 1153 – Standard Practice for Location of Wet Insulation in Roofing Systems Using Infrared Imaging. Perform the infrared roof survey shortly after sunset when the surface temperature of the roof drops quickly. Water contained in the roof system or insulation cool slower due to water having a higher specific heat capacity than roof membranes and other building products. Contractor will identify thermal anomalies by using a FLIR Systems B20 thermal imaging camera. Mark any identified anomalies on the roof surface for evaluation and repair.

R. Domestic Water Systems Functional Performance Testing

1. Participants shall include CxA, PC
2. Sample 100% of equipment and 50% of fixtures; failure 10%
3. CxA shall review prefunctional checklists, chlorination report and any factory start-up reports to verify prefunctional testing is completed.
4. Contractor to demonstrate settings and sequences of water heater, circulation pump, temperature mixing valves and controls.
5. Domestic hot water will be tested by the CxA by measuring the hot water temperature at all fixtures along with the time it takes to reach that temperature.
6. Plumbing fixtures will be checked for proper operation and water saving features.
S. HVAC System Pumps Functional Performance Test

1. Participants shall include CxA, MC, TAB, and BAS (where pumps are automatically controlled).
2. Sample 100%
3. CxA shall review prefunctional checklists, start-up reports, and TAB report.
4. CxA shall blow off strainers to validate that they are clean.
5. Pumps shall be manually started individually. Pressure differential, KW (or slip on the motor), and flow shall be checked at shut-off, wide open, and balanced (or controlled) condition. Generally the reading from the instrumentation provided with the pump (thermometers and pressure gages and flow meters as applicable) will be acceptable if used to validate an action as opposed to checking balancing. Listen to pump to ensure no excessive noise or vibration.
6. For pumps designed with automatic starting of back up pump on primary pump failure:
   a. Enable automatic controls.
   b. Start primary pump.
   c. Throw disconnect switch of primary pump, and validate that standby is energized. Perform this test on all pumps.
   d. Change lead and retest.
7. Check proof indication and alarm. Generally affect failure by turning off electrical feed at each available dedicated location (i.e.: breaker feeding drive or starter when dedicated), throwing disconnect on starter or drive and/or turning HOA to off, and disconnecting local motor disconnect (coordinate with drive manufacturer where applicable particularly when reconnecting).
8. For staged pumping systems:
   a. Vary load by opening and closing valves to affect a stage up and stage down.
   b. Fail pumps throughout the process to ensure staging logic responds correctly.
   c. Ensure minimum run and off times of stages. Consider criticality of the system.
   d. Change pump priority and perform the same process with another priority.
9. For multiple pump systems, affect or observe a normal rotation of lead or priority sequence.
10. Simulate peak and minimum operating pressure conditions on the systems and check stroke and ranges on valves to ensure adequate close off and ranging.
11. For variable speed pumps:
   a. Manipulate control valves to change flow conditions (increase and decrease) and observe control response.
   b. Ensure stable control response to step change in flow conditions in both directions.
   c. Check for the applicable acceleration and deceleration of the pumps.
   d. Spot check for critical frequencies by manually ramping pump speed from min. to max. to ensure stable operation of pumps and record/defeat any critical frequencies.
   e. Record representative part load output from the drive (using VFD read out).
   f. Check calibration of control input. Check drive bypass operation if applicable.
   g. Specifically check for status indication at minimum pump speed and ensure reliability of status signal.
12. Simulate power outage and ensure orderly and automatic restart.
T. Mini-Split Systems Functional Performance Test

1. Participants shall include CxA, MC, TAB, and BAS.
2. Sample 20%, max failure limit 10%
3. CxA shall review start-up check-lists and TAB reports.
4. Verify automatic start/stop of fan and open/close of outdoor air damper as applicable.
5. Start cooling system, manipulate control device to obtain maximum cooling. Measure temperatures and pressures to determine capacity.
6. Weather permitting cause all applicable modes of operation using false loading where practical. Check proper sequence for switching modes and proper operation within a mode.
7. Check calibration of control devices and for stable control response.
8. Check for free and adequate flow of AC condensate.
9. Simulate power outage and ensure automatic and orderly restart.

U. Rooftop Package AC Unit Functional Performance Test

1. Participants shall include CxA, MC, TAB, and BAS.
2. Sample 100%
3. CxA shall review prefunctional checklists, start-up check-lists and TAB reports.
4. Verify automatic start/stop of fan and open/close of outdoor air damper.
5. Start heating and cooling system, manipulate control device to obtain maximum cooling and heating. Measure temperatures and pressures to determine capacity.
6. Weather permitting cause all applicable modes of operation using false loading where practical. Check proper sequence for switching modes and proper operation within a mode.
7. Check calibration of control devices and for stable control response and component performance including chilled water coils, hot water coils, steam coils, humidifiers, economizer cycles, etc. Ensure proper coordination of control loops and that no fighting or energy wastes result.
8. Check for free and adequate flow of AC condensate.
9. Spot check valve close off under peak pressure conditions that the valve will try to close.
10. For variable speed fans:
    a. Manipulate air terminal units to change flow conditions and observe control response. Ensure stable control response to step change in flow conditions.
    b. Manually ramp fan speed from min. to max. to ensure stable operation of fans.
    c. Record representative part load output from the drive.
    d. Check calibration of control inputs.
    e. Check drive bypass operation if applicable.
11. For fans with inlet vanes:
    a. Manipulate air terminal units to change flow conditions and observe control response. Ensure stable control response to step change in flow conditions.
    b. Manually modulate vanes from min. to max. to ensure stable operation of fans.
    c. Record representative part load power draw on the motor.
    d. Check calibration of control input.
12. Ensure minimum required ventilation rates are maintained across the full range of control where applicable.
13. Test all interfaces with the fire alarm system and all smoke control sequences.
14. Verify interlocks with exhaust fans where applicable.
15. Test proof alarming where applicable.
16. Test operation of applicable safeties including freeze stats, high and low static devices, smoke detection, etc. Check AH component status in each event.
17. Check system status and operation in the Off, Unoccupied, and Occupied Mode of operation. Validate proper start up and shut down sequences.
18. Simulate power outage, operation under emergency power where applicable, and ensure automatic and orderly restart.
19. Where systems are headered and/or sequenced, vary loading to affect stage up and stage down. Adjust parameters to affect smooth staging. Validate that header pressure is not compromised in the event of a failure of one of the units.
20. Check temperature sensor coordination by isolating or stopping coils and heat wheels with air flowing.

V. Exhaust Fan/Air System Functional Performance Test.
1. Participants shall include CxA, MC, TAB, and BAS.
2. Sample 20%
3. CxA shall review prefunctional check-lists, start-up reports and TAB reports.
4. Verify start/stop control sequences.
5. Check the capacity of the fan at maximum conditions.
6. Cause all applicable modes of operation using false loading where practical. Check proper sequence for switching modes and proper operation within a mode.
7. For variable speed fans:
   a. Manipulate air terminal units to change flow conditions and observe control response. Ensure stable control response to step change in flow conditions.
   b. Manually ramp fan speed from min. to max. to ensure stable operation of fans. Record representative part load output from the drive.
   c. Check calibration of control input.
   d. Check drive bypass operation if applicable.
8. For fans with inlet vanes:
   a. Manipulate air terminal units to change flow conditions and observe control response. Ensure stable control response to step change in flow conditions.
   b. Manually modulate vanes from min. to max. to ensure stable operation of fans. Record representative part load power draw on the motor.
   c. Check calibration of control input.
9. Verify interlocks with AC units, thermostats etc. where applicable.
10. Test all interfaces with the fire alarm system and all smoke control sequences.
11. Test proof alarming where applicable. Simulate failures of fans and ensure proper start-up of back up fans. Check status indication at minimum fan speed to ensure reliable and repeatable condition.
12. Test operation of applicable safeties including freeze stats, high and low static devices, smoke detection, etc.
13. Check system status and operation in the Off, Unoccupied, and Occupied Mode of operation. Validate proper start up and shut down sequences.
14. Simulate power outage, operation under emergency power where applicable, and ensure automatic and orderly restart.
15. Where systems are headered and/or sequenced, vary loading to affect stage up and stage down. Adjust parameters to affect smooth staging. Validate that header pressure is not compromised in the event of a failure of one of the units.

W. HVAC VAV Air Terminal Functional Performance Test
1. Participants shall include CxA, MC, TAB, and BAS.
2. Sample 20%, max failure limit 10%
3. CxA shall review start-up check-lists and TAB reports.
4. Check the calibration of zone temperature sensors.
5. Set boxes for both minimum and maximum flow (typically by setting the space temperature setpoint up and down) and check the calibration of the flow settings.
6. Check the stability of the zone temperature control loop for the damper and any associated heating devices by changing the space setpoints and observing the response.
7. Cause all applicable modes of operation using false loading where practical. Check proper sequence for switching modes and proper operation within a mode.
8. Determine the optimal settings for the control parameters.
9. Simulate and test the unoccupied and emergency mode response of the box where applicable.
10. Check the capacity of the heating device where applicable.

X. Building Automation System Functional Performance Test

1. Participants shall include CxA, MC, and BAS.
2. Controls system sampling will typically correspond to the sampling rate of a system or piece of equipment. These sampling rates are indicated in Section 3.01 for the respective item.
3. Contractor shall operate the equipment and subsystems through all specified modes of control and sequences of operation including full and part load conditions, and emergency conditions.
4. Verify that equipment operates in accordance with design intent and approved control diagrams. This shall include checking the operation of dampers, valves, smoke detectors, high and low limit controls, of a sample of 25% of components with a maximum failure limit of 10%.
5. Analog Input Sensors: (at a sample of 50% of the inputs on the sampled devices see above for device samples) with a maximum failure rate of 10%) Spot check analog input sensors (space temperature sensors, outside, return, and mixed air temperature sensors, discharge air temperature sensors, chilled water and hot water temperature sensors, and humidity sensors, air and water differential pressure sensors, airflow monitoring stations, etc.) for acceptable accuracy (which is generally as specified for the device).
6. Valves, Dampers and Actuators: (at a sample of 50% of the inputs on the sampled devices see above for device samples) with a maximum failure rate of 10%) Ensure that valves and dampers and their actuators close off or seal against the maximum pressure differential. Ensure that the actuators stroke throughout the correct range and that the positioners are set correctly where applicable.
7. Analyze trends of control system points for a minimum of a one week period prior to and throughout the Acceptance period. Trends shall be analyzed to identify any control problems, lack of capacity, control loops fighting or unstable, etc.
8. Spot (at a sample of 50% of the inputs on the sampled devices see above for device samples) with a maximum failure rate of 10%) check the operation of all automatic switches (pressure switches, current switches, flow switches, etc.) to ensure that they are adjusted to proper make and break settings.
9. Verify the stand alone functionality of the controllers. Generally disconnect LAN communication wiring and ensure that the controller functions properly and that the loss of communication is acknowledged by the interface. Restore communications and ensure an orderly restoration to normal control.
10. Verify that the EMS interface, EMS software, graphics and functions are in accordance with design intent and approved control diagrams.
   a. Validate intuitive interface and graphic linking.
   b. Validate all graphics are done and accurate.
   c. Validate that all graphics contain required information.
d. Validate that all security passwords and access to system information has been set up correctly.

e. Validate that point naming convention is consistent and per Owner requirements.

11. Check dial in communications and pager functions where applicable to ensure functionality.

Y. Lighting Fixtures And Lighting Controls Functional Performance Testing

1. General: Provide the services of a factory trained manufacturer’s representative to assist the contractor in the installation and start up service of the lighting control system and train Owner's maintenance personnel as specified below. Representative will confirm the proper installation and operation of all system components.

2. Start-up checklists: Perform the following final checks before startup:

a. Ensure all labeling is affixed and accurate

b. Ensure all terminations are tight.

c. Check sensor placement is adequate for required duty.

d. Ensure adequate access is provided to all panels and that documentation of that panel is provided in it.

e. Ensure all circuits for the loads are energized and ready for testing.

3. Starting Procedures: Follow the manufacturer's written procedures and the following as a minimum:

a. Test, calibrate, and set all digital and analog sensing, and actuating devices. Calibrate each instrumentation device by making a comparison between the graphic display and the reading at the device, using an instrument traceable to the National Bureau of Standards, which shall be at least twice as accurate as the device to be calibrated (e.g., if field device is +/-0.5% accurate, test equipment shall be +/-0.25% accurate over same range). Record the measured value and displayed value for each device in the Start-Up Report.

b. Check each digital control point by making a comparison between the control command at the control panel and the status of the controlled device. Check each digital input point by making a comparison of the state of the sensing device and the OI display. Record the results for each device in the Start-Up Report.

c. Check loads on all breakers to ensure that the breaker is properly sized.

d. Enter all schedules per occupant's direction.

4. For Operator Interfaces:

a. Verify all elements on the graphics are functional and properly bound to physical devices and/or virtual points and that hot links or page jumps are functional and logical.

b. Output all specified reports for review and approval.

c. Verify the alarm printing and logging is functional and per requirements

d. Validate all interfaces with other systems on a point by point basis

5. Daylighting and Dimming Controls:

a. Participants shall include CxA, EC and trained manufacturer’s representative.

b. Sample 50%

c. CxA shall review prefunctional check-lists and factory start-up reports.
d. Verify daylighting and dimming control sequences and setpoints for photocells for required footcandle levels at desk level (30" above finish floor).

e. Check proper sequence for low voltage switch modes and proper operation within a mode.

6. Occupancy Sensors

a. Participants shall include CxA and EC.
b. Sample 20%
c. CxA shall reviewprefunctional check-lists.
d. Verify occupancy sensors are set for proper sequence of operation and set per approved Owner requirements including coverage, sensitivity and time delay.

Z. Landscape Irrigation Functional Performance Test

1. Participants shall include CxA and Landscape Contractor.
2. Sample: All irrigation controllers, 20% (of zones coverage test using thermographic camera for bubblers), max failure limit 0%.
3. Check irrigation controller schedule and zone settings and record to verify conformance with approved schedules and settings.
4. CxA shall review as-built drawings, pressure test documentation for drip emitters and inline drip tubing and confirm valves have been adjusted, heads aligned and coverage has been adjusted for each zone.

3.7 DOCUMENTATION, NONCONFORMANCE AND APPROVAL OF TESTS

A. Documentation: The Commissioning Agent will witness, and document the results of all Systems Functional Performance Tests using the specific procedural forms developed by the Commissioning Agent for that purpose. Prior to testing, the Commissioning Agent will provide these forms to the PM/CM and the CxC for review and approval. The Contractor shall include the filled out forms with the O&M manual data.

B. Nonconformance: The Commissioning Agent will record the results of the Systems Functional Performance Tests on the procedure or test form. All items of nonconformance issues will be noted and reported to the CM/CxC on Commissioning Field Reports and/or the Commissioning Master Issues Log.

1. Corrections of minor items of noncompliance identified may be made during the tests. In such cases, the item of noncompliance and resolution shall be documented on the Systems Functional Test Procedure.
2. Every effort shall be made to expedite the systems functional Performance Testing process and minimize unnecessary delays, while not compromising the integrity of the procedures. However, the Commissioning Agent shall not be pressured into overlooking noncompliant work or loosening acceptance criteria to satisfy scheduling or cost issues, unless there is an overriding reason to do so by direction from the PM/CM.
3. As the Systems Functional Performance Tests progresses and an item of noncompliance is identified, the Commissioning Agent shall discuss the issue with the Contractor and the VA.
4. When there is no dispute on an item of noncompliance, and the Contractor accepts responsibility to correct it:

a. The Commissioning Agent will document the item of noncompliance and the Contractor's response and/or intentions. The Systems Functional Performance Test then continues or proceeds to another test or sequence. After the day's work is complete, the Commissioning Agent will
submit a Commissioning Field Report to the PM/CM. The Commissioning Agent will also note items of noncompliance and the Contractor's response in the Master Commissioning Issues Log. The Contractor shall correct the item of noncompliance and report completion to the CM and the Commissioning Agent.

b. The need for retesting will be determined by the Commissioning Agent. If retesting is required, the Commissioning Agent and the Contractor shall reschedule the test and the test shall be repeated.

5. If there is a dispute about item of noncompliance, regarding whether it is an item of noncompliance, or who is responsible:
   a. The item of noncompliance shall be documented on the test form with the Contractor's response. The item of noncompliance with the Contractor's response shall also be reported on a Commissioning Field Report and on the Master Commissioning Issues Log.
   b. Resolutions shall be made at the lowest management level possible. Other parties are brought into the discussions as needed. Final interpretive and acceptance authority is with the PM/CM.
   c. The Commissioning Agent will document the resolution process.
   d. Once the interpretation and resolution have been decided, the Contractor shall correct the item of noncompliance, report it to the Commissioning Agent. The requirement for retesting will be determined by the Commissioning Agent. If retesting is required, the Commissioning Agent and the Contractor shall reschedule the test. Retesting shall be repeated until satisfactory performance is achieved.

C. Cost of Retesting: The cost to retest a System Functional Performance Test shall be solely the responsibility of the Contractor. Any required retesting by the Contractor shall not be considered a justified reason for a claim of delay or for a time extension by the Contractor.

D. Failure Due to Manufacturer Defect: If 10%, or three, whichever is greater, of identical pieces (size alone does not constitute a difference) of equipment fail to perform in compliance with the Contract Documents (mechanically or substantively) due to manufacturing defect, not allowing it to meet its submitted performance specifications, all identical units may be considered unacceptable by the PM/CM. In such case, the Contractor shall provide the PM/CM with the following:

1. Within one week of notification from the PM/CM, the Contractor shall examine all other identical units making a record of the findings. The findings shall be provided to the PM/CM within two weeks of the original notice.
2. Within two weeks of the original notification, the Contractor shall provide a signed and dated, written explanation of the problem, cause of failures, etc. and all proposed solutions which shall include full equipment submittals. The proposed solutions shall not significantly exceed the specification requirements of the original installation.
3. The PM/CM shall determine whether a replacement of all identical units or a repair is acceptable.
4. Two examples of the proposed solution shall be installed by the Contractor and the PM/CM shall be allowed to test the installations for up to one week, upon which the PM/CM will decide whether to accept the solution.
5. Upon acceptance, the Contractor shall replace or repair all identical items, at their expense and extend the warranty accordingly, if the original equipment warranty had begun. The replacement/repair work shall proceed with reasonable speed beginning within one week from when parts can be obtained.

E. Approval: The Commissioning Agent will note each satisfactorily demonstrated function on the test form. Formal approval of the Systems Functional Performance Test shall be
made later after review by the Commissioning Agent and by the PM/CM. The Commissioning Agent will evaluate each test and report to the PM/CM using a standard form. The PM/CM will give final approval on each test using the same form, and provide signed copies to the Commissioning Agent and the Contractor.

3.8 OPERATION AND MAINTENANCE TRAINING REQUIREMENTS

A. Training Preparation Conference: Before operation and maintenance training, CxA shall convene a training preparation conference to include Owner's operation and maintenance personnel, Contractor, and subcontractors. Perform the following:

1. Review installed systems, subsystems, and equipment.
2. Review instructor qualifications.
3. Review instructional methods and procedures.
4. Review training module outlines and contents to ensure it meets the specific maintenance personnel requirements.
5. Review course materials (including operation and maintenance manuals).
6. Inspect and discuss locations and other facilities required for instruction.
7. Review and finalize training schedule and verify availability of educational materials, instructors, audiovisual equipment, and facilities needed to avoid delays.
8. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable

B. Training of Owner Personnel

1. Provide the CxA with training agendas and schedule at least two weeks before the planned training.
2. Provide designated Owner personnel with comprehensive training in the understanding of the systems and the operation and maintenance of each major piece of commissioned electrical equipment or system.
3. Training shall start with classroom sessions, if necessary, followed by hands-on training on each piece of equipment, which shall illustrate the various modes of operation, including start-up, shutdown, fire/smoke alarm, power failure, etc.
4. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system will be repaired or adjusted as necessary and the demonstration repeated.
5. The appropriate trade or manufacturer's representative shall provide the instructions on each major piece of equipment. This person may be the start-up technician for the piece of equipment, the installing contractor or manufacturer's representative. Practical building operating expertise as well as in-depth knowledge of all modes of operation of the specific piece of equipment is required. More than one party may be required to execute the training.
6. The training sessions shall follow the outline in the Table of Contents of the operation and maintenance manual and illustrate whenever possible the use of the O&M manuals for reference.
7. Training shall include:
   a. Use the printed installation, operation and maintenance instruction material included in the O&M manuals.
   b. Include a review of the written O&M instructions emphasizing safe and proper operating requirements, preventative maintenance, special tools needed and spare parts inventory suggestions. The training shall include start-up, operation in all modes possible, shutdown, seasonal changeover and any emergency procedures.
   c. Discuss relevant health and safety issues and concerns.
   d. Discuss warranties and guarantees.
   e. Cover common troubleshooting problems and solutions.
f. Explain information included in the O&M manuals and the location of all plans and manuals in the facility.
g. Discuss any peculiarities of equipment installation or operation.
h. Classroom sessions shall include the use of overhead projections, slides, video and audio taped material as might be appropriate.

8. Hands-on training shall include start-up, operation in all modes possible, including manual, shutdown and any emergency procedures and maintenance of all pieces of equipment.

9. Training shall occur after functional testing is complete, unless approved otherwise by the PM/CM.

C. BAS Demonstration and Orientation

1. The intent of the demonstration and orientation is to provide the Owner, Testing Contractor, and Commissioning Authority with a reasonable level of assurance that the system is complete and ready for functional performance testing, and to provide an initial orientation to the system configuration, set-up, features, and commissioning related procedures.

2. Demonstrate the operation of a sampling of the BAS hardware, software, and all related components and systems to the satisfaction of the CxA. Schedule the demonstration with the Owner’s representative 2 weeks in advance. Demonstration shall not be scheduled until all hardware and software submittals, and the Pre-functional Test Reports are approved. If in the judgment of the CxA the Work fails to be demonstrated to be complete and ready for functional testing, so as to require additional site visits by the CxA for re-demonstration, Contractor shall reimburse Owner for all costs of subsequent CxA site visits for demonstration.

3. The Contractor shall supply all personnel and equipment for the demonstration, including, but not limited to, instruments, ladders, etc. Contractor supplied personnel shall be competent with and knowledgeable of all project-specific hardware, software, and the HVAC systems. All documentation and submittals shall be at the job site.

4. The system shall be demonstrated following the same procedures used in the Pre-functional Test. Demonstration shall include, but not necessarily be limited to, the following:

   a. Demonstrate that all required software is installed on workstations. Demonstrate that all graphic screens, alarms, trends, and reports are installed as submitted and approved.
   b. Demonstrate that a sampling of points specified and shown can be interrogated and/or commanded (as applicable) from all workstations, as specified.
   c. Demonstrate that remote dial-up communication abilities (as applicable) are in accordance with contract requirements.
   d. Demonstrate correct calibration and calibration procedure for a sampling of input/output devices selected by the Owner and CxA.
   e. Demonstrate that all DDC and other software programs exist at respective field panels. The Direct Digital Control (DDC) programming and point database shall be as submitted and approved.
   f. Demonstrate that all DDC programs accomplish the specified sequences of operation.
   g. Demonstrate that the panels automatically recover from power failures, as specified.
   h. Demonstrate that the stand-alone operation of panels meets the requirements of these Specifications. Demonstrate that the panels’
response to LAN communication failures meets the requirements of these Specifications.

5. Failure of any of the above items shall be noted as part of the functional testing, and failed items shall be corrected to conform to contract requirements.

6. BAS Demonstration shall be completed prior to functional performance testing and Substantial Completion.

3.9 Performance Period

A. Upon successful completion of functional acceptance tests, a performance period of 7 consecutive calendar days shall commence on first day following the last acceptance test. This period shall be completed prior to final acceptance of the project. In event of failure to meet standard of performance during any initiated performance period, it is not required that one 7-calendar day period expire in order for another performance period to begin.

B. If equipment or system operate and demonstrate continuing compliance with specified requirements for period of 7 consecutive calendar days from commencement date of performance period, it shall be deemed to have met the standard of performance.

C. Equipment will not be accepted by the Owner and final payment will not be made by the Owner until acceptable performance is met.

D. Contractor shall provide Commissioning Authority with trend logs of the system performance for the control variables and set point in each control process in 15-minute time intervals.

E. Systems shall be first tested as independent building systems followed by tests of systems tied into Owner’s systems. Types of Owner’s systems include, but are not limited to, central plant heating and cooling; off-site security / alarm monitoring; and campus automated controls systems.

F. Upon Contractor’s completion of the requirements of the commissioning plan and the successful completion of the performance period, and receipt of the required documentation, the Commissioning Authority shall provide the Owner with a statement of acceptable performance.

G. Trend Logs

1. Trend logs are databases of ASCII characters (usually numbers) representing a historical record of the systems operation. Contractor shall establish and store these trend logs.

2. Trend logs shall be set up for all control system points on an average of 15 minute intervals or change of value thresholds as approved by CxA. BAS contractor must design panel and network loading to accommodate this trending without adversely impacting the control system functionality.

3. CxA will analyze trend logs of the system operating parameters to evaluate normal system functionality. Contractor shall establish these trends, ensure they are being stored properly, and forward the data in electronic format to the CxA.

4. Data shall include a single row of field headings and the data thereafter shall be contiguous. Each record shall include a date and time field. Recorded parameters for a given piece of equipment or component shall be trended at the same intervals and be presented in a maximum of two separate two dimensional formats with time being the vertical axis and field name being the horizontal axis. Data shall be forwarded in one of the following formats.

   a. Microsoft EXCEL Spreadsheet (.xls)
   b. Comma Separated Value (.csv or .txt) preferably with quotes delimiting text fields and # delimiting date/time fields

5. If sample times are trended as COV or change of value, when output to the trending file, the latest recorded value shall be listed with any given time increment record. If the system does not have the capability to fill the archive with
the latest value, the parameter shall be recorded based on the interval common to the unit.

6. Contractor shall provide the CxA with required passwords, phone numbers, etc. to allow the CxA access to the trend log data and allow downloading to a remote location. Contractor shall also provide step-by-step written instructions for accessing the data.

3.10 DEFERRED TESTING

A. Unforeseen Deferred Tests: If any check or test cannot be completed due to the project completion level, required occupancy condition or other deficiency, execution of checklists and performance testing may be delayed upon approval of the CxA. These tests will be conducted in the same manner as the seasonal tests as soon as possible. Services of necessary parties will be negotiated.

B. Seasonal Testing: During the warranty period, seasonal testing (tests delayed until weather conditions are closer to the system’s design) shall be completed as part of this contract. The CxA shall coordinate this activity through the Owner/CM. Tests will be executed, documented by the CxA and deficiencies should be corrected by the appropriate contractor/ subcontractors with the CxA witnessing. Any final adjustments to the O&M manuals and as-built drawings due to the testing shall be made by the contractor.

3.11 Warranty Review

A. During the first year of the system and buildings’ operation, it is important to assure that the performance of the facility is maintained, particularly before the warranty period expires. At 10 months into a 12 month warranty period, operation of system and components is reviewed by the Owner, Contractor, and the CxA to identify any items that must be repaired or replaced under warranty. CxA will also interview building operating personnel to identify any outstanding warranty failures and any persistent equipment failures that should be handled within the warranty period. This review is based on warranty items and continued performance with Owner’s project Requirements. The CxA will document the results and forwards recommendations to Owner and Contractor for resolution.

END OF SECTION 019113
**Legend for Table:**

- **Note 1:** Sections with revisions are indicated in the Table in **Bold Black Font.**
- **Note 2:** New Sections are indicated in the Table in **Underlined Bold Blue Font.**

Legend for Sections:
- **Note 3:** Changes to Sections within this Project Manual include additions in **underlined blue font,** and deleted text in **gray strikeout.**

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STRUCTURAL METAL ROOF PANELS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Exterior engineered structural standing seam prefabricated and prefinished metal panel roof system.

B. Related Sections:
   1. Section 012500 - Substitution Procedures.
   2. Section 013300 - Submittal Procedures.
   4. Section 018113 - Sustainable Design Requirements.
   5. Section 055000 - Metal Fabrications.
   6. Section 076200 - Sheet Metal Flashing and Trim.

1.02 REFERENCES

A. ASTM International (ASTM):
   4. D 2244-16 - Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates.

B. California Code of Regulations (CCR):

C. American Architectural Manufacturers Association (AAMA):
   2. 621-02 - Voluntary Specification for High Performance Organic Coatings on Coil Coated Architectural Hot Dipped Galvanized (HDG) and Zinc-Aluminum Coated Steel Substrates.
D. American Iron and Steel Institute (AISI):
   1. Cold Formed Steel Design Manual.

E. Underwriters Laboratories, Inc. (UL):
      a. Test Procedure UL 580.

F. United States Green Building Council (USGBC):
   1. Leadership in Energy and Environmental Design (LEED):

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Refer to Section 017419 regarding procedures for implementing construction waste management requirements.

B. Coordination: Refer to Section 018113 regarding procedures for implementing sustainable design requirements.

1.04 SUBMITTALS

A. General: Make submittals in accordance with provisions of Section 013300.

B. Product Data: Submit complete manufacturer's descriptive literature and specifications.

C. Shop Drawings: In conjunction with the submittals requirements of Section 055000, submit complete Shop Drawings comprehensively describing fabrication and erection of metal siding. Include not less than the following:
   1. Required spacing of support framing.
   2. Location of fasteners.
   3. Special closures and trim.

D. Samples: Submit two samples 12 inches long by full panel width showing proposed metal gage, seam profile, and required finish in colors selected by Architect, for review and acceptance.

E. Quality Control Submittals:
   1. Submit engineering data for preformed metal roofing system.
   2. Test Reports: Submit test reports prepared by Underwriters Laboratories indicating proposed roof system compliance with wind uplift requirements of UL90.
   3. Certificates: Submit manufacturer's certification, based on independent testing laboratory, indicating no measurable water penetration or air leakage through the system when tested in accordance with ASTM E 1680 and ASTM E 1646.

1.05 SUSTAINABLE DESIGN SUBMITTALS

A. Material & Resources Submittals: Refer to Section 018113 for additional information on LEED submittals.

1. Letter Template for MR Credit 2.1 and MR Credit 2.2: Letter template, signed by Contractor, tabulating total waste material, quantities diverted and means by which it is diverted, and statement that requirements for the credit have been met.
   a. Comply with Section 017419 Construction Waste Management and Disposal.
2. Product Data and Certification Letter for MR Credit 4.1 and MR Credit 4.2: Indicate percentages by weight of post-consumer and pre-consumer recycled content for products having recycled content. Include statement indicating costs for each product having recycled content.

3. Product Data for MR Credit 5.1 and MR Credit 5.2: For regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

1.06 QUALITY ASSURANCE

A. Qualifications:
1. Manufacturer's Qualifications: Minimum 10 years in the manufacture of prefinished roofing systems. Maintain in-house testing facilities capable of providing timely data on installation methods.
2. Installer's Qualifications: Licensed, certified or otherwise approved in writing by the system manufacturer. Provide list of five similar projects, locations, and contact information to demonstrate satisfactory experience.

B. Field Samples: When and as directed by the Architect, install field samples of each color in designated finishes indicating jointing, flashing, and overall workmanship for review and acceptance.
1. Samples shall be 4 feet by 10 feet in a location indicated by Architect prior to installation.
2. Provide field samples identical in every respect to completed work.
3. When accepted, field samples may be deemed as incorporated into the work and will become the standards by which subsequent work of this Section will be evaluated for acceptance.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials protectively coated bearing the manufacturer's label in legible condition and with plastic sheeting or strippable film coating between all panels. Do not allow film to remain on panels in extreme heat, cold, or in direct sunlight. The Architect reserves the right to reject the following:
1. Panels and components not identifiable as accepted products of the accepted manufacturer.
2. Panels and components that are dented, bent, warped, or otherwise damaged in a manner precluding immediate installation.
3. Panels and components the finish of which has been abraded or otherwise damaged in a manner precluding restoration.

B. Storage: Store panels above ground, with one end elevated.
1. Protect panels against standing water. If panels become wet, immediately separate sheets, wipe dry, and allow to dry.

C. Handling: Handle panels with non-marring slings.
1.08 WARRANTY

A. Manufacturer's Warranty: Furnish manufacturer's 20-year warranty against failure of architectural polyvinylidene fluoride (PVDF) finish as follows:
1. Free of fading or color change in excess of 5 NBS units as measured per ASTM D 2244.
2. Will not peel, crack, chip, or delaminate.
3. Will not chalk in excess of numerical rating of 7 when measured in accordance with standard procedures specified in ASTM D 4214.

B. Contractor's Warranty: Furnish a 2-year warranty covering repairs required to maintain roof and flashings in watertight condition, including panels, flashings, sealants, fasteners, and accessories against defects in material and workmanship.

PART 2 - PRODUCTS

2.01 MANUFACTURERS


B. Acceptable Manufacturers:

C. Like materials shall be the products of one manufacturer and shall be either the ones upon which the design is based or equal products of other manufacturers accepted in advance in accordance with Section 012500.

2.02 REGULATORY REQUIREMENTS

A. Comply with requirements of applicable building codes and other agencies having jurisdiction for wind uplift rating of preformed metal roofs.

B. Waste Management: Comply with CALGreen Section 5.408 Construction Waste Reduction, Disposal and Recycling. Establish a construction waste management plan for the diverted material.
1. Recycle or salvage for reuse a minimum of 50 percent of the non-hazardous construction and demolition waste in accordance with CALGreen 5.408.1.3.
   a. Include carpet, wood, aggregate, paint, shingles, wallboard, and other materials that have recyclable value.
2. Reuse and recycle 100 percent of trees, stumps, rocks, and associated vegetation and soils resulting primarily from land clearing in accordance with CALGreen 5.408.3.
3. Submit documentation to enforcing agency which demonstrates compliance with CALGreen 5.408.1.4. Sample compliance forms are available in the CALGreen Guide.

2.03 SUSTAINABILITY REQUIREMENTS

A. LEED Goals for Materials & Resources: For additional information on LEED goal requirements, refer to Section 018113.

1. MR Credit 2.1 and MR Credit 2.2 Construction Waste Management: Divert 75 percent of construction waste from landfill in accordance with County requirements and to achieve LEED certification point as defined by the U.S. Green Building Council.
   a. Note that excavated soils and land-clearing debris (organic material) does not count toward construction waste credits, but all material shall be disposed of responsibly.

2. MR Credit 4.1 and MR Credit 4.2 Recycled Content: Use materials with recycled content such that the sum of post-consumer recycled content plus one-half of the pre-consumer content constitutes 20 percent of the total value of the materials in the project.

3. MR Credit 5.1 and MR Credit 5.2 Regional Materials: Use building materials or products that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of the project site for a minimum of 20 percent of the total materials value.

2.04 PERFORMANCE CRITERIA

A. Performance Requirements:

1. Components shall resist the required wind loads without exceeding a deflection of 1/240th of the span.

2. Section properties shall be calculated per AISI Design Manual referenced.

3. Provide UL 90 rated roofing system tested in accordance with UL 580 test procedures to resist UL 90 wind uplift rating.

4. System shall comply with ASTM E 1592.

2.05 MATERIALS

A. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A792, Class AZ50 coating designation, Grade 40. Provide sheet steel with factory-applied protective coating conforming to the following:

1. Galvalume Coating: Conform to ASTM A 792 Grade 40.
   a. Provide coating applied to a thickness of not less than 1.9 mils.

B. Fasteners: Provide manufacturer's standard corrosion-resistant screws. When exposed at faces of panels, provide fastener heads color-coated to match contiguous finish.

2.06 COMPONENTS

A. Roof Panels: MorZip Structural Standing Seam Metal Roof System, or equal.

1. Material: Sheet steel with Galvalume coating, 20 gage or as required by design loads.

   a. Panel Width: 12 inches
   b. Seam Height: 2-1/2 inches
   c. Texture: Smooth.
B. Flashing and Trim:
   1. Fabricate flashing and trim from same material as roof panels unless otherwise noted. Finish to match metal roof panels.
   2. Locations include, but are not limited to the following: Drips, eave and rake edges, roof penetrations, hips, and valleys.

C. Panel Sealant:
   2. Butyl Tape: Per panel manufacturer's recommendations for panel to panel and panel to trim seal.
   3. Butyl Sealants: Non-skinning type per panel manufacturer's recommendations.

D. Clip/Fastener Assemblies: Comply with UL 90 requirements.
   1. Fasteners: Manufacturer's standard #12-24 x 1-1/4" long self-drilling, self-tapping hex head drive screws for metal; noncorrosive base material.
   2. UL Rated Clip: Sliding 22 gage galvanized steel hook in combination with a double fastened 16 gage galvanized steel base, both at \( F_y \) (min) = 33 ksi. Clip hook shall have a shop installed hot melt butyl sealant for continuity of seal at clip locations.

E. Roof panel accessories: Accessories shall be as indicated on approved shop drawings and per manufacturer's approved standard details. Provide accessories as required for a complete installation.
   1. Sheet Metal Flashings and Trim: Sheet metal of same material, finish, and color as panels. Refer to Section 076200.
      a. Gutters and downspouts will be fabricated to the same gauge and specification as panel.
      b. End Plugs: Provide nylon seam end plugs for clean termination of panels.
      c. Provide factory fabricated rib covers at roof slope transitions.
      d. Provide transition rib covers where roofing changes direction.
   2. Fasteners: Fasteners as recommended by manufacturer.
   4. Concealed Anchor Clips: Floating anchor clip, two piece, or single halter style clip.
   5. Surface Conditioner: Surface conditioner, as recommended by manufacturer of product proposed for use.
   6. Tape: Butyl type.
   7. Field Sealant: Color coordinated primerless silicone or high grade, non-drying butyl as recommended by panel manufacturer.
      a. Do not use sealant containing asphalt.

