

**OFFICIAL BID DOCUMENT  
FOR  
HVAC REPLACEMENT  
FFA LEADERSHIP CENTER RECREATION HALL  
KENTUCKY DEPARTMENT OF EDUCATION  
HARDINSBURG, KENTUCKY**

This Official Bid Document consisting of pages 1 through 13, shall be used in submitting a bid document for the work. Copies will be furnished upon request by the authority issuing the Contract Documents.

THIS BID DOCUMENT SUBMITTED BY \_\_\_\_\_

\_\_\_\_\_  
(Name and Address of Bidder)

DATE: \_\_\_\_\_ TELEPHONE: \_\_\_\_\_

GENTLEMEN:

This Bidder, in compliance with your Request for Bid No. RFB-129-25, and having carefully examined the Drawings and complete Contract Documents as defined in Article 1 of the General Conditions as well as the Specifications for the work as prepared by Studio Kremer Architects, Inc; hereby proposes to furnish all labor, materials, supplies and services required to perform the specifics of the Contract Documents, within the time set forth therein and for the stated Lump Sum Bid Amount.

The Bidder hereby acknowledges receipt of the following Addenda:

ADDENDUM NO. _____	DATED _____	ADDENDUM NO. _____	DATED _____
ADDENDUM NO. _____	DATED _____	ADDENDUM NO. _____	DATED _____
ADDENDUM NO. _____	DATED _____	ADDENDUM NO. _____	DATED _____
ADDENDUM NO. _____	DATED _____	ADDENDUM NO. _____	DATED _____

**(IF NONE HAVE BEEN ISSUED AND RECEIVED, INSERT THE WORD NONE.)**

**OFFICIAL BID DOCUMENT  
FOR  
HVAC REPLACEMENT  
FFA LEADERSHIP CENTER RECREATION HALL  
KENTUCKY DEPARTMENT OF EDUCATION  
HARDINSBURG, KENTUCKY**

**ALL BLANKS IN THE BID DOCUMENTS SHALL BE COMPLETED AND ALL REQUIRED SUPPORT DATA SHALL BE FURNISHED. IF INDICATED I N THE BIDDING DOCUMENTS, SUMS SHALL BE EXPRESSED IN BOTH WORDS AND FIGURES. IN THE CASE OF DISCREPANCY BETWEEN THE TWO, THE AMOUNT IN WORDS SHALL PREVAIL.**

**LUMP SUM BASE BID:**

The Bidder agrees to furnish all labor, materials, supplies and services required to complete this project defined as HVAC Replacement, FFA Leadership Center Recreation Hall, Kentucky Department of Education, Hardinsburg, Kentucky for the Department for Facilities and Support Services, Commonwealth of Kentucky, in accordance with the Drawings, Specifications, and Contract Documents, and any duly issued Addenda for the LUMP SUM BID AMOUNT set forth below:

**LUMP SUM BASE BID AMOUNT:**

\_\_\_\_\_ DOLLARS  
(USE WORDS)

\_\_\_\_\_ CENTS (\$ \_\_\_\_\_ )  
(USE WORDS) (USE FIGURES)

**NOTE: THE AUTHENTICATION OF BID AND STATEMENT OF NON-COLLUSION AND NON-CONFLICT OF INTEREST PAGE MUST BE PROPERLY EXECUTED FOR THE LUMP SUM BASE BID TO BE VALID.**

**OFFICIAL BID DOCUMENT**

**AUTHENTICATION OF BID AND STATEMENT OF NON-COLLUSION AND NON-CONFLICT OF INTEREST**

**I, HEREBY CERTIFY:**

1. That I am the bidder (if the bidder is an individual), a partner in the bidder (if the bidder is a partnership), or an officer and employee of the bidding corporation having authority to sign on it's behalf (if the bidder is a corporation);
2. That the submitted bid or bids covering Division of Engineering and Contract Administration Request for Bid No. RFB-129-25 have been arrived at by the bidder independently and have been submitted without collusion with, and without any agreement, understanding or planned common course of action with any other contractor, vendor of materials, supplies, equipment or services described in the Request for Bid, designed to limit independent bidding or competition; as prohibited by provision KRS 45A.325;
3. That the contents of the bid or bids have not been communicated by the bidder or its employees or agents to any person not an employee or agent of the bidder, its surety on any bond furnished with the bid or bids and will not be communicated to any such person prior to the official opening of the bid or bids.
4. That the bidder is legally entitled to enter into the contract with the Commonwealth of Kentucky and is not in violation of any prohibited conflict of interest, including those prohibited by the provisions of KRS 164.390; and 45A.330 to 45A.340 and 45A.455;
5. This offer is for thirty (30) calendar days from the date this bid is opened. In submitting the above it is expressly agreed that upon proper acceptance by the Division of Engineering and Contract Administration of any or all items bid above, a contract shall thereby be created with respect to the items accepted;
6. That I have fully informed myself regarding and affirm the accuracy of all statements made in this Official Bid Document including Bid Amount.
7. Unless otherwise exempted by KRS 45.590, the bidder intends to comply in full with all requirements of the Kentucky Civil Rights Act and to submit data required by the Kentucky Equal Employment Act upon being designated the successful bidder.
8. That the bidder, if awarded a contract, would not be in violation of the Executive Branch Code of Ethics established by KRS 11A.001 through KRS 11A.990.
9. That the bidder is not debarred from doing business with federal agencies and that, if debarred during the life of the contract, the bidder will notify the Commonwealth buyer of record within seventy-two (72) hours of the federal debarment.

READ CAREFULLY – SIGN IN SPACE BELOW – FAILURE TO SIGN INVALIDATES BID

---

**SIGNED BY:** \_\_\_\_\_ **FIRM:** \_\_\_\_\_

**PRINT NAME:** \_\_\_\_\_ **ADDRESS:** \_\_\_\_\_

**TITLE:** \_\_\_\_\_

**DATE:** \_\_\_\_\_

**CITY** \_\_\_\_\_ **STATE** \_\_\_\_\_ **ZIP CODE** \_\_\_\_\_

**TELEPHONE NO:** \_\_\_\_\_

**FEDERAL ID. NO. OR SOCIAL SECURITY NO.** \_\_\_\_\_ **EMAIL:** \_\_\_\_\_

**\*Disadvantaged Contractors, check type of certification:**  
 WBE  MBE  DBE  SERVICE-DISABLED VETERAN

**\*Disadvantaged Contractors attach a copy of certification.**

**OFFICIAL BID DOCUMENT – SUBMITTAL DATA**

**THE FOLLOWING ITEMS ARE HEREWITH ENCLOSED AS REQUIRED:**

- Sworn Required Affidavit For Bidders, Offerors And Contractors
- Sworn Affidavit for Claiming Resident Bidder Status
- Vendor Report of Prior Violations of KRS Chapters, 136, 139, 141, 337, 338, 341 and 342.
- Bidder's Qualifications.
- Disadvantaged Business Enterprises (DBE) Participation

The utilization of minority/disadvantaged vendors and subcontractors is encouraged, whenever possible, on public projects. The bidder and contractor should make full efforts to locate disadvantaged business persons.

Bidders may use the following resources:

Commonwealth of Kentucky's SMALL BUSINESS CONNECTION website: <https://secure.kentucky.gov/sbc/default.aspx>

Kentucky Minority and Women Business Enterprise website: <https://mwbe.ky.gov/Pages/default.aspx>

Kentucky Service-Disabled Veteran-Owned Small Business website:

<https://finance.ky.gov/initiatives/sdvosb/Pages/default.aspx>

Kentucky Transportation Cabinet Disadvantaged Business Enterprise directories: <http://transportation.ky.gov/Civil-Rights-and-Small-Business-Development/Pages/Certified-DBE-Directory.aspx>

Finance and Administration Cabinet, Office of EEO/Contract Compliance: email [Finance.ContractCompliance@ky.gov](mailto:Finance.ContractCompliance@ky.gov) or call 502-564-2874

U.S. Small Business Administration, Dynamic Small Business Search website: [http://dsbs.sba.gov/dsbs/search/dsp\\_dsbs.cfm](http://dsbs.sba.gov/dsbs/search/dsp_dsbs.cfm)

Louisville/ Jefferson County Metropolitan Sewer District website: <http://www.msdlouky.org/insidemsd/diverse/find.html>

A bidder must include a list of all disadvantaged vendors and/or subcontractors contacted in order to prepare a bid (ATTACH TO OFFICIAL BID DOCUMENT).

If the bidder fails to utilize any disadvantaged vendors and/or subcontractors, a statement must be included to describe actions to include disadvantaged vendors and/or subcontractors (ATTACH TO OFFICIAL BID DOCUMENT).

The Finance and Administration Cabinet will review all submissions by bidders to determine compliance with this provision.

- List of Unit Prices, if applicable
- List of Subcontractors, if applicable
- List of Materials and Equipment, if applicable
- Bid Guaranty in the amount of no less than five percent (5%) of the TOTAL BID AMOUNT.
- Roofing Certifications, if applicable.
- All bidders are now required to be registered and active on our Vendor Self Service website

<https://vss.ky.gov/vssprod-ext/Advantage4>

**COMMONWEALTH OF KENTUCKY  
FINANCE AND ADMINISTRATION CABINET  
SWORN STATEMENT REGARDING CAMPAIGN FINANCE LAWS  
PURSUANT TO KRS 45A.110 AND KRS 45A.115**

The following form (page 5) relative to Campaign Finance Laws shall be completed in total, notarized and returned with your bid. Responsibility of a bidder or offeror for a contract award shall not be made until the bidder or offeror provides this sworn statement.





**Required Affidavit for Bidders, Offerors and  
Contractors  
(KRS 45A.110 & 45A.115)**

**Affidavit Effective for One (1) Year from Date of Execution**

**Instructions:** Pursuant to [KRS 45A.110](#) and [45A.115](#), a bidder, offeror, or contractor (“Contractor”) is required to submit a Required Affidavit for Bidders, Offerors, and Contractors to be awarded a contract, or for the renewal of a contract. An authorized representative of the contracting party must complete the attestation below, have the attestation notarized, and return the completed affidavit to the Commonwealth.

**Attestation**

As a duly authorized representative for the Contractor, I swear and affirm under penalty of perjury, that that the Contractor has not knowingly violated campaign finance laws of the Commonwealth of Kentucky and that the award of a contract will not violate any provision of the campaign finance laws of the Commonwealth. For purposes of this attestation, "Knowingly" means that the bidder or offeror is aware or should have been aware of the existence of a violation. The bidder or offer understands that the Commonwealth retains the right to request an updated affidavit at any time.

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Printed Name

\_\_\_\_\_  
Title

\_\_\_\_\_  
Date

Bidder or Offeror Name: \_\_\_\_\_

Address: \_\_\_\_\_  
\_\_\_\_\_

Commonwealth of Kentucky Vendor Code (If known):

Subscribed and sworn to before me this \_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_.

State of: \_\_\_\_\_ Notary: \_\_\_\_\_

County of: \_\_\_\_\_ My Commission Expires: \_\_\_\_\_

**REQUIRED AFFIDAVIT FOR BIDDERS, OFFERORS AND CONTRACTORS CLAIMING RESIDENT BIDDER STATUS**

**FOR BIDS AND CONTRACTS IN GENERAL:**

The bidder or offeror hereby swears and affirms under penalty of perjury that, in accordance with KRS 45A.494(2), the entity bidding is an individual, partnership, association, corporation, or other business entity that, on the date the contract is first advertised or announced as available for bidding:

1. Is authorized to transact business in the Commonwealth;
2. Has for one year prior to and through the date of advertisement
  - a. Filed Kentucky income taxes;
  - b. Made payments to the Kentucky unemployment insurance fund established in KRS 341.49; and
  - c. Maintained a Kentucky workers' compensation policy in effect.

The BIDDING AGENCY reserves the right to request documentation supporting a bidder's claim of resident bidder status. Failure to provide such documentation upon request shall result in disqualification of the bidder or contract termination.

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Printed Name

\_\_\_\_\_  
Title

\_\_\_\_\_  
Date

Company Name \_\_\_\_\_

Address \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Subscribed and sworn to before me by \_\_\_\_\_

(Affiant)

\_\_\_\_\_  
(Title)

of \_\_\_\_\_ this \_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_.  
(Company Name)

\_\_\_\_\_  
Notary Public

[seal of notary]

My commission expires: \_\_\_\_\_



### BIDDER'S QUALIFICATIONS

The Bidder's Qualifications are required by the owner to be submitted as set forth herewith:

1. This firm is a Corp. \_\_\_\_\_, Partnership \_\_\_\_\_, or Proprietorship \_\_\_\_\_.
2. A permanent place of business is maintained at:

---

STREET	CITY	STATE	ZIP CODE
--------	------	-------	----------

---

TELEPHONE NUMBER

3. The following construction plant and equipment will be made available for use on this contract:

---

---

4. In the event the contract is awarded the undersigned, surety bonds will be furnished by:

---

5. Experience of Contractor on other similar work:

---

---

---

---

6. We now have the following jobs under contract and bonded:

JOB	TOTAL CONTRACT	PERCENT COMPLETED
_____	\$ _____	_____ %
_____	\$ _____	_____ %
_____	\$ _____	_____ %
_____	\$ _____	_____ %
_____	\$ _____	_____ %

P-2

**DISADVANTAGED BUSINESS ENTERPRISE (DBE) PARTICIPATION**

- 1.01 **CERTIFICATION OF DBE:** Any DBE utilized pursuant to this Section shall be certified as a DBE by one of the following: Kentucky Finance and Administration Cabinet, Kentucky Transportation Cabinet or other state Transportation agencies, the Louisville/Jefferson County Metropolitan Sewer District, the Tri-State Minority Supplier Development Council or other state Minority Supplier Development Councils, the Ohio River Valley Women's Business Council, the Women's Business Enterprise National Council, the National Women Business Owners Council, or the Small Business Administration.
- 1.02 **OBLIGATION OF BIDDER/CONTRACTOR:** Bidder/Contractor shall make a good faith effort to meet the DBE contract goal set by the Commonwealth by including DBE's as subcontractors and/or material suppliers on 10% of the total estimated cost of the Contract. The failure to meet the foregoing goal shall not result in disqualification from bidding or being awarded a contract. However, Bidders/Contractors not meeting the DBE goal shall be expected to provide written proof of their good faith efforts. Award of the contract shall be conditioned upon satisfaction of the requirements established by this section. The Bidder/Contractor shall attempt to divide the work in the contract to facilitate use of DBE's (however, there is no requirement that the work be artificially divided or divided in a way that raises the bid price of the Bidder/Contractor).
- 1.03 **PROOF REQUIRED:** Each bidder shall furnish written proof in their bid package that they reached the DBE participation goal for this Contract, or of their good faith efforts to meet the DBE participation goal. A copy of each participating DBE's certification shall accompany the required forms. All submissions shall be subject to verification of the Commonwealth.
- A. Proof that the apparent successful bidder reached the DBE goal shall consist of the following and shall be made on form DB-2-A, attached hereto:
1. The names and addresses of DBE firms that will participate in the contract;
  2. A description of the work each named DBE firm will perform;
  3. The dollar amount of participation by each named DBE firm;
  4. The percentage amount of participation by each named DBE firm;
- B. Proof that the apparent successful bidder made a good faith efforts to meet the DBE participation goal may include the following:
1. Advertisement by the Bidder/Contractor of DBE contracting opportunities associated with this contract in at least one of each of the following periodicals: a periodical in general circulation throughout the Commonwealth, a trade periodical focused on DBE contractors/suppliers in general circulation throughout the Commonwealth, and a minority-focused periodical in general circulation throughout the Commonwealth. The Bidder/Contractor shall include copies of the dated advertisements in his bid package;
  2. Written notice of DBE opportunities in this contract to at least five pertinent DBE's at least seven days prior to the bid opening date. Copies of the written notices shall be included in the bid package;
  3. The Bidder/Contractor's response(s) to those DBE's who requested plans, specifications and/or contracting requirements. Copies of said responses shall be included in the bid package;
  4. Documentation on form DB-2-B of good faith negotiations with at least three DBE's, with no rejection of a qualified DBE without sound reason, including price quotes that are above other subcontractor's price quotes;
  5. Utilization of the Finance and Administration Cabinet's Office of Equal Employment Opportunity and Contract Compliance for referrals to organizations that assist in locating DBE's. Proof of use of such referrals and contacts made as a result thereof shall be included in the bid package.

DB-2-A

**DISADVANTAGED BUSINESS AVAILABILITY VERIFICATION**

\_\_\_\_\_ does commit itself that on the following project:  
NAME OF COMPANY

\_\_\_\_\_ PROJECT NAME REQUEST FOR BID NUMBER

The Bidder agrees to furnish information required by the Commonwealth of Kentucky to indicate the Disadvantaged Business which it intends to utilize. Breach of this commitment constitutes breach of the Bidder's contract if awarded.

NAME OF DISADVANTAGED BUSINESS	TELEPHONE	TYPE OF WORK

DOLLAR VALUE	PERCENT	DISADVANTAGED CLASSIFICATION

The undersigned shall enter into a formal agreement with the Disadvantaged business firms for work listed in this schedule conditioned upon execution of a contract with the Commonwealth of Kentucky.

Disadvantaged business firms listed above by the Bidder and accepted by the Owner and the Architect/Engineer shall be used on the work for which they were proposed and accepted and shall not be changed except with the written approval of the Owner and the Architect/Engineer. The undersigned hereby certifies that he or she has read the terms of this commitment and is authorized to bind the Bidder to the commitment herein set forth.

Signature and title of authorized official of the company and the data shall be properly executed on this document or the bid will be deemed nonresponsive.

\_\_\_\_\_  
NAME OF AUTHORIZED OFFICER TITLE

\_\_\_\_\_  
SIGNATURE DATE

If you are bidding as a General Contractor on this project i.e. direct bidding and a Disadvantaged as defined herein, please provide a copy of your DBE Certification.

Submit with Bid. \_\_\_\_\_  
(Please copy additional Disadvantaged Business Availability Forms as necessary.)

DB-2-B

**DISADVANTAGED BUSINESS UNAVAILABILITY VERIFICATION**

I, \_\_\_\_\_, \_\_\_\_\_ (TITLE)

of \_\_\_\_\_ (PRIME BIDDER)

certify that on \_\_\_\_\_ I contacted the following Disadvantaged owned business by: (circle one) Certified Mail, Phone, In Person to obtain a bid for work items to be performed on the Contract.

DISADVANTAGED CLASSIFICATION (IE. WBE, MBE, DBE, SDVOSB) CONTRACTOR	WORK ITEMS SOUGHT	FORM OF BID SUPPORT (I.E., UNIT PRICE, MATERIALS LABOR & LABOR ONLY)

To the best of my knowledge and belief, said Disadvantaged owned business was unavailable (exclusive of unavailability due to lack of agreement on price) for work on this project, or unable to prepare a bid, for the following reason(s):

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

SIGNATURE \_\_\_\_\_

DATE \_\_\_\_\_

\_\_\_\_\_ was offered an (NAME OF DISADVANTAGED BUSINESS)

opportunity to bid on the above-identified work on \_\_\_\_\_ by

\_\_\_\_\_ (SOURCE)

The above statement is a true and accurate account of why I did not submit a bid on this project.