2.07 FABRICATION

A. Panels:
   1. Provide panels in full length from ridge to eave.
   2. Where single length panels are not practical, provide mated swaged panels for positive joint end laps, shingled to accommodate water run-off (fabricated with overlap in direction of water flow).
3. Provide flush horizontal and vertical surfaces, to facilitate sealing at terminations. Panel configurations shall not create voids or require supplemental closure devices.

B. Seams:
   1. Panel seams shall interlock entire length of seam.
   2. Design standing seam to lock-up and resist joint disengagement during design wind uplift conditions.
   3. Provide factory sealant within confines on trailing edge of female seam leg to aid in resistance of leaks, and to provide panel-to-panel seal while allowing expansion and contraction movement. The seams shall be continuously locked or crimped together by mechanical means during installation.

C. Clips:
   1. Provide UL listed (standard) clip designed to allow panels to thermally expand and contract; and provide plus-or-minus 1 inch of thermal movement. Clip shall incorporate a self centering feature to allow 1-inch of movement in both directions along panel length.
   2. Design panels to use concealed anchors that permit expansion and contraction, except at eaves, end laps, ridges, valleys, hips and gables.

D. Shop Finishing: Surfaces of pans, trim, closures, and accessory items permanently exposed to view shall be finished as specified below:
   1. Fluoropolymer Finish: Manufacturer's standard 70 percent content polyvinylidene fluoride (PVF₂), equal to Kynar500 or Hylar 5000 complying with AAMA 621.
      a. Exposed Face:
         1) Primer: Baked-on epoxy primer 0.3-mil thick DFT.
         2) Finish: 0.8-mil thick DFT finish coat.
         3) Reflective gloss shall be 15 percent in accordance with ASTM D 523.
      b. Concealed Face: Polyester with a nominal dry film thickness of 0.35 mils.
         1) Primer: Baked-on epoxy primer 0.15-mil thick DFT.
         2) Finish: 0.2-mil thick DFT finish coat.
      c. Color: As selected by the Architect from the manufacturer's standard color palette.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verification of Conditions:
   1. Verify that structural members to receive panels are located in a true plane.

3.02 PREPARATION

A. Protection:
   1. Where sheet metal is in contact with dissimilar metals, execute juncture to facilitate drainage and minimize possibility of galvanic action.
2. At point of contact with dissimilar metal, coat metal with protective paint or tape which can be placed between metals.

3.03 INSTALLATION

A. Comply with manufacturer's instructions for assembly, installation, and erection for a weathertight installation. Install in accordance with reviewed Shop Drawings.

B. Remove strippable protective coating as each panel is installed. Do not allow such coatings to remain on components in extreme heat or cold, or in direct sunlight or other ultraviolet light source.

C. Standing Seam System: Anchor securely in place using clips and fasteners spaced in accordance with manufacturer's recommendations for design wind load criteria.
   1. Install seams, top closures, ridge covers, and other required flashing pieces using tape and sealants as recommended by the manufacturer to provide a completely watertight installation.
   2. Roofing panels shall be of sufficient lengths to eliminate horizontal joints where practical.
   3. Where horizontal joints are unavoidable, pans shall overlap 4 inches with upper pan having a 1-inch hook into horizontal cleat the full width of pan.
   4. Install flashings to allow for thermal movement.
   5. Where necessary to cut panels, debur, and treat with galvalume paint.
   6. No welds will be permitted in exposed surfaces.

D. Field apply sealant to penetrations, transitions, and other non-seam locations necessary for airtight, waterproof installation.

3.04 ADJUSTING

A. Repair and replace panels and trim which have been damaged. Touch-up minor damage to finish with same materials as those used in shop-applied coatings. All other damaged material shall be replaced.

3.05 CLEANING AND PROTECTION

A. Clean exposed surfaces of work promptly after completion of installation.

B. Do not allow traffic on completed roof. If required, provide cushioned walk boards.

C. Protect work as required to ensure roofing will be without damage at time of final completion.

END OF SECTION
ALUMINUM FOLDING PANEL STOREFRONTS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Glazed aluminum sliding/folding walls at Servery.
   1. Folding panel storefront does not include swing panels used as doors.

B. Referenced Sections:
   1. Section 012500 - Substitution Procedures.
   2. Section 013300 - Submittal Procedures.
   3. Section 016600 - Product, Storage, and Handling Requirements.
   4. Section 018113 - Sustainable Design Requirements.
   5. Section 084000 - Entrances, Storefronts, and Curtain Walls.
   6. Section 088100 - Glass Glazing: General requirements for glazing systems.

1.02 REFERENCES

A. ASTM International (ASTM):

B. American Architectural Manufacturers Association (AAMA):
   1. 611-12 - Voluntary Specification for Anodized Architectural Aluminum (Revised).
   2. 1303.5-76 - Voluntary Specifications for Forced-Entry Resistant Aluminum Sliding Glass Doors.

C. California Code of Regulations (CCR):
   1. Title 24, Part 2 - California Building Code (CBC), 2013 edition:

D. Fenestration Systems Inc. [formerly The Association] (CAWM):
   1. 300 - Revisions to CMBSO 1-79 - Forced entry Resistance Tests For Windows.

E. National Fenestration Rating Council (NFRC):
   1. 100 - Procedure for Determining Fenestration Product Thermal Materials.
   3. 400 - Procedure for Determining Fenestration Product Air Leakage.

F. United States Green Building Council (USGBC):
   1. Leadership in Energy and Environmental Design (LEED):

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Refer to Section 018113 regarding procedures for implementing sustainable design requirements.

1.04 SUBMITTALS

A. Product Data: Submit complete manufacturer's descriptive literature and specifications in accordance with the provisions of Section 013300.
   1. Include Owner's manual and test data listing compliance to performance criteria.

B. Shop Drawings: In accordance with Section 013300, submit Shop Drawings comprehensively describing the fabrication and installation of sliding entrances.
   1. Indicate dimensioning, direction of swing, configuration, swing panels, typical head jamb, side jambs and sill details, type of glazing material and handle height.

1.05 SUSTAINABLE DESIGN SUBMITTALS

A. Materials & Resources Submittals: Refer to Section 018113 for additional information on LEED submittals.
   1. Product Data and Certification Letter for MR Credit 4: Indicate percentages by weight of post-consumer and pre-consumer recycled content for products having recycled content. Include statement indicating costs for each product having recycled content.

   2. Product Data for MR Credit 5: For regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
1.06 CLOSEOUT SUBMITTALS

A. Submit Owner’s Manual from manufacturer. Identify with project name, location and completion date, type and size of unit installed.

1.07 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer: A single source manufacturer with at least 15 years of experience in providing folding/sliding glazed door systems for large openings.
   2. Installer: Installer experienced in the installation of manufacturer’s products or other similar products for large openings. Installer shall provide reference list of at least three projects of similar scale and complexity successfully completed in the last 3 years.

1.08 DELIVERY, STORAGE, AND HANDLING

A. In addition to general delivery, storage, and handling requirements specified in Section 016600, comply with the following:
   1. Deliver materials to job site in sealed, unopened cartons or crates. Protect units from damage. Store material under cover, protected from weather and construction activities.

1.09 FIELD CONDITIONS

A. Existing Conditions: Verify dimensions with actual field conditions. Inspect related work and adjacent surfaces. Report all conditions which prevent proper execution of this work to the Architect.

1.10 WARRANTY

A. Special Warranty: Provide warranty against defects in materials and workmanship.
   1. Warranty Period: Two years for units (installation by manufacturer’s certified trained installer required), five years for seal failure of insulated glass, and ten years for rollers, all from date of Substantial Completion of Project.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design Manufacturer:

B. Acceptable Manufacturers:
   3. Other manufacturers that comply with all specified requirements of this Section.
C. Like materials shall be the products of one manufacturer and shall be either the ones upon which the design is based or equal products of other manufacturers accepted in advance in accordance with Section 012500.

2.02 REGULATORY REQUIREMENTS

A. Conform to applicable provisions of California Building Code.

B. Comply with CALGreen 5.504.4.4 Adhesives, Sealants, and Caulks: Adhesives, sealants, primers, and caulks in amounts greater than 16 ounces shall comply with SCAQMD Rule 1168 VOC limits, as indicated in Tables 5.504.4.1 and 5.504.4.2.
   1. Aerosol adhesives and smaller sizes of adhesives and sealant or caulking shall comply with CCR Title 17, commencing with Section 94507.

C. Comply with safety glazing requirements of ANSI Z97.1 and CPSC 16CFR 1201.

2.03 SUSTAINABILITY REQUIREMENTS

A. LEED Goals for Materials & Resources: For additional information on LEED goal requirements, refer to Section 018113.
   1. MR Credit 4 - Recycled Content: Use materials with recycled content such that the sum of post-consumer recycled content plus one-half of the pre-consumer content constitutes percent of the total value of the materials in the project.
   2. MR Credit 5 - Regional Materials: Use building materials or products that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of the project site for a minimum of percent of the total materials value.

2.04 PERFORMANCE/DESIGN CRITERIA

A. Design Requirements: Design header such that the deflection with the live load is limited to the lesser of L/720 of the span and 1/4-inch.
   1. Adjustment: Provide system capable of specified amount of adjustments without removing panels from tracks.

B. Performance Requirements: System shall comply with applicable manufacturer’s independently certified minimum testing results.
   1. Air Infiltration: When tested according to ASTM E 283 and NFRC 400, provide system with maximum air leakage of 0.04 cfm/ft at a static air pressure difference of 1.57 psf (25 mph) and with maximum air leakage of 0.17 cfm/ft at a static air pressure difference of 6.24 psf (50 mph).
   2. Structural Test Performance: When tested according to ASTM E 330 at 150% of positive and negative design pressures with panel sizes of 3 feet wide and 8 feet high, provide inswing system with raised sill and reinforced posts that achieves a positive design pressure rating of +55 psf (146 mph) and a negative design pressure rating of 90 psf (187 mph).
   3. Thermal Performance U-Value: Unit shall be rated, certified, and labeled in accordance with NFRC 100, as indicated in manufacturer’s latest published data for the glazing specified.
4. Forced Entry Resistance: Provide system that, when tested according to ASTM F 842 and AAMA 1304, there was no entry.

2.05 SYSTEM DESCRIPTION

A. Design is based on Modernfold Glass Wall Model FSW-C Continuously Hinged Manual Cente Stack Folding Sliding Walls, manufactured by Modernfold, or equal.

2.06 MATERIALS

A. Aluminum: ASTM B 221 Alloy 6063 Temper T5 for extrusions with nominal thickness of 0.078-inch.

B. Glass: 1/2" clear tempered glass.
1. Refer to Section 088100 for glass and glazing requirements.

2.07 COMPONENTS

A. Panels:
1. Glass panels shall be captured in full width aluminum stiles at top and bottom of each panel.
2. Panel Size: 3'-3" maximum. Provide height as indicated on the Contract Drawings.

A. Design is based on the use of NanaWall SL60, Monumental Thermally-Broken, Aluminum-Framed, Folding Panel System as manufactured by Nana Wall Systems.

1. Thermally-Broken: 3/4-inch to 15/16-inch polyamide plastic reinforced with glass fibers. Pour and de-bridge thermal break will not be accepted.

B. Stacking Bays and Folding Panels: Provide head jamb, side jambs, sliding panels, swing panels, and stacking bays with dimensions as indicated on Contract Drawings.

1. Provide number and size of panels and location of tracks and stacking bays as indicated on Contract Drawings.
2. Provide panels with standard one lite.

C. Folding/Sliding Hardware:

1. Provide manufacturer’s standard combination folding and sliding hardware with top, bottom tracks and threshold. Running carriages shall be provided with sealed, self-lubrication, ball bearing multi-rollers.
   a. Surface mounted hinges and running carriages will not be allowed.
   b. Weight of panels to be borne by the bottom of the guide channel in the sill will not be allowed.

2. Hinges: Stainless steel with finish closest match to finish of frame and panels. Provide stainless steel security hinge pins with set screws.

3. Provide upper guide carriage and lower running carriage with four vertical stainless steel wheels and two horizontal polyamide wheels. The vertical wheels to ride on top of stainless steel guide track covers over the full length of the sill track and lie above the water runoff level. Carrying capacity of lower running carriage to be 220 lbs.
Wheels riding below the water run-off level and/or wheels riding on aluminum surfaces will not be allowed.

4. Adjustment: Provide folding/sliding hardware capable of specified amount of compensation and adjustments without needing to remove panels from tracks, in width, 1/16 inch per hinge and in height, 1/16 inch up and down.

D. Operating Hardware:

1. Main Entry Panel: On main entry pair of panels on models without a swing panel, provide manufacturer’s standard L-shaped lever handle on inside only with concealed two point locking hardware operated by 180-degree turn of handle.

2. On pairs of folding panels, provide concealed two point locking hardware operated by 180 degree turn of handle between each pair. Standard handle finish shall be stainless steel in a brushed satin finish. Face applied flush bolt locking will not be allowed.

3. Provide handle height centered at 41 3/8 inches from bottom of panel.

4. Aluminum or steel locking rods, as required to meet higher structural loads, capped by polyamide at top and bottom tracks. Rods shall have a stroke of 15 1/16 inch.
   a. Provide cylinder lock keyed to building system.

E. Glass: 3/4-inch clear insulating low E tempered, in accordance with requirements of Section 088100:

1. Provide continuous EPDM gaskets and extruded aluminum snap-in glazing bead for dry glazing.

2. Swing Panels: None.

F. Other Components:

1. Weatherstripping: Provide manufacturer’s standard double layer EPDM, Q-ion gasket, or brush seals with a two layer fiber glass reinforced polyamide fin at both the inner and outer edge of door panels or on frame for sealing between panels and between panel and frame. Single layer weather stripping will not be allowed.

2. Threshold: Provide thermally broken with polyamide raised sill in same finish as panel finish. A cover plate over the sill will not be allowed.

3. Fasteners:
   a. Aluminum or other non-corrosive materials compatible with aluminum.
   b. Provide tapered pins or machine screws for connecting frame components.

2.08 SUSPENSION SYSTEM

A. G-150 Suspension System:

1. Suspension Tracks: Extruded aluminum with a minimum wall thickness of 0.235 inches. Incorporate cast aluminum or mitered intersections, switches, and curves in stacking area. Provide alignment pins for track, intersections, switches and curves insuring both fit and roller surface integrity.
   a. Exposed track soffit: Factory-finished aluminum with white powder coat.
2. **Carriers:** Two stainless steel trolleys with vinyl roller surfaces. Trolley design incorporates eight (8) wheels of varying dimensions. Automatic indexing of panels into stack area is provided by pre-programmed switches and trolleys without electrical, pneumatic, or mechanical activation.

### 2.09 OPERATION

A. **Manually operated and top-supported series of individual glass panels.** Panels use two-piece, clamp-on top and bottom rail that fastens together from alternating sides.

### 2.10 CONSTRUCTION

A. **Provide top reinforcement as required to support panel from suspension components and provide reinforcement for hardware attachment.** Fabricate panels with concealed fasteners. Finished in-place partition shall be rigid, level, plumb, aligned with uniform joints and appearance; free of bow, warp, twist, deformation, surface and finish irregularities.

B. **Dimensions:** Fabricate operable glass panel partitions with manufacturer's standard panel sizes to form an assembled system of dimensions indicated on Drawings, and verified by field measurements.

C. **Top and Bottom Rails:** Continuous two-piece assemblies with removable end caps. Rails fasten together from alternate sides of partition allowing for field adjustment to job site conditions. Snap-on covers are furnished to facilitate installation.

D. **Bottom Rail Locking System:** Floor bolts are used to stabilize panels from movement in all directions.

### 2.11 FABRICATION

A. **General:** Shop fabricate into complete unit, verifying measurements at the job site prior to fabrication.
   1. Provide system capable of specified amount of adjustments without removing panels.

B. **Workmanship:** Fabricate in accordance with the manufacturer's published recommendations.
   1. Accurately miter and fit all members to hairline joints.
   2. Weld or mechanically fasten along entire line of contact on the unexposed side.

C. Use extruded aluminum frame and panel profiles, corner connectors, hinges, folding/sliding hardware, locking hardware and handles, glass and glazing, and weather stripping as specified herein to make a folding/sliding glass wall. Factory preassemble as is standard for manufacturer and ship with components and installation instructions.

D. **Sizes and Configurations:** See drawings for selected custom dimensions within maximum frame sizes possible as indicated in manufacturer's literature. Refer to Contract Drawings for selected number of panels and configuration (inward opening unit).
2.12 FINISH

A. Finish: Coating: Conform to the requirements of AAMA 2603 for silicone polyester specified in Section 050513.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify structural integrity of support beams.
   1. Examine surface of openings and verify dimensions.
   2. Verify rough openings are level, plumb, and square, with no unevenness, bowing, or bumps on floor.

B. Verify the structural integrity of the header such that the deflection with live and dead loads complies with the requirements of Paragraph 2.04-A.

C. Verify structural support for lateral loads in both wind load and eccentric load when the panels are stacked open.

D. Apply building dead loads to the header prior to installing the panels. If a reasonable amount of time has been allowed for the effect of this dead load on the header, then only the building live load can be used to meet the requirements of Paragraph 2.04-A.

E. Examine surfaces of openings and verify dimensions. Verify rough openings are level, plumb, and square with no unevenness, bowing, or unevenness on the floor over which the panels travel.

3.02 INSTALLATION

A. General: Install frame members in accordance manufacturer’s recommendations and installation instructions with adequate provision for settling, expanding, and contracting to occur without damage to glass. Properly flash and waterproof around the perimeter of the opening.
   1. Comply with ASTM E 557, operable glass partition manufacturer’s written installation instructions, Drawings, and approved Shop Drawings.

B. Anchoring: Anchor securely and rigidly fit frame in place, absolutely level, straight, plumb, and square in elevation, plane, location, and in proper alignment with other work.

C. Install panels, handles, and lockset in accordance with manufacturer’s recommendations.

D. If necessary, provide drain connections from lower track.

3.03 ADJUSTING

A. Adjust hardware for proper operation. Operate the doors through not less than 10 complete movement cycles. Confirm that all functions, devices and features are performing as required. Readjust door for optimum operating condition. Lubricate operating equipment as required.

3.04 CLEANING

A. General: Immediately prior to acceptance of the work, remove protective materials from the storefront system and clean exposed members.
3.05 **DEMONSTRATION**

A. Demonstrate proper operation and maintenance procedures to Owner's representative.

B. Provide Operation and Maintenance Manual to Owner's representatives.

**END OF SECTION**
PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Light gage metal wall and ceiling framing systems.
   1. Refer to Section 054100 where heavier gage or structural studs are required at interior locations.

B. Referenced Sections:
   1. Section 012500 - Substitution Procedures.
   2. Section 013300 - Submittal Procedures.
   4. Section 018113 - Sustainable Design Requirements.
   5. Section 053100 - Steel Decking: Coordination of hanger placement prior to pouring floor or roof fill.
   6. Section 054100 - Structural Metal Stud Framing: Load resisting metal studs.
   7. Section 078400 - Firestopping: Fire safing.
   8. Section 079200 - Joint Sealants.
  10. Section 098100 - Acoustic Insulation: Requirements for airtightness and reduction of sound transmission.

1.02 REFERENCES

A. ASTM International (ASTM):
   4. C 645-14 - Specification for Non-Structural Steel Framing Members.

B. California Code of Regulations (CCR):
   1. Title 24, Part 2- California Building Code (CBC), 2013 edition:
      a. Chapter 22 - Steel.
   a. Chapter 35 - Welding and Other Hot Work.
      1) Section 3504 - Fire Safety Requirements.
         a) 3504.1 - Protection of Combustibles.
         b) 3504.2 - Fire Watch.
         c) 3504.3 - Area Reviews.

C. American Iron and Steel Institute (AISI):
   1. Code of Standard Practice for Cold-Formed Steel Structural Members, latest edition.
   2. Cold-Formed Steel Framing Design Manual, latest edition.

D. ICC Evaluation Service, Inc. (ICC ES), a subsidiary corporation of the International Code Council
   1. ICC ES Evaluation Reports, Materials, Products, Methods and Types of Construction (ESR-).

E. Steel Stud Manufacturers Association (SSMA):
   1. Industrial Technical Note Series.

F. Underwriters Laboratories, Inc. (UL):

G. United States Green Building Council (USGBC):
   1. Leadership in Energy and Environmental Design (LEED):

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Refer to Section 017419 regarding procedures for implementing construction waste management requirements.

B. Coordination: Refer to Section 018113 regarding procedures for implementing sustainable design requirements.

C. RFI Requirements: Generate quality engineering drawings for RFIs, issued by a qualified detailer. Accompany RFIs with structural foundation or framing plans. Copy partial plans and relevant details from Contract Drawings and indicate grid line locations and floor levels. Furnish properly drawn engineering drawings illustrating as-built conditions, issues in question, and Contractor's proposed solutions. Photographs are not acceptable substitutions to engineering drawings.
   1. Incomplete RFIs will be returned without response. Contractor will be responsible for delay due to incomplete RFIs.

1.04 SUBMITTALS

A. Product Data: In accordance with the provisions of Section 013300, submit complete manufacturer's descriptive literature and specifications.

B. Shop Drawings: In accordance with the provisions of Section 013300, submit complete Shop Drawings comprehensively describing fabrication and installation of non-load bearing wall framing.
C. Design Data: Submit design calculations, large scale elevation of every wall, large scale wall sections, enlarged connection details showing reactions to support structure, and schedule showing member sizes

D. Test Data and Evaluation Reports: Submit independent laboratory sound test results demonstrating compliance with acoustical requirements for 20 gage EQ studs used in sound-rated partitions.

1.05 SUSTAINABLE DESIGN SUBMITTALS

A. Materials & Resources Submittals: Refer to Section 018113 for additional information on LEED submittals.

1. Letter Template for MR Credit 2: Letter template, signed by Contractor, tabulating total waste material, quantities diverted and means by which it is diverted, and statement that requirements for the credit have been met.
   a. Comply with Section 017419 Construction Waste Management and Disposal.

2. Product Data and Certification Letter for MR Credit 4: Indicate percentages by weight of post-consumer and pre-consumer recycled content for products having recycled content. Include statement indicating costs for each product having recycled content.

3. Product Data for MR Credit 5: For regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

1.06 QUALITY ASSURANCE

A. Qualifications:

1. Welder’s Qualifications: Currently certified in accordance with AWS D1.1 and D1.3, as applicable for light gage steel.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturers: Members of Steel Stud Manufacturers Association (SSMA), Chicago, IL (312)456-5590, including the following:


4. Design Shapes in Steel, South El Monte, CA (626)579-2032.


7. United Metal Producers, Inc., Corona, CA (951)739-9535.

B. Acceptable Manufacturers of Drywall Accessories:

C. Acceptable Manufacturers of Foam Sealant Tapes:

D. Like materials shall be the products of one manufacturer and shall be either the ones upon which the design is based or equal products of other manufacturers accepted in advance in accordance with Section 012500.

2.02 REGULATORY REQUIREMENTS

A. Regulations:
   1. Comply with the applicable requirements of ASTM C 754 and the ML/SFA Specifications referenced.
   2. Comply with one of the following:
      b. ICC ES Active Evaluation Report ER-4943P for members of the Steel Stud Manufacturers Association, as applicable, for the proposed manufacturer of the steel stud system.
   3. Comply with UL 2079 for deflection track in fire rated walls, as applicable.

B. Waste Management: Comply with CALGreen Section 5.408 Construction Waste Reduction, Disposal and Recycling. Establish a construction waste management plan for the diverted material.
   1. Recycle or salvage for reuse a minimum of 50 percent of the non-hazardous construction and demolition waste in accordance with CALGreen 5.408.1.3.

2.03 SUSTAINABILITY REQUIREMENTS

A. LEED Goals for Materials & Resources: For additional information on LEED goal requirements, refer to Section 018113.
   1. MR Credit 2 - Construction Waste Management: Recycle and/or salvage at least 75 percent of non-hazardous construction and demolition debris.
   2. MR Credit 4 - Recycled Content: Use materials with recycled content such that the sum of post-consumer recycled content plus one-half...
2.04 DESIGN CRITERIA

A. Design Requirements: Design of gage, spacing, and connections is indicated on the Contract Drawings.
   1. Deflection properties shall be in accordance with Structural Contract Drawings.
   2. Design is based on the use of ClarkDietrich's ProSTUD Drywall Framing System manufactured by ClarkDietrich Building Systems, or equal.

B. Framing Members, General: Cold-rolled hot-dip galvanized steel track conforming to ASTM C 645 (Note: ClarkDietrich ProSTUD EQ Drywall Framing products are not required to meet the 0.0312-inch minimum thickness requirement for 20 gage studs in accordance with ASTM C 645).
   1. Design Responsibility: Drawings and calculations shall be stamped by a Professional Engineer (PE).
   2. Coordination Effort: Design engineer shall submit a signed letter stating that they have reviewed the construction documents as related to the boundary conditions to which the light gage framing is attached to and other elements supported by the metal studs.
   3. Wind Load and Seismic Load: In accordance with Structural Contract Drawings.
   4. Accommodate interstory horizontal drift in accordance with Structural Contract Drawings.
   5. Accommodate vertical building structure deflection of 3/4-inch.
   6. Design to accommodate attachment of adjacent elements, such as windows, doors, and other architectural elements. Coordinate with other trades to accommodate welded, bolted and/or screws attachment. Design for additional loads from these elements, including weight, wind load and seismic load.
   7. Supporting elements shall be designed to avoid torsion.
   8. Ceiling and soffit framing shall be designed to deflect less than L/240. Design shall accommodate 10 psf of live load in additional to all dead load.
   9. Use of shot pins/pneumatic fasteners in direct tension is not acceptable.
   10. Expansion anchors and epoxy anchors shall have a minimum embedment of eight times bolt diameter. Such anchors shall have a current ICC report.

C. Provide properties in accordance with Steel Stud Manufacturers Association (SSMA) recommendations.
   1. In accordance with GA-216 update, where studs complying with ASTM C 645 are used to received abuse-resistant and impact-resistant gypsum panels, they shall be not less than true 20 gage
0.312-inch design thickness studs in accordance with Section 4.3 and Section 8.1 of ASTM C 645.

2. High performance gypsum board panels that provide wet code compliance, such as moisture-resistant and tile backer boards, shall be not less than true 20 gage 0.312-inch design thickness studs.

3. Refer to 1.04-D for testing sound-rated wall assemblies with 20-gage EQ studs.

D. Structural Design:
1. Structural design of overhead non-structural light gage metal framing systems is indicated on the Structural Contract Drawings.

2. Provide framing systems, gages, supports, bracing, and connections as necessary to meet the structural requirements specified.

3. Partition framing shall conform to the widths indicated. Provide thicker gages and decreased stud spacing as necessary to meet the design requirements.

4. Select framing members based on the manufacturer's published span tables.

E. Design Loads: If not otherwise indicated in Structural Contract Drawings, design loads shall be as follows:
1. Interior Ceiling Assemblies: 5 pounds per square foot uniform live load, plus dead loads.

   a. Live load not applicable where light fixtures, ductwork, and other items are independently supported.

2. Exterior Soffit Assemblies: 30 psf positive and negative uniform live load, plus dead loads.

3. Interior Partitions without Wall Mounted Casework: 10 pounds per square foot uniform live lateral load.

4. Interior Partitions with Wall Mounted Casework: 5 pounds per square foot uniform live lateral load, casework dead load, and casework live load of 25 psf of shelf area.

5. Interior Partitions at Elevator Shaftwalls: 10 pounds per square foot uniform live lateral load.

6. Seismic Loads: Conform to the requirements required by Code.

F. Deflection Requirements: If not otherwise indicated in Structural Contract Drawings, design loads shall be as follows:
1. Maximum deflection of L/240 for flexible finish materials such as gypsum board and veneer plaster.

2. Maximum deflection of L/360 for rigid finish materials including gypsum plaster, cement plaster, ceramic tile, maximum 3/8-inch thick stone tile, or mirrors.

3. Stud out-of-plane deflection properties shall be in accordance with the following:
   b. Stucco/Plaster Finishes: L/360.
   c. Tiles: L/360.

4. Deflection properties shall be in accordance with Structural Contract Drawings.
2.05 COMPONENTS

A. Framing Members: Cold-rolled hot-dip galvanized steel track conforming to ASTM C 645. Other equivalent coatings are not acceptable.

1. Floor and Ceiling Tracks: Type DHT Drywall Track, hemmed, 1-1/2-inch flange, minimum 20 gage.
   a. Provide width to accommodate stud size.

2. Wall Studs: Roll-formed C channel with knurled edges and keyhole shaped punched openings along web.
   a. Drywall Studs: Type DWS Drywall Studs, 20 gage minimum, or equivalent, standard widths as required for height and purpose, or as indicated on Contract Drawings.
   b. Shaftwall Studs: C-H/CT type studs, minimum 20 gage, or equivalent, size as required or as indicated on the Contract Drawings.
      1) J-Runner: Type J-Runner track, minimum 20 gage, 2-1/2-inch main flange by width to accommodate stud size.
   c. Where supporting impact-resistant gypsum board panels, provide minimum 20 gage studs.

3. Furring Channels: Hot dip galvanized steel conforming to requirements of ASTM C 645:
   a. Hat Shaped: Type FC Furring Channel, 7/8-inch deep with 1-1/4-inch screwable surface and 1/2-inch wing flanges, minimum 20 gage.
   b. Z-Shaped: Type ZF Furring Channel, 7/8-inch attachment flange and 1-1/4-inch face flange by depth indicated on Contract Drawings, minimum 20 gage.
   c. Resilient Channels: Type RC-1 Resilient Channel, 1/2-inch deep, minimum 25 gage.

4. Stiffeners and Main Runner Channels: Type CR cold-rolled or hot-rolled steel channels, minimum 16 gage, size as required, coated with rust-inhibitive paint.
   a. Use Bridge Clip manufactured by The Steel Network, or equal, when locking down cold rolled channels.

5. Ceiling Deflection Track:
   b. Fire-Rated Walls: Deflection track in fire rated walls shall conform to applicable ICC ES Report for product proposed for use.


B. Acoustic Isolators: One of the following:

1. Resilmont A237R Direct Fastening Furring Channel Resilient Mount and similar models for use with drywall furring channels and in other configurations as required, as manufactured by Studco Building Systems US.

2. RSIC-1 Resilient Sound Isolation Clip for use with drywall furring channels and in other configurations as required, as manufactured
by PAC International. The acoustic isolator shall have the following characteristics:

a. Natural organic rubber compound, blended with fire-inhibiting compounds.
b. Molded to isolate ferrule from clip.
c. Minimum of 12 micro-vibration controlling pedestals at point of contact with framing member.
d. Manufactured to ASTM D 2000, M2 AA 510 A13, which includes:
   1) Hardness, ASTM D 2240, Shore A: 47.
   2) Modulus 300 Percent, ASTM D 412, Die C: 5.3 MPa.
   3) Tensile Strength, ASTM D 412, Die C: 11.2 MPa.
   4) Elongation at Break, ASTM D 573: 454 percent.
e. Clip: Galvanized or aluminum-zinc coated steel, 16 gauge.
g. Projection: 1-5/8 inches from supporting structure, when 7/8-inch drywall furring channels are used.

C. Accessory Materials:
   1. Tie Wire: Conforming to the requirements of ASTM A 641.
   2. Fasteners: Steel screws conforming to ASTM C 1002 or steel sheet metal screws, as recommended by the framing member manufacturer.
   3. Access Panels: Refer to Section 083100.
   4. Fire Safing: Refer to Section 072100.
   5. Acoustical Sealants: Refer to Section 079200 and Section 098100.
   6. Self-Adhesive Foam Sealants and Sponge Neoprene Pads: Refer to Section 079200 and Section 098100.
   7. Hanger Wires: 12 gage galvanized steel wire, but not less than size and spacing recommended by manufacturer. Comply with requirements of ASTM A 641.
   8. Anchors: Shot pins in accordance with ICC ES 2388.

2.06 DRYWALL SUSPENSION SYSTEM

A. Provide a proprietary suspension system equivalent to Flat Drywall Ceilings by USG Interiors, 630 Drywall System manufactured by Chicago Metallic Corporation, or Drywall Furring Systems manufactured by Armstrong World Industries.

   1. Provide a system conforming to ASTM C 635 for Heavy Duty classification.
   2. Provide drywall attachment clips at main runners for additional surface for screw attachment of gypsum board.
   3. Cross tees shall have 1-1/2-inch wide face.
   4. Hat furring tees shall have 1-3/8-inch wide face.
   5. Provide channel molding at wall.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General:

   1. Wire-Tying:
      a. Use single-strand 16 gage or double-strand 18 gage tie wire.
      b. Splicing: Double wrap tie.
2. Deflection Relief at Non-load Bearing Walls and Partitions:
   a. Cut studs short where abutting underside of steel, concrete or other rigid construction, and attach to ceiling deflection track or clips.
      1) Allow 3/4-inch vertical deflection at primary structure.
      2) At metal deck, install filler plates across open flutes for attachment of top track.
      3) Fill space above top track or filler plate with fire safing and cover with gypsum board at rated partitions.
   b. Secure ends of horizontal stiffeners to abutting steel, concrete, or masonry walls and columns.
      1) Do not abut end studs to steel, concrete, or masonry walls and columns.

3. Partition Construction:
   a. Each partition shall be constructed as indicated on Contract Drawings, except that necessary offsets in framing may not be specifically indicated. Finished surfaces of walls shall be continuous planes for entire extent, even though stud sizes and finish panel thicknesses may vary. Adjust face of studs as necessary to accomplish this, except do not use less than sizes of studs or thickness of finish indicated.
   b. Where a partition type is shown at a given area, but not indicated at an adjoining area, or an area of similar use or type, the partition type that is indicated shall be provided.

B. Erection of Non-load Bearing Walls:
   1. General:
      a. Form corners and intersections of partitions with three studs.
      b. Place studs no more than 2 inches from internal corners.
      c. Provide headers above and below framed wall openings having area of 2 square feet or more.
      d. Brace entire wall assembly to supporting structure as required.
      e. Stud configurations transmitting noises will not be accepted.
      f. Install sheet metal reinforcing straps where required to support items including, but not limited to, wall mounted equipment, furniture, cabinets, display rails, and handrail supports. Secure to structural members with flat head screws.
      g. Provide 14 gage track as backing for supporting wall cabinets. Secure backing with three No. 10-18 self-tapping screws at each vertical stud. Provide flags to indicate position of backing.
      h. Provide metal closures at top of stud wall cavities where exposed to plenum.
   2. Floor and Ceiling Tracks:
      a. Align floor and ceiling tracks.
      b. Attach tracks to structure with specified anchors at maximum of 24 inches on centers.
      c. Tack weld to steel framing.
   3. Studs:
      a. Plumb and align studs. Level ceiling supports.
      b. Space studs at 16 inches on centers, unless otherwise indicated.
c. Extend studs from floor to roof structure continuously without splices.
d. Attach studs to floor and ceiling track by methods recommended by metal stud manufacturer.
e. Place studs with flanges pointing in the same direction on a surface.
f. Provide double 20 gage studs at door jambs.
g. Metal stud walls supporting single-sided shelving shall have double studs placed back-to-back and screwed together with No. 8 SMS at 12 inches on centers along the height of the stud.

4. Horizontal Stiffeners:
   a. Brace studs where recommended or detailed with steel channel stiffeners placed horizontally inside partition.
   b. Spacing: Maximum 5 feet on centers vertically.
   c. Wire-tie horizontal stiffeners to each stud with single strand 16 gage or double strand 18 gage tie wire.

5. Vertical Stiffeners: At wall hung equipment, add 16 gage load bearing metal studs as specified in Section 054100, or double 20 gage studs.

C. Installation of Vertical Furring:
   1. Erect free-standing vertical furring of screw studs and accessories as required for stud partitions.
   a. Stiffen and brace to structure at 48 inches on centers.

D. Installation of Suspended Ceiling Framing:
   1. Hangers:
      a. Attach hanger to steel member by use of beam clips or by wrapping around or through steel member and bolting, tying, or tack welding hanger to itself.
      b. Space hangers in accordance with SSMA recommendations.
      c. Locate hanger within 6 inches of ends of main runner channels.
      d. Attach lower end of hanger to main runner channel by wire-tying.
         1) Prevent twisting and turning of main runner channel.
         2) Develop full strength of hanger.
   2. Main Runner Channels: Cold-rolled channels.
      a. Spacing: As determined by manufacturer or applicable standards for required load.
      b. Locate main runner channel within 6 inches of parallel walls.
      c. Stop framing 1/2-inch short of any rigid vertical surface or control joint.
      d. Splicing:
         1) Overlap ends a minimum of 12 inches.
         2) Interlock flanges.
         3) Secure splice near end of each channel with tie wire.
   3. Cross Furring: Screw studs or furring channels.
      a. Spacing: As recommended by manufacturer of screw channel.
      b. Wire-tie cross-furring to main runners.
      c. Splicing:
         1) Overlap ends of cross furring minimum 8 inches.
         2) Interlock channel flanges.
         3) Wire-tie near each end of splice.
d. Suspension grillage shall not come in contact with abutting partitions or load-bearing walls.

4. Isolation Hangers: Install in accordance with manufacturer’s instructions.

3.02 INSTALLATION OF ACOUSTIC ISOLATORS

A. Install resilient sound isolation clips and drywall furring channels in accordance with manufacturer’s instructions.

B. Mechanically fasten resilient sound isolation clips to structure with screws, bolts, or expansion anchors, dependent upon structure.

C. Space resilient sound isolation clips at maximum of 24 inches by 48 inches on center for walls and ceilings.

D. Do not exceed design load (pull and shear) of 36 pounds per isolation clip.

E. Stagger isolation clip installation, so dead load is supported by all support members.

F. Splicing Drywall Furring Channels:
   1. Splice drywall furring channels with minimum of 6-inch laps.
   2. Secure laps with 2 framing screws or 18 gauge tie wire double wrapped.
   3. Locate splices between resilient sound isolation clips.
   4. Do not locate splices on resilient sound isolation clips.

G. Install resilient sound isolation clips on 1 side of wall assembly, unless otherwise indicated on the drawings.

H. Flanking Noise:
   1. Review installation details to prevent structure-borne flanking noise.
   2. Do not allow drywall furring channels or gypsum board to contact foreign materials, including floors, ceilings, or wall framing members.

I. Ensure metal ferrule of resilient sound isolation clips is in firm contact with structural member.

J. Gypsum Board:
   1. Install gypsum board in vertical or horizontal position with 1/8-inch to 1/4-inch gap around perimeter for acoustical sealant application.
   2. Install gypsum board in accordance with ASTM C 840 as specified in Section 092900.

K. Acoustical Sealant:
   1. Seal potential air leaks with acoustical sealant to achieve best Field Sound Transmission Class (FSTC).
   2. Seal electrical outlets and penetrations with acoustical sealant.
   3. Apply fire-rated acoustical sealant at locations where fire-rated assembly is required.

L. Putty Pad Sealant: Acoustically seal with putty pads, electrical boxes in walls and ceilings in which resilient sound isolation clips are used.

M. Walls: Install drywall furring channels perpendicular to framing members.
   1. Space drywall furring channels maximum of 24 inches on center.
2. Locate first drywall furring channel parallel to floor and maximum of 3 inches above floor and one drywall furring channel maximum of 6 inches from ceiling.

3.03 DRYWALL SUSPENSION SYSTEM

A. Install drywall suspension system in accordance with ASTM C 636.
   1. Install cross furring tees at 24 inches on centers for 5/8-inch thick gypsum board.
   2. Install hat furring tees at 16 inches on centers for 1/2-inch thick gypsum board.
   3. Install additional suspension wires when required to limit deflection to L/360 maximum.
   4. Provide drywall channel molding at vertical terminations.
   5. Provide drywall transition clips to allow the use of the grid as trim between gypsum board and acoustical panels.
   6. Attach gypsum board at 24 inches on centers minimum.

3.04 CLEANING

A. Waste Management: Recycle or salvage waste steel framing materials in accordance with Section 017419.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Air tightness requirements to reduce sound transmission through gaps in construction around sound-sensitive or noise producing spaces.

B. Referenced Sections:
1. Section 012500 - Substitution Procedures.
2. Section 013300 - Submittal Procedures.
4. Section 018113 - Sustainable Design Requirements.
5. Section 072100 - Thermal Insulation.
6. Section 078400 - Firestopping.
7. Section 079200 - Joint Sealants: Requirements for acoustical sealants.
8. Section 092216 - Non-Structural Metal Framing.

C. Related Sections:
1. Section 072216 - Roof Board Insulation: Requirements for roof board thermal insulation.
2. Section 098400 - Acoustic Room Components: Requirements for sound absorption insulation.
3. Division 21 - Fire Suppression.
4. Division 22 - Plumbing.
6. Division 26 - Electrical.
7. Division 27 - Communications.

1.02 REFERENCES

A. ASTM International (ASTM):
3. E 136-12b - Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 degrees C.

B. California Code of Regulations (CCR):
1. Title 24, Part 2 - California Building Code (CBC), 2013 edition:
      1) Section 720 - Thermal- and Sound-Insulating Materials.

C. United States Green Building Council (USGBC):
   1. Leadership in Energy and Environmental Design (LEED):

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Refer to Section 017419 regarding procedures for implementing construction waste management requirements.

B. Coordination: Refer to Section 018113 regarding procedures for implementing sustainable design requirements.

C. Coordination: Coordinate with plumbing, mechanical, and electrical work of Divisions 22, 23, and 26 with regard to continuity of sound insulation.

D. Preinstallation Meetings: Prior to the start of installation of the work of this Section, convene a preinstallation conference under provisions specified in Division 01. Contractor, subcontractors, and trades responsible for work in this Section shall be present to review areas of potential interference and conflict, and to review the requirements for airtight construction so that airtightness is achieved where required.

E. Environmental Requirements:
   1. Fiberglass and cellulose insulation shall meet the recycled content requirements specified in Section 018113.
   2. Insulation shall be formaldehyde-free.
   3. Product substitutions shall be approved in writing, prior to use, by the Owner or Architect as specified in Section 018113.
   4. The actual dollar cost of the amount of this product used on the project must be tracked. The actual dollar cost shall be separated into the amount that meets the requirements of Section 018113 and amount that does not meet the requirements (for the amount of product allowed for use as a substitution as described above and in Section 018113.

1.04 SUBMITTALS

A. Procedure: Comply with the submittal requirements of the referenced Sections.

B. Manufacturer's Instructions: Submit manufacturer's data sheets, published instructions and other relevant data at least two weeks prior to use.

C. Furnish certification that batt insulation proposed for use is free of added formaldehyde.

1.05 SUSTAINABLE DESIGN SUBMITTALS

A. Materials & Resources Submittals: Refer to Section 018113 for additional information on LEED submittals.
   1. Letter Template for MR Credit 2: Letter template, signed by Contractor, tabulating total waste material, quantities diverted and means by which it is diverted, and statement that requirements for the credit have been met.
      a. Comply with Section 017419 Construction Waste Management and Disposal.
2. Product Data and Certification Letter for MR Credit 4: Indicate percentages by weight of post-consumer and pre-consumer recycled content for products having recycled content. Include statement indicating costs for each product having recycled content.

3. Product Data for MR Credit 5: For regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

B. Indoor Environmental Quality Submittals: Refer to Section 018113 for additional information on LEED submittals.
   1. Product Data for IEQ Credit 4.1: For adhesives and sealants used on the inside of the weatherproofing system, documentation including printed statement of VOC content.

1.06 QUALITY ASSURANCE

A. Certifications:
   1. Provide batt insulation certified by Greenguard Environmental Institute (GEI) to be low-emitting and have minimal impact on indoor air quality.

1.07 WARRANTY

A. Warrant acoustical sealants, packing, and caulking against faulty workmanship and defective materials for a period of five years after date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturers of Fibrous Insulation Products:
   1. Johns Manville (JM), Building Insulation Division, Denver, CO
      (800)654-3103, with sales offices in Santa Ana, CA (714)668-9181.
   2. Owens Corning Insulation North America Division (OC), Toledo, OH
      (419)248-6741, (800)438-7465, with sales offices in Santa Ana, CA

B. Like materials shall be the products of one manufacturer and shall be either the ones upon which the design is based, or equal products of other manufacturers accepted in advance in accordance with Section 012500.

2.02 REGULATORY REQUIREMENTS

A. Regulations:
   1. Comply with the requirements of CBC Section 720 regarding insulation materials.
B. Waste Management: Comply with CALGreen Section 5.408 Construction Waste Reduction, Disposal and Recycling. Establish a construction waste management plan for the diverted material.
   1. Recycle or salvage for reuse a minimum of 50 percent of the non-hazardous construction and demolition waste in accordance with CALGreen 5.408.1.3.
   a. Include carpet, wood, aggregate, paint, shingles, wallboard, and other materials that have recyclable value.

C. Comply with CALGreen 5.504.4.1 Adhesives, Sealants, and Caulks: Adhesives, sealants, primers, and caulks in amounts greater than 16 ounces shall comply with SCAQMD Rule 1168 VOC limits, as indicated in Table 5.504.4.1 and Table 5.504.4.2.
   1. Aerosol adhesives and smaller sizes of adhesives and sealant or caulking shall comply with CCR Title 17, commencing with Section 94507.

D. Comply with CALGreen 5.507.4 Acoustical Control: Employ building assemblies and components with STC values determined in accordance with ASTM E 90 and ASTM E 413 or Outdoor-Indoor Sound Transmission Class (OITC) determined in accordance with ASTM E 1332, using either the prescriptive or performance method in Section 5.507.4.1 or 5.507.4.2.
   1. In accordance with CALGreen 5.507.4.3, provide an STC at least 40 for wall and floor-ceiling assemblies separating tenant spaces, and for tenant spaces from public spaces.

2.03 SUSTAINABILITY REQUIREMENTS

A. LEED Goals for Materials & Resources: For additional information on LEED goal requirements, refer to Section 018113.
   1. MR Credit 2 - Construction Waste Management: Divert 75 percent of construction waste from landfill in accordance with County requirements and to achieve LEED certification point as defined by the U.S. Green Building Council.
      a. Note that excavated soils and land-clearing debris (organic material) does not count toward construction waste credits, but all material shall be disposed of responsibly.
   2. MR Credit 4 - Recycled Content: Use materials with recycled content such that the sum of post-consumer recycled content plus one-half of the pre-consumer content constitutes 10 percent of the total value of the materials in the project.
   3. MR Credit 5 - Regional Materials: Use building materials or products that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of the project site for a minimum of 10 percent of the total materials value.

B. LEED Goals for Indoor Environmental Quality: For additional information on LEED goal requirements, refer to Section 018113.
   1. IEQ Credit 4.1 Low-Emitting Materials--Adhesives and Sealants: Interior adhesives and sealants used on the interior of the building shall comply with the requirements of the following reference standards:
2.04 PERFORMANCE CRITERIA

A. Performance Requirements: Performance characteristics of building insulation proposed for use shall be in accordance with the following:
   1. Sound Transmission Loss: When incorporated into building construction of specified sound transmission class (STC), confirmed by testing in accordance with ASTM E 90.

2.05 SYSTEM DESCRIPTION

A. Contract Drawings show typical details and Specifications designate specific materials and components to achieve airtightness. Contractor shall be alert for conditions that may require special details or materials in order to achieve airtightness and shall bring these to the attention of the Architect.

B. Rooms and constructions designated airtight include offices, server rooms, meeting/conference rooms, toilet rooms, elevator walls, mechanical and electrical rooms, and equipment rooms.

C. Where a room or construction is designated airtight, typical details for airtightness that are appropriate to the room or construction shall be employed, as well as special details required. Contractor, subcontractors, and trades are jointly responsible to coordinate construction work, observe field conditions, and see that airtightness is achieved as specified.

D. Maintain construction completely airtight around rooms or in walls, floors, and other construction designated airtight. Construction joints, structural penetrations, mechanical and electrical duct penetrations, pipe and conduit penetrations, electrical boxes and fixtures, cabinets, doors, access panels, windows, frames, and supports shall be fabricated and installed in such manner as to prevent sound transmission. Provide lintels, extra frames, blocking, escutcheons, grouting, gaskets, packing, caulking, dense putties, taping, and filling as required to stop sound transmission.

2.06 PRODUCT USAGE

A. General Location of Sound Insulation Materials:
   1. Sound Reduction at Walls Type 1:
      a. Between Studs at Interior Walls.
      b. Between Studs at Multiple Layer Gypsum Board Interior Walls.
      c. Between Studs at Double Stud Walls.
      d. Between Studs at Plumbing Walls.
   2. Sound Reduction at Walls at Type 2:
      a. Between Studs at Fire Rated Walls.
      b. Between Studs at Shaft Walls.
   3. Sound Reduction at Ceilings Type 3:
      a. On Surfaces of Ceilings.
2.07 SOUND INSULATION TYPES

A. Sound Insulation:

1. **Type 1**, Flexible, Unfaced: Conform to the requirements of ASTM C 665, Type I, and ASTM E 136.
   a. Surface Burning Characteristics:
      1) Flame Spread: 10.
      2) Smoke Developed: 10.
   b. Thickness: Full depth of cavity.
   c. Design Basis: Sound Attenuation Batts manufactured by Owens Corning, or Sound Control Batts manufactured by Johns Manville, or equal.

2. **Type 2**, Flexible, Unfaced: Conform to the requirements of FS HH-1-521F, and ASTM E 136.
   a. Combustibility: Non-combustible, in accordance with NFPA 220.
   c. Density: 2.5 pcf density
   d. Surface Burning Characteristics: Tested with ASTM E 84.
      1) Flame Spread: 0.
      2) Smoke Developed: 0.
   e. Design Basis: Thermafiber Sound Attenuation Fire Blankets (SAFB) manufactured by Thermafiber, sound attenuation fire batt (SAFB) insulation products manufactured by Fibrex Insulations, Inc., or equal.
   f. Thickness: 2-inch and 3-inch, at locations indicated on the Contract Drawings.
      1) Provide sound coefficients tested in accordance with ASTM E 423, and published by design basis manufacturer.

3. **Type 3**, Flexible, Unfaced: Conform to the requirements of ASTM E 136, unfaced.
   a. Surface Burning Characteristics:
      1) Flame Spread: 10.
      2) Smoke Developed: 10.
   b. Thickness: Full depth of cavity.
   c. Design Basis: Sonobatts Insulation manufactured by Owens Corning, or Johns Manville Sound-Shield fiberglass insulation, or equal.

2.08 JOINT FILLER PRODUCTS

A. Low-Density Glass Fiber Insulation:
   1. Refer to Section 072100, Insulation Type M6 for packing and filling small joints and openings behind sealants.

B. High-Density Ceramic or Mineral Fiber Safing:
   1. Refer to Section 078400, Safing Insulation Type O3.

C. Fire-Barrier (Acoustical) Putties:
   1. Refer to Section 078400, Safing Insulation Type O4.

D. Foamed-in-Place Silicone Sealant:
   1. Refer to Section 078400, Safing Insulation Type O5.

E. General Purpose Acoustical Sealants:
   1. Refer to Section 079200, Sealant Type F2.
F. Self-Adhesive Sponge Neoprene Pads:
   1. Refer to below, Sealant Type K1.

G. Self-Adhesive Bubble Gaskets:
   1. Refer to below, Sealant Type K2.

H. Felt Lined Metal Sleeves:
   1. Refer to Section Divisions 21, 22, 23, and 25.

I. Sheet Caulking (Electrical Box Pads):
   1. Refer to Divisions 26 and 27.

2.09 GASKETING

A. Gasketing Types:
   1. **Type K1** - Self-Adhesive Sponge Neoprene Pads: Compressible closed cell Polyvinyl Chloride foam or neoprene sponge, 8 pcf to 12 pcf density, self-adhering, for use as filler and acoustical seal in gaps of slip joints, set in place with 10% to 15% compression. Acceptable products:
      a. Norseal Type V760 Foam Sealants with firm, high-density foam for vibration damping with adhesive on one side, manufactured by Saint-Gobain Performance Plastics, or equal by D.S. Brown Company.
      b. Norseal Type V980/V990 closed cell PVC Foam Sealants with pressure-sensitive adhesive on both sides, manufactured by Saint-Gobain Performance Plastics, or equal by D.S. Brown Company.
      c. Norprene Profile custom-designed thermoplastic elastomer foam Extrusions compressible foam tapes adhesive-coated on one side, manufactured by Saint-Gobain Performance Plastics, or equal by D.S. Brown Company.
   2. **Type K2** - Self Adhesive Bubble Gaskets: Nominal 1/4-inch x 1/2-inch compressible bulb of silicone rubber or polyprene with self-adhesive on one side. Provide color selected by Architect. Acceptable Products:

B. Partition Closure Gaskets at Abutting Interior Partitions:
   1. Filler Gasket (at Window Mullions): Closed cell expanded neoprene, black premolded joint filler, equal to Everlastic Type NN1, 1040 Series, manufactured by Williams Products.
   3. Gasketing Tape: Norex BCF butyl-coated foam extrusions with compressible PVC foam core, as manufactured by The Specialty Elastomers sector of Saint-Gobain Performance Plastics.
4. Compressible Joint Filler: Manufacturer’s standard closed-cell, flexible neoprene expanded rubber, equal to Balco/Mercedes Expansion Control Type FS-250 Flex Seal System.
   a. Adhesive: Structural epoxy with a tensile strength of 4000 psi.
   b. Sealant: Type C1.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Partitions, walls, floors, and other constructions indicated to be acoustically insulated with construction designated airtight shall conform to the following:
   1. Cut openings in construction accurately for electrical boxes, piping, ductwork and other penetrating elements. Leave enough space around such elements so they remain free of rigid connection with the surrounding construction.
   2. Extend construction to a minimum of 1/8-inch and a maximum of 1/2-inch from adjacent construction to provide a suitable space for packing and caulking.
   3. Prior to packing and caulking penetrations as indicated on the Contract Drawings, verify that all penetrating elements such as piping and ductwork are free and clear of the opening to be packed and caulked.
   4. Where multiple layers of gypsum board are used, stagger joints in adjacent layers a minimum of 24 inches.
   5. Apply acoustical sealants and caulks in accordance with the manufacturer’s instructions.

B. Acoustical Gaskets:
   1. Use Self-Adhesive Sponge Neoprene Pads Type K1 to provide a compressible filler and acoustical seal in the gaps of slip joints. Set in place with 10 to 15% compression. Airtight splices work in length-wise direction.
   2. Use Self Adhesive Bubble Gaskets Type K2 to provide an acoustical seal around the edge of an operating access panels (typically set on jamb or head frame or stop to act as a compression seal).

END OF SECTION
- SECTION 114000 -

FOOD SERVICE EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. The work referred to in this section consists of furnishing all labor and material required to provide and deliver all food service equipment hereinafter specified into the building, uncrate, assemble, hang, set in place, level, and completely install, exclusive of final utility connections. Final utility connections to all equipment, shall be part of the work under additional appropriate sections of the work and not part of the food service work.

1. The equipment and its component parts shall be new and unused. All items of standard manufactured equipment shall be current models at the time of delivery. Parts subject to wear, breakage, or distortion shall be accessible for adjustment, replacement and repair.

2. Each refrigeration items specification is written to provide minimum specifications and scope of work. Refrigeration equipment shall be designed and installed to maintain the following general temperature unless otherwise specified.

   a. Walk-In Refrigerators 1.7°C / 35°F
   b. Walk-In Freezers -23.2°C / -10°F
   c. Reach-In Refrigerators 1.7°C / 35°F
   d. Reach-In Freezers -23.2°C / -10°F
   e. Undercounter Refrigerators 1.7°C / 35°F
   f. Undercounter Freezers -23.2°C / -10°F
   g. Cold Pan 5°C / 41°F

3. The materials or products specified herein by trade names, manufacturer’s name or catalog number shall be provided as specified. Substitutions will not be permitted unless approved by owner’s representative in writing no later than 10 days prior to bidding. This stipulation applies to all equipment and materials. All substitutions or alternates will be expected to perform in all respects as well as the original specification. Should no request for substitution...
be received and approved as listed above, the project is to be provided as specified.

4. The food service equipment contractor shall be responsible for all costs associated with the acceptable alternate or approved alternate items, if the item requires additional space or specific utilities that differ from specifications or drawings. The FSEC is responsible for all coordination, documentation and costs associated with any alternate item that was not submitted for approval and accepted by the consultant prior to bid. The FSEC shall be responsible for any costs associated with building changes, utility changes and drawings changes.

B. Coordinate Owner and Vendor-supplied equipment noted on the drawings or in the specifications as NIFSEC, "not in food service equipment contract". Show on roughing in Plans and sizes, utilities, and other requirements as furnished in the specifications, by owner or appropriate supplier in submittals as if the equipment is contractor furnished.

C. Bidders shall carefully examine the specifications and the project site including location and condition of existing equipment to determine cost for each "Existing-Reset" and "Existing-Modify" item to cover removal, modification (including materials), cleaning, inspection for damage, repair and resetting.

D. Field measurements shall be made prior to fabrication or installation of any equipment item.

E. The cutting of holes in equipment for pipe, drains, electrical outlets, etc., required for this installation, shall be part of this work. Work shall conform to the highest standards of workmanship and shall include welded sleeves, collars, ferrules and escutcheons.

F. Repair of all damage to the premises as a result of the equipment installation as well as the removal of all debris left by the work of this section.

G. Food service equipment and fixtures shall be cleaned and ready for operation at the time the facility is turned over to the Owner for final inspection by the Owner's Representative.

H. Food Service Equipment Contractor shall be responsible for coordinating with the Architect and Contractor in submitting all applicable documents.
I. All bidders shall submit with their costing a list of the subcontractors that are included in their bids and a complete "schedule of values" for all equipment and labor.

1.2 RELATED SECTIONS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Related Work In Other Sections by appropriate trades include the following:

1. Division 5 Section "Metal Fabrications" for equipment supports.

2. Division 6 Section "Interior Architectural Woodwork" for wood casework and plastic laminate substrates.

3. Refer to Division 23 Sections for supply and exhaust fans; exhaust ductwork; service roughing-ins; drain traps; atmospheric vents; valves, pipes, and fittings; fire extinguishing systems; and other materials required to complete food service equipment installation.

4. Refer to Division 26 & 28 Sections for connections to fire alarm systems, wiring, disconnects, and other electrical materials required to complete food service equipment installation.

C. All electric services including wiring to, and final connections to, the fixtures except, as specified differently in the specifications, drawings, or herein.

D. All water, waste and gas services to the fixtures including shut-off valves, trim, traps, etc., and final connections to the fixtures, except as specified differently in the specifications, drawings, or herein.

E. All hood or ventilator duct work above the connection position on such exhaust hoods or exhaust ventilators, except as specified differently in the specifications, drawings, or herein. Final welded connections at the junction point of exhaust hoods or exhausts ventilators, shall be part of the food service work.

F. Floors, quarry tile, concrete bases, walls, ceilings, finishes and related building work, except as specified differently in the specifications, drawings or herein.
1.3 DEFINITIONS

A. Terminology Standard: Refer to NSF 2, "Food Equipment", NSF 4, Heated Cabinets, NSF 7, Refrigerated Equipment, or other applicable NSF standards for definitions of food service equipment and installation terms not otherwise defined in this Section or in other referenced standards.

B. FSEC: Food Service Equipment Contractor

C. Owner-Furnished Equipment: Where indicated, Owner will furnish equipment items.

D. Vendor-Furnished Equipment: Where indicated the Owner's or operator's vendor will furnish equipment items.

E. NIFSEC: Not Included in Food Service Equipment Contract.

1.4 SUBMITTALS

A. Regardless of drawing formats provided it will remain the responsibility of equipment supplier to develop submittals in accordance with the Specific Conditions and assume all required responsibilities there to. The consultant is not to be liable for errors or omissions by the FSEC’s use of electronic data provided by the Consultant or the development of date used in the submittal approval process. Checking product data, rough-in drawings, wall backing drawings, shop drawings, and refrigeration drawings by Designer is for design concept only, and does not relieve the Food Service Equipment Contractor of responsibility for compliance with Contract Documents, verification of utilities with equipment requirements for conformity and location, verification of all dimensions of equipment and building conditions or reasonable adjustments due to deviations.

B. The Food Service Equipment Contractor shall review and provide an affidavit with each submittal that such review has been completed by an authorized agent of the contractor.

C. Product Data: For each type of food service equipment indicated. Include manufacturer’s model number and accessories and requirements for access and maintenance clearances, water and drainage, power or fuel, and service-connections including roughing-in dimensions.

D. Shop Drawings: For food service equipment not manufactured as standard production and catalog items by manufacturers. Include plans, elevations, sections, material schedule, roughing-in dimensions, fabrication details, service requirements, and attachments to other work.
1. Wiring Diagrams: Details of wiring for power, signal, and control systems and differentiating between manufacturer-installed and field-installed wiring.

2. Piping Diagrams: Details of piping systems and differentiating between manufacturer-installed and field-installed piping.

E. Coordination Drawings: For locations of food service equipment and service utilities. Key equipment with item numbers and descriptions indicated in Contract Documents. Include plans and elevations of equipment, access- and maintenance-clearance requirements, details of concrete, masonry or metal bases and floor depressions, and service-utility characteristics. Ventilation requirements for refrigerated equipment shall be identified in these drawings.

F. Contract Document Drawings:

1. Drawings furnished, constitute a part of these specifications and show locations of equipment and general arrangement of mechanical and electrical services. Necessary deviation from the illustrated arrangements to meet structural conditions, shall be considered a part of the work of this section. Such deviations shall be made without expense to the owner. Equipment drawings are definitive only and should not be used as construction documents or shop details.

2. The drawings are for the assistance and guidance of the Food Service Equipment Contractor. Exact locations shall be governed by the building configuration. The Food Service Equipment Contractor shall accept his contract with this understanding.

3. Should there be a conflict between the drawings and the specifications, the specifications shall govern.

G. Utility Roughing-in Drawings:

1. The Food Service Equipment Contractor shall prepare and submit one electronic file or two bond or a valid prints, of all roughing-in drawings, showing information necessary for the roughing-in of refrigerant lines, syrup/beer lines, plumbing, steam, mechanical and electrical utility requirements. Drawings shall also include construction requirements necessary for all equipment including floor depressions, raised bases, wall blocking, wall recesses and any critical dimensions for specific equipment requirements. Acceptance will be made upon the electronic file or one print which will be returned to the Food Service Equipment Contractor for reproduction purposes. Drawings not properly submitted in this format, will not be reviewed. Drawings without an “Accepted” or an “Accepted as Noted” stamp, will not be reviewed.
Drawings without an “Accepted as noted” stamp, will not be considered an authorized shop drawing and will not be allowed on the job site.

a. Furnish four (4) sets “Accepted” and/or “Accepted as Noted” shop drawings, for distribution to the field, as directed.

H. Shop Fabrication Drawings: The fabricator of the equipment shall prepare and submit through the Food Service Equipment Contractor one electronic file or two bond or original prints, of all shop drawings, showing all information necessary for fabrication and installation of the work of this section. Acceptance will be made upon the electronic file or one print which will be returned to the Food Service Equipment Contractor for reproduction purposes. Drawings not properly submitted in this format, will not be reviewed. Drawings without an “Accepted” or an “Accepted as Noted” stamp, will not be considered an authorized shop drawing and will not be allowed on the job site.

I. Samples for Initial Selection: Manufacturer’s color charts showing the full range of colors available for exposed products with color finishes.

J. Samples for Verification: Of each type of exposed finish required, minimum 4-inch- (100-mm-) square or 6-inch- (150-mm-) long sections of linear shapes and of same thickness and material indicated for work. Where finishes involve normal color and texture variations, include Sample sets showing the full range of variations expected.

K. Product Certificates: Signed by manufacturers of refrigeration systems, refrigerated equipment or their authorized agents certifying that systems furnished comply with NSF 7 requirements and will maintain operating temperatures indicated in the areas or equipment that they will serve.

L. Maintenance Data: Operation, maintenance, and parts data for food service equipment to include in the maintenance manuals specified in Division 1. Include a product schedule as follows:

1. Product Schedule: For each food service equipment item, include item number and description indicated in Contract Documents, manufacturer's name and model number, and authorized service agencies' addresses and telephone numbers.

1.5 QUALITY ASSURANCE AND LAWS AND ORDINANCES

A. Installer Qualifications: Engage an experienced installer to perform work of this Section who has specialized in installing food service equipment, who has completed installations similar in design and extent to that
indicated for this Project, and who has a record of successful in service performance.

B. Manufacturer Qualifications: Engage a firm experienced in manufacturing food service equipment similar to that indicated for this Project and with a record of successful in-service performance.

C. Source Limitations: Obtain each type of food service equipment through one source from a single manufacturer.

D. Product Options: Drawings indicate food service equipment based on the specific products indicated. Other manufacturers' equipment with equal size and performance characteristics may be considered. Refer to Division 1 Section "Substitutions."

E. Regulatory Requirements: Comply with the following National Fire Protection Association (NFPA) codes:

1. NFPA 17, "Dry Chemical Extinguishing Systems."
2. NFPA 17A, "Wet Chemical Extinguishing Systems."
4. NFPA 70, "National Electrical Code."
6. The FSEC shall certify that all work and materials comply with Federal, State and Local laws, ordinances, and regulations and is confirmed by the local inspector having jurisdiction.

   a. US PUBLIC HEALTH SERVICE
   b. LOCAL HEALTH DEPARTMENT
   c. NATIONAL BOARD OF FIRE UNDERWRITERS
   d. OSHA
   e. UL
   f. HACCP
   g. NFPA 96 – Current
   h. ADA
   i. OSHPD
   j. DSA

F. Listing and Labeling: Provide electrically operated equipment or components specified in this Section that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.
2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

G. AGA Certification: Provide gas-burning appliances certified by the American Gas Association (AGA).

H. ASME Compliance: Fabricate and label steam-generating and closed steam-heating equipment to comply with ASME Boiler and Pressure Vessel Code.


J. Food Service Equipment: Where provided, check-out aisles, sales counters, service counters, food service lines, queues, and waiting lines shall comply with CBC Sections 11B-227 and 11B-904. The top of tray slides shall be 28” minimum and 34” maximum above finish floor. Space and elements within food service employee work areas shall meet the requirements of CBC Section 11B-203.9. Food service equipment required to be accessible shall conform to all reach requirements in CBC Figures 2013, 11B-403.5.1, 11B-227.4, 11B-904.5, 11B-904.5.1, and 11B-904.5.2.

K. NSF Standards: Comply with applicable NSF International (NSF) standards and criteria and provide NSF Certification Mark on each equipment item, unless otherwise indicated.

L. ANSI Standards: Comply with applicable ANSI standards for electric-powered and gas-burning appliances; for piping to compressed-gas cylinders; and for plumbing fittings, including vacuum breakers and air gaps, to prevent siphonage in water piping.

M. SMACNA Standard: Where applicable, fabricate food service equipment to comply with the Sheet Metal and Air Conditioning Contractors National Association’s (SMACNA) "Food Service Equipment Fabrication Guidelines," unless otherwise indicated.

N. Seismic Restraints: Provide seismic restraints for food service equipment according to the Sheet Metal and Air Conditioning Contractors National Association’s (SMACNA) "Food Service Equipment Fabrication Guidelines," appendix 1, "Guidelines for Seismic Restraints of Kitchen Equipment," unless otherwise indicated.

O. Pre-installation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings."
P. Pre-installation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings." Review methods and procedures related to food service equipment including, but not limited to, the following:

1. Review access requirements for equipment delivery.
2. Review equipment storage and security requirements.
3. Inspect and discuss condition of substrate and other preparatory work performed by other trades.
4. Review structural loading limitations.
5. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

Q. Walk-in cooler and/or freezer shall comply with CBC Figures 2013, 11B-404.2.4, 11B-404.2.4.4, 11B-404.2.7 and 11B-309.4.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver food service equipment as factory-assembled units with protective crating and covering.

B. Store food service equipment in original protective crating and covering and in a dry location.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions of food service equipment installation areas by field measurements before equipment fabrication and indicate measurements on Shop Drawings and Coordination Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish required dimensions and proceed with fabricating equipment without field measurements. Coordinate construction to ensure actual dimensions correspond to established dimensions.

2. Food service aisles shall be a minimum 36” wide and tray slides shall be mounted at 34” maximum above the floor. CBC Section 1104B.5, item 5.
3. Pass-thru windows for food service shall conform to the reach and access requirements of CBC sections 1118B: 1122B.5; 1104B.3.12 and 1104B.4.2 for accessible transaction areas. Accessible pass-thru shelves shall not exceed 34-inch height above interior finished floor surface or exterior pavement.

### 1.8 COORDINATION

A. Coordinate equipment layout and installation with other work, including light fixtures, HVAC equipment, and fire-suppression system components.

B. Coordinate location and requirements of service-utility connections.

C. Coordinate size, location, and requirements of concrete bases, positive slopes to drains, floor depressions, and insulated floors. Concrete, reinforcement, and formwork requirements are specified in Division 3 Section "Cast-in-Place Concrete."

D. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 7 Section "Roof Accessories."

### 1.9 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents. Warranty period: 1 year from date of completion.

B. Refrigeration Compressor Warranty: 5 years from date of completion. Submit a written warranty signed by manufacturer agreeing to repair or replace compressors that fail in materials or workmanship within the specified warranty period.

### PART 2 - PRODUCTS

#### 2.1 MATERIALS - METAL

A. Submit a certified copy of the mill analysis of materials if requested by the Architect.

B. Finish for exposed surfaces to be #4 polished, unless otherwise specified.

C. Protective covering shall be provided on all polished surfaces of stainless steel sheet work, and retained and maintained until time of final testing, cleaning, start-up and substantial completion.
D. Stainless-Steel Sheet, Strip, Plate, and Flat Bar: ASTM A 666, Type 304, stretcher leveled, and in finish specified in "Stainless-Steel Finishes" Article.

E. Stainless-Steel Tube: ASTM A 554, Grade MT-304, and in finish specified in "Stainless-Steel Finishes" Article.

F. Zinc-Coated Steel Sheet: ASTM A 653, G115 (ASTM A 653M, Z350) coating designation; commercial quality; cold rolled; stretcher leveled; and chemically treated.

G. Zinc-Coated Steel Shapes: ASTM A 36 (ASTM A 36M), zinc-coated according to ASTM A 123 requirements.

H. Sealant: ASTM C 920; Type S, Grade NS, Class 25, Use NT. Provide elastomeric sealant NSF certified for end-use application indicated. Provide sealant that, when cured and washed, meets requirements of Food and Drug Administration's 21 CFR, Section 177.2600 for use in areas that come in contact with food.

a. Color: As selected by Architect from manufacturer’s full range of colors.

b. Backer Rod: Closed-cell polyethylene, in diameter larger than joint width.

I. Sound Dampening: NSF-certified, nonabsorbent, hard-drying, sound-deadening coating. Provide coating compounded for permanent adhesion to metal in 1/8-inch (3-mm) thickness that does not chip, flake, or blister.

J. Gaskets: NSF certified for end-use application indicated; of resilient rubber, neoprene, or PVC that is nontoxic, stable, odorless, nonabsorbent, and unaffected by exposure to foods and cleaning compounds.

K. Casters: NSF-certified, heavy duty, stainless-steel, swivel stem casters with 5-inch- (125-mm-) diameter wheels, polyurethane tires with 1-inch (25-mm) tread width, and 200-lb (90-kg) load capacity per caster. Provide brakes on 2 casters per unit.

2.2 MATERIALS – CASEWORK/MILLWORK

A. Cabinet Hardware: Provide NSF-certified, stainless-steel hardware for equipment items as indicated. Pulls, Handles and Catches to be included.

B. All wood to be thoroughly seasoned and kiln dried prior to being used for fabrication of custom casework. All wood to be free from knots, pitchy seams, or other imperfections. All exposed wood to be grade A pine.

C. All plywood to be thoroughly seasoned and kiln dried prior to being used. All plywood to be free from knots, pitchy seams, and other
imperfections. All plywood to be glued with water resistant resin. Particle board may not be substituted for plywood panels. "W.I. - Custom Grade" marine grade plywood is required on all fixtures to be installed in high humidity environments.

D. All wood to have less than 12% moisture content and be a species listed by the national hardwood association.

E. Plastic laminates shall be 1/16th thick, general purpose grade GP-50 as manufactured by Wilson Art or equal. Patterns, textures, and colors as specified under individual items. Semi exposed and cabinet liners shall be CL-20. Countertops, backsplashes and edges shall be grade GP-50 on exposed and grade BK-20 on underside of tops. Exposed vertical surfaces and cabinet liners shall be grade CL-20. Sides and edges of shelving shall be grade 50. Adhesive shall be waterproof and low VOC.

F. Hardware that is furnished and installed shall be of solid material unless specified otherwise. The hardware shall be provided with the necessary mechanisms for locking. All locks shall be furnished with two (2) keys.

G. Solid Surface Material (SSM) shall be Caesarstone, Silestone or approved equal and installed over 3/4” plywood per manufacturer’s instructions. Provide air space, trim and /or insulation around any heat or cold producing equipment to guard against discoloration and cracking.

2.3 FABRICATION, GENERAL, METAL,

A. Fabricate food service equipment according to NSF (standards 2, 4 & 7) requirements. Factory assemble equipment to the greatest extent possible.

B. STAINLESS-STEEL EQUIPMENT: for all parts of custom tables, tops, benches, sinks, cabinets, etc., as drawn or as specified, shall be AISI type 304 (18-8 Austenitic). All gauges called for shall be U.S. Standard Gauges, “S/S” or “S.S.” as shown in the drawings or specifications, shall indicate stainless steel.

1. Edges and Backsplashes: Provide equipment edges and backsplashes indicated complying with referenced SMACNA standard, unless otherwise indicated.