\_\_\_\_\_  
(SIGNATURE OF DISADVANTAGED BUSINESS)

\_\_\_\_\_  
(TITLE) (DATE)

Submit with Bid if Applicable.  
(Please copy additional Disadvantaged Business Unavailability Forms as needed.)

**OFFICIAL BID DOCUMENT  
FOR  
HVAC REPLACEMENT  
FFA LEADERSHIP CENTER RECREATION HALL  
KENTUCKY DEPARTMENT OF EDUCATION  
HARDINSBURG, KENTUCKY**

**LIST OF PROPOSED SUBCONTRACTORS:**  
**(Must be submitted with Bid)**

The following list of proposed subcontractors is required by the owner to be executed, completed, and submitted with the Bidder's Proposal. All subcontractors are subject to approval by the Division of Engineering and Contract Administration, Department of Facilities and Support Services, Frankfort, Kentucky. Failure to submit this list, completely filled out, may result in bid rejection.

If certain branches of work are to be done by the Prime Contractor, so state. This means that the Prime **WILL BE** performing the work, and it **WILL NOT** be subcontracted without approval by DECA. Review/evaluation of subcontractors will occur on the bid opening day. If the Commonwealth requests replacement of a subcontractor, on bid opening day, then the apparent low bidder will provide a replacement subcontractor prior to close of the Commonwealth's business day on that day. Failure of the apparent low bidder to comply with the preceding sentence may result in bid rejection. If subcontractor review/evaluation is not completed on the bid opening day, then procedures for any replacement will be issued based on the uniqueness of each situation. The responsibility for selection, offering of qualified, competent subcontractors to accomplish the work intended is solely the responsibility of the bidder to the Commonwealth.

**ALL BLANKS MUST BE FILLED IN. IF PERFORMED BY THE BIDDER, STATE PRIME/GENERAL CONTRACTOR.**

	<b>BRANCH OF WORK</b>	<b>NAME OF SUBCONTRACTOR</b>
1.	Mechanical	
2.	Electrical	
3.	Door Installation	
4.	Window Installation	



**OFFICIAL BID DOCUMENT  
FOR  
HVAC REPLACEMENT  
FFA LEADERSHIP CENTER RECREATION HALL  
KENTUCKY DEPARTMENT OF EDUCATION  
HARDINSBURG, KENTUCKY**

**LIST OF MATERIALS AND EQUIPMENT (MUST BE COMPLETELY FILLED OUT WHEN BID IS SUBMITTED):**

Every item listed under the different phases of construction must be clearly identified so the Owner will know what the bidder proposes to furnish. Bidders be hereby advised that this list is required by the owner to be executed, completed, and submitted with bid.

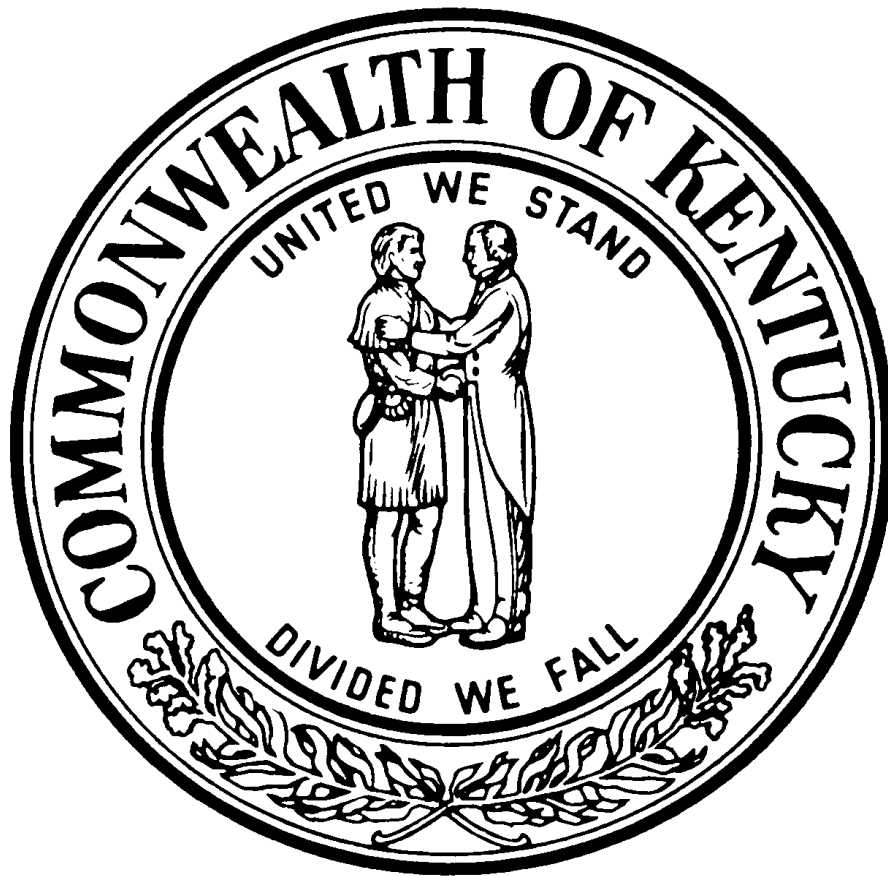
The use of the manufacturer's dealer's name only, or stating "as per plans and specifications", will not be considered as sufficient identification.

Where more than one "Make or Brand" is listed for any one item, the Owner has the right to select the one to be used.

Failure to submit a proper list may result in rejection of the bid.

	<b>MATERIAL AND/OR EQUIPMENT:</b>	<b>MANUFACTURER AND BRAND NAME:</b>
1.	VRF System	
2.	Lighting	
3.	Panelboard	
4.	Fire Alarm	
5.	Doors	
6.	Windows	

FINANCE AND ADMINISTRATION  
DEPARTMENT FOR FACILITIES AND SUPPORT SERVICES  
DIVISION OF ENGINEERING AND CONTRACT ADMINISTRATION



REQUEST FOR BID NO. RFB-129-25  
HVAC REPLACEMENT  
FFA LEADERSHIP CENTER RECREATION HALL  
KENTUCKY DEPARTMENT OF EDUCATION  
HARDINSBURG, KENTUCKY

Agency: 540  
Fund: CBAN

TEAM  
KENTUCKY™

**INDEX**  
**RFB-129-25**  
**HVAC REPLACEMENT**  
**FFA LEADERSHIP CENTER RECREATION HALL**  
**KENTUCKY DEPARTMENT OF EDUCATION**  
**HARDINSBURG, KENTUCKY**

INDEX
VSS - HOW TO SUBMIT AN ONLINE RESPONSE
OFFICIAL BID DOCUMENT
NOTICE TO CONTRACTORS
PART I ADVERTISEMENT FOR BIDS
PART II INSTRUCTIONS TO BIDDERS
PART III GENERAL CONDITIONS
PART IV PAYMENT BOND
PART V PERFORMANCE BOND
PART VI AGREEMENT BETWEEN OWNER AND CONTRACTOR
SPECIAL CONDITIONS
SPECIFICATIONS

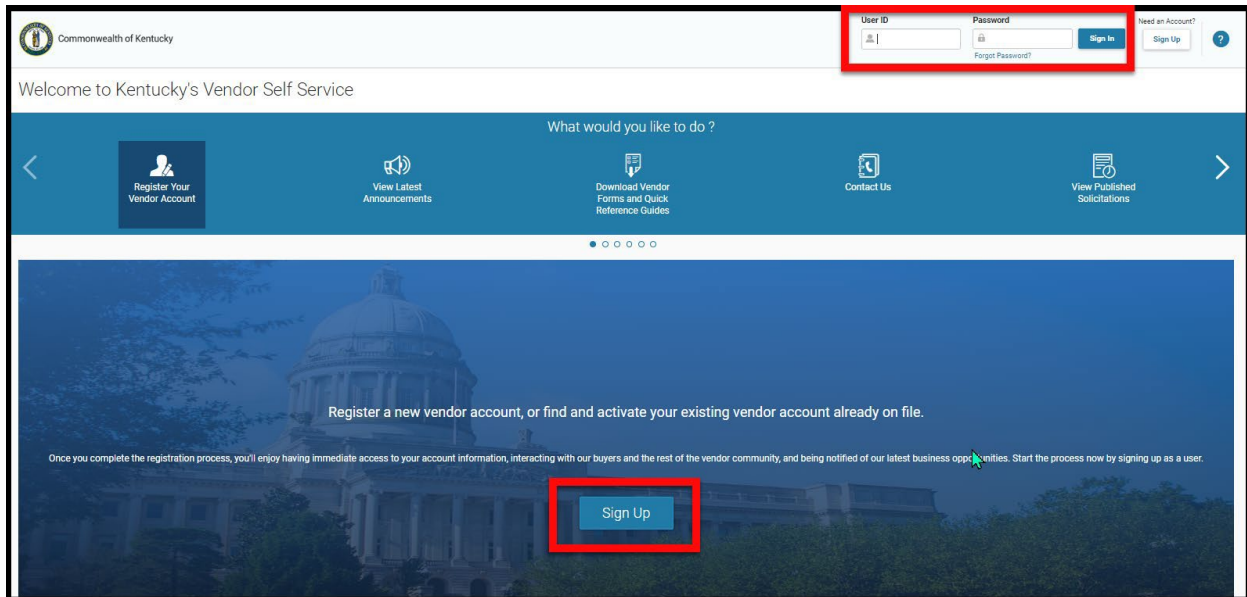
**IMPORTANT:** Please follow current state health and safety guidelines for all Commonwealth of Kentucky construction projects. All information and/or instructions will be in the Notice to Contractors and Advertisement for Bids.

**Contractors must electronically submit their Bid Documents under the corresponding Solicitation in Vendor Self Service VSS for it to be received.**

# HOW TO SUBMIT AN ONLINE RESPONSE THROUGH THE KENTUCKY VENDOR SELF SERVICE (VSS) FOR CAPITAL CONSTRUCTION

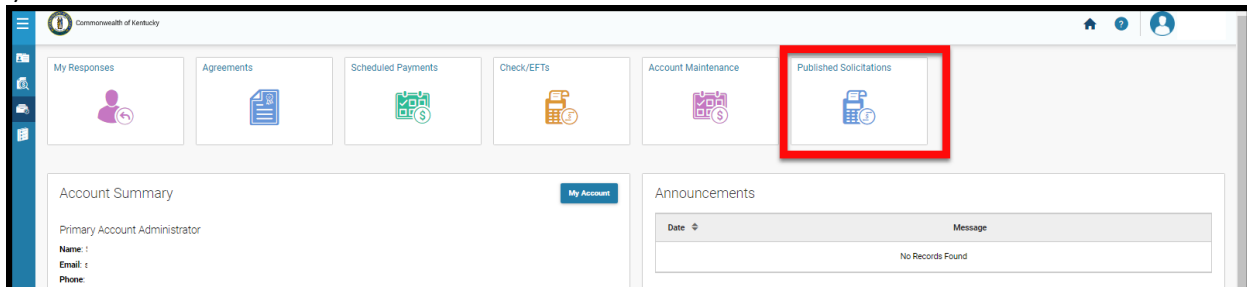
Go to <http://vss.ky.gov>

Log in or Sign up



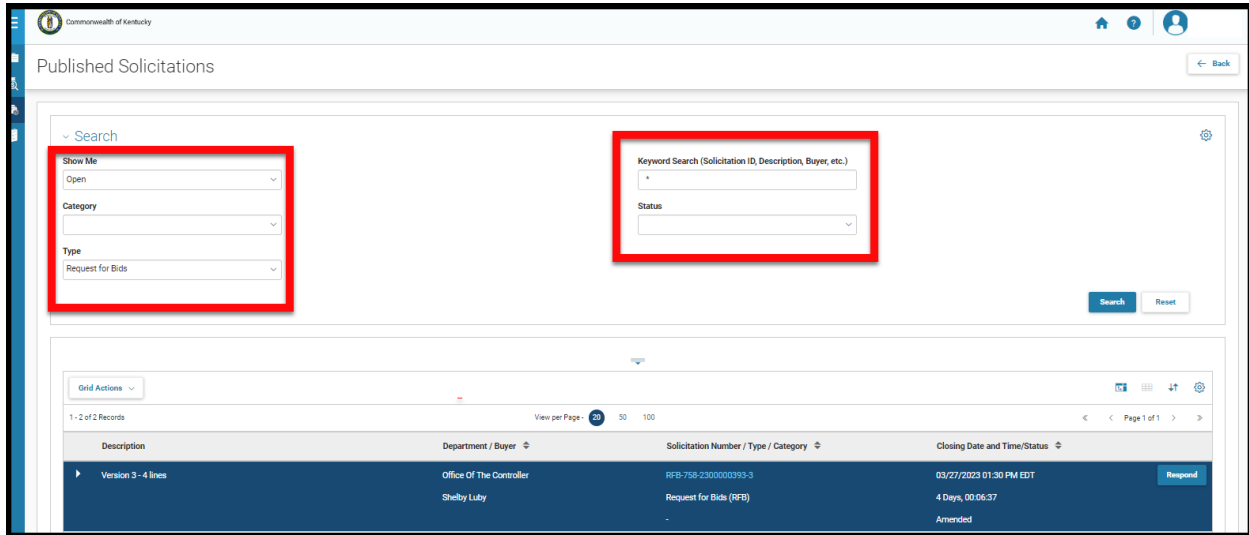
From the Home page, navigate to the Published Solicitations in one of the following ways:

i) Click the **Published Solicitations** icon.

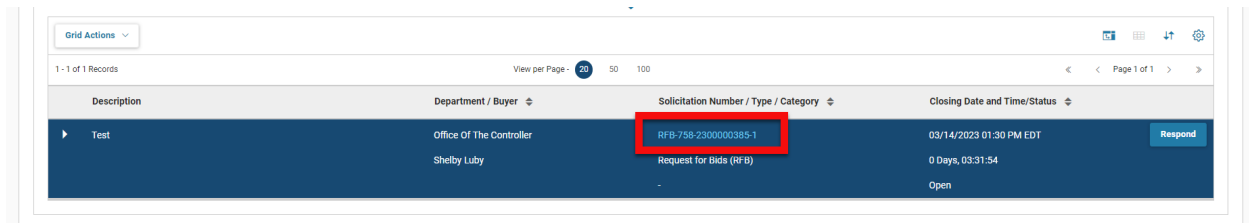


Locate the desired solicitation.

- You may search by the following fields:
  - Show Me (Open, Closing Soon, Recently Published, Recent Amendments, Recent Awards)
  - Category (Agricultural, Animal Related, Clothing, etc.) – this is not required and may not always be available
  - Type (P3 Notice, Request for Bids, Request for Information, Request for Proposals, Request for Quotes)
  - Keyword Search (can search by Solicitation ID, Solicitation Description, Agency, and Buyer)
  - Status (Awarded, Closed, Amended, Open, Reopened, Cancelled)



In the **Solicitation Number / Type / Category** column, click the solicitation number link to view the details of the solicitation.



Review the solicitation details. Make certain to review each tab, especially the Attachments tab, and check the requirements and documentation associated with the bid requirements. There may be documents that must be completed and uploaded in order for your bid to be deemed responsive.

Solicitation View Page (RFB) [Respond Online](#) [← Back](#)

Document ID: RFB-758-2300000385-1 | Time Left: 0 Days, 03:28:24

General Information	Commodity Lines	Attachments	Solicitation Instructions	Evaluation Criteria	Events
---------------------	-----------------	-------------	---------------------------	---------------------	--------

Buyer Information

Buyer Name: \_\_\_\_\_ Buyer Email: \_\_\_\_\_

Buyer Phone: \_\_\_\_\_

Important Dates

Issue Date: 03/13/2023 Closing Date: 03/14/2023 01:30 PM EDT

Bid Opening Date: - Last Amended: -

Department Information

Category: - Type: Request for Bids

Document Department: \_\_\_\_\_ Status: \_\_\_\_\_

Click **Respond Online** to create a Solicitation Response.

Solicitation View Page (RFB) [Respond Online](#) [← Back](#)

Document ID: RFB-758-2300000385-1 | Time Left: 0 Days, 03:26:39

General Information	Commodity Lines	Attachments	Solicitation Instructions	Evaluation Criteria	Events
---------------------	-----------------	-------------	---------------------------	---------------------	--------

## Step 1. Select Lines

On the Select Lines Step, there will only be one line for Construction Solicitations, and you will select that line and click **Continue**.

Solicitation Response (SR) [Continue >](#) [Save & Close](#) [Exit](#)

SR-758-ESR2300001799

1 Select Lines to Respond — 2 Respond To Lines — 3 Checklist/Scoring Criteria — 4 Enter General Comments — 5 Add Attachments — 6 Review & Submit

Group 1 Default Number of Lines: 3

- Line 1 CL1
- Line 2 CL2
- Line 3 CL3

Solicitation Response (SR) [Continue >](#) [Save & Close](#) [Exit](#)

SR-758-ESR2300001799

1 Select Lines to Respond — 2 Respond To Lines — 3 Checklist/Scoring Criteria — 4 Enter General Comments — 5 Add Attachments — 6 Review & Submit

## Step 2. Respond to Lines

All construction solicitations will be for a line type requesting a Contract Amount. You will enter **\$0.00** (zero) in the Contract Amount. Your Lump Sum Bid Amount and Alternates (if required) will be recorded on the Official Bid Document (located at [www.stateofkyprojects.com](http://www.stateofkyprojects.com)) and uploaded as an attachment as instructed under “Step 5. Add Attachments”. No other fields will be required. Click **Continue**.

Solicitation Response (SR) < Previous Continue > Save & Close Exit

SR-758-ESR2300001799

1 Select Lines to Respond — 2 Respond To Lines — 3 Checklist/Scoring Criteria — 4 Enter General Comments — 5 Add Attachments — 6 Review & Submit

Group 1 Default Number of Lines: 3

Line Number	Commodity Line Details	My Offer
1	Commodity Description CL1 Commodity Specifications	Response Type Bid Contract Amount <input type="text"/> Additional Specs <input type="button" value="Additional Specs"/> Pre Fixed Line No Pre Fixed Line Amount . Alternate Specs Submitted No Comments <input type="text"/>

## Step 3. Checklist/Scoring Criteria

Not Applicable for Construction Bids. Click **Continue**.

Solicitation Response (SR) < Previous **Continue** > Save & Close Exit

SR-758-ESR2300001799

## Step 4. Enter General Comments

Not Applicable for Construction Bids. Click **Continue**.

Solicitation Response (SR) < Previous **Continue** > Save & Close Exit

SR-758-ESR2300001799

## Step 5. Add Attachments

- Click **Add Attachments**.