2. Apply sound dampening to underside of metal work surfaces, including sinks and similar units. Provide coating with smooth surface and hold coating 1 inch (25 mm) back from open edges for cleaning.
3. Tables: Fabricate with reinforced tops, legs, and reinforced undershelves or cross bracing to comply with referenced SMACNA standard, unless otherwise indicated, and as follows:

   a. Tops: Minimum #14 gauge / 0.0781-inch- (1.984-mm-) thick stainless steel, unless otherwise indicated.

   b. Legs: 1-5/8 inch (41.3 mm) OD, minimum #16 gauge / 0.0625-inch- (1.588-mm-) thick stain-less steel with stainless-steel gusset and adjustable insert bullet-type feet with minimum adjustment of 1 inch (25 mm) up or down without exposing threads, unless otherwise indicated.

   c. Undershelves: Minimum #16 gauge / 0.625-inch- (1.588-mm-) thick stainless steel, unless otherwise indicated.

   d. Top and Undershelf Reinforcement: Provide minimum #14 gauge / 0.0781-inch- (1.984-mm-) thick, stainless-steel reinforcing, unless otherwise indicated.

   e. Cross Bracing: 1-1/4 inch (31.75 mm) OD, minimum #16 gauge / 0.0625-inch- (1.588-mm-) thick stainless steel, unless otherwise indicated.

4. Sinks: Fabricate of minimum #14 gauge / 0.0781-inch- (1.984-mm-) thick stainless steel with fully welded, 1-piece construction. Construct 2 sides and bottom of sink compartment from 1 stainless-steel sheet with ends welded integral and without overlapping joints or open spaces between compartments. Provide double-wall partitions between compartments with 1/2-inch- (13-mm-) radius rounded tops that are welded integral with sink body. Cove horizontal, vertical, and interior corners with 3/4-inch (19-mm) radius. Pitch and crease sinks to waste for drainage without pooling. Seat wastes in die-stamped depressions without solder, rivets, or welding.

   a. Wastes: 2-inch (50-mm), stainless steel ball valve, rotary-handle waste assembly with stainless-steel strainer plate, nickel-plated brass body and connected overflow.

   b. Drainboards: Minimum #14 gauge / 0.0781-inch- (1.984-mm-) thick stainless steel, pitched to sink at 1/8 inch/12 inches (3 mm/300 mm) of length. Reinforce drainboards with minimum #14 gauge / 0.0781-inch- (1.984-mm-) thick stainless steel, unless otherwise indicated.

   c. Legs: 1-5/8 inch (41.3 mm) OD, minimum #16 gauge / 0.0625-inch- (1.588-mm-) thick stain-less steel with stainless-steel
gusset welded to #12 gauge / 0.1094-inch- (2.779-mm-) thick, stainless-steel support plate. Provide adjustable insert bullet-type feet with minimum adjustment of 1 inch (25 mm) up or down without exposing threads, unless otherwise indicated.

d. Drainboard Braces: 1 inch (25 mm) OD, minimum #16 gauge / 0.0625-inch- (1.588-mm-) thick stainless steel, unless otherwise indicated.

e. Cross Bracing: 1-1/4 inch (31.75 mm) OD, minimum #16 gauge / 0.0625-inch- (1.588-mm-) thick stainless steel, unless otherwise indicated.

5. Wall Shelves and Overshelves: Fabricate to comply with referenced SMACNA standard, unless otherwise indicated, and with minimum #16 gauge / 0.0625-inch- (1.588-mm-) thick, stainless-steel shelf tops.

6. Drawers: Provide lift-out type, 1-piece, die-stamped drawer pan fabricated from #18 gauge / 0.050-inch- (1.27-mm-) thick stainless steel with inside corners radiused. Support drawer pan with #16 gauge / 0.0625-inch- (1.588-mm-) thick, stainless-steel channel frame welded to drawer front. Provide 1-inch- (25-mm) thick, double-wall front fabricated from #16 gauge / 0.0625-inch- (1.588-mm-) thick stainless steel and with integral recessed pull. Fill void in drawer front with semi rigid fiberglass sound dampening. Mount drawers on NSF-certified, full-extension, stainless-steel drawer slides that have minimum 100-lb (45-kg) load capacity per pair, ball-bearing rollers, and positive stop. Mount drawer slides for self-closing on drawer housing as indicated.

7. Refrigerated Bases: Unit to be all welded construction and fabricated in accordance with NSF Standard 7.

a. Top: 18 gauge galvanized sub-top or 14 gauge stainless steel top.

b. Exterior: Front and Sides to be 18 gauge number 4 finish type 304 stainless steel; bottom and back to be 18 gauge galvanized (unless otherwise noted).

c. Interior liner: 20 gauge number 4 finish type 304 stainless steel with 3/8” radius corners.

d. Insulation: Minimum 2” thick polyurethane foam in place insulation (CFC free).
e. Doors: 18 gauge front and 20 gauge door pan number 4 finish type 304 stainless steel with 2” polyurethane foam in place insulation, long-life press in place gasket.

f. Drawers: 300 lb. capacity with 14 gauge stainless steel track system, tandem 2” all stainless steel skate wheels, each drawer accommodates two 6” deep, 12” x 20” pans side by side.

g. Shelving: Each door section shall have stainless steel wire racks.

8. Refrigerated Pan Rails: Unit to be all welded construction and fabricated in accordance with NSF Standard 7.

a. Top: 16 gauge number 4 finish type 304 stainless steel top and inner liner.

b. Outer liner: To be 18 gauge type 304 stainless steel; bottom and back to be 18 gauge galvanized (unless otherwise noted).

c. Insulation: Minimum 2” thick polyurethane foam in place insulation (CFC free).

d. Drain: Provide with 1” stainless steel drain

e. Control: Provide with on/off control to be filed installed.

C. Welding: Use welding rod of same composition as metal being welded. Use methods that minimize distortion and develop strength and corrosion resistance of base metal. Provide ductile welds free of mechanical imperfections such as gas holes, pits, or cracks.

1. Welded Butt Joints: Provide full-penetration welds for full-joint length. Make joints flat, continuous, and homogenous with sheet metal without relying on straps under seams, filling in with solder, or spot welding.

2. Grind exposed welded joints flush with adjoining material and polish to match adjoining surfaces.

3. Where fasteners are welded to underside of equipment, finish reverse side of weld smooth and underpressed.

4. Coat unexposed stainless-steel welded joints with suitable metallic-based paint to prevent corrosion.

5. After zinc-coated steel is welded, clean welds and abraded areas and apply SSPCPaint 20, high-zinc-dust-content, galvanizing repair paint to comply with ASTM A 780.
D. Fabricate field-assembled equipment prepared for field-joining methods indicated. For metal butt joints, comply with referenced SMACNA standard, unless otherwise indicated.

E. Where stainless steel is joined to a dissimilar metal, use stainless-steel welding material or fastening devices.

F. Form metal with break bends that are not flaky, scaly, or cracked in appearance; where breaks mar uniform surface appearance of material, remove marks by grinding, polishing, and finishing.

G. Sheared Metal Edges: Finish free of burrs, fins, and irregular projections.

H. Provide surfaces in food zone, as defined in NSF 2, free from exposed fasteners.

I. Cap exposed fastener threads, including those inside cabinets, with stainless-steel lock washers and stainless-steel cap (acorn) nuts.

J. Provide pipe slots on equipment with turned-up edges and sized to accommodate service and utility lines and mechanical connections.

K. Provide enclosures, including panels, housings, and skirts, to conceal service lines, operating components, and mechanical and electrical devices including those inside cabinets, unless otherwise indicated.

L. Seismic Restraints:

1. Fabricate to comply with referenced “SMACNA Guidelines for Seismic Restraint of Kitchen Equipment” in any State, province, or jurisdiction that has legislated this requirement as necessary for acceptance. This shall include:
   a. Identifying these items on his submittal drawings, Plans, Elevations, and Sections.
   b. Showing required SMACNA methods of restraint on his submittal drawings.
   c. Referencing the appropriate detail(s).
   d. Obtain regulatory approval for all seismic engineering details.

2.4 FABRICATION, MILLWORK/CASEWORK

A. Fabricate food service equipment according to the "Manual of Millwork, current edition" of the Woodwork Institute, including all amended printed revisions, and NSF Standards. All composite wood products shall meet the latest California Air Resources Board (CARB) Composite Wood
Products Regulations. Factory assemble equipment to greatest extent possible. All specially fabricated equipment must be by one manufacturer/fabricator per specialty acceptable to Consultant and the Owner.

B. Solid Surface Material (SSM) shall be Caesarstone, Silestone or approved equal and installed over 3/4” plywood per manufacturer's instructions. Provide air space, trim and/or insulation around any heat or cold producing equipment to guard against discoloration and cracking.

2.5 EXHAUST HOOD FABRICATION

A. Definitions:

1. Listed Hood: A hood, factory fabricated and tested for compliance with UL-710 by a testing agency acceptable to authorities having jurisdiction.

2. Type I Hood: A hood designated for grease exhaust applications.

3. Type II Hood: A hood designed for heat and steam removal and for other non-grease applications.

4. Non-listed Hoods are not acceptable for this project.

B. General: Provide listed hoods with dual wall construction and manufactured from minimum #18 gauge / 0.050-inch (1.27-mm-) thick type 304 stainless steel, unless otherwise indicated. FSEC shall verify size and location of all connections required before fabrication.

1. Exhaust hood performance tests shall be in accordance with ASTM F1704-05. Manufacturer, upon request, shall be required to submit validation that full capture and containment of appliance thermal plume and smoke can be accomplished at specified/design air volumes without modifications to duct size, filter velocity or hood/system static pressure.

2. Hoods shall comply with current NFPA 96, NSF, ASHRAE 90.1, ASHRAE 154, CA-Title 24 (CA Based Projects Only), Local Applicable Codes and Manufacturers Recommendations.

3. Product/system must meet the design, construction, performance and operational intent of the project. It is the responsibility of the FSEC to verify interface of the system with all associated trades including, but not limited to; electrical, mechanical, sheet metal, plumbing and controls per Division 23.
4. Design exhaust volume shall be based on hood manufacturers heat load based design calculations and not estimated CFM/linear foot or minimum UL-710 listed volume.

C. Grease Removal: Provide removable, stainless-steel, baffle-type grease. Provide minimum #18 gauge / 0.0781-inch (1.984-mm) thick, stainless steel filter frame and removable collection basins or troughs. Filters/baffles shall be UL 1046 Classified and tested according to ASTM Standard F 2519-05 “Standard Test Method for Grease Particle Capture Efficiency of Commercial Kitchen Filters and Extractors” by a nationally recognized testing laboratory acceptable to authorities having jurisdiction. The filters/baffles must be single stage and have a minimum extraction rate of 93% at 5 microns and 98% at 15 microns.

D. Sound Level Criteria: Isolated grease filter sound levels shall not exceed an NC rating of 55 at full design exhaust volume.

E. Light Fixtures: Provide NSF, UL, CSA AND CE-certified LED fixtures, vapor-tight sealed lenses, to provide 3500K with 50 foot candles at the cooking surface. Any exposed wiring shall be concealed in stainless-steel.

F. Appliance Interlock: Hoods to be provided with Appliance Interlock Temperature Sensor to comply with IMC 2006 requirement, section 507.2.1.1.

G. Exhaust-Duct Collars: Minimum #16 gauge / 0.0625-inch (1.588-mm) thick stainless steel, FSEC shall provide all stainless steel duct collars and make final connections to hood, welded 100% grooved smooth and painted.

H. Fires suppression system: Hoods to be provided with wet chemical fire suppression system, model R102 as manufactured by “Ansul” or equal in compliance with UL300 standards. System shall include factory pre-piping, all permits and test as required by the authority having jurisdiction.

1. Automatic actuation shall be by means of fusible link with no visible conduit.

2. System shall be furnished and installed by an Ansul certified distributor in accordance with manufacturer’s instructions and the authority having jurisdiction.

3. Micro-switches shall be furnished as part of the fire protection system for “tie in” of building alarm and for the make-up air/fire/fuel shut
down. Gas valve(s) shall be electric solenoid type and support simultaneous activation.

4. Surface drop exposed piping shall be stainless steel.

### 2.6 STAINLESS-STEEL FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.

1. Remove or blend tool and die marks and stretch lines into finish.

2. Grind and polish surfaces to produce uniform, directional textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.

B. Concealed Surfaces: No. 2B finish (bright, cold-rolled, unpolished finish).

C. Exposed Surfaces: No. 4 finish (bright, directional polish).

D. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

E. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipment.

### 2.7 WALK-IN COOLERS/FREEZERS

A. Panel Construction:

1. Panels shall be pre-fabricated, sectional construction (minimum 4-inches thick for Coolers and Freezers), of tongue and groove design withfoamed-in-place gaskets (not glued, stapled, or nailed) on the male side of all interior and exterior panels and rigid urethane frame. Every panel shall be NSF and UL factory approved and bear the certifying labels. Walk-in box height to be 108"; Interior Height, unless otherwise specified.

2. Gaskets shall be impervious to stains, greases, oils, and mildew and be resistant to chemical corrosion and ultraviolet radiation. Gasket operating temperature shall be -30 degrees F to 160 degrees F (-34 degrees C to +71 degrees C).

3. Corner panels shall be 90-degree angles with coved corners; interior partition walls shall utilize `T` panels with coved corners. All panels shall be manufactured in accordance NSF approved standards.
4. Panels shall be completely filled with rigid 100% foamed-in-place non-CFC urethane between interior and exterior metal `skins' which have been die-formed and gauged for uniformity in size. Rigid polyurethane blowing agents shall comply with current US EPA SNAP program listings. Slab urethane or polystyrene are not acceptable. In addition, wood shall not be acceptable in any panel including doors, walls, floor, and ceiling.

5. Insulation shall have a 95% closed cell structure with an average in-place density of 2.2 lbs. per cubic foot, and compression strength at yield point of 19 lbs. per square inch. The R-Values of the floor, ceiling and wall panels meet the requirements under the Energy Independence and Security Act of 2009 (EISA).

6. Floor panels: Floor panels shall be die stamped with 3/8-inch radius NSF coved corners. All plane intersections shall be drawn, not cut and welded. Panels shall be fabricated similar to other panels and designed to readily withstand uniformly distributed loads, point loads for stationary shelving, rolling loads from hand truck and mobile food racks. Where noted, pre-fabricated floors shall withstand rolling loads from either manual pallet jacks or electric pallet jacks.

B. Door Construction: Walk-in coolers and freezers shall have entry and exit door hardware that complies with all of the requirements of CBC Section 11B-404.2.8.1 and maneuvering clearances at the exterior side per CBC Section 11B-404.2.7 & 11B-309.4. Doors shall be flush (in-fitting) type, self-closing, 36-inches by minimum 80-inches high, 20-guage stainless steel interior and exterior.

1. Doors shall be mounted with three adjustable cam-lift hinges (Kason 1346) and hydraulic adjustable automatic hold-open (rack and pinion) door closers. Door hardware shall be chrome plated Kason model 27C. Mounting height of latching hard-ware shall be 34 to 48 inches above finish floor. All hardware shall meet the requirements of CBC 11B-404.2.7 & 11B-309.4.

2. Door latches shall lock and have a safety release to prevent entrapment (one quarter turn of the release handle unlocks the door from the inside).

3. All freezer door will be provided with a Department of Energy approved heater strip, heated sweep gaskets, and a heated pressure relief port.

4. Provide a solid-state electronic thermometer, pre-wired light fixtures switch and pilot lights switch on each door section. Thermometer shall
have data connection capability. All door sections to have raised casings. All lights are to be vapor proof LED.

5. The door jambs, frames, and thresholds shall be made of durable Fiberglass Reinforced Plastic (FRP).

C. Assembly: Panels shall be assembled by Posi-Locs or equal which shall be foamed-in-place and activated by a hex wrench. Floor panels shall utilize post tension construction within the floor panels. Access ports to locking devices shall be covered by snap caps and shall be located in interior of walk-in.

D. Finishes: Refer to the finishes shown and the Foodservice Equipment Schedule paragraph 3.5.

1. Surfaces (walls, ceiling and closure panels):
   a. Exposed exterior 20-gauge Type 304 stainless steel, #4 finish, Rimex Windsor pattern.
   b. Unexposed exterior surfaces to be 20-gauge smooth embossed galvanized steel.
   c. Interior finishes: minimum 26-gauge Antimicrobial finish steel.
   d. Interior floor: verify on finish schedule and item specification, paragraph 3.5.

E. Accessories:

1. Provide and install 12-gauge (stainless steel) kickplates to 36-inches high on interior and exterior doors.

2. Provide (s/s) closure panels to interior ceiling and all adjacent walls, finished with 90-degree angles at the box and the ceiling/wall; no raw edges will be accepted.

3. Provide vinyl strip curtains.

4. Refrigerated compartments fabricated and standard, shall be fitted with flush mounted digital thermometers. Thermometers shall be adjustable and calibrated after installation. All thermometers shall have an accuracy of + 2 degrees and shall have the capability to be connected to a remote monitoring system, i.e. Modularm 75LC

5. Per document drawings, provide 14-inches by 24-inches view port - unheated for cooler door, heated for freezer door.

6. Freezer Door Fan Switches (at ambient facing freezer door only)
7. When Anthony doors are specified: include Optimax Pro LED Lighting.

F. Insulated Floor Depressions: The FSEC shall provide styrofoam insulation for cooler and freezer floors. Insulation shall be 60 high load extruded polystyrene, 2-inch thick, with R-value, 75°F mean temperature, min 5.0/inch²°F ft. square h/BTU; Compressive Strength: vertical, 60.0 lbs./inch square; Water Absorption maximum 0.1% by volume.

G. Approvals: Fire hazard classification according to ASTM E-84 (UL723) shall be a flame spread rating of 25 or less with a certifying UL label attached to every panel showing the meeting of the fire code. Smoke development rating to be 450 or less; Factory Mutual approved; NSF-listed with an approved toxicity rating.

H. Walk-in coolers and freezers shall have level maneuvering clearances at the exterior side (CBC 118-404.2.4.1) and accessible entry and exit door hardware (CBC 11B-404.2.7, 11B-309.4 & 11B-404.2.8.1).

2.8 REMOTE REFRIGERATION SYSTEMS

A. Furnish and install mechanical refrigeration work as indicated and specified, complete and ready for use. Principal items of work include:

1. Mechanical refrigeration systems, including compressor units, condensers, refrigerant piping, evaporator coils, control valves, compressor racks, weather covers and required miscellaneous items. Refrigeration equipment shall consist of two major assemblies. One is the condensing unit assembly with all necessary components, factory installed and wired including single point electrical control panel, circuit breakers and contactors, OSHA approved fan guards, aluminum flexible conduit for internal wiring, suction filter, sight glass, drier, adjustable dual pressure control, flexible pressure hoses, Rotolock compressor adaptors and necessary tubing. The other is the refrigeration coil assembly/heat exchanger with expansion valve, electronic thermostat temperature control with electronic defrost time clock and on/off power switch, completely factory mounted and factory pressure tested with dry nitrogen.

   a. Utilize refrigerant with an ozone depleting potential of 0

   b. R-407A Low to Medium Temperatures

   c. Other refrigerant approved by the Department of Energy for use in remote systems after December 31, 2017.

   d. Glycol – Food Grade
1. Furnishing of motor starters and walk-in refrigerator/freezer thermostats for installation under Electrical Section.

2. Sleeves, inserts, hangers, supports and other incidental items necessary to complete the work.

3. Cutting and patching of non-structural and other incidental items necessary to complete the work on this section.

4. Testing, charging, adjusting, operational testing and cleaning of equipment. Conduct all tests as required by local inspecting agencies concerned with this project.

B. Compressors and Condensing Unit: Factory assembled, scroll compressors with air cooled condensers operating at such speed within recommended range of section and discharge pressures for economical operation and with required BTU rating per hour, sizes and capacities in accordance with specifications. Provide units of same manufacturer and type throughout, new standard cataloged, to operate with refrigerant R-407A. 100 degrees ambient air, capacities selected on 16 hour running time basis for medium temperature fixtures and 18 hour running time basis for low temperature fixtures. For locations where the ambient exceeds 100 degrees Fahrenheit, the system is to be engineered for the maximum recorded ambient temperature. Additionally, all parallel systems shall include a minimum of one digital scroll compressor and be designed with 75% redundancy minimum.

C. Condensing units shall be scroll air cooled condensing unit with rigid structural bases, 20 gauge weather covers, OSHA-approved fan guards and shrouds and waterproof electrical systems. Include internal inherent motor protection, suction line, shut off valves, liquid line shut off valves, oil pressure safety switches when required, adjustable dual pressure control, crank case heaters and oil separators on systems with longer than 100 lin. ft. run from condensing unit to the evaporator coil. Any outdoor installation within 20 miles of the salt air environment shall be provided with coated condenser coils.

D. Medium temperature evaporators shall be equipped with Electronically Commutated Motors (ECM). Coils shall be low profile UL/NSF approved units with inline fans and cross fins staggered. Provide copper tubing, aluminum cased, permanently lubricated motors with thermal overload protection. Unit shall be provided with evaporator controller system capable of providing evaporator fan control, remote monitoring and diagnostics. Control system shall be interconnected to the local area network and be capable of sending alarm alerts via mobile telephone or
PART 3 - EXECUTION

3.1 EXAMINATION

A. Unless expressly stipulated, and in a timely manner, no additional allowances will be made for Contractors or Manufacturers for errors, omissions or ambiguities not reported at time of bidding. Carefully review and compare the Contract Documents and at once report to Owner and/or Designer any errors, ambiguities, inconsistencies or omissions. Unless expressly stipulated, and in a timely manner, Kitchen Equipment Contractor shall be liable to Owner or Designer for any damage resulting from such errors, inconsistencies or omissions in the Contract Documents. Work shall not be done without approved Drawings, Specifications and/or Modifications and without receiving prior written receiving authorizations from Owner or Designer. Drawings and equipment specifications are intended to complement each other. Therefore, neither should be considered complete without the others.
B. Examine areas and conditions, with Installer present, for compliance with requirements or installation tolerances, service-utility connections, and other conditions affecting installation and performance of food service equipment. Do not proceed with installation until unsatisfactory conditions have been corrected.

C. Examine roughing-in for piping, mechanical, and electrical systems to verify actual locations of connections before installation.

D. Verify all conditions at the building, particularly door openings and passageways for large equipment. Coordinate with General Contractor access to insure delivery of equipment to the required areas. Coordination shall include, but not be limited to, early delivery, hoisting, window removal and/or delay of wall construction. All special equipment, handling charges, window removal, etc. shall be paid for by the Food Service Equipment Contractor.

E. Any and all food service equipment and equipment systems noted as “by owner/operator”, “by purveyor”, or “existing” in the food service construction documents are presented for reference only. These representations must be verified in writing by the food service equipment contractor, owner, operator, and/or general contractor prior to the release of “for construction” documentation. It will be the general contractor’s responsibility to further verify and coordinate all necessary information pertaining to this equipment or systems making up, or relating to, this equipment including, but not limited to, local health department regulations, local sanitation code requirements, mechanical, structural, plumbing and electrical requirements prior to commencement of construction. Consultant or Architect take no responsibility for design, intent, function, performance, utility requirements, or code compliance of non-specified equipment.

3.2 INSTALLATION, GENERAL

A. Install food service equipment level and plumb, according to manufacturer’s written instructions, original design, and referenced standards.

B. Complete equipment field assembly, where required, using methods indicated.

1. Provide closed butt and contact joints that do not require a filler.

2. Grind field welds on stainless-steel equipment smooth, and polish to match adjacent finish. Comply with welding requirements in "Fabrication, General" Article.
C. Install equipment with access and maintenance clearances according to manufacturer’s written instructions and requirements of authorities having jurisdiction.

D. Provide cutouts in equipment, neatly formed, where required to run service lines through equipment to make final connections. Cut holes and provide sleeves for pipes on equipment, for drains, electrical, plumbing, etc., as required for proper installation. Verify sizes with Owner on the following items before ordering or fabrication: steam pans, sheet pans, trays, glass and cup racks.

E. Except for mobile and adjustable-leg equipment, securely anchor and attach items and accessories to walls, floors, or bases with stainless-steel fasteners, unless otherwise indicated.

F. Install cabinets and similar equipment on concrete or masonry bases in a bed of sealant.

G. Install hoods to comply with NFPA 96 requirements and to remain free from vibration when operating.

H. Install seismic restraints according to referenced SMACNA standard.

I. Install trim strips and similar items requiring fasteners in a bed of sealant. Fasten with stainless-steel fasteners at 48 inches (1200 mm) o.c. maximum.

J. Install sealant in joints between equipment and abutting surfaces with continuous joint backing, unless otherwise indicated. Provide airtight, watertight, vermin-proof, sanitary joints.

K. Prohibit cold storage rooms from being used by any other trade for storage or work areas. Repair or cause replacement to any damaged areas on the interior of the cold storage rooms, if the damage was caused due to the cold storage rooms being used for storage or work areas.

3.3 PROTECTING

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and installer, that ensure food service equipment is without damage or deterioration at the time of Substantial Completion.

3.4 COMMISSIONING
A. Startup Services: Engage factory-authorized service representatives to perform startup services for all equipment. Factory trained representative shall demonstrate and train Owner's maintenance and operations personnel as specified below.

1. Coordinate food service equipment startup with service-utility testing, balancing, and adjustments. Do not operate steam lines before they have been cleaned and sanitized. Provide demonstrations for both operations and maintenance personnel.

2. Remove protective coverings and clean and sanitize equipment, both inside and out, and re-lamp equipment with integral lighting. Where applicable, comply with manufacturer's written cleaning instructions.

3. Test each equipment item for proper operation. Repair or replace equipment that is defective in operation, including units that operate below required capacity or that operate with excessive noise or vibration.

4. Provide maintenance and proper operations training to both the client maintenance and operations staff.

5. Provide service parts manuals as well as maintenance manuals.

6. Provide a list of service agencies authorized by the manufacturer to service its equipment. The list must include the name and telephone number of the person to contact.

### 3.5 FOOD SERVICE EQUIPMENT SCHEDULE

<table>
<thead>
<tr>
<th>ITEM #</th>
<th>AIR CURTAIN</th>
</tr>
</thead>
</table>

| Quantity: | One (1) |
| Manufacturer: | Mars Air Systems |
| Model: | NH236-1UA-TS |
| SIS No.: | W010 |

1. One (1) Model NH236-1UA-TS High Velocity Series 2 Air Curtain, for NSF Certified 36" wide door, Unheated, Titanium Silver powder coated cabinet (Standard Production Color) cETLus, CE, NSF, Dimensions 14.00(h) x 36.00(w) x 15.62(d)

2. One (1) 5 year warranty, standard

3. One (1) options WITHOUT control panel

4. One (1) Options WITHOUT time delay

5. One (1) 99-014 Steel Mechanical Universal Surface-mounted Plunger/Roller Switch
ITEM # 1-02  MOP SINK
Quantity: One (1)
Manufacturer: Advance Tabco
Model: 9-OP-44
SIS No.: W010

1. One (1) Model 9-OP-44 Mop Sink, floor mounted, 29"W x 29"D x 16"H (overall), 24"W x 24" front-to-back x 12" deep (bowl size), free flow drain with 2" IPS outlet, stainless steel construction

ITEM # 1-03  SERVICE FAUCET
Quantity: One (1)
Manufacturer: T&S Brass
Model: B-0655-01
SIS No.: W010

1. One (1) Model B-0655-01 Service Sink Faucet, vacuum breaker nozzle with 3/4" garden hose thread, 1/2" NPT female flanged adjustable inlet with screwdriver stops, 6" wrist action handles, pail hook, bottom support, wall brace
2. One (1) 6" wrist action handle, standard, nc

ITEM # 1-04  MOP HOLDER
Quantity: One (1)
Manufacturer: Advance Tabco
Model: K-242
SIS No.: W010

1. One (1) Model K-242 Mop Hanger, 23", accommodates (3)

ITEM # 1-05  CHEMICAL WALL SHELF
Quantity: One (1)
Manufacturer: Custom
Model: STAINLESS STEEL
SIS No.: W010

1. One (1) Model STAINLESS STEEL Approximately 2'-6" l x 1"-0" w. Provide stainless steel chemical wall shelf with knife brackets. Wall shelf shall be: 18 ga stainless steel with #4 finish, bracket shall be 14 ga stainless steel. Fabricate and install per complete drawings, schedules, elevations, and details.
ITEM # 1-06  |  ICE CUBER
---|---
**Quantity:** | One (1)
**Manufacturer:** | Scotsman
**Model:** | C1030SR-32
**SIS No.:** | W010

1. One (1) Model C1030SR-32 Prodigy Plus® Ice Maker, cube style, air-cooled, no condenser (remote), up to 996 lb production/24 hours, stainless steel finish, small cube size, ENERGY STAR®
2. One (1) 3 year parts & labor warranties
3. One (1) 5 year parts & labor warranties on Evaporator
4. One (1) 5 year parts on compressor & condenser
5. One (1) Model KVS Prodigy™ Vari-Smart™ Ice Level Control, program ice bin levels to match ice needs

ITEM # 1-07  |  ICE BIN FOR ICE MACHINES
---|---
**Quantity:** | One (1)
**Manufacturer:** | Scotsman
**Model:** | B948S
**SIS No.:** | W010

1. One (1) Model B948S Ice Bin, top-hinged front-opening door, up to 893 lb ice storage capacity, for top-mounted ice maker, polyethylene liner, metallic finish exterior, includes 6" legs
2. One (1) 3 year parts & labor warranties

ITEM # 1-08  |  CORNER GUARDS
---|---
**Quantity:** | One (1)
**Manufacturer:** | Custom
**Model:** | STAINLESS STEEL
**SIS No.:** | W010

1. One (1) Model STAINLESS STEEL (LOT) Provide 14 ga. stainless steel corner guards at 6'-6" in height. Stainless steel shall have a #4 finish. Fabricate and install per complete drawings, schedules, elevations, and details.

ITEM # 1-09  |  BUMPER RAILS
---|---
**Quantity:** | One (1)
**Manufacturer:** | Custom
**Model:** | STAINLESS STEEL
**SIS No.:** | W010
1. One (1) Model STAINLESS STEEL (LOT) Approximately 30'-0" l. Provide 14 ga. stainless steel bumper rails guards mounted at 34" above the finished floor. Stainless steel shall have a #4 finish. Fabricate and install per complete drawings, schedules, elevations, and details.

ITEM # 1-10 SPARE NO.

ITEM # 1-11 WATER FILTER ASSEMBLY

Quantity: One (1)
Manufacturer: Scotsman
Model: SSM2-P
SIS No.: W010

1. One (1) Model SSM2-P Water Filter Assembly, twin system, designed for ice makers & beverage equipment, cubers over 650 lb, & up to 1200 lb, flakers & nuggets over 1200 lb, includes AquaArmor by AgION for antimicrobial protection

ITEM #1-12 FLOOR TROUGH

Quantity: One (1)
Manufacturer: Custom
Model: STAINLESS STEEL

1. Model STAINLESS STEEL Approximately 4'-9" l x 1'-0" d. Provide stainless steel floor trough, and stainless steel trough box with #4 finish. Provide IMC Teddy ASTF-ADA stainless steel accessible grating. Fabricate and install per complete drawings, schedules, elevations, and details.

ITEM # 1-13 REMOTE CONDENSER UNIT

Quantity: One (1)
Manufacturer: Scotsman
Model: ERC311-32
SIS No.: W010

1. One (1) Model ERC311-32 Condenser Unit, Remote Refrigeration, designed for outdoor installation, temperature range -20°F to 120°F, galvanized finish, use with C0630xR, C0830xR, C1030xR, & C1448xR
2. One (1) 3 year parts & labor warranties
3. One (1) 5 year parts on condenser
4. One (1) Model KERCF Air Filter kit for ERC111 & ERC 311
ITEM # 1-14 WALK-IN REFRIGERATOR

Quantity: One (1)
Manufacturer: Thermalrite
Model: CUSTOM
SIS No.: W010

1. One (1) Model CUSTOM Box description: Cooler/Freezer Combo Items
   1-14 & 1-17 - w/ 4" Floor Insulation w/Visqueen and ASTM
   15 Felt Paper and Asphalt Emulsion - Freezer Section Only - in 8"
   Depression - w/ Finished Floor and Coved Base By Others

   Dimensions:
   External (O.D.): 15' 11 1/2" x 7' 8" x 10' 0"
   Internal (I.D.): 15' 3 1/2" x 7' 0" x 9' 8"
   Volume: 1035 ft³

   Finishes
   Walls: Sanisteel White - 26 ga. Anti-Microbial (5mm) - interior
   Galvanized/Smooth - 20 Ga. & St. Stl. Type 304 #4 finish - 20 Ga. - exterior
   Ceilings: Sanisteel White - 26 ga. Anti-Microbial (5mm) - interior
   Galvanized/Smooth - 20 Ga. - exterior

   Panel Thickness
   Walls: 4" UL Listed Class 1 Foam
   Ceilings: 4" UL Listed Class 1 Foam

Doors
D01:
1 Finished opening 36" x 80" hinged flush cooler door
1 Interior finish - St. Stl. Type 304 #4 finish - 20 Ga.
1 Exterior finish - St. Stl. Type 304 #4 finish - 20 Ga.
1 Exterior jamb finish - St. Stl. Type 304 #4 finish - 20 Ga.
1 Viewport- Unheated 14"x24"
1 Kick plate: 36" 16GA Stainless steel - interior and exterior
3 Hinge- Kason 1245 Reversible Cam-Rise
1 Light- 1806LED000 (120v) Fixture(Mtd to Jamb) and Optic Globe (Ship Loose)
1 Door- Flush Mount
1 Temp Alarm- Modularm 75LC (120v) Multi-Monitor, Temperature Alarm, Door Ajar Alarm, Automatic Light Control, AC Failure Alarm, Panic Alarm (Low voltage 1P-1,120v F°/C°
1 Gasket- Magnetic
D02:
1 Finished opening 36" x 80" hinged flush freezer door
1 Interior finish - St. Stl. Type 304 #4 finish - 20 Ga.
1 Exterior finish - St. Stl. Type 304 #4 finish - 20 Ga.
1 Exterior jamb finish - Sanisteel White - 26 ga. Anti-Microbial (5mm)
1 Viewport- 120v Heated 14"x24"
1. One (1) Model ADT-070 Evaporator coil provided as an integral part of the remote refrigeration system. Evaporator coils shall be a direct expansion type. Evaporators used will be all "Underwriters Laboratory Listed" supplied from factory with an expansion valve, solenoid valve and Eco-Smart demand defrost controller, pre-wired and pre-piped under nitrogen pressure and designed for use with the refrigerant specified.

ITEM # 1-16  REFRIGERATOR SHELVING UNITS

Quantity: One (1)
Manufacturer: Cambro
Model: CAMSHELVING
SIS No.: W010

1. One (1) Model CAMSHELVING (LOT) 4 tier, 21” deep shelving units, posts to be 72” high, shelving units shall have a smooth surface without any welding or crevices. Posts and traverses shall be made of steel metal core with thick polypropylene covers. Shelf plates shall have a smooth surface without any welding or crevices, be of a structural web design and removable to be washed manually or in a commercial dishwasher. Shelf plates shall contain CamGuard, antimicrobial that inhibits the growth of mold, fungus and bacteria. Posts shall have dovetails that allow shelves to be adjusted in 4” increments. Provide dunnage stands for all traverses 54” or longer and at corners where corner connectors are used. Verify evaporator coil location, shelving units below coil to have 3 shelves. Provide in the configuration shown on plans, verify final sizes of shelves and posts by field measuring prior to ordering.
ITEM # 1-17  WALK-IN FREEZER  <Included>

Quantity: One (1)
Manufacturer: Thermalrite
Model: CUSTOM
SIS No.: W010

1. One (1) Model CUSTOM See item #1-14 for full specification

ITEM # 1-18  SPARE NO.

ITEM # 1-19  SPARE NO.

ITEM # 1-20  CO2 AND SODA SYSTEM

Quantity: One (1)
Manufacturer: NIFSEC
Model: BY VENDOR
SIS No.: W010

1. One (1) Model BY VENDOR Co2 and Soda Bag and Box System - NIFSEC, Provided by Vendor. Vendor to supply suitable water filtration system, as approved by Owner.

ITEM # 1-21  EVAPORATOR COIL  <Included>

Quantity: One (1)
Manufacturer: RDT Refrigeration
Model: LET-065
SIS No.: W010

1. One (1) Model LET-065 Evaporator coil provided as an integral part of the remote refrigeration system. Evaporator coils shall be a direct expansion type. Evaporators used will be all "Underwriters Laboratory Listed" supplied from factory with an expansion valve, solenoid valve and Eco-Smart demand defrost controller, pre-wired and pre-piped under nitrogen pressure and designed for use with the refrigerant specified.

ITEM # 1-22  FREEZER SHELVING UNITS

Quantity: One (1)
Manufacturer: Cambro
Model: CAMSHELVING
SIS No.: W010
1. One (1) Model CAMSHELVING (LOT) 4 tier, 21” deep shelving units, posts to be 72” high, shelving units shall have a smooth surface without any welding or crevices. Posts and traverses shall be made of steel metal core with thick polypropylene covers. Shelf plates shall have a smooth surface without any welding or crevices, be of a structural web design and removable to be washed manually or in a commercial dishwasher. Shelf plates shall contain CamGuard, antimicrobial that inhibits the growth of mold, fungus and bacteria. Posts shall have dovetails that allow shelves to be adjusted in 4” increments. Provide dunnage stands for all traverses 54” or longer and at corners where corner connectors are used. Verify evaporator coil location, shelving units below coil to have 3 shelves. Provide in the configuration shown on plans, verify final sizes of shelves and posts by field measuring prior to ordering.