< 1 Select Lines — 2 Respond To Lines — 3 Respond To Criteria — 4 Enter Discounts & Comments — 5 **Add Attachments** — 6 >

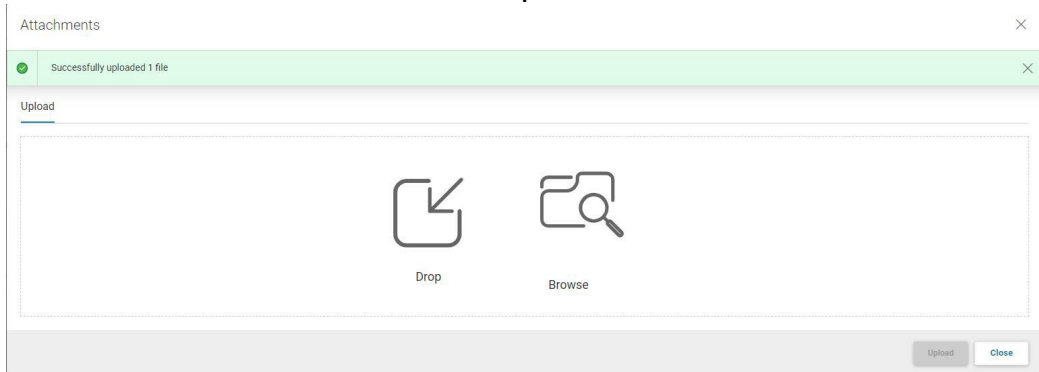
**Add Attachments**

×

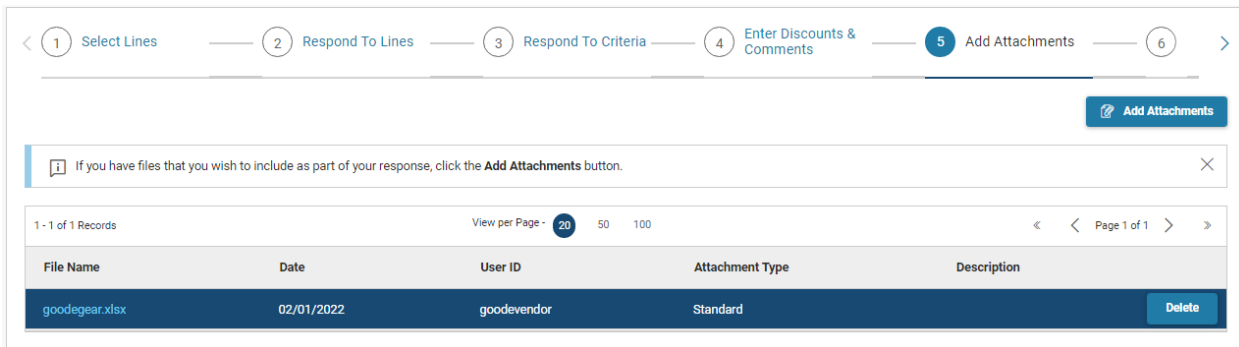
0 Records View per Page: 20 50 100 < < Page 0 of 0 > >

File Name	Date	User ID	Attachment Type	Description
No Records Found				

- Click **Browse** on the Attachments page to locate your Completed Official Bid Documents and 5% Bid Bond (if Required) Once all files are selected, click **Upload**. Documents are limited to ten (10) at one time.
- Maximum Attachment Size per file is 65000 KB



- Verify the “*Successfully Uploaded File*” message displays. Click **Close**.
- Review the attached file(s). Click **Add Attachments** to add a new file. Click **Delete** to remove a file.

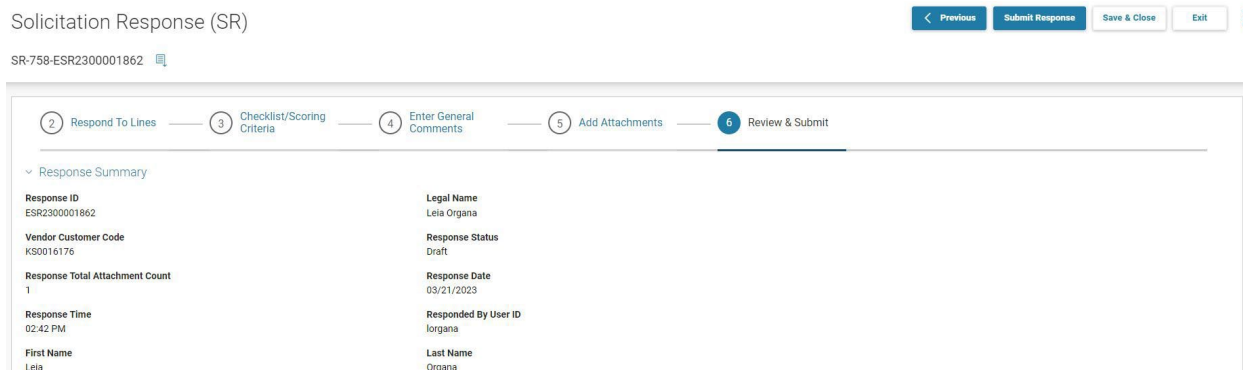


- If all files are attached, click **Continue** to proceed to the next step.



## Step 6. Review and Submit

Review all information entered. If all information is correct, click **Submit Response**.





Verify the *“Thank you for your response. It has been successfully submitted.”* message displays. All responses will be listed. If you do not see your solicitation ID listed, you may enter the solicitation ID in the Keyword Search. A successful submission will have a **Response Status** of *Accepted*.

**An email notification will be sent to verify that your response was accepted.**



EXTERNAL SENDER: Do not click any links or open any attachments unless you trust the sender and know the content is safe.  
EXPÉDITEUR EXTERNE: Ne cliquez sur aucun lien et n'ouvrez aucune pièce jointe à moins qu'ils ne proviennent d'un expéditeur fiable, ou que vous ayez l'assurance que le contenu provient d'une source sûre.

Alex Goode:

This message is to notify you that your response to the following Solicitation has been accepted by City of LA's Vendor Self Service.

Solicitation Details:  
Solicitation : RFB 40 220000910040  
Description : SCBA, Parts, Titan - requires catalog Closing Date/Closing Time:2022-02-04/12:00:00 Your Response Details:  
Response ID : SR 40 ESR20220106000001785-1 Total Bid : 129634.15 Web Response Date/Web Response Time : 2022-01-27/10:39:22 Your Location Details:  
Headquarters Legal Name : Goode Vendor  
Location Name : Goode Vendor

If you have questions, please contact the City of Los Angeles at [askVSS@lacity.org](mailto:askVSS@lacity.org). Please include your vendor code in the subject.

**If you do not receive an email notification, you may still check the status of your bid submission by following the steps as listed in the following section, “Solicitation Responses.”**

**If your submission was not successfully submitted, you may reach out to the Customer Resource Center help desk for assistance by email at [Finance.CRCGroup@ky.gov](mailto:Finance.CRCGroup@ky.gov) or by phone at 502-564-9641 or toll-free at 877-973-4357.**

## SOLICITATION RESPONSES

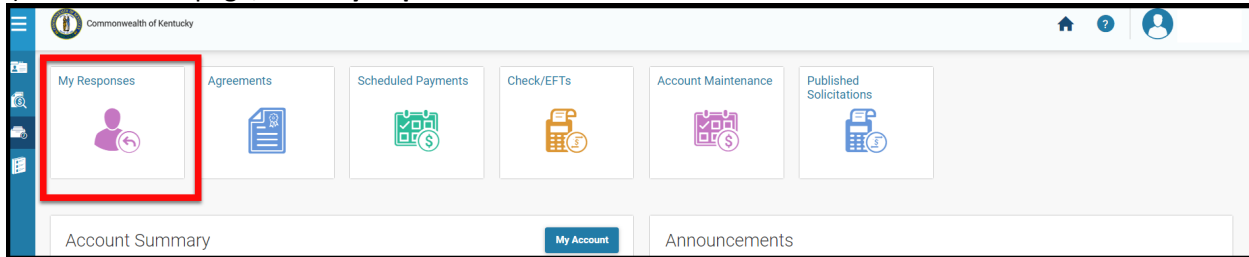
Responses may be viewed on the **My Responses** section. Additional information may be found in the *How to Locate a Response for a Business Opportunity* guide (available on the VSS website under **Download Vendor Forms**).

### How to View Your Responses

Log in to VSS.

From the Home page, use one of the following methods to access the **My Responses** page

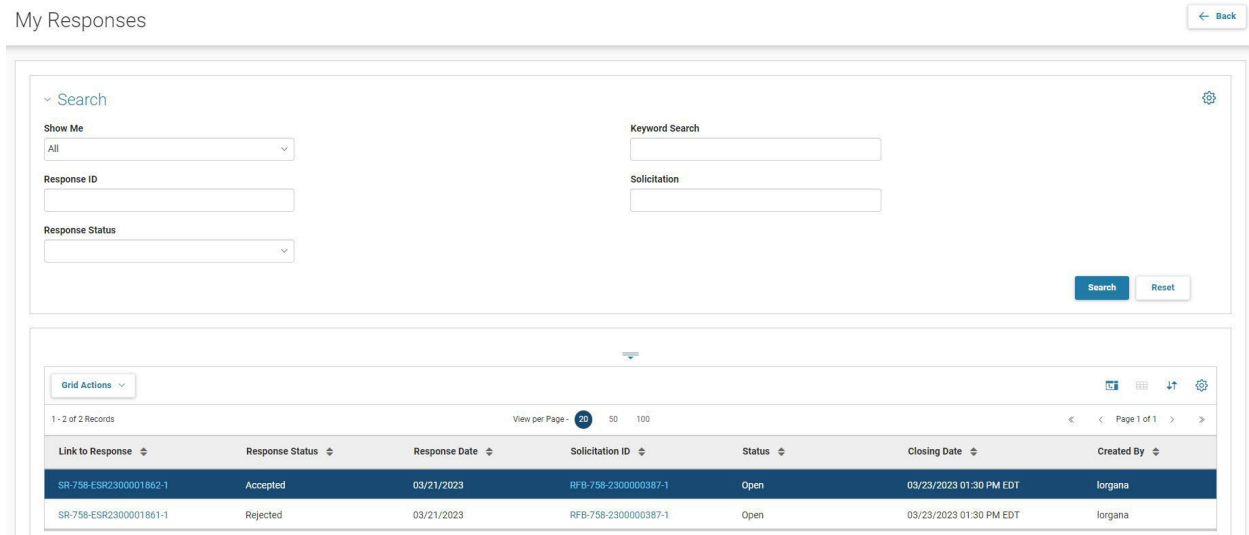
i) On the Home page, click **My Responses**.



The **My Responses** page displays all the responses for your vendor code.

The **Link to Response** column has a link to view the response. Click the link to view.

The **Response Status** column shows the status of your responses. Only **Accepted** statuses are successfully submitted responses.



1. Click My Responses from the Home Page
2. Click the Highlighted SR Link for the corresponding response.
3. Click Withdraw Response or Discard from within the 3 Dot Menu.

**OFFICIAL BID DOCUMENT  
FOR  
HVAC REPLACEMENT  
FFA LEADERSHIP CENTER RECREATION HALL  
KENTUCKY DEPARTMENT OF EDUCATION  
HARDINSBURG, KENTUCKY**

This Official Bid Document consisting of pages 1 through 13, shall be used in submitting a bid document for the work. Copies will be furnished upon request by the authority issuing the Contract Documents.

THIS BID DOCUMENT SUBMITTED BY \_\_\_\_\_

\_\_\_\_\_  
(Name and Address of Bidder)

DATE: \_\_\_\_\_ TELEPHONE: \_\_\_\_\_

GENTLEMEN:

This Bidder, in compliance with your Request for Bid No. RFB-129-25, and having carefully examined the Drawings and complete Contract Documents as defined in Article 1 of the General Conditions as well as the Specifications for the work as prepared by Studio Kremer Architects, Inc; hereby proposes to furnish all labor, materials, supplies and services required to perform the specifics of the Contract Documents, within the time set forth therein and for the stated Lump Sum Bid Amount.

The Bidder hereby acknowledges receipt of the following Addenda:

ADDENDUM NO. _____	DATED _____	ADDENDUM NO. _____	DATED _____
ADDENDUM NO. _____	DATED _____	ADDENDUM NO. _____	DATED _____
ADDENDUM NO. _____	DATED _____	ADDENDUM NO. _____	DATED _____
ADDENDUM NO. _____	DATED _____	ADDENDUM NO. _____	DATED _____

**(IF NONE HAVE BEEN ISSUED AND RECEIVED, INSERT THE WORD NONE.)**

**OFFICIAL BID DOCUMENT  
FOR  
HVAC REPLACEMENT  
FFA LEADERSHIP CENTER RECREATION HALL  
KENTUCKY DEPARTMENT OF EDUCATION  
HARDINSBURG, KENTUCKY**

**ALL BLANKS IN THE BID DOCUMENTS SHALL BE COMPLETED AND ALL REQUIRED SUPPORT DATA SHALL BE FURNISHED. IF INDICATED IN THE BIDDING DOCUMENTS, SUMS SHALL BE EXPRESSED IN BOTH WORDS AND FIGURES. IN THE CASE OF DISCREPANCY BETWEEN THE TWO, THE AMOUNT IN WORDS SHALL PREVAIL.**

**LUMP SUM BASE BID:**

The Bidder agrees to furnish all labor, materials, supplies and services required to complete this project defined as HVAC Replacement, FFA Leadership Center Recreation Hall, Kentucky Department of Education, Hardinsburg, Kentucky for the Department for Facilities and Support Services, Commonwealth of Kentucky, in accordance with the Drawings, Specifications, and Contract Documents, and any duly issued Addenda for the LUMP SUM BID AMOUNT set forth below:

**LUMP SUM BASE BID AMOUNT:**

\_\_\_\_\_ DOLLARS  
(USE WORDS)

\_\_\_\_\_ CENTS (\$ \_\_\_\_\_)  
(USE WORDS) (USE FIGURES)

**NOTE: THE AUTHENTICATION OF BID AND STATEMENT OF NON-COLLUSION AND NON-CONFLICT OF INTEREST PAGE MUST BE PROPERLY EXECUTED FOR THE LUMP SUM BASE BID TO BE VALID.**

**OFFICIAL BID DOCUMENT**

**AUTHENTICATION OF BID AND STATEMENT OF NON-COLLUSION AND NON-CONFLICT OF INTEREST**

**I, HEREBY CERTIFY:**

1. That I am the bidder (if the bidder is an individual), a partner in the bidder (if the bidder is a partnership), or an officer and employee of the bidding corporation having authority to sign on it's behalf (if the bidder is a corporation);
2. That the submitted bid or bids covering Division of Engineering and Contract Administration Request for Bid No. RFB-129-25 have been arrived at by the bidder independently and have been submitted without collusion with, and without any agreement, understanding or planned common course of action with any other contractor, vendor of materials, supplies, equipment or services described in the Request for Bid, designed to limit independent bidding or competition; as prohibited by provision KRS 45A.325;
3. That the contents of the bid or bids have not been communicated by the bidder or its employees or agents to any person not an employee or agent of the bidder, its surety on any bond furnished with the bid or bids and will not be communicated to any such person prior to the official opening of the bid or bids.
4. That the bidder is legally entitled to enter into the contract with the Commonwealth of Kentucky and is not in violation of any prohibited conflict of interest, including those prohibited by the provisions of KRS 164.390; and 45A.330 to 45A.340 and 45A.455;
5. This offer is for thirty (30) calendar days from the date this bid is opened. In submitting the above it is expressly agreed that upon proper acceptance by the Division of Engineering and Contract Administration of any or all items bid above, a contract shall thereby be created with respect to the items accepted;
6. That I have fully informed myself regarding and affirm the accuracy of all statements made in this Official Bid Document including Bid Amount.
7. Unless otherwise exempted by KRS 45.590, the bidder intends to comply in full with all requirements of the Kentucky Civil Rights Act and to submit data required by the Kentucky Equal Employment Act upon being designated the successful bidder.
8. That the bidder, if awarded a contract, would not be in violation of the Executive Branch Code of Ethics established by KRS 11A.001 through KRS 11A.990.
9. That the bidder is not debarred from doing business with federal agencies and that, if debarred during the life of the contract, the bidder will notify the Commonwealth buyer of record within seventy-two (72) hours of the federal debarment.

READ CAREFULLY – SIGN IN SPACE BELOW – FAILURE TO SIGN INVALIDATES BID

**SIGNED BY:** \_\_\_\_\_ **FIRM:** \_\_\_\_\_

**PRINT NAME:** \_\_\_\_\_ **ADDRESS:** \_\_\_\_\_

**TITLE:** \_\_\_\_\_

**DATE:** \_\_\_\_\_

**CITY**                      **STATE**                      **ZIP CODE**

**TELEPHONE NO:** \_\_\_\_\_

**FEDERAL ID. NO. OR SOCIAL SECURITY NO.** \_\_\_\_\_ **EMAIL:** \_\_\_\_\_

<b>*Disadvantaged Contractors, check type of certification:</b>			
<input type="checkbox"/> WBE	<input type="checkbox"/> MBE	<input type="checkbox"/> DBE	<input type="checkbox"/> SERVICE-DISABLED VETERAN

**\*Disadvantaged Contractors attach a copy of certification.**

**OFFICIAL BID DOCUMENT – SUBMITTAL DATA**

**THE FOLLOWING ITEMS ARE HEREWITH ENCLOSED AS REQUIRED:**

- Sworn Required Affidavit For Bidders, Offerors And Contractors
- Sworn Affidavit for Claiming Resident Bidder Status
- Vendor Report of Prior Violations of KRS Chapters, 136, 139, 141, 337, 338, 341 and 342.
- Bidder's Qualifications.
- Disadvantaged Business Enterprises (DBE) Participation

The utilization of minority/disadvantaged vendors and subcontractors is encouraged, whenever possible, on public projects. The bidder and contractor should make full efforts to locate disadvantaged business persons.

Bidders may use the following resources:

Commonwealth of Kentucky's SMALL BUSINESS CONNECTION website: <https://secure.kentucky.gov/sbc/default.aspx>

Kentucky Minority and Women Business Enterprise website: <https://mwbe.ky.gov/Pages/default.aspx>

Kentucky Service-Disabled Veteran-Owned Small Business website:

<https://finance.ky.gov/initiatives/sdvosb/Pages/default.aspx>

Kentucky Transportation Cabinet Disadvantaged Business Enterprise directories: <http://transportation.ky.gov/Civil-Rights-and-Small-Business-Development/Pages/Certified-DBE-Directory.aspx>

Finance and Administration Cabinet, Office of EEO/Contract Compliance: email [Finance.ContractCompliance@ky.gov](mailto:Finance.ContractCompliance@ky.gov) or call 502-564-2874

U.S. Small Business Administration, Dynamic Small Business Search website: [http://dsbs.sba.gov/dsbs/search/dsp\\_dsbs.cfm](http://dsbs.sba.gov/dsbs/search/dsp_dsbs.cfm)

Louisville/ Jefferson County Metropolitan Sewer District website: <http://www.msdlouky.org/insidemsd/diverse/find.html>

A bidder must include a list of all disadvantaged vendors and/or subcontractors contacted in order to prepare a bid (ATTACH TO OFFICIAL BID DOCUMENT).

If the bidder fails to utilize any disadvantaged vendors and/or subcontractors, a statement must be included to describe actions to include disadvantaged vendors and/or subcontractors (ATTACH TO OFFICIAL BID DOCUMENT).

The Finance and Administration Cabinet will review all submissions by bidders to determine compliance with this provision.

- List of Unit Prices, if applicable
- List of Subcontractors, if applicable
- List of Materials and Equipment, if applicable
- Bid Guaranty in the amount of no less than five percent (5%) of the TOTAL BID AMOUNT.
- Roofing Certifications, if applicable.
- All bidders are now required to be registered and active on our Vendor Self Service website

<https://vss.ky.gov/vssprod-ext/Advantage4>

**COMMONWEALTH OF KENTUCKY  
FINANCE AND ADMINISTRATION CABINET  
SWORN STATEMENT REGARDING CAMPAIGN FINANCE LAWS  
PURSUANT TO KRS 45A.110 AND KRS 45A.115**

The following form (page 5) relative to Campaign Finance Laws shall be completed in total, notarized and returned with your bid. Responsibility of a bidder or offeror for a contract award shall not be made until the bidder or offeror provides this sworn statement.



## Required Affidavit for Bidders, Offerors and Contractors (KRS 45A.110 & 45A.115)

### Affidavit Effective for One (1) Year from Date of Execution

**Instructions:** Pursuant to [KRS 45A.110](#) and [45A.115](#), a bidder, offeror, or contractor (“Contractor”) is required to submit a Required Affidavit for Bidders, Offerors, and Contractors to be awarded a contract, or for the renewal of a contract. An authorized representative of the contracting party must complete the attestation below, have the attestation notarized, and return the completed affidavit to the Commonwealth.

#### Attestation

As a duly authorized representative for the Contractor, I swear and affirm under penalty of perjury, that that the Contractor has not knowingly violated campaign finance laws of the Commonwealth of Kentucky and that the award of a contract will not violate any provision of the campaign finance laws of the Commonwealth. For purposes of this attestation, "Knowingly" means that the bidder or offeror is aware or should have been aware of the existence of a violation. The bidder or offer understands that the Commonwealth retains the right to request an updated affidavit at any time.

Signature	Printed Name
Title	Date

Bidder or Offeror Name: \_\_\_\_\_

Address: \_\_\_\_\_  
\_\_\_\_\_

Commonwealth of Kentucky Vendor Code (If known): \_\_\_\_\_

Subscribed and sworn to before me this \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_.

State of: \_\_\_\_\_ Notary: \_\_\_\_\_

County of: \_\_\_\_\_ My Commission Expires: \_\_\_\_\_

**REQUIRED AFFIDAVIT FOR BIDDERS, OFFERORS AND CONTRACTORS CLAIMING RESIDENT BIDDER STATUS**

**FOR BIDS AND CONTRACTS IN GENERAL:**

The bidder or offeror hereby swears and affirms under penalty of perjury that, in accordance with KRS 45A.494(2), the entity bidding is an individual, partnership, association, corporation, or other business entity that, on the date the contract is first advertised or announced as available for bidding:

1. Is authorized to transact business in the Commonwealth;
2. Has for one year prior to and through the date of advertisement
  - a. Filed Kentucky income taxes;
  - b. Made payments to the Kentucky unemployment insurance fund established in KRS 341.49; and
  - c. Maintained a Kentucky workers' compensation policy in effect.

The BIDDING AGENCY reserves the right to request documentation supporting a bidder's claim of resident bidder status. Failure to provide such documentation upon request shall result in disqualification of the bidder or contract termination.

\_\_\_\_\_  
Signature Printed Name

\_\_\_\_\_  
Title Date

\_\_\_\_\_  
Company Name

\_\_\_\_\_  
Address

Subscribed and sworn to before me by \_\_\_\_\_  
(Affiant) (Title)

of \_\_\_\_\_ this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_.  
(Company Name)

\_\_\_\_\_  
Notary Public

[seal of notary]

My commission expires: \_\_\_\_\_



**VENDOR REPORT OF PRIOR VIOLATIONS  
ON CONSTRUCTION SEALED BIDS**

This form is applicable to all sealed bids for construction projects issued by the Finance and Administration Cabinet, Division of Engineering and Contract Administration (DECA) in accordance with KRS 45A.080.

The **Prime Bidder** on any construction sealed bid **shall** provide the required information attached, for the Prime Bidder, as an **attachment to the bid**.

The information required is specifically - **any violations issued within the last five (5) calendar years of the following:**

1. Violations of KRS Chapter 136 (Corporation and Utility Taxes);
1. Violations of KRS Chapter 139 (Sales and Use Taxes);
2. Violations of KRS Chapter 141 (Income Taxes);
3. Violations of KRS Chapter 337 (Wages and Hours);
4. Violations of KRS Chapter 338 (Occupational Safety and Health of Employees);
5. Violations of KRS Chapter 341 (Unemployment Insurance);
6. Violations of KRS Chapter 342 (Workers Compensation); and
7. Violations of Occupational Safety and Health Laws **in any other states and at the federal level**.

If there are no violations for a particular category, vendor should attach a statement to that effect.

If there are violations for a particular category, the vendor should list them and provide the following information for each: the date of the violation, a short description of the violation (including statutory citation), the name of the governmental enforcement agency involved, and the amount of any penalties imposed as a result of the final determination.

Please note that this information may be provided to other governmental agencies, such as the Kentucky Labor Cabinet, as part of the bid process. DECA reserves the unqualified right to disqualify any vendors from participating further in this bid process.

In addition, the successful prime bidder and subcontractors shall remain in continuous compliance with KRS 45A.485 during the life of any contract awarded, and shall notify DECA of any new final determinations of violations in **any** of the above-mentioned categories, which occur after contract award, and during the life of any contract awarded. Failure to comply with these requirements may result in the bidder and subcontractors being disqualified from participating in future bid opportunities for the Commonwealth.

COMPANY NAME: \_\_\_\_\_

TAX PAYER ID #: \_\_\_\_\_

**THIS VENDOR VIOLATION FORM MAY BE SENT TO THE LABOR CABINET FOR VERIFICATION. PLEASE MAKE SURE ALL YOUR VIOLATIONS ISSUED WITHIN THE LAST FIVE (5) YEARS ARE LISTED. IF YOU LIST "NONE" BUT THE LABOR CABINET'S RECORDS SHOW OTHERWISE, YOUR BID MAY BE REJECTED. FOR A LIST OF YOUR VENDOR VIOLATIONS, YOU CAN FAX OR EMAIL THE LABOR CABINET WITH YOUR REQUEST.**

FAX NUMBER IS (502) 696-1984 OR EMAIL: [wages@ky.gov](mailto:wages@ky.gov) .

Violation Category	Date	Description	Govt. Enforcement Agency	Amount of Penalties

**BIDDER'S QUALIFICATIONS**

The Bidder's Qualifications are required by the owner to be submitted as set forth herewith:

1. This firm is a Corp. \_\_\_\_\_, Partnership \_\_\_\_\_, or Proprietorship \_\_\_\_\_.
2. A permanent place of business is maintained at:

---

STREET CITY STATE ZIP CODE

---

TELEPHONE NUMBER

3. The following construction plant and equipment will be made available for use on this contract:

---



---

4. In the event the contract is awarded the undersigned, surety bonds will be furnished by:

---

5. Experience of Contractor on other similar work:

---



---



---



---

6. We now have the following jobs under contract and bonded:

JOB	TOTAL CONTRACT	PERCENT COMPLETED
_____	\$ _____	_____ %
_____	\$ _____	_____ %
_____	\$ _____	_____ %
_____	\$ _____	_____ %
_____	\$ _____	_____ %

P-2

**DISADVANTAGED BUSINESS ENTERPRISE (DBE) PARTICIPATION**

- 1.01 **CERTIFICATION OF DBE:** Any DBE utilized pursuant to this Section shall be certified as a DBE by one of the following: Kentucky Finance and Administration Cabinet, Kentucky Transportation Cabinet or other state Transportation agencies, the Louisville/Jefferson County Metropolitan Sewer District, the Tri-State Minority Supplier Development Council or other state Minority Supplier Development Councils, the Ohio River Valley Women's Business Council, the Women's Business Enterprise National Council, the National Women Business Owners Council, or the Small Business Administration.
- 1.02 **OBLIGATION OF BIDDER/CONTRACTOR:** Bidder/Contractor shall make a good faith effort to meet the DBE contract goal set by the Commonwealth by including DBE's as subcontractors and/or material suppliers on 10% of the total estimated cost of the Contract. The failure to meet the foregoing goal shall not result in disqualification from bidding or being awarded a contract. However, Bidders/Contractors not meeting the DBE goal shall be expected to provide written proof of their good faith efforts. Award of the contract shall be conditioned upon satisfaction of the requirements established by this section. The Bidder/Contractor shall attempt to divide the work in the contract to facilitate use of DBE's (however, there is no requirement that the work be artificially divided or divided in a way that raises the bid price of the Bidder/Contractor).
- 1.03 **PROOF REQUIRED:** Each bidder shall furnish written proof in their bid package that they reached the DBE participation goal for this Contract, or of their good faith efforts to meet the DBE participation goal. A copy of each participating DBE's certification shall accompany the required forms. All submissions shall be subject to verification of the Commonwealth.
- A. Proof that the apparent successful bidder reached the DBE goal shall consist of the following and shall be made on form DB-2-A, attached hereto:
1. The names and addresses of DBE firms that will participate in the contract;
  2. A description of the work each named DBE firm will perform;
  3. The dollar amount of participation by each named DBE firm;
  4. The percentage amount of participation by each named DBE firm;
- B. Proof that the apparent successful bidder made a good faith efforts to meet the DBE participation goal may include the following:
1. Advertisement by the Bidder/Contractor of DBE contracting opportunities associated with this contract in at least one of each of the following periodicals: a periodical in general circulation throughout the Commonwealth, a trade periodical focused on DBE contractors/suppliers in general circulation throughout the Commonwealth, and a minority-focused periodical in general circulation throughout the Commonwealth. The Bidder/Contractor shall include copies of the dated advertisements in his bid package;
  2. Written notice of DBE opportunities in this contract to at least five pertinent DBE's at least seven days prior to the bid opening date. Copies of the written notices shall be included in the bid package;
  3. The Bidder/Contractor's response(s) to those DBE's who requested plans, specifications and/or contracting requirements. Copies of said responses shall be included in the bid package;
  4. Documentation on form DB-2-B of good faith negotiations with at least three DBE's, with no rejection of a qualified DBE without sound reason, including price quotes that are above other subcontractor's price quotes;
  5. Utilization of the Finance and Administration Cabinet's Office of Equal Employment Opportunity and Contract Compliance for referrals to organizations that assist in locating DBE's. Proof of use of such referrals and contacts made as a result thereof shall be included in the bid package.

DB-2-A

**DISADVANTAGED BUSINESS AVAILABILITY VERIFICATION**

\_\_\_\_\_ does commit itself that on the following project:  
NAME OF COMPANY

\_\_\_\_\_ PROJECT NAME REQUEST FOR BID NUMBER

The Bidder agrees to furnish information required by the Commonwealth of Kentucky to indicate the Disadvantaged Business which it intends to utilize. Breach of this commitment constitutes breach of the Bidder's contract if awarded.

NAME OF DISADVANTAGED BUSINESS	TELEPHONE	TYPE OF WORK

DOLLAR VALUE	PERCENT	DISADVANTAGED CLASSIFICATION

The undersigned shall enter into a formal agreement with the Disadvantaged business firms for work listed in this schedule conditioned upon execution of a contract with the Commonwealth of Kentucky.

Disadvantaged business firms listed above by the Bidder and accepted by the Owner and the Architect/Engineer shall be used on the work for which they were proposed and accepted and shall not be changed except with the written approval of the Owner and the Architect/Engineer. The undersigned hereby certifies that he or she has read the terms of this commitment and is authorized to bind the Bidder to the commitment herein set forth.

Signature and title of authorized official of the company and the data shall be properly executed on this document or the bid will be deemed nonresponsive.

\_\_\_\_\_  
NAME OF AUTHORIZED OFFICER TITLE

\_\_\_\_\_  
SIGNATURE DATE

If you are bidding as a General Contractor on this project i.e. direct bidding and a Disadvantaged as defined herein, please provide a copy of your DBE Certification.

Submit with Bid.  
(Please copy additional Disadvantaged Business Availability Forms as necessary.)

DB-2-B

**DISADVANTAGED BUSINESS UNAVAILABILITY VERIFICATION**

I, \_\_\_\_\_, \_\_\_\_\_ (TITLE)

of \_\_\_\_\_ (PRIME BIDDER)

certify that on \_\_\_\_\_ I contacted the following Disadvantaged owned business by: (circle one) Certified Mail, Phone, In Person to obtain a bid for work items to be performed on the Contract.

DISADVANTAGED CLASSIFICATION (IE. WBE, MBE, DBE, SDVOB) CONTRACTOR	WORK ITEMS SOUGHT	FORM OF BID SUPPORT (IE., UNIT PRICE, MATERIALS LABOR & LABOR ONLY)

To the best of my knowledge and belief, said Disadvantaged owned business was unavailable (exclusive of unavailability due to lack of agreement on price) for work on this project, or unable to prepare a bid, for the following reason(s):

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

SIGNATURE \_\_\_\_\_

DATE \_\_\_\_\_

\_\_\_\_\_ was offered an (NAME OF DISADVANTAGED BUSINESS)

opportunity to bid on the above-identified work on \_\_\_\_\_ by

\_\_\_\_\_ (SOURCE)

The above statement is a true and accurate account of why I did not submit a bid on this project.

\_\_\_\_\_  
(SIGNATURE OF DISADVANTAGED BUSINESS)

\_\_\_\_\_  
(TITLE) (DATE)

Submit with Bid if Applicable.  
(Please copy additional Disadvantaged Business Unavailability Forms as needed.)

**OFFICIAL BID DOCUMENT  
FOR  
HVAC REPLACEMENT  
FFA LEADERSHIP CENTER RECREATION HALL  
KENTUCKY DEPARTMENT OF EDUCATION  
HARDINSBURG, KENTUCKY**

**LIST OF PROPOSED SUBCONTRACTORS:**  
**(Must be submitted with Bid)**

The following list of proposed subcontractors is required by the owner to be executed, completed, and submitted with the Bidder's Proposal. All subcontractors are subject to approval by the Division of Engineering and Contract Administration, Department of Facilities and Support Services, Frankfort, Kentucky. Failure to submit this list, completely filled out, may result in bid rejection.

If certain branches of work are to be done by the Prime Contractor, so state. This means that the Prime **WILL BE** performing the work, and it **WILL NOT** be subcontracted without approval by DECA. Review/evaluation of subcontractors will occur on the bid opening day. If the Commonwealth requests replacement of a subcontractor, on bid opening day, then the apparent low bidder will provide a replacement subcontractor prior to close of the Commonwealth's business day on that day. Failure of the apparent low bidder to comply with the preceding sentence may result in bid rejection. If subcontractor review/evaluation is not completed on the bid opening day, then procedures for any replacement will be issued based on the uniqueness of each situation. The responsibility for selection, offering of qualified, competent subcontractors to accomplish the work intended is solely the responsibility of the bidder to the Commonwealth.

**ALL BLANKS MUST BE FILLED IN. IF PERFORMED BY THE BIDDER, STATE PRIME/GENERAL CONTRACTOR.**

	<b>BRANCH OF WORK</b>	<b>NAME OF SUBCONTRACTOR</b>
1.	Mechanical	
2.	Electrical	
3.	Door Installation	
4.	Window Installation	

**OFFICIAL BID DOCUMENT  
FOR  
HVAC REPLACEMENT  
FFA LEADERSHIP CENTER RECREATION HALL  
KENTUCKY DEPARTMENT OF EDUCATION  
HARDINSBURG, KENTUCKY**

**LIST OF MATERIALS AND EQUIPMENT (MUST BE COMPLETELY FILLED OUT WHEN BID IS SUBMITTED):**

Every item listed under the different phases of construction must be clearly identified so the Owner will know what the bidder proposes to furnish. Bidders be hereby advised that this list is required by the owner to be executed, completed, and submitted with bid.

The use of the manufacturer’s dealer’s name only, or stating “as per plans and specifications”, will not be considered as sufficient identification.

Where more than one “Make or Brand” is listed for any one item, the Owner has the right to select the one to be used.

Failure to submit a proper list may result in rejection of the bid.

	<b>MATERIAL AND/OR EQUIPMENT:</b>	<b>MANUFACTURER AND BRAND NAME:</b>
1.	VRF System	
2.	Lighting	
3.	Panelboard	
4.	Fire Alarm	
5.	Doors	
6.	Windows	



**Andy Beshear**  
GOVERNOR

**FINANCE AND ADMINISTRATION CABINET  
DEPARTMENT FOR FACILITIES AND SUPPORT SERVICES  
OFFICE OF FACILITY DEVELOPMENT**

**Holly M. Johnson**  
SECRETARY

**AND EFFICIENCY**

403 Wapping Street  
Frankfort, Kentucky 40601-3462

**Sam Ruth**  
COMMISSIONER

**C. Scott Baker**  
EXECUTIVE DIRECTOR

**NOTICE TO CONTRACTORS  
FOR  
HVAC REPLACEMENT  
FFA LEADERSHIP CENTER RECREATION HALL  
KENTUCKY DEPARTMENT OF EDUCATION  
HARDINSBURG, KENTUCKY**

Attached hereto is a copy of the "Advertisement for Bids" for furnishing all labor, equipment, appliances and materials necessary for HVAC Replacement, FFA Leadership Center Recreation Hall, Kentucky Department of Education, Hardinsburg, Kentucky.

**SAME IS DESIGNATED AS:**

<b>REQUEST NO.</b>	Request for Bid No. RFB-129-25
<b>BID ON:</b>	HVAC REPLACEMENT FFA LEADERSHIP CENTER RECREATION HALL KENTUCKY DEPARTMENT OF EDUCATION HARDINSBURG, KENTUCKY
<b>BID DATE:</b>	December 10, 2024 1:30 P.M., Eastern Time

Responsible Contractors who have proper experience, equipment and qualifications are invited to bid on this work. These factors will be considered in the Award of Contract and all work will be performed under the standard regulations for construction of the Commonwealth of Kentucky.



**PART I  
ADVERTISEMENT FOR BIDS**

1. **INVITATION:**

Sealed bid documents for the following work will be received by the Division of Engineering and Contract Administration. Bids will be received through Vendor Self Service VSS as described in the manner and on the date hereinafter specified for the furnishing of all labor, materials, supplies, tools, appliances, equipment, services, etc., necessary for HVAC Replacement, FFA Leadership Center Recreation Hall, Kentucky Department of Education, Hardinsburg, Kentucky, as set forth in the specifications and as shown on the drawings prepared by Steven Ward, Studio Kremer Architects, Inc., Paul Graves, CMTA, and approved by the Department for Facilities and Support Services of the Commonwealth of Kentucky and under the terms and conditions to this Request for Bid.

2. **PROJECT DESCRIPTION:**

The following Project Narrative describes Mechanical, Electrical, and Architectural work associated with the HVAC renovation of the Recreation Hall on the Future Farmers of America campus.