ITEM # 1-23  DRY SHELVING UNITS

| Quantity: | One (1) |
| Manufacturer: | Cambro |
| Model: | CAMSHELVING |
| SIS No.: | W010 |

1. One (1) Model JA14 Jet-Air Convection Oven, Electric, dual oven, capacity (14) 18"x26" pans, integrated steam injection (shot and pulse) system, reversing 2-speed fan system, delay timer, programmable controls, timer, full view glass doors, interior light, stainless steel interior & exterior, casters, (2) 3/4 hp

ITEM # 1-24  CONVECTION OVEN

| Quantity: | One (1) |
| Manufacturer: | Doyon Baking Equipment |
| Model: | JA14 |
| SIS No.: | W010 |
2. One (1) INTERNATIONAL ORDERS: Any orders outside the United States or Canada will be subject to a 5% International Warranty Fee added to the invoice
3. One (1) Two year parts and one year labor warranty, standard
4. One (1) 120/4 wire
5. One (1) Model PLF240 Water Filter System (head & cartridge) (WF001)

<table>
<thead>
<tr>
<th>ITEM # 1-25</th>
<th>CONDENSATE HOOD (TYPE II)</th>
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<tbody>
<tr>
<td>Quantity:</td>
<td>One (1)</td>
</tr>
<tr>
<td>Manufacturer:</td>
<td>Halton</td>
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<tr>
<td>Model:</td>
<td>CH</td>
</tr>
<tr>
<td>SIS No.:</td>
<td>W010</td>
</tr>
</tbody>
</table>
1. One (1) Model CH Condensate hood to be U.L. approved for intended use, and NSF approved. Double wall construction, 18ga. type 304 stainless steel. Provide 3" air space on back, top, and ends, as required. Ship all duct collars loose. Provide stainless steel closure strips as needed for a complete installation.

<table>
<thead>
<tr>
<th>ITEM # 1-26</th>
<th>EXHAUST HOOD TRIM AND CLOSURE PANEL</th>
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<tbody>
<tr>
<td>Quantity:</td>
<td>One (1)</td>
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<tr>
<td>Manufacturer:</td>
<td>Custom</td>
</tr>
<tr>
<td>Model:</td>
<td>STAINLESS STEEL</td>
</tr>
<tr>
<td>SIS No.:</td>
<td>W010</td>
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</tbody>
</table>
1. One (1) Model STAINLESS STEEL Approximately 12'-0" l x 0'-0" w. Provide 14 ga stainless steel exhaust hood trim and closure panels with #4 finish. Provide all necessary closure, louvers and trim strips for a complete installation. Fabricate and install per complete drawings, schedules, elevations, and details.

<table>
<thead>
<tr>
<th>ITEM # 1-27</th>
<th>ROLL-IN PROOFER RETARDER</th>
</tr>
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<tbody>
<tr>
<td>Quantity:</td>
<td>One (1)</td>
</tr>
<tr>
<td>Manufacturer:</td>
<td>Doyon Baking Equipment</td>
</tr>
<tr>
<td>Model:</td>
<td>ER136</td>
</tr>
<tr>
<td>SIS No.:</td>
<td>W010</td>
</tr>
</tbody>
</table>
1. One (1) Model ER136 Proofer/Retarder, Roll-in, one-section, capacity one single rack, heat and humidity controls, self-contained refrigeration 7 day timer, automatic refrigeration. to proofing system, full view glass door, stainless steel interior and exterior
2. One (1) INTERNATIONAL ORDERS: Any orders outside the United States or Canada will be subject to a 5% International Warranty Fee added to the invoice
3. One (1) Two year parts and one year labor warranty, standard
4. One (1) 120/3 wire
5. One (1) Model PLF240 Water Filter System (head & cartridge) (WF001)
6. One (1) Door hinged on left

ITEM # 1-28 WALL FLASHING

Quantity: One (1)
Manufacturer: Custom
Model: STAINLESS STEEL
SIS No.: W010

1. Model STAINLESS STEEL (LOT) Approximately 6'-0" l. Provide 20 ga. stainless steel wall flashing from floor to exhaust hood with #4 finish. Provide all necessary closure and trim strips for a complete installation. Fabricate and install per complete drawings, schedules, elevations, and details.

ITEM # 1-29 SPARE NO.

ITEM # 1-30 SPARE NO.

ITEM # 1-31 BAKER'S TABLE W/FLOUR EDGE

Quantity: One (1)
Manufacturer: Custom
Model: STAINLESS STEEL/WOOD
SIS No.: W010

1. One (1) Model STAINLESS STEEL/WOOD Approximately 7'-3" l x 3'-0" w. Provide stainless steel bakers table with 1-5/8" legs with adjustable bullet feet, lower and/or mid shelves, 6" high back and end splash. Top shall be NSF approved solid maple, and legs shall be 16 ga stainless steel. Fabricate and install per complete drawings, schedules, elevations, and details.

ITEM # 1-32 WALL SHELF (KNIFE BRACKETS)

Quantity: One (1)
Manufacturer: Custom
Model: STAINLESS STEEL
SIS No.: W010

1. One (1) Model STAINLESS STEEL Approximately 7'-3" l x 1'-0" w. Provide stainless steel wall shelf with knife brackets. Wall shelf shall be: 18 ga stainless steel with #4 finish, bracket shall be 14 ga stainless steel
steel. Fabricate and install per complete drawings, schedules, elevations, and details.

ITEM # 1-33 INGREDIENT BIN

Quantity: Three (3)
Manufacturer: Cambro
Model: IBS27148
SIS No.: W010

1. Three (3) Model IBS27148 Ingredient Bin, mobile, 27 gallon capacity, 1-pc seamless polyethylene bin, 2-pc sliding polycarbonate lid, S-hook on front (scoop NOT included), (4) 3" heavy duty casters (2 front swivel, 2 fixed), white with clear cover, NSF

ITEM # 1-34 REFRIGERATOR RACK, ROLL-IN

Quantity: Two (2)
Manufacturer: Metro
Model: RF13N
SIS No.: W010

1. Two (2) Model RF13N Roll-In Refrigerator Rack, pass-thru, 21-1/4"W x 64"H, 26"D, open frame design, slides on 1-1/2" centers, holds (36) 18"x26" pans, sized to fit refrigerator, riveted extruded aluminum frame construction, natural finish, 5" swivel casters (2) with brakes, NSF
2. Two (2) Model A37 Mobile Tray Rack Corner Bumper Set, gray, adds 1/2" to overall width & 1" to overall depth of rack

ITEM # 1-35 COMPACT PREP TABLE REFRIGERATOR

Quantity: One (1)
Manufacturer: Traulsen
Model: UST4818-LR
SIS No.: W010

1. One (1) Model UST4818-LR Dealer's Choice Compact Prep Table Refrigerator with low-profile flat cover, Reach-in, two-section, 48" wide, holds (18) 1/6 pans 4" deep (included), can accommodate up to 6" deep pans, stainless steel exterior top, sides & door with Santoprene® EZ-Clean Gasket, hinged left/right, anodized aluminum interior, galvanized exterior back and bottom, rear-mounted self-contained refrigeration, (4) 4" casters, 1/4 HP, cULus, NSF
2. One (1) 3 year service/labor & 5 year compressor warranty, standard
3. One (1) 8' cord
4. One (1) Model CASTER 5SET4 Casters, 6", set of 4, for 27", 32" & 48" models
ITEM #1-36   HAND SINK

Quantity: One (1)
Manufacturer: IMC/Teddy
Model: ADA-WSX

1. Model ADA-WSX ADA-WS Handicap Hand Sink, wall mounted, 19-1/4" W, 20-1/2" front-to-back, 16/304 stainless steel, integrated backsplash, non-drip marine edges, 14 gauge. stainless steel front apron w/rear flange & "Z" strip, ADA, NSF

2. Model ITD Integrated Towel Dispenser (built in to apron)
3. Model SD Soap Dispenser, stainless steel construction, 1 pint capacity
4. Model SS Side Splashes for hand sink (pair)

ITEM # 1-37   PANTRY FAUCET

Quantity: One (1)
Manufacturer: T&S Brass
Model: B-0325-CR
SIS No.: W010

1. One (1) Model B-0325-CR Pantry Faucet, double, 4" c/c, swivel gooseneck, lever handles, 00AA inlets & Ceramas
2. One (1) Model B-0199-01F-15 Aerator, non-splash, flow control, 1.40 gpm, 55/64"-27 UNS female threads

ITEM # 1-38   SPARE NO.

ITEM # 1-39   SPARE NO.

ITEM # 1-40   SPARE NO.

ITEM # 1-41   WORK TABLE

Quantity: One (1)
Manufacturer: Custom
Model: STAINLESS STEEL
SIS No.: W010

1. One (1) Model STAINLESS STEEL Approximately 14'-3" l x 2'-6" w. Provide stainless steel work table with 1-5/8" legs with adjustable bullet feet, lower and/or mid shelves, 6" high back and end splash. Top shall be 14 ga stainless steel, and legs shall be 16 ga. Fabricate and install per complete drawings, schedules, elevations, and details.
2. One (1) CSS Model PREP SINK Provide 16 ga stainless steel sink tub measuring approximately 18" w x 24" d x 12" h. Welded in place with polished seams.
3. One (1) Fisher Model 29033 DrainKing Waste Valve, flat strainer, overflow body, chrome finish
4. One (1) CSS Model DRAWER Provide 16 ga stainless steel utensil drawer with metal roller track hardware, and lock measuring approximately 20" l x 20" w x 5" d

ITEM # 1-42 WALL / SPLASH MOUNT FAUCET

Quantity: One (1)
Manufacturer: T&S Brass
Model: B-0231-CR
SIS No.: W010

1. One (1) Model B-0231-CR Faucet, 12" swing nozzle, 8" wall mount base, 1/2" NPT female Inlets, Ceramas cartridges

ITEM # 1-43 TRASH RECEPTACLE W/DOLLY

Quantity: Two (2)
Manufacturer: Rubbermaid
Model: FG262000GRAY
SIS No.: W010

1. Two (2) Model FG262000GRAY ProSave® BRUTE® Container, without lid, 20 gallon, 19-1/2"D x 22-7/8"H, round, reinforced rims, built in handles, double rimmed base, high-impact plastic construction, gray, NSF
2. Two (2) All-plastic, professional-grade construction will not rust, chip or peel; resists dents.
3. Two (2) Reinforced rims add strength and durability
4. Two (2) Built-in handles allow easy, non-slip lifting and anti-jam nesting
5. Two (2) Double-ribbed base increases stability and dragging capacity
6. Two (2) USDA Meat & Poultry Equipment Group listed and assist in complying with HACCP guidelines.
7. Two (2) Certified to NSF Standard #2 and Standard #21
8. Two (2) Model FG264043BLA BRUTE® Quiet Dolly, 18-1/4"D x 6-5/8"H, non-marking blue casters, black

ITEM # 1-44 FOOD SLICER

Quantity: One (1)
Manufacturer: Bizerba
Model: GSP-HDAUTOW/LIFT
SIS No.: W010
1. One (1) Model GSP-HDAUTOW/LIFT (355706) PRO Safety Slicer with seamless aluminum rear wall, with Lift Device, automatic or manual, gravity feed, 13" (330mm) dia. hard chromium-plated blade, anodized aluminum carriage and gauge plate, slice thickness 0" - 0.94" (0-24mm), proximity switch 15 to 45 seconds time delay power, blade shut-off switch in thickness knob, aluminum housing, with servo assist (replacement for SE12D PRO with LIFT)

2. One (1) (913004009) 90mm rear wall

ITEM # 1-45 DROP-IN HOT WELL

| Quantity: | Two (2) |
| Manufacturer: | Wells |
| Model: | HW-106D |
| SIS No.: | W010 |

1. Two (2) Model HW-106D Cook 'N Hold Warmer, built-in, electric, for 11-quart round inserts, wet operation with drain, stainless steel construction, with Wellslok, UL

2. Two (2) Limited 2 year parts & 1 year labor warranty, standard

3. Two (2) Model 20623 direct

4. Two (2) Model 20908 Round Inset, 11 quart, with handles & slotted lid, fits 10-1/2" opening

ITEM #1-46 WALL SHELF (KNIFE BRACKETS)

| Quantity: | Two (2) |
| Manufacturer: | Custom |
| Model: | STAINLESS STEEL |

1. Model STAINLESS STEEL Approximately 7'-6" l x 1''-0'' w. Provide stainless steel wall shelf with knife brackets. Wall shelf shall be: 18 ga stainless steel with #4 finish, bracket shall be 14 ga stainless steel. Fabricate and install per complete drawings, schedules, elevations, and details

ITEM # 1-47 POT SHELVING UNITS

| Quantity: | One (1) |
| Manufacturer: | Cambro |
| Model: | CAMSHELVING |
| SIS No.: | W010 |

1. One (1) Model CAMSHELVING (LOT) 4 tier, 24” deep shelving units, posts to be 72” high, shelving units shall have a smooth surface without any welding or crevices. Posts and traverses shall be made of steel metal core with thick polypropylene covers. Shelf plates shall have a smooth surface without any welding or crevices, be of a structural web
design and removable to be washed manually or in a commercial dishwasher. Shelf plates shall contain CamGuard, antimicrobial that inhibits the growth of mold, fungus and bacteria. Posts shall have dovetails that allow shelves to be adjusted in 4” increments. Provide with CSRDB donut bumper and CSCTL casters with brake.

ITEM # 1-48 SPARE NO.

ITEM # 1-49 SPARE NO.

ITEM # 1-50 SPARE NO.

ITEM #1-51 HAND SINK

Quantity: One (1)
Manufacturer: IMC/Teddy
Model: ADA-WSX

1. Model ADA-WSX ADA-WS Handicap Hand Sink, wall mounted, 19-1/4"W, 20-1/2" front-to-back, 16/304 stainless steel, integrated backsplash, non-drip marine edges, 14 gauge. stainless steel front apron w/rear flange & "Z" strip, ADA, NSF
2. Model ITD Integrated Towel Dispenser (built in to apron)
3. Model SD Soap Dispenser, stainless steel construction, 1 pint capacity
4. Model SS Side Splashes for hand sink (pair)

ITEM # 1-52 PANTRY FAUCET

Quantity: One (1)
Manufacturer: T&S Brass
Model: B-0325-CR
SIS No.: W010

1. One (1) Model B-0325-CR Pantry Faucet, double, 4" c/c, swivel gooseneck, lever handles, 00AA inlets & Ceramas
2. One (1) Model B-0199-01F-15 Aerator, non-splash, flow control, 1.40 gpm, 55/64"-27 UNS female threads

ITEM # 1-53 3 COMPARTMENT POT SINK

Quantity: One (1)
Manufacturer: Custom
Model: STAINLESS STEEL
SIS No.: W010
1. One (1) Model STAINLESS STEEL Approximately 9'-0" l x 2'-6" w. Provide stainless steel pot sink assembly with 1-5/8" legs with adjustable bullet feet, lower and/or mid shelves, 8" high back and end splash. Top shall be 14 ga stainless steel, and legs shall be 16 ga. Fabricate and install per complete drawings, schedules, elevations, and details.

2. Three (3) CSS Model SINKS Provide 16 ga stainless steel sink tub measuring approximately 18" w x 26" d x 14" h. Welded in place with polished seams.

3. Three (3) Fisher Model 29033 DrainKing Waste Valve, flat strainer, overflow body, chrome finish

### ITEM # 1-54 WALL / SPLASH MOUNT FAUCET

| Quantity: | Two (2) |
| Manufacturer: | T&S Brass |
| Model: | B-0291 |
| SIS No.: | W010 |

1. Two (2) Model B-0291 Kettle & Pot Sink Faucet, Big-Flo, wall mounted 8" centers, 3/4" IPS model LL street EL inlets with locknuts, 18" swing nozzle, 175°F four arm handles, 1-1/4" diameter holes required in backsplash

### ITEM # 1-55 UTENSIL RACK

| Quantity: | One (1) |
| Manufacturer: | Custom |
| Model: | STAINLESS STEEL |
| SIS No.: | W010 |

1. One (1) Model STAINLESS STEEL Approximately 7'-0" l x 1/4" w x 2" d. Provide stainless steel flatbar utensil rack with sliding hooks 8" on center. Stainless steel shall be 16 ga with #4 finish. Fabricate and install per complete drawings, schedules, elevations, and details.

### ITEM # 1-56 WORK TABLE

| Quantity: | One (1) |
| Manufacturer: | Custom |
| Model: | STAINLESS STEEL |
| SIS No.: | W010 |

1. One (1) Model STAINLESS STEEL Approximately 13'-6" l x 2'-6" w. Provide stainless steel work table with 1-5/8" legs with adjustable bullet feet, lower and/or mid shelves, 6" high back and end splash. Top shall be 14 ga stainless steel, and legs shall be 16 ga. Fabricate and install per complete drawings, schedules, elevations, and details.
2. One (1) CSS Model DRAWER Provide 16 ga stainless steel utensil drawer with metal roller track hardware, and lock measuring approximately 20" l x 20" w x 5" d.

<table>
<thead>
<tr>
<th>ITEM # 1-57</th>
<th>WALL SHELF (KNIFE BRACKETS)</th>
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<tbody>
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<td>Manufacturer:</td>
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<td>STAINLESS STEEL</td>
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<tr>
<td>SIS No.:</td>
<td>W010</td>
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</table>

1. One (1) Model STAINLESS STEEL Approximately 6'-6" l x 1"-0" w. Provide stainless steel wall shelf with knife brackets. Wall shelf shall be: 18 ga stainless steel with #4 finish, bracket shall be 14 ga stainless steel. Fabricate and install per complete drawings, schedules, elevations, and details.

<table>
<thead>
<tr>
<th>ITEM # 1-58</th>
<th>SPARE NO.</th>
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<th>ITEM # 1-59</th>
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<th>ITEM # 1-60</th>
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<tr>
<th>ITEM # 1-61</th>
<th>COFFEE GRINDER  &lt;NIC&gt;</th>
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<td>Manufacturer:</td>
<td>NIFSEC</td>
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<td>W010</td>
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1. One (1) Coffee Grinder - NIFSEC

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<th>ITEM # 1-62</th>
<th>COFFEE BREWER  &lt;NIC&gt;</th>
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<td>NIFSEC</td>
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<td>SIS No.:</td>
<td>W010</td>
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1. Two (2) Coffee Brewer - NIFSEC

<table>
<thead>
<tr>
<th>ITEM # 1-63</th>
<th>TEA BREWER  &lt;NIC&gt;</th>
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<tr>
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<td>Manufacturer:</td>
<td>NIFSEC</td>
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<tr>
<td>SIS No.:</td>
<td>W010</td>
</tr>
</tbody>
</table>
1. One (1) Tea Brewer - NIFSEC

ITEM # 1-64 REMOTE REFRIGERATION RACK AND SYSTEM

| Quantity: | One (1) |
| Manufacturer: | RDT Refrigeration |
| Model: | CUSTOM |
| SIS No.: | W010 |

1. Model No. ZS1-3 Eco-Cool as manufacturer by Refrigeration Design Technologies (RDT)

| Quantity: | 1 |
| Electrical: | 208-230v/3ph |

The RDT UL-Listed horizontal discharge, air-cooled rack system designed for outdoor installation. The unit shall be pre-wired for a single point electrical connection with a main fused disconnect. The refrigeration unit shall be housed in a weather-protected compact structural galvanized steel frame. The unit shall include individual dedicated air-cooled condensers. Condensers shall be aluminum fin/copper tube designed to operate at 15 degrees TD. The exterior housing shall feature stainless steel with one piece stainless steel louvers. Entire galvanized metal frame shall be pre-assembled, welded and cleaned. Lifting points shall be integrated in the feet at each corner to facilitate installation. Condenser fan motors shall be mounted within the enclosure.

All compressor units shall be scroll type and factory assembled to operate with R-407a refrigerant.

- 5.0 HP (primary) medium temperature digital scroll compressor.
- 5.0 HP (back-up) medium temperature scroll compressor with manual change over for 100% redundancy.
- 2.5 HP low temperature scroll compressor for walk-in freezer.

Compressors and refrigeration piping will be installed in such a manner as to eliminate noise with vibration eliminators in refrigeration lines, as needed.

Each system shall be equipped with a ball-bearing fan motor, an XC645CX Dixell controller (digital compressors only), oil separator, fixed head pressure control, suction filter, liquid line sight glass, liquid line drier, crankcase heaters, headmaster controls or fan cycling, liquid line inlet and outlet valves, defrost cycle and armored super hose connections (in lieu of capillary tubes).
All refrigerant lines shall be extended to one side of the package in a neat and orderly manner. All tubing shall be securely supported and anchored with non-corrosive coated clamps. All joints must be brazed, not soldered. All piping and controls shall be factory pressure-tested with nitrogen at 175 PSI.

All field piping installed as per factory standards and the sizing of the piping shall meet proper velocities as per factory standards. Insulation will be foam type 25/50 smoke and fire type. Medium temperature will use 3/4" thick wall, low temperature will use 1" thick wall and sub-cooled liquid lines will use 1/2" thick wall insulation. All insulation shall be jacketed with Aluminum (complying with division 15000,) 1-1/2" overlap and secured with wire "zip" ties. All jacket elbows to be roll formed. All field piping installed with plastic bushing wherever steel to copper tubing comes together. Include all labor, material, equipment, tools, refrigerant, oil, and other required accessories for the complete installation of the systems as shown and specified. Interconnection of all accessories accomplished for ease of servicing.

After installation and before charging, evacuate all piping systems to a 500 micron evacuation. After evacuation, charge system with nitrogen and maintain pressure of 150% working pressure for 6 hours. Cap off, install pressure gauge and hold for 24 hours minimum. Re-evacuate, hold for 6 hours, charge and make electronic detector test all joints.

Final wiring of connections, conduit and/or pull boxes, provided under applicable electrical and plumbing contracts. See R-1 drawing for wiring schematic for field wiring.

WARRANTY AND SERVICE:
Included shall be a full one (1) year warranty for all parts by factory and 90 day warranty on labor on the entire refrigeration package, from the day of final acceptance of the installation as previously specified.

ITEM #2-01 WORK COUNTER

Quantity: One (1)
Manufacturer: Custom
Model: STAINLESS STEEL

1. Model STAINLESS STEEL Approximately 6'-6" l x 3'-0" w. Provide stainless steel work counter with undershelf and/or mid shelf, galvanized metal base, and 6" high back and end splash. Top shall be 14 ga stainless steel, body to be 16 ga. Fabricate and install per complete drawings, schedules, elevations, and details.

2. Custom Stainless Steel Model HAND SINK Provide 16 ga stainless steel sink tub measuring approximately 10" w x 14" d x 7" h. Welded in place with polished seams. Provide with T&S basket strainer.
### ITEM # 2-02  PANTRY FAUCET

<table>
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<tr>
<th>Quantity</th>
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<tbody>
<tr>
<td>Manufacturer</td>
<td>T&amp;S Brass</td>
</tr>
<tr>
<td>Model</td>
<td>B-0325-CR</td>
</tr>
<tr>
<td>SIS No.</td>
<td>W010</td>
</tr>
</tbody>
</table>

1. One (1) Model B-0325-CR Pantry Faucet, double, 4" c/c, swivel gooseneck, lever handles, 00AA inlets & Ceramas
2. One (1) Model B-0199-01F-15 Aerator, non-splash, flow control, 1.40 gpm, 55/64"-27 UNS female threads

### ITEM # 2-03  MICROWAVE CONVECTION OVEN

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<th>Quantity</th>
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<tr>
<td>Manufacturer</td>
<td>Turbochef</td>
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<tr>
<td>Model</td>
<td>I3</td>
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<tr>
<td>SIS No.</td>
<td>W010</td>
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</tbody>
</table>

1. One (1) Model I3 I3™ Convection/Microwave Oven, Rapid Cook, electric, 23" wide, ventless, countertop, fully insulated cook chamber, stores up to 200 recipes, internal catalytic converter, smart voltage sensor technology (US only), digital display, removable rack and grease collection pan, top and bottom jet plates, pull down door with ergonomic handle, multi-speed convection blower, (2) solid PTFE baskets, (1) oven cleaner, (1) oven guard, (1) aluminum paddle, (2) trigger sprayers, (1) standard rack, side hand grips, stainless steel front, top & sides, cULuS, CE, ANSI, TUV
2. One (1) All items FOB: Carrollton, Texas: Consumable/accessory orders less than $5,000 will incur a handling fee. Orders shipping standard ground will incur a $15.00 handling fee. Orders shipping other than standard ground will incur $25.00 handling fee
3. One (1) One year parts and labor warranty
4. One (1) 6 foot cord (nominal), standard

### ITEM # 2-04  TRASH RECEPTACLES (COUNTER)

<table>
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<tr>
<th>Quantity</th>
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<tbody>
<tr>
<td>Manufacturer</td>
<td>Rubbermaid</td>
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<tr>
<td>Model</td>
<td>FG295700BLA</td>
</tr>
<tr>
<td>SIS No.</td>
<td>W010</td>
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</tbody>
</table>

1. Two (2) Model FG295700BLA Waste Basket, 41-1/4 qt., 15-1/4"W x 11"D x 19-7/8"H, medium, soft, rolled rims, all plastic, won't chip, rust or dent, black
ITEM # 2-05 SOAP AND TOWEL DISPENSER

Quantity: One (1)
Manufacturer: Bobrick Washroom
Model: B-35903
SIS No.: W010

1. One (1) Model B-35903 Recessed paper towel dispenser shall be constructed entirely of type-304 stainless steel with satin finish. Flange shall be drawn, one-piece, seamless beveled construction. Paper towel dispenser shall have full-length stainless steel piano hinge and be equipped with a tumbler lock. Rounded towel tray shall have a hemmed opening to dispense paper towels without tearing. Capacity: 350 C-fold or 475 multifold paper towels.

2. One (1) Model B-822 Lavatory-mounted soap dispenser shall dispense liquid soaps, lotions, and detergents. Valve shall be operable with one hand and require less than 5 lb (22 N) of force to comply with ADA Accessibility Guidelines (ADAAG). Piston shall have arcs and radiuses on top and sides complementing other Bobrick Contura™ Series accessories in the washroom. Stainless steel spout shall rotate 360 degrees without damage to valve mechanism. Cover shall lock to body with concealed locking mechanism opened only with special key provided. Piston, spout and supply tube assembly shall be removable for top filling and maintenance. Shank shall accommodate up to 4" (102 mm) mounting thickness. Capacity: 34 fl. oz. (1 liter).

ITEM #2-06 2 OPEN BURNER RANGE

Quantity: One (1)
Manufacturer: Montague Company
Model: PART OF ITEM #2-07

1. Model PART OF ITEM #2-07 2 Open Burner Range - Part Of Item #2-07

ITEM #2-07 HD RANGE, 48" MANUAL GRIDDLE

Quantity: One (1)
Manufacturer: Montague Company
Model: 2/C24-8+C12-5
1. Model 2/C24-8+C12-5 Legend Heavy Duty Range, gas, 48”, fry top, 3/4” thick, manual control, countertop, stainless steel front & 4” flue riser, black sides, 4” high adjustable legs, 90,000 BTU
2. Standard warranty: one year parts and labor warranty
3. Unitized construction including: guard rail, front panels & capping strips, per seam
4. Natural gas
5. 1" Left rear manifold with pressure regulator (up to 400,000 BTU/hr)
6. Cap & stainless steel manifold cover, left
7. 1” plate with Standard 36” depth range
8. Left Side, stainless steel for range
9. Thermostats for fry top, add Suffix "T" to model number, 48” wide (three thermostats)
10. Legend Heavy Duty Range, gas, 12”, Add-A-Unit , (2) 30,000 BTU open burners, countertop, stainless steel front & 4” flue riser, black sides, 4” high adjustable legs, 60,000 BTU, CE, NSF, cETLus
11. Standard warranty: one year parts and labor warranty
12. Natural gas
13. 1-1/4" Front manifold without pressure regulator, standard
14. Cap & stainless steel manifold cover, right
15. Right Side, stainless steel for range
16. Guard rail finished end

ITEM #2-08 CHARBROILER, GAS, COUNTERTOP

Quantity: One (1)
Manufacturer: Montague Company
Model: UFLC-24R

1. Model UFLC-24R Legend Char-Broiler, 24” heavy-duty range match countertop, self-cleaning stainless steel radiants, 2-position cast iron Ultra-Flow reversible top grate, stainless steel front & top trim, black sides, 4” adjustable nickel legs, 76,000 BTU
2. Standard warranty: one year parts and labor warranty
3. Extended one year warranty, per section
4. Natural gas
5. 1-1/4" front manifold standard
6. 36-5/8" Depth std.

ITEM #2-09 HD RANGE, 12", ADD-A-UNIT, WORK TOP

Quantity: One (1)
Manufacturer: Montague Company
Model: 12-S
1. Model 12-S Legend Heavy Duty Range, 12", Add-A-Unit, (1) work top, open cabinet base with stainless steel front & 4" flue riser, black sides, black intermediate & bottom shelves, 6" high adjustable stainless steel legs, cETLus, NSF, CE
2. Standard warranty: one year parts and labor warranty
3. Extended one year warranty, per section
4. Unitized construction including: guard rail, front panels & capping strips, per seam
5. 1-1/4" Front manifold without pressure regulator, standard

ITEM #2-10 REFRIGERATED EQUIPMENT BASE

Quantity: One (1)
Manufacturer: Montague Company
Model: RB-84-SC

1. Model RB-84-SC Legend Heavy Duty Extreme Cuisine Refrigerated Equipment Base/Stand, 84" self-contained, two sections of drawers on 14 gauge stainless steel track system, (4) 27-1/4" wide drawers, (8) pan capacity (pans NOT included), welded stainless steel body, frame, front, sides & top, 6" adjustable stainless steel legs, cord & plug
2. Standard warranty: one year parts and labor warranty
3. Extended one year warranty, per section
4. 4 year (parts only) compressor warranty, Self-contained units only.
5. 6" adjustable stainless steel legs, standard

ITEM #2-11 WORK COUNTER

Quantity: One (1)
Manufacturer: Custom
Model: STAINLESS STEEL

1. Model STAINLESS STEEL Approximately 7'-6" l x 3'-0" w. Provide stainless steel work counter with undershelf and/or mid shelf, galvanized metal base, and 6" high back and end splash. Top shall be 14 ga stainless steel, body to be 16 ga. Fabricate and install per complete drawings, schedules, elevations, and details.
2. Custom Stainless Steel Model PREP SINK Provide 16 ga stainless steel sink tub measuring approximately 18" w x 24" d x 12" h. Welded in place with polished seams.
3. Fisher Model 29033 DrainKing Waste Valve, flat strainer, overflow body, chrome finish

ITEM # 2-12 WALL / SPLASH MOUNT FAUCET
1. One (1) Model B-0231-CR Faucet, 12" swing nozzle, 8" wall mount base, 1/2" NPT female Inlets, Ceramas cartridges

ITEM # 2-13 SHAVER/BLENDER MACHINE

Quantity: One (1)
Manufacturer: Island Oasis
Model: SB3X
SIS No.: W010

1. One (1) Model SB3X Designed to allow operators to serve Island Oasis frozen beverages faster, the company's signature SB3X machine combines the functions of an ice shaver and a blender. It generates up to three of the same frozen beverage at a time with the push of a button. The unique portion control feature insures the same drink every time with no waste.

Key Features:
- Speed: Just 9 seconds for a 12 oz. drink
- Consistency: Shaves the exact amount of ice for each drink
- Portion Control: No product waste, saves money
- Versatile: Ideal for all of your frozen beverage recipes, including: Smoothies, Margaritas, Daiquiris, Lattes

ITEM # 2-14 INSULATED ICE BIN STORAGE BIN

Quantity: One (1)
Manufacturer: Custom
Model: STAINLESS STEEL
SIS No.: W010

1. One (1) Model STAINLESS STEEL Provide 14 ga. stainless steel ice storage bin with #4 finish. Provide all necessary closure, louvers and trim strips for a complete installation. Insulation shall be polyurethane. Fabricate and install per complete drawings, schedules, elevations, and details.

ITEM # 2-15 WALL SHELF (CONCEALED BRACKETS)

Quantity: One (1)
Manufacturer: Custom
Model: STAINLESS STEEL  
SIS No.: W010  

1. One (1) Model STAINLESS STEEL Approximately 5'-6" l x 1"-0" w. Provide stainless steel wall shelf with concealed brackets. Wall shelf shall be: 18 ga stainless steel with #4 finish, bracket shall be 14 ga stainless steel. Fabricate and install per complete drawings, schedules, elevations, and details.

ITEM # 2-16  REACH-IN REFRIGERATOR  
Quantity: One (1)  
Manufacturer: Victory Refrigeration  
Model: RS-1D-S1  
SIS No.: W010  

1. One (1) Model RS-1D-S1 UltraSpec Series Refrigerator Featuring Secure-Temp 1.0™ Technology, Reach-in, one-section, self-contained refrigeration, 21.5 cu. ft. capacity, (1) hinged door, (3) shelves, stainless steel exterior & interior, standard depth cabinet, full height 20 gauge stainless steel door, V-TEMP electronic temperature control/indicator, LED lighting, expansion valve technology, Santoprene door gaskets with 2 year warranty, stainless steel breakers, 1/3 HP, UL, cUL, NSF, MADE IN USA

2. One (1) 3 years parts & labor warranty (excludes maintenance items)
3. One (1) Remote refrigeration (1/3 hp medium temp. compressor by others)
4. One (1) (for cabinet only)
5. One (1) (for cabinet only)
6. One (1) Door hinging: standard on right
7. One (1) Legs, set of 4, 6" high adjustable stainless steel, standard

ITEM # 2-17  DIPPER WELL  
Quantity: One (1)  
Manufacturer: T&S Brass  
Model: B-2282-01-F05  
SIS No.: W010  

1. One (1) Model B-2282-01-F05 Dipperwell Faucet, with drain, stainless steel bowl, removable inner overflow cup, 0.5 gpm flow control, brass knob, polish chrome plated

ITEM #2-18  FILLER PANELS AND TRIM  
Quantity: One (1)  
Manufacturer: Custom  
Model: STAINLESS STEEL
1. Model STAINLESS STEEL Provide 14 ga. stainless steel filler panel with #4 finish. Provide all necessary closure, louvers and trim strips for a complete installation. Fabricate and install per complete drawings, schedules, elevations, and details.

**ITEM #2-19 FIRE PULL BOX**

| Quantity | One (1) |
| Manufacturer | Custom |
| Model | PART OF ITEM #2-30 |

1. Model PART OF ITEM #2-30 Fire Pull Box - Box by electrician, Mechanism part of item #2-30 Fire Protection System.

**ITEM # 2-20 VERTICAL SNEEZEGUARD**

| Quantity | One (1) |
| Manufacturer | BSI |
| Model | ZG9500-4 |
| SIS No. | W010 |

1. One (1) Model ZG9500-4 Zguard: 18" x 40"+40" x 18" -U shaped --- Includes (2) ZGUARD 9500-4 Adjustable Vertical Partition Series End Post(s) S/S Post #4 Finish, Brushed ALUMINUM Bracket Finish, (3) ZGUARD 9500-4 Adjustable Vertical Partition Series Center Post(s) S/S Post #4 Finish, Brushed ALUMINUM Bracket Finish, 3/8" tempered glass front panels, DOES NOT INCLUDE TOP SHELVES, ZGuard Mounting Method MWU5- Below Counter Mount Heavy Duty Flange - Sufficient sub structure as well as access below counter is required when using this under counter mount., Unit shall be shipped knocked down to accommodate packing and shipping. Some assembly is required on-site by others., (166) # shipping weight each. Does not include Heat Lamps or Lights

**ITEM # 2-21 ESPRESSO MACHINE</NIC>**

| Quantity | One (1) |
| Manufacturer | NIFSEC |
| SIS No. | W010 |

1. One (1) Espresso Machine - NIFSEC
ITEM # 2-22  SERVICE COUNTER

| Quantity: | One (1) |
| Manufacturer: | Custom |
| Model: | STAINLESS STEEL / MILLWORK |
| SIS No.: | W010 |

1. One (1) Model STAINLESS STEEL / MILLWORK Approximately 16'-9" l x 3'-6" w. Provide stainless steel undercounter with stone top, stainless steel intermediate and/or lower shelves, galvanized metal base, millwork die front with hardwood veneer or high pressure laminate finish. See finish schedule for specific finish requirements. Fabricate and install per complete drawings, schedules, elevations, and details.