**Mechanical:**

All existing window air conditioning units and floor finned tube radiators are to be removed. The new mechanical system is a variable refrigerant flow (VRF) system that will utilize refrigerant as the method of cooling/heating. Each classroom will have two (2) wall-mounted indoor units to adequately cool or heat the classroom. The recreation hall will have three (3) fan coil units installed for cooling or heating the space. Condensing units will be installed exterior to the building in two separate locations to decrease the distance of piping installation. A VRF monitoring system will be installed in the recreation hall and can be utilized to control the individual units that are installed. The VRF system will also connect to the campus BAS enabling users to log-in online to view system performance and set any parameters needed.

**Electrical:**

The existing panelboard will be replaced with a new panelboard to ensure the safety and reliability of electrical systems when the building is utilized.

Existing lighting will be upgraded from fluorescent to LED improving not only the aesthetic of the spaces but has increased lower occupant stimulation levels and provides opportunity to lower operational cost. New exterior lighting will replace the existing exterior lighting. Lighting controls will be upgraded to meet current code requirements.

The existing fire alarm system is not compliant with current code requirements. There will be a new voice evacuation fire alarm system and devices for the safety of occupants within the building.

**Architectural:**

The existing windows and doors will be replaced with new windows and doors which will improve thermal comfort and building energy efficiency. The exterior and interior finishes are remaining to keep the initial aesthetic of the building.

3. **METHOD OF BIDDING:**

Bids will be received from Prime Contractors on a Lump Sum Bid Basis for the total project. All phases of work shall be bid to and through the Prime Contracting Firms. Bids shall be submitted in the manner herein described and on the official bid document form included with the conditions and specifications and shall be subject to all the conditions as set forth and described in the Bid Documents.

**SPECIAL NOTE:**

**Bids shall be submitted on the Official Form supplied by the Division of Engineering and Contract Administration. Failure to comply with the bid requirements will be cause for invalidation of bid.**

4. **METHOD OF AWARD:**

Award shall be issued to the lowest-cost responsive bid properly submitted by a responsible bidder. The Bid Document shall contain all qualifying requirements and forms. It is the intent of the Commonwealth of Kentucky to use all available funds.

Kentucky Workers' Compensation:

Pursuant to KRS 45A.480, the Commonwealth of Kentucky may not contract with any person not in compliance with Kentucky's KRS Chapter 342 workers' compensation insurance requirements.

Bid is subject to Reciprocal preference for Kentucky resident bidders and Preferences for a Qualified Bidder or the Department of Corrections, Division of Prison Industries (KAR 200 5:410).

**KRS 45A.490 Definitions for KRS 45A.490 to 45A.494.**

As used in KRS 45A.490 to 45A.494:

- (1) "Contract" means any agreement of a public agency, including grants and orders, for the purchase or disposal of supplies, services, construction, or any other item; and
- (2) "Public agency" has the same meaning as in KRS 61.805.

**KRS 45A.492 Legislative declarations.**

The General Assembly declares:

- (1) A public purpose of the Commonwealth is served by providing preference to Kentucky residents in contracts by public agencies; and
- (2) Providing preference to Kentucky residents equalizes the competition with other state that provide preference to their residents.

**KRS 45A.494 Reciprocal preference to be given by public agencies to resident bidders -- List of states -- Administrative regulations.**

- (1) Prior to a contract being awarded to the lowest responsible and responsive bidder on a contract by a public agency, a resident bidder of the Commonwealth shall be given a preference against a nonresident bidder registered in any state that gives or requires a preference to bidders from that state. The preference shall be equal to the preference given or required by the state of the nonresident bidder.
- (2) A resident bidder is an individual, partnership, association, corporation, or other business entity that, on the date the contract is first advertised or announced as available for bidding:
  - (a) Is authorized to transact business in the Commonwealth; and
  - (b) Has for one (1) year prior to and through the date of the advertisement, filed Kentucky corporate income taxes, made payments to the Kentucky unemployment insurance fund established in KRS 341.490, and maintained a Kentucky workers' compensation policy in effect.
- (3) A nonresident bidder is an individual, partnership, association, corporation, or other business entity that does not meet the requirements of subsection (2) of this section.
- (4) If a procurement determination results in a tie between a resident bidder and a nonresident bidder, preference shall be given to the resident bidder.
- (5) This section shall apply to all contracts funded or controlled in whole or in part by a public agency.
- (6) The Finance and Administration Cabinet shall maintain a list of states that give to or require a preference for their own resident bidders, including details of the preference given to such bidders, to be used by public agencies in determining resident bidder preferences. The cabinet shall also promulgate administrative regulations in accordance with KRS Chapter 13A establishing the procedure by which the preferences required by this section shall be given.
- (7) The preference for resident bidders shall not be given if the preference conflicts with federal law.
- (8) Any public agency soliciting or advertising for bids for contracts shall make KRS 45A.490 to 45A.494 part of the solicitation or advertisement for bids.

The reciprocal preference as described in KRS 45A.490-494 above shall be applied in accordance with 200 KAR 5:400.

**Determining the residency of a bidder for purposes of applying a reciprocal preference**

Any individual, partnership, association, corporation, or other business entity claiming resident bidder status shall submit along with its response the attached Required Affidavit for Bidders, Offerors, and Contractors Claiming Resident Bidder Status. The BIDDING AGENCY reserves the right to request documentation supporting a bidder's claim of resident bidder status. Failure to provide such documentation upon request shall result in disqualification of the bidder or contract termination.

A nonresident bidder shall submit, along with its response, its certificate of authority to transact business in the Commonwealth as filed with the Commonwealth of Kentucky, Secretary of State. The location of the principal office identified therein shall be deemed the state of residency for that bidder. If the bidder is not required by law to obtain said certificate, the state of residency for that bidder shall be deemed to be that which is identified in its mailing address as provided in its bid.

5. **PROJECT CONTACTS:**

**Architect:** Steven Ward, Studio Kremer Architects, Inc., steven@studiokremer.com, (502) 345-6263

**Consultant:** Paul Graves, CMTA, pgraves@cmta.com, (502) 326-3085

**Project Manager:** Tony Yates, Division of Engineering and Contract Administration, Tony.Yates@ky.gov, (502) 229-9759

**Agency:** Josh Mitcham, Kentucky Department of Education, josh.mitcham@education.ky.gov, (270) 756-2301

**Purchasing Agent:** Susan Ward, Division of Engineering and Contract Administration, Susan.Ward@ky.gov, (502) 226-0335

6. **BID SUBMITTAL:**

**Solicitation responses ("bid") shall be received by electronic submission through the Commonwealth's eProcurement system.**

**Please be advised:** Bids shall not be accepted via postal carrier (USPS, UPS, FED EX, etc.) nor can bids be hand delivered.

Response must contain all information required by the Solicitation and be executed by an authorized agent of the Bidder, affirmed by electronically submitting the bid through the eProcurement system.

To bid, all bidders **SHALL** be registered in the Commonwealth eProcurement System via the Vendor Self Service (VSS) System at <https://vss.ky.gov>. Allow 24 – 48 hours to complete Vendor Registration. Vendors must be logged in to their Vendor Self Service account to submit a response. The Customer Resource Center is not able to complete registrations and activate accounts on the same day. Closing dates will not be extended for Vendors not registered by the date/time of the bid closing. Vendor Self Registration Guides are provided at <https://vss.ky.gov> under "Download Vendor Forms and Quick Reference Guides."

All bidders are cautioned to begin their electronic submission in sufficient time to complete before the closing date and time. Delays due to inability to register, document upload impediments, or technical difficulties shall not be justification for acceptance of a late bid or proposal. If you need assistance, contact:

**Customer Resource Center (CRC)**

- Email at [Finance.CRCGroup@ky.gov](mailto:Finance.CRCGroup@ky.gov);
- Locally at 502-564-9641 or toll-free 877-973- HELP (4357).

Online bid responses must be in an "Accepted" status prior to the closing date and time of the solicitation. The assigned date and time stamp from the eProcurement system generated at the time of final acceptance and formal submission by the vendor shall establish the date and time the bid was submitted. A bid may be modified or withdrawn electronically through VSS prior to the bid closing date and time.

**Please be advised**, VSS will not allow submission of an online response after the published date and time for closing.

- 
- **Bidders shall attach the Official Bid Document and Bid Bond (if required) as a single combined attachment when submitting their electronic bids. If using a certified check, please upload copy of check with your Official Bid Document in lieu of bid bond.**
- 

Bidder assumes full responsibility for timely submission of the bid in compliance with the above described procedures and conditions.

All results will be posted to <https://www.stateofkyplanroom.com> after the bid opening and review. If additional information is needed from the successful bidder, the buyer may be in contact.

**There will be a public bid reading by conference call on the bid opening date at 2:30 PM, ET.  
The dial in number is 502-782-2663 or 844-603-5060.  
Conference ID# 240522018#  
Participant code is 75309#**

7. **BID WITHDRAWAL:**

No bidder may withdraw his bid for a period of thirty (30) days after the date set for the opening of bids.

8. **BONDING:**

All bids shall be accompanied by a bid guarantee (in the form of a bid bond or certified check) of not less than five (5%) percent of the amount of the lump sum base bid. A 100% Performance Bond and a separate 100% Payment Bond shall be furnished by the successful bidder. All bonding and insurance requirements are contained in the Instructions to Bidders and/or General Conditions. Bonds should be executed by a surety company authorized to do business by the Kentucky Secretary of State and the Kentucky Department of Insurance within the Commonwealth of Kentucky.

9. **RIGHT TO REJECT:**

The Division of Engineering and Contract Administration, Commonwealth of Kentucky, reserves the right to reject all bids and to waive all informalities and/or technicalities where the best interest of the Commonwealth may be served.

10. **GENERAL INFORMATION:**

- A. Bidder's Qualifications, List of Unit Prices, List of Proposed Subcontractors, and List of Materials are required to be submitted with the bid.
- B. All documents related to this project shall be submitted, transmitted, transferred, reviewed, approved, or rejected, and/or otherwise processed using the Owner's Document Collaboration System ("eCommunications" or "eComm") which is the Owner's web-based document collaboration system that shall be used by all project participants. No submission, transmittal, transfer, review, approval, or processing shall be deemed official without the use of this system. All additions or deletions of employees to their eComm vendor record will be the responsibility of the contractor.
- C. Each demolition/renovation project must comply with Kentucky Division of Air Pollution Control Regulation 401 KAR 57:011. This includes notification, in writing, to the Division of Air Pollution Control, ten (10) days before start of the project.

D. **Tobacco-Free:** Pursuant to Executive Order, use of any tobacco products (including e-cigarettes) is prohibited in all Executive Branch buildings and parking lots and on the grounds. Please refer to Executive Order # 2014-747 for complete details.  
For FAQ's go to: <http://tobacco-free.ky.gov/Pages/FAQs.aspx>

E. **EEO Requirements:**  
The Equal Employment Opportunity Act of 1978 applies to All State government projects with an estimated value exceeding \$500,000. The contractor shall comply with all terms and conditions of the Act. The successful bidder shall visit <https://www.prod.eeoc.ky.gov/eeoc/epic> and sign in with their VSS credentials and click on **New EEO-1 Certification** to complete EEO-1 report form.

F. **REGISTRATION WITH SECRETARY OF STATE:**

Domestic and foreign corporations shall be registered with the Kentucky Secretary of State and declared to be in "good standing" prior to award of contract. Offeror should verify status at the following website: <http://www.sos.ky.gov> and click on "Business Services". Failure to comply with this requirement within (5) days after notification may render your bid non-responsive.

G. **REGISTRATION WITH SECRETARY OF STATE BY A FOREIGN ENTITY:**

Pursuant to KRS 45A.480(1)(b), an agency, department, office, or political subdivision of the Commonwealth of Kentucky shall not award a state contract to a person that is a foreign entity required by KRS 14A.9-010 to obtain a certificate of authority to transact business in the Commonwealth ("certificate") from the Secretary of State under KRS 14A.9-030 unless the person produces the certificate within fourteen (14) days of the bid or proposal opening. Therefore, foreign entities should submit a copy of their certificate with their solicitation response. If the foreign entity is not required to obtain a certificate as provided in KRS14A.9-010, the foreign entity should identify the applicable exception in its solicitation response. Foreign entity is defined within KRS 14A.1-070.

**For all foreign entities required to obtain a certificate of authority to transact business in the Commonwealth, if a copy of the certificate is not received by the contracting agency within the time frame identified above, the foreign entity's solicitation response shall be deemed non-responsive or the awarded contract shall be cancelled.**

Businesses can register with the Secretary of State at <https://www.sos.ky.gov/Pages/default.aspx>

H. **REGISTRATION with eMARS (eProcurement):**

All bidders MUST be registered in the Commonwealth eProcurement System via the Vendor Self Service System at <https://vss.ky.gov>

Allow 24 – 48 hours to complete Vendor Registration. Vendors must be logged in to their Vendor Self Service (VSS) account to submit a response. Registrations completed the day of bid closing must be completed by the Vendor in the VSS portal. The Customer Resource Center is not able to complete registrations and activate accounts on the same day. Closing dates will not be extended for Vendors not registered by the date/time of the bid closing. Vendor Self Registration Guides are provided at <https://finance.ky.gov/eProcurement/Pages/doing-business-with-the-commonwealth.aspx>

All bidders are cautioned to begin their electronic submission in sufficient time to complete before the closing date and time. Delays due to technical difficulties or document upload impediments shall not be justification for acceptance of a late bid or proposal. Vendor attention to this advisory is encouraged. If you need assistance, please contact the Customer Resource Center (CRC) by email at [Finance.CRCGroup@ky.gov](mailto:Finance.CRCGroup@ky.gov) or phone 502-564-9641 or toll-free 877-973- HELP (4357).

I. **SITE VISIT MEETING INFORMATION:**

There will be a site visit meeting on November 25, 2024 at 10:00 A.M. Central Time. Interested contractors are encouraged to attend. The site visit meeting will be held at 111 FFA Camp Road, Hardinsburg, KY 40143.

**NO QUESTIONS WILL BE ANSWERED AT THE SITE VISIT. ALL TECHNICAL QUESTIONS SHALL BE EMAILED TO THE ARCHITECT/ENGINEER OF RECORD FOR THIS PROJECT.**

**ALL PROCUREMENT QUESTIONS SHALL BE DIRECTED TO BUYER OF RECORD FOR THIS PROJECT.**

J. **HEALTH AND SAFETY GUIDELINES:**

**IMPORTANT:** For any health and safety guideline refer to the Team Kentucky website:

<https://www.chfs.ky.gov/agencies/dph/Pages/RespiratoryDiseases.aspx>

# INSTRUCTIONS TO BIDDERS

## Section 1: Definitions

---

1. "Addendum" means a written or graphic instrument issued by the purchasing agency prior to the execution of the contract that modifies or interprets the Bidding Documents by addition, deletion, clarification or correction.
  2. "Alternate" means an optional item stated in the bid the amount of which is to be added to or deducted from the amount of the base bid.
  3. "Architect" or "Engineer" means a firm that provides professional design services and is engaged by the Division of Engineering and Contract Administration for Capital Construction Projects, and identified as such in the Contract Documents. The term refers to the design team, consisting of the prime architect/engineer and all Sub-Consultants (if used) or consultant identified by the owner.
  4. "Bid" means the sum stated in the Bid Response for which the bidder offers to perform the work described in the specifications and detailed on the plans.
  5. "Bidder" means one who submits a bid directly to the owner for the work described in the bidding documents.
  6. "Bidding Documents" means the Solicitation, including Instructions to Bidders, General Conditions, Special and Supplemental Conditions, Forms for Response, plans, specifications and Addenda issued prior to receipt of bids.
  7. "Bid Response" means a complete and properly signed document, offering to do the work or designated portion thereof, supported by data called for by the bidding documents.
  8. "Chief Purchasing Officer" means the secretary of the Finance and Administration Cabinet, who shall be responsible for all procurement of the Commonwealth except as provided by KRS Chapters 175, 176, 177, and 180. KRS 45A.030(3).
  9. "Commonwealth" means the Commonwealth of Kentucky.
  10. "Construction" means the process of building, altering, repairing, improving or demolishing any public structures or buildings, or other public improvements of any kind to any public real property. It does not include the routine maintenance of existing structures, buildings or real property. KRS 45A.030(4).
  11. "Contract (CT/CT2)" means a document established to purchase a specific quantity or amount of goods or non-professional services at a specific price. KRS 45A.030(8).
  12. "Contract Modification" means any written alteration in the specifications, delivery point, rate of delivery, contract period, price, quantity or other contract provisions of any existing contract, whether accomplished by unilateral action in accordance with a contract provision or by mutual action of the parties to the contract. It includes bilateral actions, such as supplemental agreements, and unilateral actions, such as change orders, administrative changes, notices of termination and notices of the exercise of a contract option. KRS 45A.030(9).
  13. "DECA" means the Division of Engineering and Contract Administration within the Department for Facilities and Support Services, Finance and Administration Cabinet.
  14. "Delivery Order (DO/DO2)" means a document established by a state agency to purchase a specific quantity at a specific price referencing a Master Agreement. DO documents are generally used for commodities and DO2 documents are used for services.
  15. "DFSS" means the Department for Facilities and Support Services within the Finance and Administration Cabinet.
  16. "DRP" means the Division of Real Properties within the Department for Facilities and Support Services, Finance and Administration Cabinet.
-

17. "Electronic Offer" means an online bid through the state's eProcurement system, an offer submitted by electronic mail, or an offer submitted by facsimile.
18. "FAC" means the Finance and Administration Cabinet.
19. "Government Body" means any department, commission, council, board, bureau, committee, institution, legislative body, agency, government, corporation or other establishment of the executive or legislative branch of the state government. KRS 45A.030(17).
20. "Master Agreement (MA)" means a document that establishes a price agreement for use by state agencies with a vendor for supplying specific goods and services at specific unit prices during a specified time period. It does not place an order for goods and services.
21. "Offer" means a bid, proposal, Solicitation response or quotation.
22. "OPS" means the Office of Procurement Services within the Finance and Administration Cabinet.
23. "Owner" means the Commonwealth of Kentucky.
24. "Person" means any business, individual, organization or group of individuals. KRS 45A.030(20).
25. "Planholder" means any entity, supplier and/or subcontractor that has purchased plans and specifications from the Division of Engineering and Contract Administration's reprographics vendor in order to submit a bid with the Commonwealth of Kentucky.
26. "Procurement" means the purchasing, buying, renting, leasing or otherwise obtaining of any supplies, services or construction. It includes all functions that pertain to the procurement of any supply, service or construction item, including description of requirements, selection and solicitation of sources, preparation and award of contract, and all phases of contract administration. KRS 45A.030(21).
27. "Proof of Necessity Agreement (PON2)" means a type of contract established by a state agency to purchase professional services (i.e. personal service contracts, grants and memoranda of agreements).
28. "Purchase Order (PO/PO2)" means a type of contract established by a state agency to purchase a specific quantity or amount of goods or non-professional services at a specific price and is generally for a one-time purchase. A PO2 for non-professional services may contain an option to renew for an additional time period.
29. "Purchasing Agency" means any governmental body that is authorized by this code or its implementing administrative regulations or by way of delegation from the chief purchasing officer to contract on its own behalf rather than through the central contracting authority of the chief purchasing officer. KRS 45A.030(23).
30. "Purchasing Officer" means any person authorized by a governmental body in accordance with procedures prescribed by administrative regulations to enter into and administer contracts and make written determinations and findings with respect thereto. The term includes an authorized representative acting within the limits of authority. KRS 45A.030(24).
31. "Quote" or "Quotation Response" means a complete offer to perform the work specified in the Request for Quotation.
32. "RFB" means a Request for Bids.
33. "RFI" means a Request for Information.
34. "RFP" means a Request for Proposals. KRS 45A.070(5).
35. "RFQ" means a Request for Quotations.