ITEM # 2-23  COMPACT PREP TABLE REFRIGERATOR

| Quantity: | One (1) |
| Manufacturer: | Traulsen |
| Model: | UST7230-LR |
| SIS No.: | W010 |

1. One (1) Model UST7230-LR Dealer's Choice Compact Prep Table Refrigerator with low profile flat cover, Reach-in, two-section, 72" wide, holds (30) 1/6 pans 4" deep (included) can accommodate up to 6" deep pans, stainless steel exterior top, sides & doors with Santoprene® EZ-Clean Gasket, hinged left/right, anodized aluminum interior, galvanized exterior back & bottom, rear mounted, self-contained refrigeration, (6) 4" casters, 1/4 HP, cULus, NSF
2. One (1) 3 year service/labor & 5 year compressor warranty, standard
3. One (1) 8' cord
4. One (1) Model CASTER SET4 Casters, 3-1/2", set of 6, for 60" & 72" models

ITEM # 2-24  SERVICE/SELF-SERVICE COMBO MERCHANDISER

| Quantity: | One (1) |
| Manufacturer: | Structural Concepts |
| Model: | HOU4852R |
| SIS No.: | W010 |

1. One (1) Model HOU4852R Encore® Service/Self-Service Combo Merchandiser, 50"W, upper: curved lift-up front glass, clear glass rear sliding doors without lock, lighted glass shelf in upper display with center glass divider, convertible refrigeration, lower: open self-service refrigerated, top light, sheet metal deck, black interior, black trim, (2) cutaway end panels with mirror, Breeze™ with EnergyWise self-contained refrigeration system, cETLus, ETL-Sanitation
2. One (1) NOTE: If GFCI is required, a GFCI breaker MUST be used in lieu of a GFCI receptacle
3. One (1) NOTE: 43" minimum entry door clearance required (with out shipping skid)
4. One (1) 1 yr. parts & labor warranty, 5 yr. compressor warranty, standard
5. One (1) Extended second year parts & labor warranty (excluding compressor) at time of order
6. One (1) Slide out self-contained refrigeration system, standard
7. One (1) cord with
8. One (1) NOTE: Compressor air intake from rear & out front panel, front panel cannot be blocked (Not applicable with remote refrigeration option)
9. One (1) Base Support: Units are supplied with levelers extended 1-1/4" & MUST be adjusted during installation to ensure unit is level for operation
10. One (1) LED 3500K lights (MUST BE CHOSEN WHEN CASE IS ORDERED)
11. One (1) Interior: Stainless steel in lieu of standard black
12. One (1) Exterior: Stainless steel (includes rear of case)
13. One (1) Rear Exterior: White, standard
14. One (1) Trim: Silver
15. One (1) Upper Rear: Clear glass rear sliding doors, standard
16. One (1) Night curtain, retractable, non-locking

ITEM # 2-25 SELF-SERVICE REFRIGERATED MERCHANDISER

Quantity: One (1)
Manufacturer: Structural Concepts
Model: B5932
SIS No.: W010

1. One (1) Model B5932 Oasis® Self-Service Refrigerated Merchandiser, 59-5/8"W, high profile, open front, (4) non-lighted shelves, top light, Breeze-E (Type II) with EnergyWise self-contained refrigeration system, Blue Fin coated coil, one piece formed ABS plastic tub, black interior, full end panels with mirror, cETLus, ETL-Sanitation
2. One (1) NOTE: If GFCI is required, a GFCI breaker MUST be used in lieu of a GFCI receptacle
3. One (1) 1 yr. parts & labor warranty, 5 yr. compressor warranty, standard
4. One (1) Extended second year parts & labor warranty (excluding compressor) at time of order
5. One (1) Remote refrigeration with expansion valve, solenoid valve & thermostat (does not include condensing unit), requires floor drain
6. One (1) Base Support: Levelers, standard
7. One (1) Interior: Stainless steel, in lieu of standard black
8. One (1) Exterior: Stainless steel
9. One (1) Lower front panel: Stainless steel (with stainless steel exterior only)
10. One (1) Left end panel: Full with mirrored interior, metal edging, standard
11. One (1) Right end panel: Full with mirrored interior, metal edging, standard
12. One (1) Roll-down security cover, locking (requires two end panels (full or cutaway) per case) but CANNOT be used with Case to Case acrylic end panel (must be chosen when case is ordered)
13. One (1) 6 ft cord, exit at base, standard

ITEM # 2-26  SELF-SERVICE HEATED MERCHANDISER

Quantity: One (1)
Manufacturer: Structural Concepts
Model: B3632H
SIS No.: W010

1. One (1) Model B3632H Oasis® Self-Service Heated Merchandiser, 36-1/2"W, high profile, open front, (3) lighted metal shelves, top light, stainless steel mirror interior, full end panels with mirror, casters, 6 ft cord, cETLus, ETL-Sanitation
2. One (1) NOTE: If GFCI is required, a GFCI breaker MUST be used in lieu of a GFCI receptacle
3. One (1) One year parts & labor warranty, standard
4. One (1) Extended second year parts & labor warranty at time of order
5. One (1) Exterior: Stainless steel
6. One (1) Lower front panel: Stainless steel (with stainless steel exterior only)
7. One (1) Left end panel: Full with mirrored interior, metal edging, standard
8. One (1) Right end panel: Full with mirrored interior, metal edging, standard
9. One (1) Exterior back panel: Solid back panel - black, standard

ITEM # 2-27  BEVERAGE COUNTER

Quantity: One (1)
Manufacturer: Custom
Model: STAINLESS STEEL / MILLWORK
SIS No.: W010

1. One (1) Model STAINLESS STEEL / MILLWORK Approximately 11'-0" l x 3'-0" w. Provide stainless steel undercounter with stone top with side and back splash, stainless steel intermediate and/or lower shelves, galvanized metal base, millwork die front with hardwood veneer or high pressure laminate finish. See finish schedule for specific finish requirements. Fabricate and install per complete drawings, schedules, elevations, and details.
ITEM #2-28  EXHAUST HOOD

Quantity: One (1)
Manufacturer: Halton
Model: KVE

1. Model KVE Approximately 9'-0" l x 4'-6" w x 2'-0" h. Provide 18 ga type 304 stainless steel Type I exhaust hood consisting of the following: outer casing/ main body, inner liner, exhaust duct, pressure measurement T.A.B. ports. Outer casing panels shall be constructed of stainless steel with a brushed satin finish. Each joint shall be welded and liquid tight, avoiding harmful dripping of condensation. All exposed welds shall be ground and polished to the original finish of metal. Canopy ends and front shall be double sided wall construction. Provide 3 inch air space on back, top, and ends, as required. The hood shall be provided with Capture Jet® with Side-Jet technology. The Capture Jet® air shall be introduced through a special discharge panel and shall not exceed 10% of the calculated exhaust airflow. The Capture Jet® discharge velocity shall be a minimum of 1500 feet per minute. Slot or grille type discharge shall not be used. The Capture Jet® shall be internally mounted with a speed control and will not require a fire damper or electronic shut down in fire mode. The hood shall be equipped with KSA multi-cyclone stainless steel grease extractors. The KSA filters shall be NSF and UL classified with 93-98% efficiency on particulate in the 5-10 micron range based on ASTM-F2519-05. Exhaust volume shall be based on ASTM-F1704-05 and F2474-05. Baffle or slot type extractors shall not be used. Hood lights shall be U.L. Listed LED fixtures, suitable for grease hoods. per fixture, 50 foot candles at cooking surface. The lighting shall be suitable for single phase power supply. The master electrical panel consisting of one starter per motor with overload protection shall be supplied. Control panel to hood or remote mounted. Hood shall be protected by an Ansol Fire Protection System. Hood to include a built in fire protection system cabinet to match exhaust hood finish. Provide in accordance with complete drawings, details, and specifications.

ITEM #2-29  EXHAUST HOOD TRIM AND CLOSURE PANEL

Quantity: One (1)
Manufacturer: Custom
Model: STAINLESS STEEL

1. Model STAINLESS STEEL Approximately 9'-0" l x 4'-6" w. Provide 14 ga stainless steel exhaust hood trim and closure panels with #4 finish. Provide all necessary closure, louvers and trim strips for a complete installation. Fabricate and install per complete drawings, schedules, elevations, and details.
ITEM #2-30  FIRE PROTECTION SYSTEM

Quantity: One (1)
Manufacturer: Ansul Fire Protection
Model: R102

1. Model R102 Provide One (1) each Fire Protection System complete with nozzles, fusible links, piping, pull box, and actuators, utilizing a wet chemical extinguishing agent fabricated and installed by an approved Ansul system installer. Provide in accordance with complete drawings, details, and specifications section 114000. System to be an R-102 automatic type and be manufactured and installed per the current NFPA guidelines and be U.L. approved. Cylinders shall be mounted on wall in a stainless steel enclosure, or mounted in a stainless steel cabinet attached to the exhaust hood. All piping to be concealed with the exception of drops which shall be chrome sleeved and of as minimal exposure as possible. Size, number, and location of nozzles or fusible links to be in accordance with U.L. limits for this particular system. Fire system contractor shall provide engineered drawings, acquire permit, coordinate start-up and testing with the appropriate Fire Officials, and obtain final certification. Provide as-built drawings at completion of install. Fire System installer to provide adequate job site visits to coordinate installation of un-exposed pipe and installation of system. Include the appropriately sized and approved electronic gas shut-off valve(s).

ITEM # 2-31  ICE & SODA DISPENSER  <NIC>

Quantity: One (1)
Manufacturer: NIFSEC
SIS No.: W010

1. One (1) Beverage Dispenser - NIFSEC

ITEM # 2-32  TEA DISPENSER  <NIC>

Quantity: One (1)
Manufacturer: NIFSEC
SIS No.: W010

1. One (1) Tea Dispenser - NIFSEC
ITEM # 2-33  JUICE DISPENSER  <NIC>
Quantity: One (1)
Manufacturer: NIFSEC
SIS No.: W010

1. One (1) Juice Dispenser - NIFSEC

ITEM # 2-34  COFFEE SHUTTLE  <NIC>
Quantity: Three (3)
Manufacturer: NIFSEC
SIS No.: W010

1. Three (3) Coffee Shuttle - NIFSEC

ITEM # 2-35  CONDIMENT DISPENSER  <NIC>
Quantity: One (1)
Manufacturer: NIFSEC
SIS No.: W010

1. One (1) Condiment Dispenser - NIFSEC, By Owner

ITEM # 2-36  TRASH RECEPTACLES (COUNTER)
Quantity: One (1)
Manufacturer: Rubbermaid
Model: FG295700BLA
SIS No.: W010

1. One (1) Model FG295700BLA Waste Basket, 41-1/4 qt., 15-1/4"W x 11"D x 19-7/8"H, medium, soft, rolled rims, all plastic, won’t chip, rust or dent, black

ITEM # 2-37  SOUP BAR COUNTER
Quantity: One (1)
Manufacturer: Custom
Model: STAINLESS STEEL / MILLWORK
SIS No.: W010

1. One (1) Model STAINLESS STEEL / MILLWORK Approximately 12'-0" l x 3'-6" w. Provide stainless steel undercounter with stone top, stainless steel intermediate and/or lower shelves, galvanized metal base, millwork die front with hardwood veneer or high pressure laminate finish. See
finish schedule for specific finish requirements. Fabricate and install per complete drawings, schedules, elevations, and details.

ITEM # 2-38 SPARE NO.

ITEM # 2-39 SPARE NO.

ITEM # 2-40 SPARE NO.

ITEM # 2-41 COLD FOOD WELL UNIT, DROP-IN, REFRIGERATED

Quantity: Two (2)
Manufacturer: Vollrath
Model: 36430

1. Model 36430 NSF7 Refrigerated Cold Pan, drop-In, 3-pan, 6-5/8" deep well, accommodates standard 12" x 20" pans with adaptor bars, drip-free flange, polyurethane foam insulated, 18/8 stainless steel, 18 gauge galvanized exterior housing, self contained refrigeration, 1/4 HP, cord with, cULus, NSF, Made in USA (allow 3-6 business days lead time)

ITEM # 2-42 DROP-IN HOT WELL

Quantity: Two (2)
Manufacturer: Vollrath
Model: 3646410

1. Model 3646410 Soup Well, drop-in, thermostatic control mounted in stainless steel corded control panel, accommodates (1) 11 quart inset, over flange 12-13/16" dia., cutout 12-1/4" dia, outside 12-13/16" dia, well outer 12" dia., 3/4" drain, 6 ft. cord with, cULus, NSF, Made in USA

ITEM # 2-43 SNEEZEGUARD

Quantity: Two (2)
Manufacturer: BSI
Model: ZG9930
SIS No.: W010

1. Two (2) Model ZG9930 Zguard: 53"+53" --- Includes (2)
ZGUARD 9930 Adjustable w/ Top Shelf Series End Post(s) S/S
Post #4 Finish, Brushed ALUMINUM Bracket Finish, (1) ZGUARD 9915 Adjustable Cantilevered w/ Top Shelf Series Center Post(s) S/S Post #4 Finish, Brushed ALUMINUM Bracket Finish, 3/8" tempered glass front panels and 3/8" topshelves, (1) 1/4" tempered glass RIGHT end panel, BSI LED lights installed in a slim-line housing, wiring and installation by others in the field., ZGuard Mounting Method MWUS- Below Counter Mount Heavy Duty Flange - Sufficient sub structure as well as access below counter is required when using this under counter mount., Unit shipped fully assembled. , (291) # shipping weight each. Does not include Heat Lamps

ITEM # 2-44  MERCHANDISE DISPLAY SHELVING W/ SLATWALL

Quantity: Two (2)
Manufacturer: Custom
Model: MILLWORK
SIS No.: W010

1. Two (2) Model MILLWORK Fabricate and install per complete drawings, schedules, elevations, and details. See FS Drawings.

ITEM # 2-45  CASHIER STAND (MOBILE)

Quantity: Two (2)
Manufacturer: Custom
Model: MILLWORK
SIS No.: W010

1. Two (2) Model MILLWORK Approximately 2'-6" l x 3'-0" w. Provide millwork cashier stand with hardwood veneer or high pressure laminate finish, stone top, and 5" dia. heavy-duty, non-marking casters, all with brakes. See finish schedule for specific finish requirements. Stand to include locking cash drawer and cash register. Fabricate and install per complete drawings, schedules, elevations, and details.

ITEM # 2-46  CASH REGISTER <NIC>

Quantity: Two (2)
Manufacturer: NIFSEC
SIS No.: W010

1. Two (2) Cash Register – NIFSEC
ITEM # 2-47 SNEEZEGUARD WITH PASS SHELF

Quantity:       One (1)
Manufacturer:  BSI
Model:          ZG9915
SIS No.:        W010

1. One (1) Model ZG9915 Zguard: 46” --- Includes (2) ZGUARD 9915 Adjustable Cantilevered w/ Top Shelf Series End Post(s) S/S Post #4 Finish, Brushed ALUMINUM Bracket Finish, 3/8” tempered glass front panels and 3/8” topshelves, (1) 1/4” tempered glass RIGHT end panel, (1) 1/4” tempered glass LEFT end panel, ZGuard Mounting Method MWU5- Below Counter Mount Heavy Duty Flange - Sufficient sub structure as well as access below counter is required when using this under counter mount., Unit shall be shipped knocked down to accommodate packing and shipping. Some assembly is required on-site by others., (138) # shipping weight each. Does not include Heat Lamps or Lights

ITEM # 3-01 WALK-IN REFRIGERATOR

Quantity:       One (1)
Manufacturer:  Thermalrite
Model:          CUSTOM
SIS No.:        W010

1. Dimensions:
   External (O.D.): 13' 2 1/2" x 14' 0" x 9' 4" - w x d x h
   Internal (I.D.): 12' 6 1/2" x 13' 4" x 9' 0" - w x d x h
   Volume: 1505 ft³

Finishes
   Walls: Sanisteel White - 26 ga. Anti-Microbial (5mm) - interior
   Galvanized/Smooth - 20 Ga. & St. Stl. Type 304 #4 finish - 20 Ga. - exterior
   Ceilings: Sanisteel White - 26 ga. Anti-Microbial (5mm) - interior
   Galvanized/Smooth - 20 Ga. - exterior

Panel Thickness
   Walls: 4” UL Listed Class 1 Foam
   Ceilings: 4” UL Listed Class 1 Foam

Doors
   D01:
   1  Finished opening 36” x 80” hinged flush cooler door
   1  Interior finish - St. Stl. Type 304 #4 finish - 20 Ga.
   1  Exterior finish - St. Stl. Type 304 #4 finish - 20 Ga.
   1  Exterior jamb finish - St. Stl. Type 304 #4 finish - 20 Ga.
   1  Viewport- Unheated 14”x24”
   1  Kick plate: 36” 16GA Stainless steel - interior and exterior
2 Hinge- Kason 1245 Reversible Cam-Rise
1 Light- 1806LED000 (120v) Fixture(Mtd to Jamb) and Optic Globe (Ship Loose)
1 Door Closer - Calibre (hold open feature) 16503-AL
1 Door- Flush Mount
1 Hinge (Additional)
1 Temp Alarm- Modularm 75LC (120v) Multi-Monitor, Temperature Alarm, Door Ajar Alarm, Automatic Light Control, AC Failure Alarm, Panic Alarm (Low voltage 1P-1,120v F°/C°
1 Gasket- Magnetic

Openings
1 D03: Anthony 401 glass door, NCPO 120 3/8"W x 75 1/2"H (5 x 23"Wx75"H), 8" sill
1 D02: Anthony 401 glass door, NCPO 96 5/8"W x 75 1/2"H (4 x 23"Wx75"H), 7" sill

Accessories
6 Trim Metal - Wall Closure/Vertical - (Standard 1" x 6" x Height) (match panel finish)
1 Single 90° Notch
1 Header Brace Bracket - Standard 2 Trim Metal - Wall Closure/Vertical - (Standard 1" x 6" x Height) (match panel finish)
2 Light- (120v) LED 30 watt Vapor-Proof Fixture (4') - (bulbs included in price)
28 Lock Wall Panels to Ceiling Panels (Factory Ceiling Caps - Standard)
27 Trim Metal - Removable Ceiling Closure Kit - Stainless Steel (Field Verified) See Plan/LF
3 Caulk - Silicone White (Tubes)
1 Ceiling Hanger Bracket (no rods) - Foam Rail 1 Frame with 5 x 401 right hinged normal temp cooler glass doors 23"w x 75"h, with Energy Controller, Cylinder Locks, Optimax Pro LED Lights, and 24" deep Gravity Feed shelving - (5) shelves per door - Freight allowed
1 Frame with 4 x 401 right hinged normal temp cooler glass doors 23"w x 75"h, with Energy Controller, Cylinder Locks, Optimax Pro LED Lights, and 24" deep Gravity Feed shelving - (5) shelves per door - Freight allowed
1 Frame with 4 x 401 left hinged normal temp cooler glass doors 23"w x 75"h, with Energy Controller, Cylinder Locks, Optimax Pro LED Lights, and 24" deep Gravity Feed shelving - (5) shelves per door - Freight allowed

Miscellaneous
1 Kason Vinyl Strip Curtains 7 Pieces of Galvanized Steel Floor Track - 8' Lengths
28 Lin.Ft. Stainless Steel Coved Base (6" High) @ Exp. Ext. 49 Lin.Ft. Matching Coved Base (6" High) @ Int.
ITEM # 3-02  EVAPORATOR COIL  <Included>

Quantity:  One (1)
Manufacturer:  RDT Refrigeration
SIS No.:  W010

1. One (1) Evaporator coil provided as an integral part of the remote refrigeration system. Evaporator coils shall be a direct expansion type. evaporators used will be all "underwriters laboratory listed" supplied from factory with an expansion valve, solenoid valve and eco-smart demand defrost controller, pre-wired and pre-piped under nitrogen pressure and designed for use with the refrigerant specified.

ITEM # 3-03  REFRIGERATOR SHELVING UNITS

Quantity:  One (1)
Manufacturer:  Cambro
Model:  CAMSHELVING
SIS No.:  W010

1. One (1) Model CAMSHELVING (LOT) 4 tier, 21” deep shelving units, posts to be 72” high, shelving units shall have a smooth surface without any welding or crevices. Posts and traverses shall be made of steel metal core with thick polypropylene covers. Shelf plates shall have a smooth surface without any welding or crevices, be of a structural web design and removable to be washed manually or in a commercial dishwasher. Shelf plates shall contain CamGuard, antimicrobial that inhibits the growth of mold, fungus and bacteria. Posts shall have dovetails that allow shelves to be adjusted in 4” increments. Provide dunnage stands for all traverses 54” or longer and at corners where corner connectors are used. Verify evaporator coil location, shelving units below coil to have 3 shelves. Provide in the configuration shown on plans, verify final sizes of shelves and posts by field measuring prior to ordering.

ITEM # 3-04  GRAVITY FLOW SHELVES  <Included>

Quantity:  One (1)
Manufacturer:  Thermalrite
Model:  PART OF ITEM #3-01
SIS No.:  W010

1. One (1) Model PART OF ITEM #3-01 Gravity Flow Shelves - part of walk-in item #3-01

ITEM # 3-05  FREEZER MERCHANDISER

Quantity:  One (1)
Manufacturer: Beverage Air
Model: MMF27-1-B-LED
SIS No.: W010

1. One (1) Model MMF27-1-B-LED MarketMax™ Freezer Merchandiser, reach-in, one-section, (1) triple pane glass door, 27 cu. ft. capacity, electronic control, digital display, (5) epoxy coated steel shelves, LED interior lighting, self-closing door with automatic hold-open feature, antimicrobial door handles, bottom-mounted refrigeration, black exterior, 3/4 hp, UL, cUL, UL EPH, MADE IN USA
2. One (1) 3 years parts & labor warranty (excludes maintenance items)
3. One (1) Additional 2 yr compressor warranty, standard
4. One (1) 8' cord, standard
5. One (1) Self-contained refrigeration standard
6. One (1) Stainless steel exterior
7. One (1) Model 61C31-193A-01 Gravity shelf organizer (one kit per door), for LV27/MM27

ITEM #3-06 SELF-SERVICE REFRIGERATED MERCHANDISER

Quantity: One (1)
Manufacturer: Structural Concepts
Model: B3632
SIS No.: W010

1. Model B3632 Oasis® Self-Service Refrigerated Merchandiser, 36-5/8"W, high profile, open front, (4) non-lighted metal shelves, top light, Breeze-E (Type II) with EnergyWise self-contained refrigeration system, Blue Fin coated coil, one piece formed ABS plastic tub, black interior, full end panels with mirror, cETLus, ETL-Sanitation
2. NOTE: If GFCI is required, a GFCI breaker MUST be used in lieu of a GFCI receptacle
3. 1 yr. parts & labor warranty, 5 yr. compressor warranty, standard
4. Extended second year parts & labor warranty (excluding compressor) at time of order
5. Breeze-E (Type II) with EnergyWise self-contained refrigeration, lower front air intake/upper front air discharge, standard
6. 110-120v/60/1ph, 16.0 amps, cord with NEMA 5-20P
7. NOTE: Compressor air intake through lower front & channeled up rear & out upper front, front panel cannot be blocked
8. Base Support: Casters, with levelers, standard
9. Interior: Stainless steel, in lieu of standard black
10. Exterior: Wilsonart or Formica NON-PREMIUM laminate (Color chart available from factory rep or access color selections via www.wilsonart.com or www.formica.com)
11. NOTE: SCC will not be responsible for additional charges incurred for Premium or other Manufacturer’s laminate selections not originally quoted
12. Lower front panel: Black, standard
13. Left end panel: Cutaway with insulated glass, metal edging
14. Right end panel: Full with mirrored interior, metal edging, standard
15. Roll-down security cover, locking (requires two end panels (full or cutaway) per case) but CANNOT be used with Case to Case acrylic end panel)(must be chosen when case is ordered)
16. 6 ft cord, exit at base, standard

END OF SECTION 11 40 00 FOOD SERVICE EQUIPMENT SPECIFICATIONS
PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Translucent roller shades systems for solar control at west and south glazing of Building B. Refer to Section 012300, Alternatives for use in Building A.
   1. Manual and electric motorized control type operators.
   2. Local group and master control system for shade operation.

B. Referenced Sections:
   1. Section 012500 - Substitution Procedures.
   2. Section 013300 - Submittal Procedures.
   3. Section 018113 - Sustainable Design Requirements.
   4. Section 084000 - Entrances, Storefronts, and Curtain Walls.
   5. Section 092216 - Non-Structural Metal Framing: Backing for support of roller shade brackets, and roller shade pockets.
   6. Section 092900 - Gypsum Board: Coordination with gypsum board assemblies for installation of shade pockets, closures, and related accessories.
   7. Section 095300 - Acoustical Ceiling Suspension Assemblies: Coordination with acoustical ceiling systems for installation of closures and related accessories.
   8. Division 26 Electrical Sections: Electric service for motor controls.

1.02 REFERENCES

A. ASTM International (ASTM):

B. California Code of Regulations (CCR):
   1. Title 19 - Public Safety:
      a. Division 1 - State Fire Marshal:
         1) Chapter 1 - General Fire and Panic Safety Standards:
            a) Subchapter 1 - Administration:
               (1) Article 3 - General Provisions:
                  (a) Section 3-08 - Decorative Materials.
C. California Code of Regulations (CCR):
   1. Title 24, Part 2 - California Building Code (CBC), 2013 edition:
      a. Chapter 11B - Accessibility to Public Buildings, Public Accommodations, Commercial Buildings, and Public Housing:
         1) Division 3 - Building Blocks.
         a) Section 11B-308 - Reach Ranges.
         b) Section 11B-309 - Operable Parts.
         (1) 11B-309.4 - Operation.

D. National Fire Protection Association (NFPA):
   2. 701 - Standard Methods of Fire Tests for Flame-Resistant Textiles and Films.

E. United States Green Building Council (USGBC):
   1. Leadership in Energy and Environmental Design (LEED):

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Refer to Section 018113 regarding procedures for implementing sustainable design requirements.

B. Coordination: Coordinate penetrations and ceiling-mounted items.

1.04 SUBMITTALS

A. General: Make submittals in accordance with provisions of Section 013300.

B. Product Data: Submit complete manufacturer's descriptive literature and specifications. Include:
   1. Preparation instructions and recommendations.
   2. Styles, material descriptions, dimensions of individual components, profiles, features, finishes and operating instructions.
   3. Storage and handling requirements and recommendations.
   4. Mounting details and installation methods.
   5. Typical wiring diagrams including integration of motor controllers with building management system.

C. Shop Drawings: Submit plans, elevations, sections, details of installation, operational clearances, and relationship to adjoining work, indicating:
   1. Shade schedule coordinating room number, window type, opening sizes, quantities, and key to details. Use same room designations indicated on Drawings.
   2. Shade layout, seam, and batten locations.
   3. Overall arrangement of shades and control locations.
   4. Detailed wiring diagrams and schematics for electrically operated units, including connection details for all components supplied under this Section for installation and connection under Division 26.

D. Samples: Submit the following for each color and texture required.
   2. Aluminum finish color samples.
3. Verification Samples: One fully operational window shade sample of each type required complete with selected sample colors including sample of seam and batten when applicable.

E. Quality Control Submittals:
   1. Test Reports: Submit certified independent laboratory test reports confirming physical characteristics of materials used in the performance of the work of this Section.
   2. Certification: Submit certification showing independent test calculations that comply with NFPA 701 requirements.

F. Maintenance Data: Methods for maintaining roller shades, precautions regarding cleaning materials and methods, instructions for operating hardware and controls.

1.05 SUSTAINABLE DESIGN SUBMITTALS

A. Material & Resources Submittals: Refer to Section 018113 for additional information on LEED submittals.

1. Product Data and Certification Letter for Credit MR 4: Indicate percentages by weight of post-consumer and pre-consumer recycled content for products having recycled content. Include statement indicating costs for each product having recycled content. Include statement indicating costs for each product having recycled content.

2. Product Data for MR Credit 5: For regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

B. Environmental Certification: Submit written certification from the manufacturer, including third party evaluation, recycling characteristics, and perpetual use certification as specified below. Initial submittals, which do not include the Environmental Certification, below will be rejected. Materials that are simply ‘PVC free’ without identifying their inputs shall not qualify as meeting the intent of this specification and shall be rejected.

C. Recycling Characteristics: Provide documentation that the shade cloth can and is part of a closed loop of perpetual use and not be required to be down cycled, incinerated or otherwise thrown away. Scrap material can be sent back to the mill for reprocessing and recycling into the same quality yarn and woven into new material, without down cycling. Certify that this process is currently underway and will be utilized for this project.

1.06 MAINTENANCE MATERIAL SUBMITTALS

A. Extra Stock Materials:

1. Furnish the following additional spare materials as Owner’s maintenance stock:
   a. Additional 5 percent of the total length of qualified stainless steel chain required on the project, not to exceed 100 feet.
   b. Additional 5 percent of each type of shade mounting hardware or brackets, but not less than one pair of each type.
c. A quantity of replacement shade bands completely fabricated and ready to attach to roller tubes equal to 5 percent of the total number of shade bands of each fabric and each color in the largest size required for each of those fabrics.

d. Additional 5 percent of each motor type used on project.

e. Additional 5 percent of each motor control component used on project.

2. Clearly label spare components and supply to Owner upon completion in original packaging for storage on site by Owner.

1.07 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer: A minimum of 20 years’ experience manufacturing products comparable to those specified in this Section.
   2. Installer: Trained and certified by the manufacturer with a minimum of 10 years’ experience in installing products comparable to those specified in this Section.

B. Mockups:
   1. Provide mockup of one typical manual roller shade assembly for evaluation of mounting, appearance (color, weave, and density), accessories, and quality of workmanship.
   2. Locate mockup at window designated by Architect.
   3. Do not proceed with remaining work until mockup is accepted by Architect.
   4. Accepted mockups may become part of the completed work to serve as a standard of workmanship.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver shades to project in labeled protective packaging. Uniquely labeled to identify each shade for each opening. Schedule delivery to prevent delays to completion of work but to minimize on site storage time.

1.09 FIELD CONDITIONS

A. Ambient Conditions: Install roller shades after finish work including painting is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Dimensions: Verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate construction of surrounding conditions to allow for timely field dimension verification.

1.10 WARRANTY

A. Special Warranty:
   1. EcoVeil Shadecloth: Manufacturer’s standard non-depreciating 10-year warranty.
   2. Hardware and Chain Warranty: Manufacturer’s standard non-depreciating 25-year limited warranty.
   4. Installation: One year from date of Substantial Completion, not including scaffolding, lifts, or other means to reach inaccessible areas.
PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Design is based on products of MechoShade Systems, Inc., Long Island City, NY (718)729-2020, with offices in Los Angeles, CA (310)370-8012, www.mechoshade.com, or equal.

B. Acceptable Manufacturers of Control Systems:
   1. Leviton.
   2. Lutron.
   3. WhisperShade IQ System.

B. Like materials shall be the products of one manufacturer and shall be either the ones upon which the design is based or equal products of other manufacturers accepted in advance in accordance with Section 012500.

2.02 REGULATORY REQUIREMENTS

A. Regulations: Comply with applicable codes and regulations of governmental agencies having jurisdiction.
   1. Materials used in this Section shall be tested, listed, and labeled for flammability, combustibility, and smoke developed by a testing agency acceptable by the to the authority having jurisdiction.
      a. Conform to NFPA 296, ASTM E 84, ASTM E 162, and NFPA 701 for large and small scale requirements.

2. Manual shades shall be operable with one hand and shall not require tight grasping, pinching or twisting of the wrist. The force required to activate controls shall be no greater than 5 pounds of force in accordance with CBC11B-309.4.
   a. Allowable reach ranges shall be in accordance with CBC Section 11B-308 - Reach Ranges.

3. Comply with Decorative Materials requirements of CCR Title 19 Division 1, Chapter 1, Subchapter 1, Article 3, Section 3-08.

4. Comply with CBC Section 803.1 for flame spread and smoke developed classifications based on building location and group classification when tested in accordance with ASTM E 84, ASTM D 635, and ASTM D 1929.

5. Electrical: Control systems and components shall be approved as a system by either Underwriter Laboratories (UL) or Electronic Testing Laboratories (ETL).

2.03 SUSTAINABILITY REQUIREMENTS

A. LEED Goals: For information on LEED goal requirements, refer to Section 018113. Contractor shall provide a narrative for the following LEED goals:
   1. MR Credit 4: Use materials with recycled content that the sum of post-consumer recycled content plus one-half of the pre-consumer content constitutes 10 percent of the total value of the materials in the project.
   2. MR Credit 5: Use building materials or products that have been extracted, harvested or recovered, as well as manufactured, within 500 miles of the project site for 10 percent of the total materials value.
2.04 PERFORMANCE CRITERIA

A. Performance Requirements, Fabric: Provide shade fabrics meeting Class B material fire rating.
   1. Fire Retardancy: Shade fabrics shall be tested in accordance with ASTM E 84, ASTM E 162, and NFPA 701 large and small scale vertical burn test shall be rated Pass.

2. Surface Burning Characteristics:
   a. Flame spread index: 25 or less.
   b. Smoke developed index: 450 or less.

3. Toxicity: Shade fabrics shall be successfully tested in accordance with University of Pittsburgh Toxicity Protocol, including LC50 analysis and toxicity characteristics.

4. Anti-microbial:
   a. Results for ATCC6538 (Staphylococcus aureus) and ATCC13388 (Pseudomonas aeruginosa) indicating minimum 0.197 inches (5mm) No Growth Contact Area.
   b. Results for ATCC9642, ATCC9644, ATCC9348 and ATCC9645 indicating No Growth in accordance with ASTM G 21.

2.05 SYSTEM DESCRIPTION

A. Design is based on Mechoshade /5 manual shade system manufactured by MechoShade Systems, Inc., or equal.
   1. Provide motor operated shades at first floor event space in Building B.

B. Shade Cloth: Environmentally certified PVC-free thermoplastic polyolefin (TPO) shadecloth manufactured by open-end process that assures material can be repolymerized and rewoven into new shadecloth.
   1. Fabric shall be tensioned in the finishing stage prior to heat setting to keep the warp ends straight and minimize or eliminate weave distortion to keep fabric flat. Finish with heat and pressure.

2.06 ROLLER SHADE TYPES

A. Window Solar Shades Type RS-1:
   1. Shade Cloth: EcoVeil 0950 Series Dense Basket Weave, fabricated from TPO for both core yarn and jacket, single thickness, 0.018 opaque coated reinforced yarn, non-raveling 0.030-inch thick fabric.
      a. Weave: 1% open basket weave.
      b. Color: As indicated on Contract Drawings.
   2. Mounting:
      a. Surface: Bottom of window frame in roller shade assembly.
      b. Recessed: Wall mounted above ceiling with removable closure plate level with ceiling in color to match ceiling.
         1) Refer to electrical drawings for electrical connections.

B. Window Solar Shades Type RS-2:
   1. Shade Cloth: EcoVeil 1550 Series Dense Basket Weave, fabricated from TPO for both core yarn and jacket, single thickness, 0.018 opaque coated reinforced yarn, non-raveling 0.030-inch thick fabric.
      a. Weave: 3% open basket weave.
2.07 SHADE BANDS

A. Shade Bands: Construction of shade band includes the fabric, the hem weight, hem-pocket, shade roller tube, and the attachment of the shade band to the roller tube. Sewn hems and open hem pockets are not acceptable.

1. Hem Pockets and Hem Weights: Fabric hem pocket with RF-welded seams (including welded ends). Hem weights shall be of appropriate size and weight for shade band. Hem weight shall be continuous inside a sealed hem pocket. Hem pocket construction and hem weights shall be similar, for all shades within one room.

2. Shade Band and Shade Roller Attachment:
   a. Use extruded aluminum shade roller tube of a diameter and wall thickness required to support shade fabric without excessive deflection. Roller tubes less than 1.55 inch in diameter for manual shades, and less than 2.55 inches for motorize shades are not acceptable.
   b. Provide for positive mechanical engagement with drive/brake mechanism.
   c. Provide for positive mechanical attachment of shade band to roller tube; shade band shall be made removable/replaceable with a snap-on/snap-off spline mounting, without having to remove shade roller from shade brackets.
   d. Mounting spline shall not require use of adhesives, adhesive tapes, staples, and/or rivets.
   e. Any method of attaching shade band to roller tube that requires the use of adhesive, adhesive tapes, staples, and/or rivets is not acceptable.

2.08 COMPONENTS

A. Access and Material Requirements:
   1. Provide shade hardware allowing for the removal of shade roller tube from brackets without removing hardware from opening and without requiring end or center supports to be removed.
   2. Provide shade hardware that allows for removal and re-mounting of the shade bands without having to remove the shade tube, drive or operating support brackets.
   3. Use only engineered plastics by DuPont for plastic components of shade hardware.
      a. Styrene based plastics, polyester, or reinforced polyester are not acceptable.
B. Operated Chain Drive Hardware and Brackets for Manual Operation:
   1. Provide for universal, regular and offset drive capacity, allowing drive chain to fall at front, rear or non-offset for all shade drive end brackets. Universal offset shall be adjustable for future change.
   2. Provide hardware capable for installation of a removable fascia, for both regular and/or reverse roll, which shall be installed without exposed fastening devices of any kind.
   3. Provide shade hardware system that allows for removable regular and/or reverse roll fasciae to be mounted continuously across two or more shade bands without requiring exposed fasteners of any kind.
   4. Provide shade hardware system that allows for operation of multiple shade bands (multi-banded shades) by a single chain operator, subject to manufacturer's design criteria. Connectors shall be offset to assure alignment from the first to the last shade band.
   5. Provide shade hardware system that allows multi-banded manually operated shades to be capable of smooth operation when the axis is offset a maximum of 6 degrees on each side of the plane perpendicular to the radial line of the curve, for a 12 degrees total offset.
   6. Provide positive mechanical engagement of drive mechanism to shade roller tube. Friction fit connectors for drive mechanism connection to shade roller tube are not acceptable.
   7. Provide shade hardware constructed of minimum 1/8-inch thick plated steel or heavier as required to support 150 percent of the full weight of each shade.
   8. Drive Bracket / Brake Assembly:
      a. MechoShade Drive Bracket model M5 shall be fully integrated with MechoShade accessories, including, but not limited to, SnapLoc fascia, center supports, and connectors for multi-banded shades.
      b. M5 drive sprocket and brake assembly shall rotate and be supported on a welded 3/8-inch steel pin.
      c. The brake shall be an over-running clutch design which disengages to 90 percent during the raising and lowering of a shade. The brake shall withstand a pull force of 50 lbs. in the stopped position.
      d. The braking mechanism shall be applied to an oil-impregnated hub on to which the brake system is mounted. The oil impregnated hub design includes an articulated brake assembly, which assures a smooth, non-jerky operation in raising and lowering the shades. The assembly shall be permanently lubricated. Products that require externally applied lubrication and or not permanently lubricated are not acceptable.
      e. The entire M5 assembly shall be fully mounted on the steel support bracket, and fully independent of the shade tube assembly, which may be removed and reinstalled without effecting the roller shade limit adjustments.
      f. Drive Chain: #10 qualified stainless steel chain rated to 90-pound minimum breaking strength. Nickel plate chain shall not be accepted.
C. Shade Hardware and Shade Brackets for Motorized Operation:
   1. Provide shade hardware constructed of minimum 1/8-inch thick plated steel, or heavier, thicker, as required to support 150 percent of the full weight of each shade.
   2. Provide shade hardware system that allows for field adjustment of motor or replacement of any operable hardware component without requiring removal of brackets, regardless of mounting position (inside, or outside mount).
   3. Provide shade hardware system that allows for operation of multiple shade bands offset by a maximum of 8-45 degrees from the motor axis between shade bands (4-22.5 degrees) on each side of the radial line, by a single shade motor (multi-banded shade subject to manufacturer's design criteria).
   4. Provide positive mechanical engagement of drive mechanism to shade roller tube. Do not rely on friction fit connections for drive mechanism to shade roller tube.