36. "SAS" means the Office of Statewide Accounting Services within the Finance and Administration Cabinet.
37. "Secretary" means the secretary of the Finance and Administration Cabinet.
38. "Solicitation" means an RFB, RFI, RFP or RFQ.
39. "Sub-bidder" or "Subcontractor" means one who submits a bid to a prime bidder for materials or labor for a portion of the work described in the bidding documents.
40. "Tiered Pricing" means a determination of price based on volume, where the larger the volume, the larger the discount offered.
41. "Time" means calendar days.
42. "Unit Price" means an amount stated in the bid as a price per unit of measurement for materials or services as described in the bidding documents.
43. "Using Agency" means the state government entity that utilizes the work being contracted.

**BIDDER INSTRUCTIONS FOR COMPETITIVELY SEALED BID CONSTRUCTION SOLICITATIONS**

---

1. **Bidder's Representations:** Each bidder, by submitting a bid, swears or affirms, under penalty of law, that:
  - a. The bidder has read and understands the bidding documents and the bid is made in accordance with the bidding documents.
  - b. The bidder has carefully examined the site of the proposed work and is familiar with the local conditions under which the work is to be performed.
  - c. The bid is premised upon furnishing the work required by the bidding documents.
  - d. The bid amount has been arrived at by the bidder independently and has been submitted without collusion with, and without any agreement, understanding or planned common course of action with any other contractor, vendor of materials, supplies, equipment or services described in the Solicitation, that is designed to limit independent bidding or competition.
  - e. The contents of the bid have not been communicated by the bidder or its employees or agents to any person not an employee or agent of the bidder, or its surety on any bond furnished with the bid and will not be communicated to any such person prior to the bid opening.
  - f. The bidder is legally entitled to enter into a contract with the Commonwealth and the award of a contract shall not create any conflict of interest, including those set out in KRS 45A.330 – KRS 45A.340; KRS 45A.455 and KRS 164.390.
  
2. **Bidding Documents:**
  - a. A bidder, sub-bidder, sub-contractor and others may obtain bidding documents in the manner and for the charge, if any, stated in the Solicitation.
  - b. A complete set of bidding documents shall be used in preparing bids. The Commonwealth assumes no responsibility for misinterpretations resulting from the use of incomplete sets of bidding documents. The bidder shall supply all information called for in the Solicitation. Failure to supply the specified information may be cause for determining the bid nonresponsive.
  - c. The Commonwealth, in providing bidding documents, does so only for the purpose of obtaining bids on the work and does not confer a license or grant for any other use.
  - d. A bidder shall promptly notify the purchasing officer of any ambiguity, inconsistency or error, which it may discover upon examination of the bidding documents or of the site and local conditions.
  - e. All questions regarding the meaning or interpretation of the bidding documents shall be directed in writing to the purchasing officer. Unless otherwise specified in the Solicitation, questions received less than ten (10) calendar days prior to the date for receipt of bids may not be answered.
  - f. Any interpretation, correction or change of the bidding documents shall be made by an addendum issued by the purchasing agency. Interpretations, corrections or changes of the bidding documents made in any other manner shall not be binding and bidders shall not rely upon such interpretations, corrections or changes.
  - g. Unless otherwise indicated in the bidding documents, the materials, products and equipment described or referenced by manufacturers' or vendors' names, trade names and catalog numbers are intended to establish a standard of required function, dimension, appearance and quality. Unless otherwise stated, equal items may be furnished or used if approved by the purchasing officer in consultation with the architect or the director of DECA.

- h. Addenda shall be published on the Commonwealth's eProcurement web site, and shall be issued to all who are registered planholders with the contracted reprographics company or other distribution authorized by the director of DECA.
- i. Copies of addenda shall be made available for inspection wherever bidding documents are on file.
- j. No addenda of a material nature shall be issued later than seven (7) calendar days prior to the date for receipt of bids, except for addenda postponing the date for receipt of bids or withdrawing the Solicitation.
- k. The bidder shall ascertain prior to submitting a bid that the bidder has received all addenda issued by the purchasing officer for the particular solicitation. The bidder shall acknowledge receipt of all addenda on the Bid Response or by a separate letter to the purchasing officer, which shall be received at or prior to the hour and date specified for receipt of bids.

### **3. Bidding Procedure:**

- a. Bids shall be submitted on the Bid Documents provided by the purchasing officer.
- b. All blanks in the Bid Documents shall be completed and all required support data shall be furnished.
- c. If required in the bidding documents, sums shall be expressed in both words and numerical figures. In the case of discrepancy between the two, the amount in words shall prevail.
- d. The authorized representative of the bidder, who signed the Bid Response, shall initial any alteration or erasure in ink.
- e. The bid shall be firm in offer and conform substantially to the advertised terms, plans and specifications. Any qualifications or reservation imposed by a bidder in the bid retaining the option of accepting, modifying or rejecting an offered contract shall be cause to render the bid not firm and ineligible for consideration of award. Any offer in response to the Solicitation that includes terms contrary or in addition to those in the Solicitation may be considered non-responsive and may be rejected by the Commonwealth.
- f. All alternates specifically called for by the Commonwealth shall be bid. Voluntary alternate bids or an alternate to a lump sum bid shall not be considered.
- g. The bidder shall make no stipulations on the Bid Response nor qualify the bid in any manner.
- h. A person legally authorized to bind the bidder to a contract shall sign the Bid Response. The Bid Response shall also include the legal name of the bidder and a statement indicating whether the bidder is a sole proprietorship, a partnership, a corporation or other legal entity. A bid by a corporation shall also identify the state of incorporation and federal employer identification number.
- i. The purchasing officer shall retain the bid security of bidders until:
  - 1. The contract has been executed and performance and payment bonds have been furnished;
  - 2. The specified time has elapsed so that bids may be withdrawn; or
  - 3. All bids have been rejected.
- j. The completed Bid Response, bid security, and required support data shall be enclosed in a sealed envelope. The envelope shall be addressed to the bid receipt clerk stated in the Solicitation and shall identify the bidder's name and address, the invitation number stated in the bidding documents, closing date and hour. If the bid is sent by mail, the sealed envelope shall contain the notation "BID ENCLOSED" on the face thereof.

- k. Bids shall be received at the designated location prior to the closing time and date for receipt of bids indicated in the Solicitation or any extension thereof made by addendum. Bids received after the closing time and date for receipt of bids may be considered for evaluation and award only if:
  - 1. No other bids were received within the advertisement period;
  - 2. The readvertisement time delay would seriously affect the operations of the using agency; and
  - 3. In the reasonable judgment of the purchasing officer, the bid was finalized prior to the official closing time and date for the receipt of bids.
- l. A bidder shall assume full responsibility for timely delivery at the location designated for receipt of bids.
- m. Oral, telephonic, facsimile or telegraphic bids or changes in bids by such methods are not permitted and shall not be considered.
- n. A competitively solicited contract shall be awarded from a bid evaluation in the state's eProcurement system or all bidders shall be notified of the award in writing.

**4. Modification or Withdrawal of a Bid:**

- a. A bid may be withdrawn prior to the closing time and date for receipt of bids by written request from an authorized representative of the bidder. The modification or withdrawal of a bid shall be received by the receipt clerk stated in the Solicitation prior to bid closing time to be considered valid.
- b. A withdrawn bid may be resubmitted up to the closing time designated for the receipt of bids.
- c. No bidder may withdraw, modify or cancel its bid for a period of thirty (30) calendar days following closing time and date for receipt of bids without the bid security being subject to forfeiture.

**5. Legal Requirements:**

- a. A foreign corporation submitting a bid shall be registered with the Kentucky Secretary of State and be declared in good standing prior to the issuance or receipt of a contract.
- b. A domestic corporation submitting a bid shall be in good standing in accordance with the requirements of the Kentucky Secretary of State.

**6. Taxes:**

- a. The winning bidder shall be liable for payment of Kentucky sales and use tax.
- b. The winning bidder is deemed the end user of all building materials used in construction projects for the Commonwealth.
- c. The winning bidder may not separately state Kentucky sales or use tax payable by the Commonwealth.

**7. Planholder's List:** The published planholder and addenda listing is for general information purposes and the exclusion or inclusion of any firm in no way expresses or implies Commonwealth approval or disapproval of the qualifications of any listed bidder, subcontractor, or material or equipment supplier.

**8. Bid Bonds:** Pursuant to KRS 45A.185, DECA or the using agency may require a bid bond as surety that a bidder will hold its offer firm for a specified period of time. If the Solicitation requires a bid bond, a bidder shall file with the requesting agency a bid bond or certified check in the amount and form specified by the Solicitation with the requesting agency. The bond shall be received either with the bid or prior to the bid closing to be considered.

- a. The bond shall be in an amount equal to at least five percent (5%) of the amount of the bid or as stated in the Solicitation.
- b. In addition to signing the bid bond as principal, the bidder shall have the bond signed by a surety company authorized to do business in the Commonwealth. A list of surety companies may be obtained from the Kentucky Department of Insurance. If the surety on a bond has its authority to do business in Kentucky revoked or, if for any reason it ceases to do business in the Commonwealth, the bidder shall promptly obtain another surety on the bond.
- c. The bond shall be conditioned on full performance of all obligations imposed on the bidder by the Solicitation, including the obligation to keep the price firm for as long a period as specified in the Solicitation, obligation to enter into a contract with the Commonwealth, and the obligation to file a performance payment bond if required by contract. The bid bond shall provide that upon failure to perform an obligation, the Commonwealth may recover from the bidder and the surety, or either of them, any and all damages suffered because of the failure.
- d. If a bidder elects to submit a certified check in lieu of a bid bond, it shall be security for full performance of all obligations referred to in subsection c. of this Section.
- e. If a bidder is not awarded a contract, the certified check shall be returned to that bidder promptly after the award is made. The successful bidder's check shall be returned after the contract is awarded or as soon as the bidder has filed a performance bond, if required. Checks may be returned by certified mail, return receipt requested. The return receipts shall be electronically attached or hard copies attached to each bidder's bid and filed in the bid folder.

**9. Consideration of Bids:**

- a. Unless the bidding documents indicate otherwise, all properly identified, timely bids shall be publicly opened, read aloud, and listed on the official bid tabulation. Tabulations shall be made available to bidders upon written request to the FAC's Open Records Custodian.
- b. The Commonwealth retains the right to cancel the Solicitation, to reject any and all bids, and to waive technicalities and minor irregularities in bids, if such action is determined to be in the best interest of the Commonwealth.
- c. Grounds for the disqualification of bids are stated in 200 KAR 5:306(4)(2).
- d. Minor or technical deficiencies or irregularities in a bid may be waived by the purchasing officer on behalf of the Commonwealth, if:
  - 1. The purchasing officer determines that it is in the Commonwealth's best interest to do so;
  - 2. The technicalities or irregularities are mere matters of form not affecting the material substance of a bid, represent an immaterial deviation from or variation in the precise requirements of the Solicitation, and have no more than a trivial or negligible effect on price, quality, quantity or delivery of supplies or performance of services being procured; and
  - 3. The correction or waiver of the technicality or irregularity does not affect the relative standing of, or prejudice other bidders.
- e. If the Commonwealth does not waive the deficiency, the deficient bid shall be rejected.

**10. Acceptance of Bid:**

- a. A contract shall be awarded, after a reasonable bid evaluation period, in accordance with the Solicitation, if the acceptable bid is within the amount budgeted by the agency.

- b. The Commonwealth reserves the right to accept or reject any alternate bid. If alternates designated by the Commonwealth are considered in the award, the alternates shall be accepted in the sequence in which they are listed on the Bid Documents and the lowest bid sum shall be computed on the basis of the sum of the base bid plus any alternates accepted.

**11. Qualification of Contractors:**

- a. A bidder shall submit a statement of the bidder's qualifications as part of the Bid Response. The purchasing officer shall have the right to make such inquiry as deemed necessary to determine the ability of the bidder to perform the work in a prompt and efficient manner in accordance with the contract documents. The failure of a bidder to promptly supply information in connection with the purchasing officer's inquiry may be grounds for a determination that such bidder is nonresponsive.
- b. In determining the qualifications and responsibility of a bidder, the purchasing officer shall consider the bidder's experience, facility, previous work standing, financial standing, skill, quality and efficiency of construction plant, and equipment proposed to be utilized on the project.
- c. The Commonwealth may reject any bid if an investigation and evaluation of the bidder's qualifications give reasonable doubt that the bidder can perform the work in a prompt and efficient manner in accordance with the contract documents.

**12. Unit Prices:**

- a. If requested in the Solicitation, a bidder shall submit a list of unit prices in accordance with the Bid Document instructions, which shall include labor, materials, equipment, appliances, supplies, overhead and profit, as applicable.
- b. Unit prices shall be used for the pricing of changes in the quantity of work from that indicated by the contract drawings and specifications, if the Commonwealth has authorized such changes in writing.
- c. Only one (1) unit price shall be quoted for each designated item of work. The unit price shall be used to calculate price adjustments based on deductive as well as additive changes.
- d. Unit prices shall apply to all phases of the work whether the work is performed by the bidder or by the bidder's subcontractor.
- e. For unit prices of a lump sum bid contract, the Commonwealth reserves the right, prior to an award of contract, to evaluate the unit prices and adjust or reject any unit price that is determined by the purchasing officer to be unreasonable in amount.
- f. If a total sum bid is made by line item, and unit prices are quoted for estimated quantities of units of work, such unit prices are not subject to change. However, the purchasing officer reserves the right to correct mathematical errors in extensions and additions by the bidder. In the latter case, the purchasing officer's corrected bid sum total shall supersede the bidder's incorrect computed bid sum total.

**13. Subcontractor Listing:**

- a. If requested, a bidder shall list the names of subcontractors proposed for each of the principal portions of the work, including those persons or entities who are to furnish material or equipment fabricated to a special design, in the designated place on the Bid Documents.
- b. When a listed subcontractor is proposed for a principal portion of the work as required in subsection a. above, and that subcontractor is not self-performing the work, but is subcontracting the work to lower tier subcontractor, each lower tier subcontractor shall be listed in parenthesis after the name of the main subcontractor. Without such listing of lower tier contractors, the main subcontractor must perform the work of that principal portion of the work with its own forces in its entirety.

- c. A bidder shall establish, to the satisfaction of the purchasing officer, the reliability and responsibility of the listed subcontractors. The bidder may be required by the purchasing officer to provide additional information regarding listed subcontractors, including listed lower tier subcontractors.
- d. If, after due investigation, there is reasonable objection to the qualifications of a listed subcontractor or a listed lower tier subcontractor, the bidder shall, upon written direction of the purchasing officer, submit the name of an acceptable substitute subcontractor or lower tier subcontractor with no change in bid price. The failure of the bidder to promptly comply with this requirement may be grounds for rejection of the bid.
- e. Any listed subcontractor or listed lower tier subcontractor to whom the purchasing officer does not make written objection prior to the award of the contract shall be deemed acceptable to the Commonwealth.
- f. A bidder shall make no other substitution for any listed subcontractor or listed lower tier subcontractor without first receiving the approval of the purchasing officer in writing of the intended substitution and the specific reason for the substitution. A substitution may be disapproved if the purchasing officer has reasonable objection. The purchasing officer may require a written agreement from the subcontractor being released.
- g. Any work performed by a lower tier subcontractor that is not listed on the form of proposal in the manner described above, where required by the purchasing officer, shall be deemed to have been installed at the risk of the general contractor and the Commonwealth reserves the right, at its sole discretion, to reject that portion of the work and require that the work be removed and installed by a listed subcontractor or that the Commonwealth otherwise be compensated by a credit change order for an amount determined by the Commonwealth as reasonable for acceptance of such work installed by a non-listed lower tier subcontractor.
- h. Nothing contained in the bidding documents shall be deemed to create a contractual relationship between the Commonwealth and any subcontractor.

#### **14. Materials and Contractor Listing:**

- a. If requested, a bidder shall submit a listing of primary materials and equipment, including manufacturer's name, brand and catalog number. The materials and equipment listing shall be bound with the Bid Response or completed in the time period designated in Section 15.b. of this FAP.
- b. Prior to the final acceptance of a bid, the purchasing officer shall make a preliminary review of the bidder's list of materials and equipment. The purchasing officer shall advise the bidder of the tentative acceptability of such materials and equipment, subject to satisfactory completion and approval of shop drawings, or direct such other action as may be necessary in order to meet the requirements of the contract documents. If any of the listed material or equipment is determined not to meet the requirements of the contract documents, the bidder shall be required to furnish other material or equipment meeting those requirements at no change in bid price. Preliminary review and acceptance of the above list shall not relieve the bidder, as the contractor, of the obligation to furnishing equipment and materials in accordance with the contract documents.

#### **15. Post-Bid Review:**

- a. A bidder may have an authorized representative at the bid opening for the submittal of the material and equipment listing and the post-bid review of the apparent winning bid.
- b. Unless otherwise provided in the bidding documents or authorized by the purchasing officer, the apparent winning bidder shall submit the material and equipment listing no later than one (1) hour after the close of the reading of the bids. The materials and equipment listing shall be that listing bound with the Bid Documents.
- c. After opening, the scope of work bid by each bidder shall be reviewed by representatives of the purchasing agency, the using agency, the architect or engineer, and the apparent winning bidder. Review shall be directed toward subcontractors, material listing, unit prices and qualifications of the bidder.

- d. The bidder's representative shall have the authority and ability to respond to questions that arise during the review.

**16. Equal Employment and Nondiscrimination:**

- a. The Commonwealth is committed to a policy of providing equal job opportunities on public contracts and prohibiting discrimination based on race, creed, color, sex, age, religion, national origin or disability in employment. KRS 45.560 – KRS 45.640.
- b. The utilization of minority vendors and subcontractors is encouraged, whenever possible, on public works contracts. The bidder and contractor should make full efforts to locate minority business persons. KRS 45A.610.
- c. Unless exempted in accordance with KRS 45.590, the provisions of KRS 45.560 – KRS 45.640 shall be binding upon the declared successful bidder and the resulting contract shall contain the provisions set forth in KRS 45.570(2).
- d. Unless a bidder is exempt under KRS 45.560 – KRS 45.640, the apparent successful bidder shall submit to the purchasing agency in the manner described and on the form(s) required, the information required by KRS 45.600 within five (5) calendar days of being declared the apparent low bidder. The form(s) shall be reviewed by the FAC Office of Equal Employment Opportunity and Contract Compliance.

**17. Performance and Payment Bonds:**

- a. Pursuant to KRS 45A.190 and KRS 45A.195, a bidder shall deliver the required performance and payment bonds to the purchasing agency upon notification of intent to award, or, with the approval of the purchasing officer, within fourteen (14) calendar days after that date. Otherwise, the Commonwealth may determine that the proposed awardee has abandoned the Bid Response and the bid shall become null and void.
- b. Unless otherwise specified in the bidding documents, the bonds shall be written on the form bound in the bidding document in the number of copies to be specified by the purchasing officer.
- c. A bidder shall require the attorney-in-fact, who executes required bonds on behalf of the surety, to affix thereto a certified and current copy of his/her Power of Attorney. The date of the Power of Attorney shall not precede the date of the bonds. The bonds shall be executed with a licensed resident or non-resident agent, who represents insurance companies authorized to do business in Kentucky.

**18. Award of Contract:**

- a. The issuance of an award of a contract is contingent upon securing an acceptable bid that is within the amount of budgeted funds and determining that the award of contract is in the best interest of the Commonwealth.
- b. Unless otherwise provided in the bidding documents, the Agreement between the Commonwealth and the contractor shall be written on the standard form of agreement bound within the Solicitation. The Commonwealth shall not be required to enter into or sign further agreements, leases, company orders or other documents to complete the Agreement.
- c. The Commonwealth's acceptance of the bidder's offer in response to the Solicitation, indicated by the issuance of a contract award, shall create a binding agreement between the parties consisting of the documents listed below. In the event of a conflict between the provisions contained in the contract, the order of precedence shall be in the same listing order as below.
  - 1. Solicitation including any addenda;
  - 2. Specifications;



3. Special Conditions;
4. General Conditions;
5. Technical provisions of the specifications;
6. Drawings/plans; and
7. Bid Response to the Solicitation.

**19. Award of Construction and Construction-Related Contracts:** Capital construction funded contracts require properly authorized Appropriation, Allotment, Revenue Budget, Project Management Master and Journal Voucher Transfer documents (SAS-5, SAS-14) for award of contract and allocation of construction funds. The issuing agency shall execute a construction contract using agency or general fund accounts on the basis of a duly signed agency Purchase Request.



**FINANCE AND ADMINISTRATION CABINET  
DEPARTMENT FOR FACILITIES MANAGEMENT  
DIVISION OF ENGINEERING AND CONTRACT ADMINISTRATION**

**GENERAL CONDITIONS of the Contract for Construction**  
**- General Contractor**

These **General Conditions of the Contract for Construction – General Contractor** have been implemented by the Kentucky Division of Engineering and Contract Administration for the purpose of delineating the provisions of the Contract for Construction when the Commonwealth has entered into a Contract with a General Contractor to accomplish a Capital Construction Project. The Document as a whole outlines the primary obligations and basic expectations for each entity involved in the Project.

These General Conditions apply to each section of the specifications and to the Contract Documents as a whole and are binding upon the Contractor and all Subcontractors as each are subject to the provisions contained herein.

These General Conditions are intended to define and establish certain definitions, procedures, rules and provisions of the Contract governing the operation so that the Work may be continued and be completed in an orderly, expeditious and workmanlike manner.

These General Conditions, together with the specifications and Contract Documents, shall further establish the standards of material and workmanship for the Work.

Specific Project requirements may alter the provisions indicated herein where strict adherence to the provisions of this document are not warranted or applicable. The Special Conditions and Supplemental Conditions contained in the Contract Documents, if present, modify and take precedence over the provisions of these General Conditions for this specific Project.

These General Conditions are based on and are consistent with the specific Kentucky Revised Statutes passed by the Kentucky Legislature and signed into effect by the Governor; specific Kentucky Administrative Regulations promulgated by State Agencies to enhance and clarify procedures that are authorized by a specific statute; specific Finance Cabinet Administrative Regulations; and the DECA Procedures Manual.

## Contents

<u>Page</u>	<u>Article</u>	<u>Title</u>
3	'1.	<u>Definitions of Terms</u>
6	'2.	<u>Intent and Interpretation</u>
8	'3.	<u>The Architect, Engineer, Consultant (A-E)</u>
12	'4.	<u>Construction Schedule</u>
13	'5.	<u>Shop Drawings; Submittals</u>
15	'6.	<u>Documents and Samples at the Site</u>
15	'7.	<u>Contract Documents Property of Owner</u>
15	'8.	<u>Supervision and Construction Procedures</u>
19	'9.	<u>Labor, Material and General Contractor Warranty</u>
23	'10.	<u>Surveys, Permits, Fees, Notices, and Tests</u>
22	'11.	<u>Protection of Work, Property, Employees and Public</u>
25	'12.	<u>Inspection of Work/ Defective or Incomplete Work / Special Inspections</u>
27	'13.	<u>Royalties and Patents</u>
27	'14.	<u>Changes in the Work/ Change Orders</u>
31	'15.	<u>Project Records</u>
31	'16.	<u>Delays and Extensions of Time</u>
35	'17.	<u>Subcontractors</u>
36	'18.	<u>Payment</u>
39	'19.	<u>Completion</u>
45	'20.	<u>Correction of Work</u>
46	'21.	<u>Suspension of Work</u>
47	'22.	<u>Termination</u>
48	'23.	<u>Indemnification</u>
48	'24.	<u>Insurance</u>
50	'25.	<u>Performance and Payment Bonds</u>
51	'26.	<u>Claims by the Contractor/Concealed Conditions/Disputes</u>
52	'27.	<u>Liens</u>
52	'28.	<u>Assignments</u>
53	'29.	<u>Separate Contracts</u>
53	'30.	<u>Allowances</u>
53	'31.	<u>Project Meetings</u>
55	'32.	<u>Miscellaneous Provisions Regarding Contractor's Work</u>
56	'33.	<u>Apprentices</u>
56	'34.	<u>Nondiscrimination in Employment</u>
55	'35.	<u>Affirmative Action; Reporting Requirements</u>
57	'36.	<u>Access to Records</u>
58	'37.	<u>Commonwealth Project Forms and other Web links</u>

# Articles

## **1. Definitions of Terms**

Wherever used in these General Conditions or in other Contract Documents, the following terms have the meaning indicated which are applicable to both the singular and plural thereof:

**1.1 Addenda** Written or graphic instruments issued prior to the opening of Bids which clarify, correct or change the Bidding Requirements or the Contract Documents. An Addendum supersedes related provisions of the Contract Documents which are clarified, corrected or changed by the addenda.

**1.2 Agency or Using Agency**, defined by KRS 45a.030, and is the state government entity which utilizes the Work being contracted. The Agency is a “client” of the Owner and advises the Owner of the needs, requirements and desires of the Agency related to the project. The Owner consults with the Agency on matters related to the Project. The Agency does not possess the legal authority of the Owner (see KRS 45a.045).

**1.3 Architect, Engineer or Consultant (A-E)** is the person or entity, either a registered Architect, Registered Engineer, or Consultant, who is identified as such in the Contract Documents and on the drawings or any replacement Registered Architect, Registered Engineer, or consultant identified by the Owner. The A-E is a separate contractor and not an agent of the Owner. The term includes any associates or consultants employed by the A-E to assist in providing the required professional services to the Owner.

**1.4 Certification of Payment** is the Owner’s Progress Payment Forms, DOA-24 and DOA-25. All Payments made to the Contractor under this contract shall be on the appropriate Owner’s Progress Payment Form.

**1.5 Change Order** means a written order to the Contractor executed by the Owner and the A-E after execution of the Contract, directing a change in the Work and may include a change in the Contract Price or the Contract Time, or any combination thereof. There shall be no authorized changes in the Work, which affect either Contract Price or Contract Time, without a fully executed Change Order, except as provided elsewhere herein.

**1.6 Contract** is the legal relationship, duties and obligations between the Owner and Contractor as evidenced by the Contract Documents for the Project.

**1.7 Contract Time** is the number of calendar days between the Date of Commencement and the dates set for Substantial Completion and Final Completion of the Work, including any adjustments thereto, all as established in the Contract between Owner and Contractor

**1.8 Contract Documents** include the Invitation for Bids, the Instructions to Bidders, the Payment and Performance Bonds, the General Conditions, the Special or Supplemental Conditions, the drawings, specifications, solicitation addenda, the contractors response to the solicitation, any written clarification of the response, the award document containing the Agreement between Owner and Contractor, and modifications issued after execution of the Contract. Modifications include (1) Change Orders issued as provided in Article 14, and (2) Field Orders for minor changes in the work issued by the A-E as provided in Article 14. Documents not included or expressly contemplated in this Paragraph, 1.8, do not, and shall not, form any part of the Contract between the Owner and the Contractor.

**1.9 Contract Sum** means the sum stated in the Contract including any authorized adjustments thereto and is the total amount payable by the Owner to the Contractor for the performance of the Work under the Contract Documents.

**‘1.10 Contractor or General Contractor** means the person or entity with whom the Owner has executed the Contract for construction. The Contractor may also be referred to as General Contractor. The Contractor shall hold his subcontractors, suppliers and others under his employ or contract to the terms and conditions of the Contract Documents.

**‘1.11 Damages for untimely performance** means a calculated monetary amount to be paid to the Owner, based on real costs which the Commonwealth incurs, due to the Contractor's failure to complete the Work within the allowable time identified in the Contract Documents. This term may also be referred to as "Liquidated Damages" where the actual cost of damages for untimely performance cannot be readily calculated and a definite sum is predetermined to be paid to the Owner. The amount of Liquidated Damages shall be defined in the Special Conditions of this Project.

**‘1.12 Date of Commencement** is the date specified in the Contract as the date upon which the Contractor is authorized to begin work. The Contract Time as set forth in paragraph 1.7 is determined using this Date of Commencement as the starting date.

**‘1.13 DECA Project Manager** means the person(s) delegated authority to act on behalf of the Owner. Such person(s) is employed by the Owner, DECA's Project Manager(s) will be designated at the Pre-Construction Meeting. DECA reserves the right to change its designated Project Manager(s) at any stage of the Work, for the sole purpose or benefit of the Commonwealth.

**‘1.14 Delay** means an event that causes an increase in the duration of the Project, or that changes the sequence of the Work or individual Work activities, thereby preventing completion of the Project within the time period specified in the Contract Documents. An event that does not cause an increase in the duration of the Project or prevents the completion of the Project within the time period specified in the Contract Documents, such as an event that is not on the critical path of the project schedule, is not a delay under this Contract.

**‘1.15 Direct Expenses** is defined as "All items of expenses directly incurred by or attributable to a specific project, assignment or task" and "Direct costs consist of direct materials, direct labor, subcontract costs, and other miscellaneous direct costs such as bonding and equipment rentals, that are directly related to and can be specifically attributed to an individual contract."

**‘1.16 Drawings** are the graphic and pictorial portions of the Contract Documents, wherever located and whenever issued, showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules and diagrams. Where it is obvious that a drawing illustrates only a part of the given work or of a number of items, the remainder shall be deemed repetitious and so construed.

**‘1.17 Document Collaboration** is the Owner's web-based document collaboration system that shall be used by all project participants for the submission, transmittal, transfer, review, approval, processing of all documents related to this project. Where the General Conditions, the technical specifications, or the Contract for Construction indicates that a submission of documents is required, this submission shall be through the Owner's Document Collaboration System.

**‘1.18 Extra Work** as used in Article 14 is defined as Work not part of the existing Contract Documents which is being added to the Contract by a fully executed Change Order.

**‘1.19 A Field Order** is a written order issued by the A-E which clarifies or interprets the Contract Documents, or orders minor changes in the Work which does not require a change under Article 14. Field Orders are issued to the Contractor through the Owner's Document Collaboration System. Field Orders are also called A-E's Supplemental Instructions (ASIs).

**‘1.20 Final Completion** is defined as the Work being acceptable under the Contract Documents and the Contract fully performed in accordance with the terms and conditions of the Contract Documents and the entire payment balance due the Contractor is due and payable.

**'1.20.1 Final Completion Date** shall have the meaning as described to it in Article '19.5.

**'1.21 Notice of Intent to Award** is a written letter issued to the apparent successful contractor after acceptance of bid price, unit prices, subcontractors and equipment and materials to inform them of such acceptance and request the required additional documentation to initiate the Contract. **This is NOT an authorization to proceed.**

**'1.22 Owner** means the Commonwealth of Kentucky, acting through the Finance and Administration Cabinet and its Administrative Agent, the Department for Facilities and Support Services, Division of Engineering and Contract Administration. The Owner is represented solely by the Division of Engineering and Contract Administration. The Owner is represented by the DECA Project Manager for the specific Project.

**'1.23 The Project** is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner or by other Contractors, working under separate Contract with the Owner.

**'1.24 Resident Observer** means an individual who has a direct contract with the A-E to observe and report on activities at the work site. A Resident Observer employed by the A-E is not authorized to serve as the Owners Representative, unless so designated by the Owner in writing.

**'1.25 Retainage** means money earned by a contractor for work accepted by the Owner, but withheld to ensure proper performance by the contractor. Retainage is further defined in Article '18.

**'1.26 Shop Drawings** means drawings, completion diagrams, schedules, and other data specially prepared for the Work by the Contractor or any Subcontractor, lower tier subcontractors, manufacturer, supplier, or distributor to illustrate some portion of the Work. Shop Drawings and other submittals from the Contractor to the A-E shall be transmitted through the Owner's Document Collaboration System. Unless other requirements are indicated in the Special Conditions for this project or unless otherwise permitted by the A-E in writing, all shop drawings required by the Contract Documents shall to be submitted to the A-E for review and acceptance within the time indicated below:

**'1.26.1 For Projects of less than 180 calendar day duration:** thirty (30) calendar days of the Date of Commencement.

**'1.26.2 For Projects of more than 181 calendar days and less than 360 calendar days duration:** less than sixty (60) calendar days of the Date of Commencement.

**'1.26.3 For Projects of more than 361 calendar days duration:** less than ninety (90) calendar days of the Date of Commencement.

**'1.26.4 In circumstances where a specific shop drawing required by the Contract Documents cannot reasonably be submitted** to the A-E for review and acceptance, the Contractor shall notify the A-E in writing within the time periods indicated above for submission, and if the A-E finds it reasonable to waive this submission time period requirement, the A-E may do so in writing.

**'1.26.5 In circumstances where a specific shop drawing required by the Contract Documents cannot be reasonably reviewed by the A-E within the time prescribed elsewhere in the Contract Documents,** the A-E shall notify the Contractor in writing prior to the date required for the review of the reasons for the time needed for reviewing the Shop Drawing.

**'1.27 Specifications** are the descriptive and written portions of the Contract Documents, wherever located and whenever issued, that describe the quality and performance of building materials and systems, using code citations and published standards. The drawings and specifications are complementary, together providing the information required for a complete facility. However, the specifications overrule the drawings where there is a conflict or contradiction. However, the Contractor shall inquire of the A-E for a determination of the resolution of the conflict or contradiction.

**'1.28 Subcontractor** means the person or entity having a direct contract with the Contractor for the performance of a part of the Work. The Owner has no direct contractual relationship with the subcontractor.

**'1.29 Substantial Completion** is the point at which, as certified in writing by the A-E and accepted by the Owner that the Project is: 1) at a level of completion in strict compliance with the Contract (see article '19.4 for a complete listing of requirements for compliance); 2) all necessary approvals by public authorities has been given; and, 3) that the Owner or the Agency can enjoy beneficial use or occupancy and can use, operate and maintain (the Owner has received all required warranties and documentation) it in all respects, for its intended purpose. Partial use or occupancy of the Project shall not result in the Project being deemed substantially complete and such partial use or occupancy shall not be evidence of Substantial Completion.

**'1.29.1 Substantial Completion Date** shall have the meaning as described to it in Article 19.

**'1.30 Warranty, General.** The Contractor shall warrant all equipment, materials, products, and workmanship provided by the Contractor under these Contract Documents for a period of twelve (12) months after the Date of Final Completion. This period of time is called the One-Year Warranty Period and is further defined in Article 9.2.

**'1.31 The Work** includes the construction and services required by the Contract Documents, whether completed or partially completed, and includes all labor, supervision, materials, equipment, services, and things provided or to be provided by the Contractor to fulfill the Contractor's obligations.

## **'2. Intent and Interpretation**

**The A-E shall be the authority of the Contract Documents as to their intent or interpretation,** except as defined below and/or as provided in paragraph 3.4.

**'2.1** Anything that may be required, implied or inferred by the documents which make up the Contract, or any one or more of them, shall be provided by the Contractor for the Contract Sum;

**'2.2** Nothing contained in the Contract Documents shall create, nor be interpreted to create, privity or any other relationship whatsoever between the Owner and any person except the Contractor;

**'2.3** When a word, term, or phrase is used in the Contract Documents, it shall be interpreted or construed first, as defined herein; second, if not defined, according to its generally accepted meaning in the construction industry; and third, if there is no generally accepted meaning in the construction industry, according to its common and customary usage;

**'2.4** The words "include", "includes", or "including", shall be deemed to be followed by the phrase, "without limitation".

**'2.5** The specification herein of any act, failure, refusal, omission, event, occurrence or condition as constituting a material breach of the resulting Contract shall not imply that any



other, non-specified act, failure, refusal, omission, event, occurrence or condition shall be deemed not to constitute a material breach of the resulting Contract;

**'2.6** In the event of any conflict, discrepancy, or inconsistency, the following shall control:

**'2.6.1** As between figures given on plans and scaled measurements, the figures shall govern; When two or more figures given on the plans are in conflict, the Contractor shall inform the A-E of such conflict immediately and the A-E shall clarify the correct figure to be used. The Contractor shall not proceed with any work related to the figures in conflict until the A-E has provided this clarification.

**'2.6.2** As between large scale plans and small scale plans, the large scale plans shall govern;

**'2.6.3** As between plans and specifications, the requirements of the specifications shall govern; When there is a conflict between the plans and specifications, the Contractor shall inform the A-E of such conflict immediately and the A-E shall clarify the correct interpretation to be used. The Contractor shall not proceed with any work related to the conflict until the A-E has provided this clarification.

**'2.6.4** When any conflict, discrepancy, or inconsistency exists as described in Article '2.6, and when there is a necessary determination by the A-E, with agreement by the Owner, that the provisions indicated above do not result in the proper interpretation and resolution of the conflict, the A-E may provide written directive as to how the conflict is to be resolved.

**'2.6.4.1** When such written directive, as indicated in '2.6.4 results in a cost difference to properly resolve the conflict, discrepancy, or inconsistency, a cost adjustment may be determined by the A-E to be appropriate.

**'2.6.4.2** The Contractor shall notify the A-E/ Owner of his proposed necessity of a cost difference result within fourteen (14) calendar days of the receipt of the directive to resolve the conflict.. However, should the Contractor proceed with the work related to the conflict resolution without written notice of the proposed cost difference to the A-E within the prescribed time, no cost adjustment will be granted.

**'2.7 Meaning of Execution.** Execution of the Contract Documents by the Contractor is a representation that the Contractor has thoroughly examined the site of the Work, become familiar with the local conditions under which the Work is to be performed, and correlated personal observations with the requirements of the Contract Documents.