2.09 MOTOR CONTROL SYSTEMS

A. IQ Intelligent Motors: Specifications and design of shade motors and motor control system are based on the IQ Intelligent motor logic control system manufactured by MechoShade Systems, or equal.

1. Motor Control System:
   a. Provide power to each shade motor via individual 3 conductor line voltage circuits connecting each motor to the relay based motor logic controllers (IQ).
   b. Control system components shall provide appropriate (spike and brown out) over-current protection (+/- 10 percent of line voltage) for each of the four individual motor circuits and shall be rated by UL or ETL as a recognized component of this system and tested as an integrated system.
   c. Motor control system shall allow each group of four shade motors in any combination to be controlled by each of four local switch ports, with up to fourteen possible sub-group combinations via local 3-button wall switches and all at once via a master 3 button switch. System shall allow for overlapping switch combinations from two or more local switches.
   d. Multiple subgroups from different IQ Motors shall be capable of being combined to form groups operated by a single 3 button wall switch, from either the master port or in series from a local switch port.
   e. Each shade motor shall be accessible (for control purposes) from up to four local switches and one master switch.
   f. Control system shall allow for automatic alignment of shade hem bars in stopped position at 25 percent, 50 percent, and 75 percent of opening heights, and up to three user-defined intermediate stopping positions in addition to all up/all down, regardless of shade height, for a total of five positions. Control system shall allow shades to be stopped at any point in the opening height noting that shades may not be in alignment at these non-defined positions).
   g. Control system shall have two standard operating modes: Normal mode allowing the shades to be stopped anywhere in the window's
opening height and uniform mode, allowing the shades to only be stopped at the predefined intermediate stop positions. Both modes shall allow for all up/all down positioning.

h. Control system components shall allow for interface with both audiovisual system components and building fire and life safety system via a dry contact terminal block.

i. Control system components shall allow for interface with external analog input control devices such as solar activated controllers, 24 hour timers, and similar items; via a dry contact terminal block.

j. Reconfiguration of switch groups (as specified in Paragraph 2.09-A-1-c above) shall not require rewiring of the hardwired line voltage motor power supply wiring, or the low voltage control wiring. Reconfiguration of switch groups shall be accomplished within the motor control device (IQ/MLC).

2. Wall Switches:
   a. Five-position architectural flush mounted switches for solar control and two-positions for blackout control with metal cover plate and no exposed fasteners.
   b. Connect local wall switches to control system components via low voltage (12v DC) 4 conductor modular cable equipped with RJ-11 type connectors supplied, installed and certified under Division 16.
   c. Connect master wall switches to control system components via low voltage (12v DC) 6 conductor modular cable equipped with RJ-12 type connectors supplied, installed and certified under Division 26.
   d. Set switches to provide 5 stops, except that black out shades shall be up/down only.

2.10 ACCESSORIES

A. Fasteners: Not fewer than two fasteners per bracket, fabricated from metal non-corrosive to shade hardware and adjoining construction; type designed for securing to supporting substrate; and supporting shades and accessories under conditions of normal use.

B. Guide Cables: Provide manufacturer's standard guide cables, aluminum mounting blocks, clevis connectors, and hooks as required to control shades at sloping walls.

2.11 FABRICATION

A. Fabricate units to completely fill existing openings from head to sill and jamb-to-jamb, unless specifically indicated otherwise.
   1. Comply with manufacturer’s edge clearance standards and recommendations.
   2. Shades shall be fabricated from a single roll of fabric without seams.

B. Fabricate shade cloth to hang flat without buckling or distortion. Fabricate with heat-sealed trimmed edges to hang straight without curling or raveling. Fabricate unguided shade cloth to roll true and straight without shifting sideways more than 1/8 inch in either direction per 8 feet of shade height due to warp distortion or weave design. Fabricate hem as follows:
C. Provide battens in standard shades as required to ensure proper tracking and uniform rolling of the shade bands. Contractor shall be responsible for ensuring that the width-to-height (W:H) ratios shall not exceed manufacturer's standards or, in absence of such standards, Contractor shall be responsible for establishing appropriate standards to ensure proper tracking and rolling of the shadecloth within specified standards. Battens shall be roll-formed stainless steel or tempered steel, as required.

D. Shades shall be railroaded. Provide seams in railroaded multi-width shade bands as required to meet size requirements and in accordance with seam alignment as acceptable to Architect. Seams shall be properly located. Furnish battens in place of plain seams when the width, height, or weight of the shade exceeds manufacturer's standards. In absence of such standards, ensure proper use of seams or battens as required to, and ensure the proper tracking of the railroaded multi-width shade bands.
1. Double hem shades having different colors on outside and inside.

E. Hembars and Hempockets: Fabric hempocket with RF-welded seams, including welded ends. Hemweights shall be of appropriate size and weight for shade band and must be continuous inside a sealed hempocket. Match hempocket construction for all shades in same rooms.

2.12 FINISHES

A. Finishes: Fascia, Closure, and Closure Mounts:
1. Aluminum Components: PPG Duracron baked enamel in custom colors as indicated.
2. Steel Components: Cadmium-plated, satin-finished, or bonderized prior to painting with manufacturer's standard baked-enamel finish in custom colors as indicated.
3. Custom Color: Match ceiling finish.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Ensure that painting and other finishing operations have been completed before proceeding with installation. Do not begin installation until substrates have been properly prepared.

3.02 PREPARATION

A. Surfaces shall be thoroughly cleaned prior to installation.

3.03 INSTALLATION

A. General: Install materials and systems in accordance with the manufacturer's recommendations, and in proper relation to adjacent construction.
B. Attach the tracks securely to concealed framing with self-drilling self-tapping steel screws in accordance with approved Contract Drawings.
C. Install roller shades level, plumb, square, and true. Allow clearances for window operation hardware, and located so shade band is not closer than 2 inches to interior face of glass. Allow proper clearances for window operation hardware.
   1. Maximum Variation of Gap at Window Perimeter: 1/4-inch per 8 feet ±1/8-inch of shade height.
   2. Maximum Offset from Level: 1/16-inch per 5 feet of shade width.

D. Fabric shall hang flat, without buckling or distortion. The edges shall hang straight without raveling. An unguided roller shade cloth shall roll true and straight, without shifting sideways more than 1/8-inch in either direction due to warp distortion, or weave design.

E. Motor Control: To control the responsibility for performance of motorized roller shade systems, assign the design, engineering, and installation of motorized roller shade systems, motors, controls, and low voltage electrical control wiring specified in this Section to a single manufacturer and their authorized installer/dealer. Architect will not produce a set of electrical drawings for the installation of control wiring for the motors, or motor controllers of the motorized roller shades. Power wiring (line voltage), shall be provided by the Contractor for the roller shade installer/dealer in accordance with the requirements provided by the manufacturer. Coordinate the following with the roller shade installer/dealer:
   1. Contractor shall provide power panels and circuits of sufficient size to accommodate roller shade manufacturer’s requirements, as indicated on the mechanical and electrical drawings.
   2. Main Contractor shall coordinate with requirements of roller shade installer/dealer, before inaccessible areas are constructed.
   3. Roller shade installer/dealer shall run line voltage as dedicated home runs (of sufficient quantity, in sufficient capacity as required) terminating in junction boxes in locations designated by roller shade dealer.
   4. Roller shade installer/dealer shall provide and run all line voltage (from the terminating points) to the motor controllers, wire all roller shade motors to the motor controllers, and provide and run low voltage control wiring from motor controllers to switch/ control locations designated by the Architect. All above-ceiling and concealed wiring shall be plenum-rated, or installed in conduit, as required by the electrical code having jurisdiction.
   5. Contractor shall provide conduit with pull wire in all areas, which might not be accessible to roller shade contractor due to building design, equipment location, or schedule.

3.04 ADJUSTING

A. Adjusting: Adjust roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.
   1. Touch-up, repair or replace damaged products before Substantial Completion.

3.05 CLEANING

A. Cleaning: Clean roller shade surfaces after installation, according to manufacturer’s recommendations.
B. Remove finger marks, smears, and other visual soiling from exposed surfaces upon completion of the installation. Take care not to damage the fabric when cleaning it.

3.06 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain systems.

3.07 PROTECTION

A. Protect installed products until completion of project.

END OF SECTION
SECTION 28 31 00

FIRE DETECTION AND ALARM

PART 1 GENERAL

1.01 SECTION INCLUDES
   A. Fire alarm system design and installation, including all components, wiring, and conduit.
   B. Transmitters for communication with supervising station.
   C. Circuits from protected premises to supervising station, including conduit.

1.02 RELATED REQUIREMENTS
   A. Section 07 84 00 - Firestopping: Materials and methods for work to be performed by this installer.
   B. Section 08 71 00 - Door Hardware: Electrically operated locks and door holder devices to be monitored and released by fire alarm system.
   C. Section 14 24 00 - Hydraulic Elevators: Elevator systems monitored and controlled by fire alarm system.
   D. Section 21 13 13 - Fire-Suppression Sprinkler Systems: Supervisory, alarm, and actuating devices installed in sprinkler system.
   E. Section 23 33 00 - Air Duct Accessories: Smoke dampers monitored and controlled by fire alarm system.

1.03 REFERENCE STANDARDS
   C. IEEE C62.41.2 - Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits; 2002 (Cor 1, 2012).
   D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SUBMITTALS
   A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
   B. Proposal Documents: Submit the following with cost/time proposal:
1. NFPA 72 "Record of Completion", filled out to the extent known at the time.
2. Manufacturer's detailed data sheet for each control unit, initiating device, and notification appliance.
3. Certification by Contractor that the system design will comply with the contract documents.

C. Drawings must be prepared using AutoCAD Release 16.
   1. Owner will provide floor plan drawings for Contractor's use; verify all dimensions on Owner-provided drawings.

D. Evidence of designer qualifications.

E. Design Documents: Submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, riser diagrams, and description of operation:
   1. Copy (if any) of list of data required by authority having jurisdiction.
   2. NFPA 72 "Record of Completion", filled out to the extent known at the time.
   3. Clear and concise description of operation, with input/output matrix similar to that shown in NFPA 72 Appendix A-7-5-2.2(9), and complete listing of software required.
   4. System zone boundaries and interfaces to fire safety systems.
   5. Location of all components, circuits, and raceways; mark components with identifiers used in control unit programming.
   6. Circuit layouts; number, size, and type of raceways and conductors; conduit fill calculations; spare capacity calculations; notification appliance circuit voltage drop calculations.
   7. List of all devices on each signaling line circuit, with spare capacity indicated.
   8. Manufacturer's detailed data sheet for each component, including wiring diagrams, installation instructions, and circuit length limitations.
   9. Description of power supplies; if secondary power is by battery include calculations demonstrating adequate battery power.
10. Certification by either the manufacturer of the control unit or by the manufacturer of each other component that the components are compatible with the control unit.
11. Certification by the manufacturer of the control unit that the system design complies with the contract documents.
12. Certification by Contractor that the system design complies with the contract documents.

F. Evidence of installer qualifications. Installer must be Siemens Certified.

G. Evidence of instructor qualifications; training lesson plan outline.

H. Evidence of maintenance contractor qualifications, if different from installer.

I. Inspection and Test Reports:
   1. Submit inspection and test plan prior to closeout demonstration.
2. Submit documentation of satisfactory inspections and tests.
3. Submit NFPA 72 “Inspection and Test Form,” filled out.

J. Operating and Maintenance Data: See Section 017800 for additional requirements. Revise and resubmit until acceptable; have one set available during closeout demonstration:
1. Complete set of specified design documents, as approved by authority having jurisdiction.
2. Additional printed set of project record documents and closeout documents, bound or filed in same manuals.
3. Contact information for firm that will be providing contract maintenance and trouble call-back service.
4. List of recommended spare parts, tools, and instruments for testing.
5. Replacement parts list with current prices, and source of supply.
6. Detailed troubleshooting guide and large scale input/output matrix.
7. Preventive maintenance, inspection, and testing schedule complying with NFPA 72; provide printed copy and computer format acceptable to Owner.
8. Detailed but easy to read explanation of procedures to be taken by non-technical administrative personnel in the event of system trouble, when routine testing is being conducted, for fire drills, and when entering into contracts for remodeling.

K. Project Record Documents: See Section 017800 for additional requirements. Have one set available during closeout demonstration:
1. Complete set of floor plans showing actual installed locations of components, conduit, and zones.
2. "As installed" wiring and schematic diagrams, with final terminal identifications.
3. "As programmed" operating sequences, including control events by device, updated input/output chart, and voice messages by event.

L. Closeout Documents:
1. Certification by manufacturer that the system has been installed in compliance with his installation requirements, is complete, and is in satisfactory operating condition.
2. NFPA 72 "Record of Completion", filled out completely and signed by installer and authorized representative of authority having jurisdiction.

M. Maintenance Materials, Tools, and Software: Furnish the following for Owner’s use in maintenance of project.
1. Furnish spare parts of same manufacturer and model as those installed; deliver in original packaging, labeled in same manner as in operating and maintenance data and place in spare parts cabinet.
2. In addition to the items in quantities indicated in PART 2, furnish the following:
a. All tools, software, and documentation necessary to modify the fire alarm system using Owner’s personnel; minimum modification capability to include addition and deletion of devices, circuits, and zones, and changes to system
description, operation, and evacuation and instructional messages.

b. One copy, on CD-ROM, of all software not resident in read-only-memory.

c. Extra Fuses: Two for each installed fuse; store inside applicable control cabinet.

1.05 QUALITY ASSURANCE

A. Designer Qualifications: NICET Level III or IV (3 or 4) certified fire alarm technician or registered fire protection engineer, employed by fire alarm control panel manufacturer, Contractor, or installer, with experience designing fire alarm systems in the jurisdictional area of the authorities having jurisdiction.

B. Installer Qualifications: Firm with minimum 3 years documented experience installing fire alarm systems of the specified type and providing contract maintenance service as a regular part of their business.

1. Authorized representative of control unit manufacturer; submit manufacturer’s certification that installer is authorized; include name and title of manufacturer’s representative making certification. Installer and programer must be Siemens certified.

2. Installer Personnel: At least 2 years of experience installing fire alarm systems.

3. Supervisor: NICET level III or IV (3 or 4) certified fire alarm technician; furnish name and address.

C. Maintenance Contractor Qualifications: Same entity as installer or different entity with specified qualifications.

D. Instructor Qualifications: Experienced in technical instruction, understanding fire alarm theory, and able to provide the required training; trained by fire alarm control unit manufacturer.

1.06 WARRANTY

A. Provide control panel manufacturer’s warranty that system components other than wire and conduit are free from defects and will remain so for 5 years after date of Substantial Completion.

B. Provide installer’s warranty that the installation is free from defects and will remain so for 1 year after date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fire Alarm Control Units - Basis of Design: Siemens Building Technologies, Inc; As shown on plans: www.usa.siemens.com.

B. Initiating Devices, and Notification Appliances:

1. Same manufacturer as control units.

2. Provide all initiating devices and notification appliances made by the same manufacturer.

2.02 FIRE ALARM SYSTEM

A. Fire Alarm System: Provide a new automatic fire detection and alarm system:
1. Provide all components necessary, regardless of whether shown in the contract documents or not.
2. Protected Premises: Entire building shown on drawings.
3. Comply with the following; where requirements conflict, order of precedence of requirements is as listed:
   a. ADA Standards.
   b. The requirements of the State Fire Marshal.
   c. The requirements of the local authority having jurisdiction, which is Campus Fire Department and County Fire Authority.
   d. Applicable local codes.
   e. The contract documents (drawings and specifications).
   f. NFPA 72; where the word "should" is used consider that provision mandatory; where conflicts between requirements require deviation from NFPA 72, identify deviations clearly on design documents.
4. Evacuation Alarm: Multiple smoke zones; allow for evacuation notification of any individual zone or combination of zones, in addition to general evacuation of entire premises.
6. General Evacuation Zones: Each smoke zone is considered a general evacuation zone unless otherwise indicated, with alarm notification in all zones on the same floor, on the floor above, and the floor below.
7. Program notification zones and voice messages as directed by Owner.
8. Hearing Impaired Occupants: Provide visible notification devices in all public areas and in dwelling units.
10. Master Control Unit (Panel): New, located at supervising station.

B. Supervising Stations and Fire Department Connections:
1. Public Fire Department Notification: By on-premises supervising station.
2. On-Premises Supervising Station: Existing proprietary station operated by Owner, located at Administration Building.
3. Means of Transmission to On-Premises Supervising Station: Directly connected noncoded system.

C. Circuits:
1. Initiating Device Circuits (IDC): Class B, Style A.
2. Signaling Line Circuits (SLC) Within Single Building: Class B, Style 0.5.
3. Notification Appliance Circuits (NAC): Class B, Style W.

D. Spare Capacity:
1. Initiating Device Circuits: Minimum 25 percent spare capacity.
4. Master Control Unit: Capable of handling all circuits utilized to capacity without requiring additional components other than plug-in control modules.

E. Power Sources:
1. Primary: Dedicated branch circuits of the facility power distribution system.
2. Secondary: Storage batteries.
3. Capacity: Sufficient to operate entire system for period specified by NFPA 72.
2.03 FIRE SAFETY SYSTEMS INTERFACES

A. Supervision: Provide supervisory signals in accordance with NFPA 72 and as shown on drawings.
   1. Sprinkler water control valves.
   2. Elevator shut-down control circuits.

B. Alarm: Provide alarm initiation in accordance with NFPA 72 for the following:
   1. Sprinkler water flow.
   2. Kitchen hood suppression activation; also disconnect fuel source from cooking equipment.
   3. Elevator lobby, elevator hoistway, and elevator machine room smoke detectors.
   4. Duct smoke detectors.
   5. Heat detectors.

C. Elevators:
   1. Elevator lobby, hoistway, and machine room smoke detectors: Elevator recall for fire fighters’ service.
   2. Elevator Machine Room Heat Detector: Shut down elevator power prior to hoistway sprinkler activation.
   3. Sprinkler pressure or waterflow: Shut down elevator power prior to hoistway sprinkler activation.

D. HVAC:
   1. Duct Smoke Detectors: Close dampers indicated; shut down air handlers indicated.

E. Doors:
   1. Smoke Barrier Door Magnetic Holders: Release upon activation of smoke detectors in smoke zone on either side of door, upon alarm from manual pull station on same floor, and upon sprinkler activation on same floor. Refer to Section 08 71 00.

2.04 COMPONENTS

A. General:
   1. Provide flush mounted units where installed in finish areas; in unfinished areas, surface mounted unit are acceptable.
   2. Provide legible, permanent labels for each control device, using identification used in operation and maintenance data.

B. Fire Alarm Control Units, Initiating Devices, and Notification Appliances: Analog, addressable type; listed, classified, and labeled as suitable for the purpose intended. Siemens Building Technologies, Inc.

C. Master Control Unit: As specified for Basis of Design above, or equivalent.

D. Initiating Devices; Siemens Building Technologies, Inc.

E. Notification Appliances; Siemens Building Technologies, Inc.

F. Circuit Conductors: Copper or optical fiber; provide 200 feet (60 m) extra; color code and label.

G. Surge Protection: In accordance with IEEE C62.41.2 category B combination waveform and NFPA 70; except for optical fiber conductors.

H. Locks and Keys: Deliver keys to Owner.
1. Provide the same standard lock and key for each key operated switch and lockable panel and cabinet; provide 5 keys of each type.

I. Instruction Charts: Printed instruction chart for operators, showing steps to be taken when a signal is received (normal, alarm, supervisory, and trouble); easily readable from normal operator's station.
   1. Frame: Stainless steel or aluminum with polycarbonate or glass cover.
   2. Provide one for each control unit where operations are to be performed.
   3. Obtain approval of Owner prior to mounting; mount in location acceptable to Owner.
   4. Provide extra copy with operation and maintenance data submittal.

PART 3 EXECUTION

3.01 INSTALLATION
   A. Install in accordance with applicable codes, NFPA 72, NFPA 70, and the contract documents.
   B. Conceal all wiring, conduit, boxes, and supports where installed in finished areas.
   C. Obtain Owner's approval of locations of devices, before installation.
   D. Install instruction cards and labels.

3.02 INSPECTION AND TESTING FOR COMPLETION
   A. Notify Owner 7 days prior to beginning completion inspections and tests.
   B. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.
   C. Provide the services of the installer's supervisor or person with equivalent qualifications to supervise inspection and testing, correction, and adjustments.
   D. Prepare for testing by ensuring that all work is complete and correct; perform preliminary tests as required.
   E. Provide all tools, software, and supplies required to accomplish inspection and testing.
   F. Perform inspection and testing in accordance with NFPA 72 and requirements of local authorities; document each inspection and test.
   G. Correct defective work, adjust for proper operation, and retest until entire system complies with contract documents.
   H. Diagnostic Period: After successful completion of inspections and tests, Operate system in normal mode for at least 14 days without any system or equipment malfunctions.
      1. Record all system operations and malfunctions.
      2. If a malfunction occurs, start diagnostic period over after correction of malfunction.
      3. Owner will provide attendant operator personnel during diagnostic period; schedule training to allow Owner personnel to perform normal duties.
      4. At end of successful diagnostic period, fill out and submit NFPA 72 "Inspection and Testing Form."
3.03 OWNER PERSONNEL INSTRUCTION

A. Provide the following instruction to designated Owner personnel:
   2. Classroom Instruction: Owner furnished classroom, on-site or at other local facility.
   3. Factory Instruction: At control unit manufacturer's training facility.

B. Administrative: One-hour session(s) covering issues necessary for non-technical administrative staff; classroom:
   1. Initial Training: 1 session pre-closeout.

C. Basic Operation: One-hour sessions for attendant personnel, security officers, and engineering staff; combination of classroom and hands-on:
   1. Initial Training: 1 session pre-closeout.

D. Maintenance Technicians: Detailed training for electrical technicians, on programming, maintaining, repairing, and modifying; factory training:
   1. Initial Training: one week, pre-closeout.

E. Furnish the services of instructors and teaching aids; have copies of operation and maintenance data available during instruction.

3.04 CLOSEOUT

A. Closeout Demonstration: Demonstrate proper operation of all functions to Owner.
   1. Be prepared to conduct any of the required tests.
   2. Have at least one copy of operation and maintenance data, preliminary copy of project record drawings, input/output matrix, and operator instruction chart(s) available during demonstration.
   3. Have authorized technical representative of control unit manufacturer present during demonstration.
   4. Demonstration may be combined with inspection and testing required by authority having jurisdiction; notify authority having jurisdiction in time to schedule demonstration.
   5. Repeat demonstration until successful.

B. Occupancy of the project will not occur prior to Substantial Completion.

C. Substantial Completion of the project cannot be achieved until inspection and testing is successful and:
   1. Specified diagnostic period without malfunction has been completed.
   2. Approved operating and maintenance data has been delivered.
   3. **Spare parts, extra materials, and tools have been delivered.**
   4. All aspects of operation have been demonstrated to Owner.
   5. Final acceptance of the fire alarm system has been given by authorities having jurisdiction.
   6. Specified pre-closeout instruction is complete.

3.05 MAINTENANCE

A. Provide to Owner, a proposal as an alternate to the base bid, for a maintenance contract for entire warranty period, to include the work described below; include the total cost of contract, proposal to be valid at least until 30 days after date of Substantial Completion.

B. Perform routine inspection, testing, and preventive maintenance required by NFPA 72, including:
1. Maintenance of fire safety interface and supervisory devices connected to fire alarm system.
2. Repairs required, unless due to improper use, accidents, or negligence beyond the control of the maintenance contractor.
3. Record keeping required by NFPA 72 and authorities having jurisdiction.

C. Provide trouble call-back service upon notification by Owner:
   1. Provide on-site response within 2 hours of notification.
   2. Include allowance for call-back service during normal working hours at no extra cost to Owner.
   3. Owner will pay for call-back service outside of normal working hours on an hourly basis, based on actual time spent at site and not including travel time; include hourly rate and definition of normal working hours in maintenance contract.

D. Provide a complete description of preventive maintenance, systematic examination, adjustment, cleaning, inspection, and testing, with a detailed schedule.

E. Maintain a log at each fire alarm control unit, listing the date and time of each inspection and call-back visit, the condition of the system, nature of the trouble, correction performed, and parts replaced. Submit duplicate of each log entry to Owner's representative upon completion of site visit.

F. Comply with Owner's requirements for access to facility and security.

END OF SECTION 28 31 00
PART 1 GENERAL

1.01 SECTION INCLUDES

A. Excavating, backfilling and compacting for utilities outside the building to point of connection with public and/or private utility mains.

1.02 RELATED REQUIREMENTS

A. Document Geotechnical Investigation Report for Proposed Physical Education and Student Union Complex (L-636), Los Medanos Community College, RMA Group no. 15-095-02 dated January 6, 2016: Geotechnical report; bore hole locations and findings of subsurface materials.

B. Section 31 22 00 - Grading: Site grading.

C. Section 31 23 16 - Excavation: Building and foundation excavating.

D. Section 31 23 23 - Fill: Backfilling at building and foundations.

1.03 REFERENCES


B. Standard Specifications, California State Department of Transportation (Caltrans), latest edition.


E. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN/m³)); 2012.


G. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN m/m³)); 2012.


I. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2011.

J. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth); 2005.

L. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth); 2010.

1.04 SUBMITTALS
   A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
   B. Samples: 10 lb (4.5 kg) sample of each type of fill; submit in air-tight containers to testing laboratory.
   C. Materials Sources: Submit name of imported materials source.
   D. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used.
   E. Compaction Density Test Reports.

1.05 DELIVERY, STORAGE, AND HANDLING
   A. When necessary, store materials on site in advance of need.
   B. When fill materials need to be stored on site, locate stockpiles where allowed by the Owner's representative.
       1. Protect stockpiles from erosion and deterioration of materials.

PART 2 PRODUCTS

2.01 FILL MATERIALS
   A. General Fill: Stripped topsoil or expansive soil with clay usable in landscape or non-structural area.
      1. Free of lumps larger than 3 inches, rocks larger than 2 inches, debris, and large organic material.
   B. Engineered Fill: Structural fill conforming to the requirements of the Geotechnical Report and in accordance with specification section 312323 Fill.
   C. Aggregate Base: 3/4" Class 2 conforming to Caltrans Section 26 with a minimum R-value of 78.
      1. Acceptable as Engineered Fill.
   D. Concrete for Backfill of Utility Trenches: Controlled Low-Strength Material, CLSM, per Caltrans Section 19-3.02G for bedding of storm drainage or sanitary sewer pipes, 100 psi compressive strength, minimum.
   E. Course Aggregate: Crushed rock, 1/2" maximum, conforming to the Greenbook Section 200-1.2.
   F. Granular Fill - Pea Gravel: Natural stone; washed, free of clay, shale, organic matter.
      1. Graded in accordance with ASTM C136/C136M, within the following limits:
         a. Minimum Size: 1/4 inch (6 mm).
         b. Maximum Size: 5/8 inch (16 mm).
   G. Sand: Conforming to Caltrans Section 19-3.02F(2).

2.02 ACCESSORIES
   A. Geotextile Fabric: Non-biodegradable, woven, Mirafi; 140N manufactured by Mirafi.
2.03 SOURCE QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for general requirements for testing and analysis of soil material.

B. Where fill materials are specified by reference to a specific standard, testing of samples for compliance will be provided before delivery to site.

C. If tests indicate materials do not meet specified requirements, change material and retest.

D. Provide materials of each type from same source throughout the Work.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey monuments and intended elevations for the work are as indicated.

3.02 PREPARATION

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

B. Locate, identify, and protect utilities that remain and protect from damage.

C. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

D. Protect plants, lawns, rock outcroppings, and other features to remain.

E. Protect existing trees and tree roots. Trenching under the dripline of existing trees shall be performed by hand using hand tools.

3.03 TRENCHING

A. Notify the Owner's Representative of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

B. Slope banks of excavations deeper than 4 feet (1.2 meters) to angle of repose or less until shored.

C. Do not interfere with 45 degree bearing splay of foundations.

D. Cut trenches wide enough to allow inspection of installed utilities.

E. Hand trim excavations. Remove loose matter.

F. Remove large stones and other hard matter that could damage piping or impede consistent backfilling or compaction.

G. Remove excavated material that is unsuitable for re-use from site.

H. Stockpile excavated material to be re-used in area designated in Section 31 22 00.

I. Remove excess excavated material from site.

J. Trenching under the dripline of existing trees shall be performed by hand using hand tools only. Contractor shall not cut or damage existing roots unless approved by a certified Arborist.

3.04 PREPARATION FOR UTILITY PLACEMENT

A. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.
B. Compact subgrade to density equal to or greater than requirements for subsequent fill material.

C. Until ready to backfill, maintain excavations and prevent loose soil from falling into excavation.

3.05 BACKFILLING

A. Backfill to elevations indicated using unfrozen materials.

B. Fill up to subgrade elevations unless otherwise indicated.

C. Employ a placement method that does not disturb or damage other work.

D. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.

E. Maintain optimum moisture content of fill materials to attain required compaction density.

F. Correct areas that are over-excavated.
   1. Thrust bearing surfaces: Fill with concrete.
   2. Other areas: Use general fill, flush to required elevation, compacted to minimum 95 percent of maximum dry density.

G. Compaction Density Unless Otherwise Specified or Indicated:
   1. Under paving, slabs-on-grade, and similar construction: 90 to 95 percent of maximum dry density as indicated in the Geotechnical Report.
   2. At Landscaped areas: 90 percent of maximum dry density.

H. Reshape and re-compact fills subjected to vehicular traffic.

3.06 BEDDING AND FILL AT SPECIFIC LOCATIONS

A. Use Engineered Fill compacted to 90 percent of maximum dry density where trenches cross under footings, grade beams, and other structural elements. Otherwise, use General Fill unless otherwise specified or indicated.

B. Utility Piping, conduits, and duct banks:
   1. Bedding: Use Fill Type per plans.
   2. Cover with general fill. See subsection 'A' above.
   3. Fill up to subgrade elevation.
   4. Compact in maximum 6 inch (150 mm) lifts to 90 percent of maximum dry density.

C. Over Subdrainage Piping at Foundation Perimeter and Under Slabs:
   1. Drainage fill and geotextile fabric: Section 33 41 00.
   2. Cover drainage fill with general fill. See subsection 'A' above.
   3. Fill up to subgrade elevation.
   4. Compact to 90 percent of maximum dry density.

3.07 TOLERANCES

D. Top Surface of General Backfilling: Plus or minus 1 inch (25 mm) from required elevations.

E. Top Surface of Backfilling Under Paved Areas: Plus or minus 1 inch (25 mm) from required elevations.
3.08 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection and testing.

B. Perform compaction density testing on compacted fill in accordance with ASTM D1556, ASTM D2167, or ASTM D6938.

C. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D1557 ("modified Proctor"), AASHTO T 180, or ASTM D698 ("standard Proctor").

D. If tests indicate work does not meet specified requirements, remove work, replace and retest.

E. Frequency of Tests: As required by the Geotechnical Engineer.

3.09 CLEANING

A. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

B. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF SECTION 31 23 16.13
SECTION 32 13 13

CONCRETE PAVING

PART 1 - GENERAL

1.01 SECTION INCLUDES
A. Walks.
B. Stairs and ramps.
C. Mow strips.
D. Detectable warnings.

1.02 RELATED REQUIREMENTS
A. Division 03 Section Cast-in-Place Concrete
B. Division 05 Section Metal Fabrications
C. Division 05 Section Pipe and Tube Railings.
D. Division 05 Section Decorative Metal Railings
E. Division 31 Section Earthwork
F. Division 32 Section Architectural Site Concrete
G. Division 32 Section Concrete Paving Joint Sealants
H. Division 32 Section Chain Link Fences and Gates
I. Division 32 Section Decorative Metal Fences and Gates

1.03 DEFINITIONS
A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: Fly ash and other pozzolans, and ground granulated blast-furnace slag, subject to compliance with requirements.

1.04 PREINSTALLATION CONFERENCE
A. Conduct conference at Project site two weeks prior to start of work of this section. Required attendance of all affected installers.
1. Review methods and procedures related to concrete paving, including but not limited to, the following:
   2. Concrete mixture design
   3. Testing and inspection procedures.
   4. Concrete finishes and finishing.
   5. Cold- and hot-weather concreting procedures.
   6. Curing procedures.
   7. Construction joints.
  10. Concrete repair procedures.
  12. Review special testing and inspection procedures.
  13. Placement sequence and schedule.
  14. Require representatives of each entity directly concerned with concrete paving to attend, including the following:
a. Contractor’s superintendent.
b. Independent testing agency responsible for concrete design mixtures.
c. Ready-mix concrete manufacturer.
d. Concrete paving subcontractor.
e. District’s Representative
f. Architect’s Representative
g. Inspector of Record
h. Manufacturer’s representative for specialty concrete paving finishes.
i. Provide meeting minutes for pre-installation conference

1.05 SUBMITTALS

A. Product Data: For each type of product indicated.
   1. Proprietary admixtures, pigments, curing compounds, hardeners, sealers, form-release agents, etc.: Indicate compatibility with other materials used.
   2. Stenciling material

B. LEED Submittals:
   1. Product Data for Credit MR 4.1 [and Credit MR 4.2]: For products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content. Include statement indicating costs for each product having recycled content.
   2. Design Mixtures for Credit ID 1.1: For each concrete mixture containing fly ash as a replacement for Portland cement or other Portland cement replacements. For each design mixture submitted, include an equivalent concrete mixture that does not contain Portland cement replacements, to determine amount of Portland cement replaced.

C. Samples for Initial Selection: For each type of product, finish, ingredient, or admixture requiring color selection.
   1. Submit full range of manufacturer’s standard and custom range of colors and products for review and selection. Provide custom colors on samples as required. Upon selection of color, submit 12”x12” sample of material in the specified color finish for review by Landscape Architect in addition to the specified mock ups.

D. Design Mixtures: Submit proposed mix designs and test data for each class of concrete and for each method of placement.
   1. Prepare mix designs on the basis of field experience (preferred) and/or trial mixes, in compliance with California Building Code (CBC), Section 1905A.3.
   2. Prepare mix designs on the basis of field experience (preferred) and/or trial mixes, in compliance with California Building Code (CBC), Section 1905.3.
   3. Mix designs shall be prepared, stamped and signed by a structural or civil engineer registered in the State of California.
      a. Mix designs shall be reviewed by the Architect (AOR) and Structural Engineer of Record (SEOR).
   4. Identify for each mix design submitted the method by which proportions have been selected.
      a. For mix designs based on field experience, include individual strength test results, standard deviation, and required average compressive strength f’c calculations.
b. For mix designs based on trial mixtures, include trial mix proportions, test results, graphical analysis and show required average compressive strength \( f'_c \) results. Provide gross weight and yield per cubic yard of trial mixes.

c. Indicate quantity of each ingredient per cubic yard of concrete and percentages.

d. Indicate type and quantity of admixtures proposed or required.

e. Indicate water to cement ratio by weight.

f. Measured slump.

g. Measured air content.

h. Provide shrinkage test results.

5. Multiple mix designs or multiple manufacturers shall not be permitted for the same application.

E. Mix designs should contain no fly ash.

F. Submit proposed alternate design mixtures for review by the Architect and SEOR when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

G. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement. Shop drawings should include details such as reveals, recessed lights, handrails, or other elements requiring steel coordination.

1. Coordinate with and identify the details of the Contract Drawings on the shop drawings.

2. Comply with ACI 315, part B and CRSI requirements.

H. Construction Joint Layout: Indicate proposed construction joints required to construct the structure. Submit dimensioned drawing indicating layout of construction joints, contraction (control) joints, dowelled joints, decorative scoring and placement sequence of concrete if different than layout indicated on plans.

1. Location of construction joints are subject to approval of the Architect.

2. All form seams are to align with construction joints or reveals.

I. Placement Schedule: Submit concrete placement schedule before start of placement operations. Include locations of all joints including construction joints.

J. Pavement-Marking Shop Drawings: Indicate pavement markings, lane separations, and defined parking spaces. Indicate, with international symbol of accessibility, spaces allocated for people with disabilities.

K. Qualification Data: For qualified ready-mix concrete manufacturer (batch plant)[ and installer of detectable warnings].

L. Welding Certificates: Submit certifications signed by AWS Certified Welding Inspector of prequalified welding procedures, qualifications of welding procedures unless prequalified, qualifications of welding operators and qualifications of welders.

M. Material Certificates: For the following, submit manufacturer data, test results, and technical information for aggregate, sand and cement, submit \( \frac{1}{2} \) cubic foot physical sample. For sealant submit manufacturer color standard and custom palette together with physical samples:
1. Cementitious materials.
2. Aggregates and sand.
3. Steel reinforcement and reinforcement accessories.
4. Fiber reinforcement.
5. Admixtures.
6. Curing compounds.
8. Bonding agent and epoxy adhesives.
10. Sealer.
11. Sealant.

N. Material Test Reports: For each of the following:
   1. Aggregates. Include service-record data indicating absence of deleterious expansion of concrete due to alkali-aggregate reactivity.

O. Detectable Warning Device Warranty: Submit copies of manufacture's five year warranty for each of these products and manufacturer custom and standard color palette.

P. Field quality-control reports.
   1. Submit copies of delivery tickets complying with ASTM C 94 for each load of concrete delivered to the site. Tickets shall include all information required by the referenced standard.

Q. Minutes of pre-installation conference.

1.06 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with CBC Chapter 19A.
   1. Chemical products field-applied to concrete shall comply with the air quality requirements of authorities having jurisdiction.
   2. Comply with requirements of local, State and other authorities having jurisdiction for work performed within public right-of-ways.

B. Regulatory Requirements: Comply with CBC Chapter 19.

C. Chemical products field-applied to concrete shall comply with the air quality requirements of authorities having jurisdiction.

D. Comply with requirements of local, State and other authorities having jurisdiction for work performed within public right-of-ways.

E. Industry Standards: Comply with the following unless modified by requirements in the Contract Documents.
   1. ACI 301, "Specifications for Structural Concrete".
   2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials".
   3. ACI 302.1R, "Guide for Concrete Floor and Slab Construction".
   4. ACI 304R, "Guide for Measuring, Mixing, Transporting, and Placing Concrete".
   5. ACI 305R, "Hot Weather Concreting".
   7. ACI 318, "Building Code Requirements for Structural Concrete".
   8. ACI 347, "Guide to Formwork for Concrete".
   9. ACI SP-66, "ACI Detailing Manual".
   10. CRSI, "Manual of Standard Practice".
   11. CRSI, "Placing Reinforcing Bars".
F. Detectable Warning Installer Qualifications: An employer of workers trained and approved by manufacturer of cast-in-place, surface-applied unit-paver-type detectable truncated dome products.

G. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
   1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities" (Quality Control Manual - Section 3, "Plant Certification Checklist").

H. Source Limitations for Concrete Paving: Obtain each color, size, type, and variety of concrete material and concrete mixture from single manufacturer with resources to provide concrete of consistent quality in appearance and physical properties. Secure all material required for the duration of the project as needed to ensure consistent quality in appearance.

I. Welding Qualifications: Comply with CBC Chapter 17A.
   1. Qualify welding procedures and welding personnel according to AWS D1.4/D 1.4M, "Structural Welding Code - Reinforcing Steel" prior to performing any welding.
   2. Qualify welding inspection personnel according to AWS QC1, "Standard for AWS Certification of Welding Inspectors."

J. 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.

K. Concrete Testing Service: Engage a qualified testing agency to perform material evaluation tests and to design concrete mixtures.

L. ACI Publications: Comply with ACI 301 unless otherwise indicated.

M. Mockups: Before casting concrete paving, build mockups to verify selections made under Sample submittals and to fully demonstrate typical joints (including expansion and saw cut joints), surface finish, texture, color tolerances, standard of workmanship and completed product. Build mockups to comply with the following requirements, using materials indicated for the completed Work:
   1. Build mockups in the location and of the size indicated or, if not indicated, as directed by Architect.
      a. Paving Modules: Construct at least one 6 ft. x 6 ft. mockup of each color, finish, and mix design of special paving module, including stenciled areas, banding and curbs
      b. Radial Paving Patterns: Construct at least one 180 sq. ft. mockup of curved or radial paving patterns.
      c. Detectable Warnings: Grooves minimum 12 inches X 6 ft. long.
      d. Stairs: Construct minimum 2 risers and treads X 4’ long with nosing grooves and stained color within groves for each color and finish specified.
      e. Mow Strip: maximum 6’ long for each specified width and color.
      f. Truncated Domes: minimum 3’X6’ long set in concrete with concrete base and grout.
      g. Repairs: In presence of Architect, damage part of the exposed-face surface for each finish, color, and texture, and demonstrate materials and techniques proposed for repair of tie holes, honeycombing, spalls, surface blemishes, etc. to match adjacent undamaged surfaces.
2. Build mockups full-size, matching site concrete components indicated on the Drawings. Mock-ups shall be complete in every detail, including joints, reveals, edges, chamfers, etc. Include complex joinery conditions where necessary to integrate to other Project components as indicated including multiple pour conditions. Mockups should be provided for each finish, color, joint and detail specified.

3. Maintain accurate records of variables associated with each mockup to facilitate the matching of accepted mockups during actual construction.

4. Demonstrate curing, cleaning, and protecting of cast-in-place concrete paving, finishes, and contraction and expansion joints, as applicable.

5. Mockup Acceptance: Obtain Architect’s approval of mockups before casting architectural site concrete and paving.
   a. The Architect may reject mockups that, in the Architect’s sole judgment, do not demonstrate an acceptable completed product, including, but not limited to, color, joint work, surface finish, texture, tolerances, and standard of workmanship.
   b. The Architect may require modifications to mockups to obtain acceptable results.
   c. The Architect may require modifications to mockup repairs to obtain acceptable results.
   d. The Architect may require removal and reconstruction of mockups to obtain acceptable results. Multiple mock ups maybe required.
   e. Contractor shall provide additional mockups as required to obtain results acceptable to the Architect at no additional cost to the Owner.

6. Mockup Disposition: Accepted mockups shall not become part of the completed Project. Maintain mockup onsite for the duration of construction and until all work has been accepted. Remove and legally dispose mockups after acceptance of final installed work prior to Project Completion. If sufficient permanent concrete paving work has been completed, Contractor may submit a written request to Architect to transfer quality control for concrete paving from the accepted mockups to one or more designated portions of the permanent work.

7. Provide written meeting minutes for each mock up review indicating items reviewed, approvals, rejections, connections, or other action items.

1.07 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 55 deg F for water-based materials, and not exceeding 95 deg F.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending, damage, and rust.
   1. Label bundles with durable identification tags. Maintain reinforcement identification after bundles are broken.
   2. Store reinforcement to avoid excessive rusting or fouling with grease, oil, dirt or other bond-weakening contaminants.
   3. Avoid damaging applied coatings, if any, on steel reinforcement.
PART 2 - PRODUCTS

2.01 FORMS

A. Formwork: Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth surfaces.
1. Set forms to alignment, grade and required dimensions. Formwork shall not deviate more than 1/4 inch from required vertical positions and 1/4 inch from required horizontal positions. Exposed Surfaces: Provide faced plywood panels complying with, or equivalent to, DOC PS 1, Structural I. Provide minimum 7-ply plywood and provide balance sheets for panels coated one-side only. Furnish in largest practicable sizes to minimize number of joints. Provide Medium-Density Overlay (MDO) panels or high density overlay (HDO) panels, with mill-applied release agent and edge sealant. Provide one of the following panels, or comparable substituted product:
2. Hold forms rigidly in place by stakes, clamps, spreaders, and braces at 3 feet on centers, and where required to ensure rigidity.
3. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces.
4. Place joint filler or backer rod on vertical surfaces in contact with concrete paving.
5. Benders or thin plank forms may be used on curves, grade changes, or curb returns. Back forms for curb returns may be made of ½-inch thick benders cleated together for full depth of the curb.
6. Keep forms in place until concrete is sufficiently hard to prevent damage to concrete.
7. Reuse of Forms:
   a. Do not reuse forms if there is any evidence of surface wear or defect which would impair quality of surface or edge.
   b. Thoroughly clean and properly coat forms before reuse.
   c. Do not use forms from previous projects.
8. Provide new forms specifically purchased for this project. Reuse of forms from past projects or contractors stock will not be accepted.

B. Curved Work: Kerf back of plywood form-facing panels, or use accepted flexible or curved forms for curved work with a radius of 100 feet or less.

C. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces.
1. Obtain written acceptance of form release agent from integral colored concrete pigment manufacturer.
2. Form-release agents shall be non-staining and can cause no visual effect to the finish.
2.02 STEEL REINFORCEMENT

A. Recycled Content: Provide steel reinforcement with an average recycled content of steel so postconsumer recycled content plus one-half of pre-consumer recycled content is not less than 60 percent.

B. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, fabricated from as-drawn steel wire into flat sheets.


E. Reinforcing Bars: ASTM A 615/A 615M, Grade 60; deformed.

F. Low-Alloy-Steel Reinforcing Bars (for Welding): ASTM A 706/A 706M, Grade 60, deformed, unless otherwise indicated.

G. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 plain-steel bars. Cut bars true to length with ends square and free of burrs.
   1. Provide two-component "Speed Dowel System" manufactured by Greenstreak.

H. Tie Bars: ASTM A 615/A 615M, Grade 60, deformed.

I. Hook Bolts: ASTM A 307, Grade A, internally and externally threaded. Design hook-bolt joint assembly to hold coupling against paving form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.

J. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete specified, and as follows:
   1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.

K. Zinc Repair Material: ASTM A 780.

2.03 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of same type, brand, and source throughout Project:
   1. Portland Cement: ASTM C 150, Type II/V, Type I/II or Type IV, gray, unless white cement is required to achieve colors indicated. Supplement with the following:
      a. Flay Ash: none accepted.

B. Normal-Weight Aggregates: ASTM C 33, complying with building code. Provide aggregates from a single source. All aggregates shall be free of materials with deleterious reactivity to alkali in cement when tested in accordance with ASTM C 289.
   1. Comply with CBC section 1903A.3.
   2. Comply with CBC section 1903.3.
   3. Service Class, based on CBC Figure 1904A.2.2, "Weathering Probability Map":
      a. Severe and Moderate: Class 5S.
      b. Negligible: Class 2N.
4. Service Class, based on CBC Figure 1904.2.2, "Weathering Probability Map":
   a. Severe and Moderate: Class 5S.
   b. Negligible: Class 2N.
   a. Source: TMT Enterprises, LH Voss, Cemex, Graniterock
   b. No pea gravel will be accepted.
   a. Source: TMT Enterprises, LH Voss, Cemex, Graniterock
   b. Color to be white to light no dark material.
C. Aggregate Sizes: [3/8 inch] <Insert dimensions> nominal.
D. Water: Potable and complying with ASTM C 94/C 94M.
E. Shrinkage-Reducing Admixture: Commercially formulated, shrinkage inhibitor capable of reducing initial shrinkage by 80% and long-term shrinkage by 50%. Provide product suitable for use with either air-entrained or non-air-entrained concrete as appropriate to structural member and project location.
   1. Products: Subject to compliance with requirements, provide one of the following (as required):
      a. Euclid Chemical Company (The), an RPM company; EUCON SRA, SRA+
      c. Sika Corporation; Control 40.
      d. BASF; MasterSet, MasterKure, MasterAir
      e. Central Concrete Supply Co.; Aridus
F. Color Pigment: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, free of carbon black, nonfading, and resistant to lime and other alkalis.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Davis Colors - Liquid
      b. QC Construction Products - Liquid
      c. Scofield, L. M. Company: Chromix - L
      d. Solomon Colors, Inc. - Liquid
   2. Color: As indicated on plans.

2.04 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) dry or cotton mats.
B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
C. Water: Potable.
D. Evaporation Retarder: Waterborne, monomolecular, film forming, manufactured for application to fresh concrete. Provide products with not more than 100g/L volatile organic content.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. BASF Construction Chemicals, LLC; Confirm.
b. Conspec by Dayton Superior; Aquafilm.
   c. Nox-Crete Products Group; MONOFILM.

E. Clear, Waterborne, Membrane-Forming Curing Compound (Colored Concrete): Provide products that are acceptable to concrete color pigment manufacturer complying with ASTM C 309, Type 1, Class B, 18 to 25 percent solids, nondissipating, certified by curing compound manufacturer to not interfere with bonding of sealers with no glossy finish and compatible with specified sealer. Provide products with not more than 100g/L volatile organic content.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Sinak Corporation; The Cure WCE or Lithium Cure 1000.
      b. L. M. Scofield; Cureseal-W.
      c. Butterfield Color; Clear Guard H2O.

F. All curing materials should be dissipating without leaving a shiny, cloudy, or glossy finish. Curing material does not substitute requirement of a sealer.

2.05 HARDENERS AND SEALERS

A. Penetrating Liquid Floor and Horizontal Surface Treatment (Sealer): Clear, chemically reactive, waterborne solution of inorganic silicate or siliconate water-based lithium quartz materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces. Materials shall be compatible with concrete admixtures and shall be recommended by manufacturer for intended use. Provide product with 0g/L volatile organic content.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Sinak Corporation; Concrete Sealer HLQ 125.
      b. L. M. Scofield; Cureseal-W.
      c. Butterfield Color; Clear Guard H2O.
      d. BASF Construction Chemicals - Building Systems; Kure-N-Harden.
      e. Dayton Superior Corporation; Edoco by Dayton Superior; Titan Hard.
      f. Euclid Chemical Company (The), an RPM company; Euco Diamond Hard.
      g. L&M Construction Chemicals, Inc.; Seal Hard.

2.06 AGGREGATE BASE

A. Granular Fill: Class II crushed aggregate per Section 26 of Cal-Trans standards. Clean mixture of crushed stone or crushed or uncrushed gravel; ASTM D 448, Size 57, with 100 percent passing a 1-1/2-inch (37.5-mm) sieve and 0 to 5 percent passing a No. 8 (2.36-mm) sieve.

B. Fine-Graded Granular Material: Clean mixture of crushed stone, crushed gravel, and manufactured or natural sand; ASTM D 448, Size 10, with 100 percent passing a 3/8-inch (9.5-mm), 20 to 10 / 10 to 30 percent passing a No. 100 (0.15-mm) sieve, and at least 0-5 percent passing No. 200 (0.075-mm) sieve; complying with deleterious substance limits of ASTM C 33 for fine aggregates.

2.07 RELATED MATERIALS

A. Joint Fillers:
   1. ASTM D 1751, asphalt-saturated cellulosic fiber in preformed strips.
3. 1/4" thickness.

B. Bonding Agent: ASTM C 1059, Type II, non-re-emulsifiable. Provide proprietary products composed of latex polymers.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. W. R. Meadows, Inc.; "Acry-Lok".
      b. Grace Construction Products, W. R. Grace & Co.; "Daraweld C".
      c. Larsen Products Corp., "Weld-Crete".

C. Pigmented Mineral Dry-Shake Hardener: Factory-packaged, dry combination of Portland cement, graded quartz aggregate, color pigments, and plasticizing admixture. Use color pigments that are finely ground, nonfading mineral oxides interground with cement.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. BASF Construction Chemicals, LLC; Mastercron.
      b. L&M Construction Chemicals, Inc.; QUARTZPLATE FF
      c. Scofield, L. M. Company; LITHOCHROME Color Hardener.
      f. Conspec by Dayton Superior; Conshake 600 Colortone.
      g. Dayton Superior Corporation; Quartz Tuff.
      h. Euclid Chemical Company (The), an RPM company; Surflex.
      i. Lambert Corporation; COLORHARD.
      j. Metalcrete Industries; Floor Quartz.
      k. Southern Color N.A., Inc.; Mosaics Color Hardener.
      l. Symons by Dayton Superior; Hard Top.
      m. <Insert manufacturer's name; product name or designation>.
      n. Color: As selected by Architect from manufacturer's full range.

2.08 DETECTABLE WARNING MATERIALS

A. General: All detectable warning systems shall comply with Americans with Disabilities Act (28 CFR Part 36 ADA Standards for Accessible Design, Appendix A, Section 4.29.2 Detectable Warnings on Walking Surfaces), and CBC requirements (Section 11B-24, 11B-705 and others). All detectable warning materials shall have raised truncated domes with a base diameter of nominal 0.90 inch (22.9 mm), tapering to a top diameter of 0.45 inch (11.4 mm), a height of nominal 0.20 inch (5.08 mm), and a center-to-center spacing of 2.35 inches (59.7 mm) nominal. The orientation of the dome pattern for all panels shall be parallel with the panel edges. Detectable warning materials shall visually contrast with surrounding areas.
   1. California Compliance Warranty: All detectable warning systems shall be approved by DSA-AC. If not approved, DSA will accept a written five (5) year product warranty provided by the manufacturer of detectable warning products and directional surfaces. Such warranty shall indicate compliance with architectural standards as published in the current edition of the California Building Standards Code, and also include durability criteria which indicate that the shape, color fastness, confirmation, sound-on-cane acoustic quality, resilience, and attachment will not degrade significantly for at least five (5) years after initial installation. As defined by the State, "not degrade significantly"
means that the product maintains at least 90 percent of its approved design characteristics, as determined by the enforcing agency.

B. Safety Step TD (Surfaced Truncated Domes)
   1. Traditional System
   2. Ramp Up System

C. Concrete Paver Detectable Dome Warning System: Provide standard size precast architectural concrete paving units for installation in sand or mortar beds.
   1. Basis-of Design Product: Provide the following, or comparable substitute product:
         1) Size: per approved plans and details. Nominal 12 inches by 12 inches by 2 3/8 inches (4.7 cm by 4.7 cm by 6 cm).
         2) Color: per approved plans and details. As selected by Architect from manufacturer's complete range.
      b. Wausau Tile - ADA-2 Truncated dome pavers.
         1) 12 inches by 12 inches by 2 3/8 inches
         2) Color as selected by Architect from manufacturer's complete range.

2.09 CONCRETE MIXTURES

A. Prepare design mixtures, proportioned according to ACI 301 (ACI 301M), for each type and strength of normal-weight concrete, and as determined by either laboratory trial mixtures or field experience.
   1. Use a qualified independent testing agency for preparing and reporting proposed concrete design mixtures for the trial batch method.
   2. Proportioning:
      a. The proportioning of ingredients shall be such that the concrete can be readily worked into forms and around reinforcement under the conditions of placement to be used, without segregation or excessive bleeding.
      b. When proportioning by weight of loose, dry material, 94 pounds of cement shall be considered 1 cubic foot.
         1) Fine aggregate volume shall be at least 35 percent, with a maximum of 50 percent, of the sum of the separate fine and coarse aggregate volumes.
         2) Broom Finish: Coarse aggregate 50 percent-50 percent fine aggregate.
         3) Abrasive blast finish: Coarse aggregate 40 percent, fine aggregate 60 percent.
         4) Exposed aggregate: Coarse aggregate 60 percent, fine aggregate 40 percent.
      c. Total water content shall not exceed 35 gallons per cubic yard of concrete.
      d. Weighing equipment shall be accurate within 1 pound and shall be adjustable for varying aggregate moisture content.
      e. A beam auxiliary shall register any part of the last 100 pounds of each aggregate. The aggregate hopper shall have a volume adjustment.
   3. Prepare compressive strength data for both 7-day and 28-day strengths.
      a. The 7-day compressive strength shall be at least 60 percent of the required 28- day strength.
      b. The 28-day compressive strength shall be as indicated.
c. Provide drying shrinkage test data at 28 days, from not less than 3 test specimens.

B. When automatic machine placement is used, prepare and submit design mixtures suitable for use with machine placement, including reduced slump as required. Obtain laboratory test results that meet or exceed requirements.

C. Proportion mixtures to provide normal-weight concrete with the following properties:
   1. Typical Compressive Strength (28 Days): Provide the following minimum compressive strength (28 days) for concrete paving unless otherwise indicated: 3000 psi.
   2. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.50-0.60.
   3. Slump Limit: 4 inches, plus or minus 1 inch, unless indicated otherwise.
      a. Slump Limit (High-Range Water-reducing Admixture): 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture, plus or minus 1 inch, unless indicated otherwise.
      b. Slump Limit (Plasticizing Admixture): 8 inches for concrete with verified slump of 2 to 4 inches before adding plasticizing admixture, plus or minus 1 inch, if required.

D. Limit water-soluble, chloride-ion content in hardened concrete to 0.06 percent by weight of cement. Limit total chloride-ion content in hardened concrete to 0.10 percent by weight of concrete when tested per AASHTO T 260 potentiometric titration.

E. Limit "drying shrinkage" after 28 days of curing hardened concrete to 0.045 percent of the original concrete volume.

F. Limit water-soluble, chloride-ion content in hardened concrete to [0.15] [0.30] percent by weight of cement.

G. Chemical Admixtures: Admixtures may only be used if they are incorporated into the accepted concrete mix designs. Use admixtures according to manufacturer's written instructions.
   1. Use [water-reducing admixture] [high-range, water-reducing admixture] [high-range, water-reducing and retarding admixture] [plasticizing and retarding admixture] in concrete as required for placement and workability.
   2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
   3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.
   4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.

H. Liquid Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with accepted mockup.
2.10 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M. Furnish batch certificates for each batch discharged and used in the Work.
   1. When air temperature is between 85 and 90 deg. F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg. F (32 deg. C), reduce mixing and delivery time to 60 minutes.

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

C. For concrete batches of 1 cu. yd. (0.76 cu. m) or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.

D. For concrete batches larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd.

E. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixing time, quantity, and amount of water added.

F. Integral Colored Concrete Mixes: Add pigments at the concrete batch plant. Minimum batch size shall be three (3) yards. The same brand of cement, source of sand, and water/cement ratio shall be maintained for each load of the same color.
   1. Batching Procedure: Before adding color-conditioning admixture, the mixing drum shall be thoroughly cleaned and wetted with approximately 40 gallons of the mix water and/or a portion of the aggregates. After cleaning and wetting of the drum, add the specified quantity of admixture correctly packaged for the mix design and batch quantity. Proceed with normal batching of balance of ingredients. After loading is complete, mix at mixing speed for a minimum of 15 minutes. Do not add water after a portion of the load has been discharged.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.

B. Proof-roll prepared subbase surface below concrete paving with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding.
   1. Completely proof-roll subbase in one direction and repeat in perpendicular direction. Limit vehicle speed to 3 mph.
   2. Correct subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch according to requirements in Division 31 Section "Earth Moving."

C. Proceed with concrete paving installation only after unsatisfactory conditions have been corrected.
3.02 PREPARATION
   A. Remove loose material from compacted subbase surface immediately
      before placing concrete.

3.03 EDGE FORMS AND SCREED CONSTRUCTION
   A. Set, brace, and secure edge forms, bulkheads, and intermediate screed
      guides to required lines, grades, and elevations. Install forms to allow
      continuous progress of work and so forms can remain in place at least 24
      hours after concrete placement.
   B. Clean forms after each use and coat with form-release agent to ensure
      separation from concrete without damage.
   C. Slope stair and step treads at not less than 1.0 percent and not more than
      2.0 percent cross slope to drain.

3.04 STEEL REINFORCEMENT
   A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating,
      placing, and supporting reinforcement.
   B. Clean reinforcement of loose rust and mill scale, earth, ice, or other
      bond-reducing materials.
   C. Arrange, space, and securely tie bars and bar supports to hold
      reinforcement in position during concrete placement. Maintain minimum
      cover to reinforcement.
   D. Epoxy-Coated Reinforcement: Use epoxy-coated steel wire ties to fasten
      epoxy-coated reinforcement. Repair cut and damaged epoxy coatings with
      epoxy repair coating according to ASTM D 3963/D 3963M.
   E. Install fabricated bar mats in lengths as long as practicable. Handle units
      to keep them flat and free of distortions. Straighten bends, kinks, and
      other irregularities, or replace units as required before placement. Set
      mats for a minimum 2-inch overlap of adjacent mats.

3.05 JOINTS
   A. General: Form construction, isolation or expansion joint, and saw cut /
      contraction joints and tool edges true to line, with faces perpendicular to
      surface plane of concrete. Construct transverse joints at right angles to
      centerline unless otherwise indicated.
      1. When joining existing paving, place transverse joints to align with
         previously placed joints unless otherwise indicated.
   B. Isolation (Expansion) Expansion Joints: Form isolation joints of preformed
      joint-filler strips abutting concrete curbs, catch basins, manholes, inlets,
      structures, other fixed objects, and where indicated.
      1. Locate expansion joints at intervals of 20 feet maximum unless
         otherwise indicated.
      2. Extend joint fillers full width and depth of joint and recess 1 inch from
         finish surface where no joint sealant is indicated.
      3. Terminate joint filler not less than 1/2 inch or more than 1 inch below
         finished surface if joint sealant is indicated.
      4. Furnish joint fillers in one-piece lengths. Where more than one length
         is required, lace or clip joint-filler sections together.
      5. Break steel at expansion joints.
      6. Dowels- provide prefabricated 'speed dowel' assemblies.
C. Saw Cut (Control) Joints: Form weakened-plane saw cut joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth plus 1/4 inch of the concrete thickness, as follows, and to match jointing of existing adjacent concrete paving:
   1. Continue steel reinforcement across sawcut joints unless otherwise indicated.

D. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 1/8-inch radius unless otherwise noted. Repeat tooling of edges after applying surface finishes. Eliminate edging-tool marks on concrete surfaces.

3.06 CONCRETE PLACEMENT

A. Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast-in. Notify other trades as necessary to permit installation of their work.

B. Remove snow, ice, or frost from subbase surface and steel reinforcement before placing concrete. Do not place concrete on frozen surfaces.

C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

D. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.

E. Do not add water to concrete during delivery or at Project site. Do not add water to fresh concrete after testing.

F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

G. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.
   1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, and side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels and joint devices.

H. Screed paving surface with a straightedge and strike off.

I. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

J. Curbs and Gutters: Produce curbs and gutters to required cross section, lines, grades, finish, and jointing.

K. Slip-Form Paving: Use accepted design mixture for automatic machine placement. Produce paving to required thickness, lines, grades, finish, and jointing.

L. Compact subbase and prepare subgrade of sufficient width to prevent displacement of slip-form paving machine during operations.
M. Cold-Weather Placement: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing, or low temperatures. Comply with ACI 306.1 and the following:
   1. When air temperature has fallen to or is expected to fall below 40 deg. F (4.4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg. F (10 deg C) and not more than 80 deg. F (27 deg C) at point of placement.
   2. Do not use frozen materials or materials containing ice or snow.
   3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in design mixtures.

N. Hot-Weather Placement: Comply with ACI 305R (ACI 305R M) and as follows when hot-weather conditions exist:
   1. Cool ingredients before mixing to maintain concrete temperature below 90 deg. F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated in total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
   2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
   3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

O. Provide sand and base materials as indicated.

3.07 FLOAT FINISHING

A. General: Do not add water to concrete surfaces during finishing operations.

B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.
   1. Burlap Finish: Drag a seamless strip of damp burlap across float-finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.
   2. Medium-to-Fine-Textured Broom Finish: Draw a soft-bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture. Required to meet slip coefficient requirement.
   3. Portland cement concrete paving shall be stable, firm, and slip resistant and shall comply with CBCSections 11B-302 and 11B-403.

3.08 DETECTABLE WARNINGS

A. Detectable Warnings, General: Install detectable warnings as part of the concrete paving placement sequence. Set true to line and elevation. Comply with maximum slope and cross-slope requirements for accessible walkways.
   1. Blockouts: Form blockouts in concrete and asphalt pavements for installation of detectable paving units.
      a. Tolerance for Opening Size: Plus 1/4 inch, no minus.
B. Detectable warnings surfaces shall comply with CBC Section 11B-705.1.

C. Detectable warning surfaces shall be yellow conforming to FS 33538 of Federal Standard 595C, except for locations at curb ramps, islands, or cut through medians where color used shall contrast visually with that of adjacent walking surfaces, either light-on-dark or dark-on-light. CBC Sections 11B-705.1.1.3 and 11B-705.1.1.5.

D. Detectable warning surfaces shall differ from adjoining surfaces in resiliency or sound-on-cane contact. CBC Section 11B-705.1.1.4.

E. Provide 5 year minimum warranty per DSA Bulletin 10/31/02, revised 04/09/08.

F. Precast Detectable Warning Tiles: Comply with approved plans and details along with manufacturer's written instructions.

G. Surface-Mounted Detectable Warning Tiles: Comply with manufacturer's written instructions. Do not install directly over asphalt pavements.

H. For installation at asphalt pavements, comply with installation indicated on Drawings. If not indicated, provide one of the following installation methods:

I. Saw-cut and remove asphalt pavement in location of warning tile to a minimum depth of 6 inches. Replace removed pavement materials with reinforced concrete paving materials. When cured, install surface-mounted detectable warning tiles.

J. Provide 0.032 inch aluminum separation sheet cut to same size as surface mounted tiles. Adhere sheet to asphalt paving with a thin coat of urethane adhesive, holding adhesive 1 inch from edge of sheet. Install surface-mounted detectable warning tiles to sheet with adhesive and mechanical fasteners per manufacturer's written instructions.

K. Cast-in-Place Detectable Warning Pavers: Integrate into installation of unit pavers. Comply with manufacturer's written instructions.

L. Cast-in-Place Detectable Warning Grooves: Install detectable warnings as part of the concrete paving placement sequence. Set true to line and elevation. Form well-defined, clean grooves with appropriate tools.

3.09 CONCRETE PROTECTION, CURING AND SEALING:

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Comply with ACI 306.1 for cold-weather protection.

C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete but before float finishing.

D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

E. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound or a combination of these as follows:
1. **Moisture Curing:** Keep surfaces continuously moist for not less than seven days with the following materials:
   a. Water.
   b. Continuous water-fog spray.
   c. Absorptive cover, water saturated and kept continuously wet.
      Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

2. **Moisture-Retaining-Cover Curing:** Cover concrete surfaces with moisture-retaining cover, placed in widest practicable width, with sides and ends lapped at least 12 inches and sealed by waterproof tape or adhesive. Immediately repair any holes or tears occurring during installation or curing period using cover material and waterproof tape.

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

**F. Seal Concrete:** Apply specified sealer in accordance with manufacturer’s recommendations.
   1. Apply full strength in two coats with airless sprayer at the manufacturer’s recommended rate.
   2. After the first coat is completely dry, apply second coat at right angles to the first coat.

### 3.10 PAVING TOLERANCES

**A.** Comply with tolerances in ACI 117, the Americans with Disabilities Act, the CBC and as follows:
   1. **Elevation:** 1/8 inch.
   2. **Thickness:** Plus 3/8 inch, minus 1/4 inch.
   3. **Surface:** Gap below 10-foot-long, unleveled straightedge not to exceed 1/8 inch. Surface must properly drain.
   4. **Surface Discontinuities:** Maximum 1/4 inch, subject to further limitations of accessible routes.
   5. **Alignment of Tie-Bar End Relative to Line Perpendicular to Paving Edge:** 1/2 inch per 12 inches of tie bar.
   6. **Lateral Alignment and Spacing of Dowels:** 1/4 inch.
   7. **Vertical Alignment of Dowels:** 1/8 inch.
   8. **Alignment of Dowel-Bar End Relative to Line Perpendicular to Paving Edge:** 1/8 inch per 12 inches of dowel.
   9. **Joint Spacing:** 3 inches, except joint position shall be within 1/4 inch of objects in alignment with joint such as benches, light poles, pull boxes, etc.
   10. **Sawcut Joint Depth:** Plus 1/4 inch, no minus.
   11. **Joint Width:** Plus 1/16 inch, no minus.

**B. Stair Treads:** Stair treads within a run shall be constructed equally and shall shed water away from the path of travel. Maximum tread slope down from riser to nosing in direction of travel: 1.0 percent, plus or minus 0.5 percent. Maximum tread cross-slope perpendicular to direction of travel: 2.0 percent, plus 0.0 percent, minus 1.0 percent or as required to shed water.

**C. Ramps:** Ramps shall shed water away from the path of travel. Maximum ramp slope in direction of travel: 8.33 percent. Maximum ramp
cross-slope perpendicular to direction of travel: 2.0 percent, plus 0.0 percent, minus 1.0 percent or as required to shed water.

3.11 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
   1. Testing Frequency: Obtain at least one composite sample for each 20 cu. Yd., or fraction thereof of each concrete mixture placed each day.
      a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
   2. Slump: ASTM C 143/C 143M; 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.
   3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
   4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg. F and below and when it is 80 deg. F and above, and one test for each composite sample.
   5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
   6. Compressive-Strength Tests: ASTM C 39/C 39M; test one specimen at seven days and two specimens at 28 days.
      a. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at 28 days.

C. Strength of each concrete mixture will be satisfactory if average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.

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

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

F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.
G. Remove and replace concrete pavement where test results indicate that it does not comply with specified requirements. Concrete paving will be considered defective if it does not pass tests and inspections.

H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

I. Prepare test and inspection reports.

3.12 REPAIRS AND PROTECTION

A. Remove and replace concrete paving that is broken, damaged, cracked, chipped, stained or defective or that does not comply with requirements in this Section as determined by Landscape Architect. Remove work in complete sections from joint to joint unless otherwise approved by Architect.

B. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory paving areas with Portland cement concrete bonded to paving with epoxy adhesive.

C. Protect concrete paving from damage. Exclude all but pedestrian traffic from paving for at least 28 days after placement. When construction traffic is permitted, maintain paving as clean as possible by providing adequate surface protection and by removing surface stains and spillage of materials as they occur.
   1. Rubber tire marks are unacceptable in the completed construction.

D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Project Completion inspections.

E. Repair of damaged, defective or rejected concrete is not permitted. Remove all concrete from expansion joint to expansion joint or greater as required to provide a constant continuous finish.

3.13 FINAL CLEANING

A. Remove all excess concrete, form materials, over pours, waste, etc., and legally dispose off-site.

B. Provide a final acid and power wash for all concrete paving surfaces. Do not use any material that will affect the appearance of the concrete.

C. All over pours in planting areas should be removed prior to landscape operations.

D. Clean concrete paving to remove stains, markings, dust, and debris.

END OF SECTION 32 13 13
SECTION 33 31 11

SITE SANITARY SEWERAGE GRAVITY PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sanitary sewerage drainage piping, fittings, and accessories.
B. Connection of building sanitary drainage system to private sanitary sewer mains.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete for cleanout base pad construction.
B. Section 31 23 16.13 - Trenching: Excavating, bedding, and backfilling.
C. Section 31 23 23 - Fill: Bedding and backfilling.
D. Section 33 05 13 - Manholes and Structures.

1.03 DEFINITIONS

A. Bedding: Fill placed under, beside and directly over pipe, prior to subsequent backfill operations.

1.04 REFERENCE STANDARDS


1.05 SUBMITTALS

A. See Section 01 3300 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide data indicating pipe, pipe accessories.
C. Manufacturer’s Installation Instructions: Indicate special procedures required to install Products specified.

PART 2 PRODUCTS

2.01 SEWER PIPE MATERIALS

A. Provide products that comply with applicable code(s).
B. Plastic Pipe: ASTM D3034, SDR 35, Poly(Vinyl Chloride) (PVC) material; inside nominal diameter as indicated, bell and spigot style rubber gasket joints.

C. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps and other configurations required.

2.02 PIPE ACCESSORIES

A. Trace Wire: Magnetic detectable conductor, clear plastic covering, imprinted with "Sewer Service" in large letters.

2.03 BEDDING AND COVER MATERIALS


PART 3 EXECUTION

3.01 GENERAL

A. Perform work in accordance with applicable code(s).

3.02 EXAMINATION

A. Prior to beginning work, verify that building service connections, municipal and site storm main size, location, and invert are as indicated.

3.03 TRENCHING

A. See Section 31 23 16.13 for additional requirements.

B. Hand trim excavation for accurate placement of pipe to elevations indicated.

C. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

3.04 INSTALLATION - PIPE

A. Verify that trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on layout drawings.

B. Install pipe, fittings, and accessories in accordance with manufacturer’s instructions. Seal watertight.
   1. Plastic Pipe: Also comply with ASTM D2321.

C. Lay pipe to slope gradients noted on layout drawings; with maximum variation from true slope of 1/8 inch (3 mm) in 10 feet (3 m).

D. Connect to building sanitary sewer outlet and municipal sewer system, through installed sleeves.

E. Install trace wire 6 inches (150 mm) above top of pipe; coordinate with Section 31 23 16.13.

3.05 INSTALLATION - CLEANOUTS

A. Form bottom of excavation clean and smooth to correct elevation.

B. Form and place cast-in-place concrete base pad, with provision for sanitary sewer pipe end sections.

C. Establish elevations and pipe inverts for inlets and outlets as indicated.
D. Mount lid and frame level in grout to elevation indicated.

**3.06 FIELD QUALITY CONTROL**

A. Perform field inspection and testing in accordance with Section 01 40 00.

B. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

C. Pressure Test: Test in accordance with **Greenbook, Section 306-7.8.2.4**.

**3.07 PROTECTION**

A. Protect pipe and bedding cover from damage or displacement until backfilling operation is in progress.

END OF SECTION 33 31 11