**'2.7.1** Execution of the Contract Documents is a further representation that Contractor has received, reviewed and carefully examined all of the Contract Documents, and has found them in all respects to be complete, accurate, adequate, consistent, coordinated and sufficient for construction, the Contractor is fully qualified to act as the contractor for the Project and has, and shall maintain, any and all licenses, permits or other authorizations necessary to act as the contractor for, and to construct the Project.

**'2.8 Prior Agreements.** The Contract Documents supersede any and all prior discussions, communications, representations, understandings, negotiations or agreements between the Owner and the Contractor and the Agency and the Contractor.

**'2.9 Contractor's Performance.** The Contractor shall perform all of the Work required, implied or reasonably inferable from the Contract including, but not limited to, the following:

**'2.9.1** Construction of the Project;



**‘2.9.2** The furnishing of any required surety bonds and insurance;

**‘2.9.3** The provision or furnishing, and prompt payment therefor, of labor, supervision, services, materials, supplies, equipment, fixtures, appliances, facilities, tools, transportation, storage, power, fuel, heat, light, cooling, or other utilities, required for construction and all necessary building permits and other permits required for the construction of the Project;

**‘2.9.4** The creation and submission to the A-E of detailed and comprehensive record drawings and specifications, depicting all as-built construction. Said as-built drawings shall be submitted to the Owner by the A-E upon Final Completion of the Project and receipt of same by the Owner shall be a condition precedent to final payment to the Contractor and to the A-E.

**‘2.10 Time.** All limitations of time set forth in the Contract Documents are material and are of the essence of the Contract. The Contractor shall execute the work in such a manner as consistent with the limitations of time set forth. The Contractor shall make reasonable progress on the completion of the Work on a continual and consistent basis. Any failure of the Contractor to execute the Work in a timely manner consistent with the limitations of time set forth in the Contract Documents may be deemed at a Material Breach of Contract.

**‘2.11 Intent of Contract Documents.** The intent of the Contract Documents is to include all items necessary for the proper completion of the Work by the Contractor. Labor or materials which are evidently necessary to produce the desired results, even though not specifically mentioned in the Contract Documents, shall be included in the Work. The A-E is the interpreter of the Contract Documents and where any clarification regarding interpretation of the Documents is required the A-E shall be notified in writing pursuant to paragraph 2.13 below.

**‘2.12 Contract Documents Complementary, etc.** The Contract Documents are complementary, and what is required by one shall be as binding as if required by all. In case of conflicts between the various Contract Documents, the order of precedence shall be as follows: (1) Addenda, (2) Special Conditions, (3) General Conditions, (4) Division 1 - General Requirements of the Specifications; (5) Technical provisions of the Specifications; (6) Drawings.

**‘2.13 Questions to A-E.** In the event a question arises regarding the meaning or intent of the drawings and specifications, the Contractor shall report it at once to the A-E by the submission of a Request for Information through the Owner’s Document Collaboration System. The A-E shall furnish, with reasonable promptness, as defined by the Contract between the Owner and the A-E, additional instructions, by means of drawings or otherwise, necessary for the proper execution of the work, consistent with the requirements of Article 3.

**‘2.14** Paragraph, titles, headings, and drawing numbers are for convenience only and form no operative part of the Contract. The General Contractor, and by the “flow down” provisions of these General Conditions, every subcontractor, shall provide all Work defined, identified, enumerated, specified or otherwise indicated to be provided by the Contract Documents.

### **‘3. The Architect, Engineer, Consultant (A-E)**

**Unless otherwise directed by the Owner in writing, the A-E shall perform those duties and discharge those responsibilities allocated to the A-E in the Contract Documents.** The duties, obligations and responsibilities of the A-E shall include, but are not limited to, the following:

**‘3.1 Owner’s Representative.** The A-E will be the Owner’s Agent during construction, through issuance of final payment, and during the contractor’s One Year Warranty period. The A-E will advise and consult with the Owner. In the event the Owner should find it necessary or

convenient to replace the A-E, the Owner shall retain a replacement A-E and the role of the replacement A-E shall be the same as the role of the A-E.

**'3.2 Communication through A-E.** Except as otherwise provided in the Contract Documents, the Owner's instructions to the Contractor shall be through the A-E and the Contractor's communications with the Owner shall be through the A-E. Should the contractor act on communications from any other entity, other than through the A-E, he is acting at his own risk and may be required to reverse the actions taken as his own expense.

**'3.2.1 All documents related to this project shall be submitted, transmitted, transferred, reviewed, approved or rejected, and/or otherwise processed using the Owner's Document Collaboration System** which is the Owner's web-based document collaboration system that shall be used by all project participants. No submission, transmittal, transfer, review, approval or processing shall be deemed Official without the use of this system.

**'3.2.1.1 All documents transmitted for purposes of administration of the Contract** are to be in electronic (PDF) format and transmitted via the Commonwealth's Document Collaboration System that receives, logs and store documents, processes documents through workflows and notifies addressees via email.

**3.2.1.2 The A-E/ Engineer and the Contractor are required** to become familiar with this system, to use this for all official transmittal of information pertaining to this project, and to respond to the requirements of this system within a reasonable time as defined elsewhere herein and/or by the terms of their Contract with the Owner.

**3.2.1.2.1 Training:** The Owner has an agreement with the service provider of the Document Collaboration System to provide training, support and assistance to users of the system via a web-based training session which can be arranged upon request. Further training as may be required by a specific user of the system is the responsibility of the user of the system.

**'3.3 Review of Work.** The A-E shall approve, or respond otherwise, in a timely manner, as defined by the Contract between the Owner and the A-E, as necessary concerning shop drawings or other submittals received from the Contractor. Should the A-E have reasonable cause to be unable to approve, or respond otherwise to submissions from the Contractor, the A-E shall provide written explanation of the reasonable cause within the timely manner, as defined by the Contract between the Owner and the A-E.

**'3.3.1 The A-E shall be authorized to refuse to accept work** which is defective or otherwise fails to comply with the requirements of the Contract. The A-E shall refuse the work in writing when he deems it necessary to refuse the work. If the A-E deems it appropriate, the A-E shall be authorized to call for extra inspection or testing of the work for compliance with requirements of the Contract.

**'3.3.1.1 The costs of the extra inspection or testing** shall be paid by the Contractor, unless the results of the extra inspection or testing find that the work was originally in conformance with the Contract requirements and that the extra inspection or testing was not necessary. A reduction in the Contract Sum shall be provided by Change Order to reimburse the Owner for the costs of the extra inspection or testing.

**'3.3.1.2 In cases where the Contractor covers up work** that is required by the Contract Documents to be inspected or tested prior to the inspection or testing, the cost of uncovering the work and performing the inspection or testing shall be at the

Contractor's expense even if the work is found to have been originally in conformance with the Contract Documents. A reduction in the Contract Sum shall be provided by Change Order to reimburse the Owner for the costs of the extra inspection or testing.

**'3.3.2 The A-E shall review the Contractor's Payment Requests** and shall approve in writing those amounts which, in the opinion of the A-E, are properly owing to the Contractor as provided in the Contract. The A-E shall perform this review, approval and submission of his recommendation to the Owner, within ten (10) business days of receipt of the Payment Request from the General Contractor.

**'3.3.3** The A-E shall perform those inspections required by the Owner.

**3.4 Interpretation of Contract Documents.** The A-E shall be the interpreter of the requirements of the Contract Documents and the judge of the performance thereunder by the Contractor, subject to the provisions of Article 26.

**'3.4.1 Claims, disputes, and other matters in question** that arise relating to the execution or progress of the Work shall be referred initially to the A-E for decision, which he will render in writing within a reasonable time, as defined by the Contract between the Owner and the A-E.

**'3.4.2 Should the Contractor find disagreement with the A-E** as to the proper interpretation of the Contract Documents or other decision of the A-E, he must refer the A-E's decision to the Director of the Division of Engineering in writing within seven (7) days. The Director of the Division of Engineering will then discuss and negotiate the A-E's decision with the A-E to seek reasonable resolution of the matter. Following these discussions and negotiations, the A-E's initial decision or revised decision shall be binding, unless the Contractor appeals the A-E's initial or revised decision to the Secretary of the Finance and Administration Cabinet in accordance with the provisions of Article 26.

**'3.4.3 Should the Director of the Division of Engineering find disagreement with the A-E** as to the proper interpretation of the Contract Documents or any other decision of the A-E, the Director of the Division of Engineering may appeal the A-E's initial or revised decision to the Secretary of the Finance and Administration Cabinet in accordance with the provisions of Article 26.

**'3.4.4 The A-E shall have authority to reject Work** which does not conform to the Contract Documents. In the event of rejection, the A-E may recommend in writing withholding payment to the Contractor for the rejected Work, and such recommendation shall give the Owner the authority to withhold payment for such Work.

**'3.5 Review of Shop Drawings, etc.** The A-E shall review and approve, or take other appropriate action upon Contractor's submittals (such as Shop Drawings, product data, and samples) for conformance with the design concept and the information given in the Contract Documents. Such action shall be taken with reasonable promptness, as defined by the Contract between the Owner and the A-E, so as to cause no delay. The A-E may determine concurrently with the Contractor the timing and scheduling of the A-E's Review, with the understanding that some submittals are more critical to the Critical Path of the Completion of the project than others.

**'3.5.1 The A-E's approval** of a specific item shall not indicate approval of an assembly of which the item is a component. The A-E's approval of Shop Drawings or samples shall not relieve the Contractor from his responsibility for any deviations from the requirements of the Contract Documents unless the Contractor has in writing called the A-E's attention to such deviation at the time of submission and the A-E has given written approval to the specific deviation, nor shall any approval by the A-E relieve the Contractor from responsibility for errors or omissions in the Shop Drawings.

**‘3.5.2 If, for any reason, any item specified and approved by the A-E as a shop drawing submittal, will not be available when needed** in the course of the work, and Contractor can show he has made a reasonable, persistent effort to obtain item in question, the Contractor is to notify the A-E in writing, immediately, and the A-E will either determine the source of the supply or arrange with the Owner for appropriate substitution, within the terms of the Contract. Otherwise, the Contractor will not be excused for delays in securing materials or products specified, and will be held accountable if completion of the project is thereby delayed.

**‘3.6 Preparation of Change Orders.** The A-E, in consultation with the Owner, shall prepare Change Orders. The A-E shall also have authority to order minor changes in the Work as provided in Article 14.2.

**‘3.7 Final Inspections, Certification.** The A-E, in consultation with the Owner, shall conduct inspections to determine the dates of Substantial Completion and Final Completion. The A-E shall also receive and forward to the Owner, for the Owner’s review, written warranties and related documents required by the Contract and assembled by the Contractor.

**‘3.8 The A-E shall review the Contractor’s Payment Requests** and shall approve in writing those amounts which, in the opinion of the A-E, are properly owing to the Contractor as provided in the Contract. The A-E will perform this review, approval and submission of his recommendation to the Owner, within ten (10) business days of receipt of the Payment Request from the Contractor.

**3.8.1 When there is reasonable justification that causes the A-E to be unable to perform this review, approval and submission of his recommendation to the Owner within the time prescribed in paragraph 3.8 above,** the A-E will notify the Contractor in writing as to the justification and as to the time that will be required for this review, approval and submission of his recommendation to the Owner.

**‘3.8.2 The Contractor may submit no more than one (1) payment request** each thirty (30) calendar day period, except where specifically agreed by the Owner that additional payment requests may be submitted within the thirty (30) calendar day period for reasons consistent with the Contractor’s performance of the Contract.

**‘3.9 The A-E, in consultation with the Owner, shall be authorized to require the Contractor to make changes or deviations in the work** which do not involve a change in the Contract Sum or in the Contract Time for the Contractor’s performance consistent with the intent of the Contract. The A-E shall make such changes or deviations in the work by written Field Order.

**‘3.10 The duties, obligations and responsibilities of the Contractor under the Contract** shall in no manner whatsoever be changed, altered, discharged, released, or satisfied by any duty, obligation or responsibility of the A-E. The Contractor is not a third-party beneficiary of any Contract by and between the Owner and the A-E. It is expressly acknowledged and agreed that the duties of Contractor to the Owner are independent of, and are not diminished by, any duties of the A-E to the Owner.

**‘3.11 The duties, obligations and responsibilities of both the A-E and the Contractor,** under their respective Contracts, shall in no manner whatsoever be changed, altered, discharged, released, or satisfied by any duty, obligation or responsibility of the Resident Observer. It is expressly acknowledged and agreed that the duties of Contractor and/or A-E to the Owner are independent of, and are not diminished by, any duties of the Resident Observer to the A-E/Owner. A copy of the Resident Observers Duties, Responsibilities and Limitations

are enumerated in the DECA Procedures Manual, are to be discussed at the Pre-Construction Meeting and are by reference made a part of these General Conditions.

#### **4. Construction Schedule**

**The Contractor, within fifteen (15) days of the Date of Commencement shall prepare and submit for the Owner and A-E's approval a construction schedule for completing the Work.** This submission shall be transmitted through the Owner's Document Collaboration System. The schedule shall indicate the starting and completion dates of the various stages of the Work, shall not exceed time limits established by the Contract Documents for the various stages of Work, shall be updated monthly and furnished to the Owner and A-E, shall be related to the Work of any other contractors on the Project to the extent required by the circumstances, and shall provide for expeditious and practicable execution of the Work. *Progress Payments to the Contractor are contingent upon receipt of the updated monthly project schedule and schedule of submittals.*

**4.1 Time Frame of Schedule:** *Extend schedule form date established for commencement of the Work (the Notice of Award or Notice to Proceed) to Substantial Completion, to Final Completion, and indicating all critical milestones along the time of the schedule.*

**4.1.1 Work by Owner:** *Include a separate activity for each portion of the Work to be performed by the Owner or by others working under separate contract with the Owner.*

**4.1.2 Products Ordered in Advance:** *Include a separate activity for each product pre-ordered by the Owner. Include the delivery date indicated in the Special Conditions or as relayed to the Contractor from the Owner.*

**4.1.3 Work Restrictions and "blackout dates":** *Show the effect of specified work restrictions and "blackout dates" as defined in the Special Conditions.*

**4.1.4 Commissioning:** *Show separate activities for each building system to receive commissioning by others working under separate contract with the Owner, allowing sufficient time for functional startup, commissioning, correction of commissioning issues and final commissioning. Note: Commissioning must be accomplished in its entirety by the Date of Substantial Completion.*

**4.1.5 Testing and Balancing:** *Show separate activity for testing and balancing by others working under separate contract with the Owner. Note: Testing and Balancing must be accomplished in its entirety by the Date of Substantial Completion.*

**4.2 The original schedule** shall be accompanied by a proposed schedule of values as described in Article 18.1. The original Project Schedule, Schedule of Submittals and the Schedule of Values are to be submitted to the A-E, reviewed and accepted by the A-E and the Owner, prior to submittal of the first Progress Payment. No payment will be made to the Contractor without an approved Schedule of Values and a Project Schedule.

**4.2.1 The original schedule** shall show the project being completed on the established Date of Substantial Completion. To do this, the Contractor shall include in the flow of work any existing "float" which may be identified during the layout of the project schedule.

**4.2.2 The Contractor acknowledges that all float** (including Total Float, Free Float, and Sequestered Float) is a shared commodity available to the Project and is not for the exclusive benefit of any party; float is an expiring resource available to accommodate changes in the Work, however originated, or to mitigate the effect of events that may delay performance or completion of all or part of the Work.



**‘4.3 The Contractor shall promptly notify the A-E and Owner** if the Contractor is materially ahead of, or behind the updated construction schedule. Failure to so notify the A-E and Owner shall relieve the Owner from liability for damages caused by delay or impact. Strict compliance with the requirements of this article shall be a condition precedent to payment to the Contractor, and failure by the Contractor to strictly comply with said requirements shall constitute a material breach of the Contract.

**‘4.3.1 On projects where a CPM schedule is required, the Contractor shall report on the status of any “float”,** including the addition of “float”, the use of “float”, and the anticipation of the use of “float” at each project Progress Meeting.

**‘4.4 For projects with a Contract Sum of \$1,000,000 or greater** the schedule shall be in critical path method (CPM) format. The schedules shall include all activities necessary for performance of the work showing logic (sequences, dependencies, etc.) duration of each activity with the critical path highlighted. The schedules shall include, but not be limited to, submittal processing and review time required by the A-E, fabrication and delivery of materials, construction, testing clean-up, work and/or materials to be provided by the Owner, dates and durations for major utility outages requiring coordination with the Owner and the Owner’s operations, and significant milestones related to the completion of the Project.

**‘4.4.1 For projects where the CPM format is required for schedules,** any subsequent adjustment, modification or change in the schedule shall include an indication of the original Critical Path and the adjustment, modification, or change shall clearly delineate the adjustment, modification or change in the schedule and shall be accompanied by a written statement of the cause and reason for the adjustment, modification or change.

**‘4.4.2 For projects where the CPM format is required for schedules and subsequent adjustment, modification or change in the schedule** does not include the information required by paragraph 4.3.1 above, the revised schedule shall be rejected and payment of the Contractor’s General Conditions costs suspended until this provision is complied with satisfactorily.

**‘4.5 Work Hours on site shall be coordinated with the A-E, Owner and Using Agency and shall be initially defined and scheduled at the Pre-Construction Conference,** adjusted by notification to the A-E, Owner and Using Agency during each monthly Progress Meeting, and shall comply with the following criteria:

**‘4.5.1 Generally, work hours on site shall be** from 7am to 4pm, weekdays, unless otherwise defined in the Special Conditions. However, unless restricted or modified by the Special Conditions, the Contractor may propose a different work hour schedule up to 24/7/365 with acceptance by the Owner.

**‘4.5.2 The Contractor shall have job site supervision on site** during any work hours scheduled and/or any extended work hours accepted by the Owner.

## **‘5. Shop Drawings; Submittals**

**‘5.1 Schedule for Submittals.** Prior to submission of the first application for payment and in sufficient time to allow the A-E reasonable time for review, the Contractor shall submit to the A-E a schedule of submittals which shall be coordinated with the construction schedule. This submission shall be transmitted through the Owner’s Document Collaboration System. The Contractor shall keep the schedule of submittals current and present an updated schedule of submittals at each project progress meeting. This schedule of submittals shall contain anticipated and actual dates of the submittal of shop drawings and shall be consistent with the requirements for scheduling submittals defined in Article 1.26 of these General Conditions.

**'5.2 Submittals of Shop Drawings, Samples, etc.** The Contractor shall review, approve, and submit Shop Drawings, samples, and product data in accordance with the approved schedule as herein detailed.

**'5.2.1 The Contractor's stamp of approval** on any Shop Drawing or sample shall constitute a representation to Owner and A-E that the Contractor has either determined and verified all quantities, dimensions, field construction criteria, materials, catalog numbers, and similar data, or he assumes full responsibility for doing so, and that he has reviewed or coordinated each Shop Drawing or sample with the requirements of the Work and the Contract Documents.

**'5.2.2 The A-E shall review and approve, with reasonable promptness** as defined by the Contract between the Owner and A-E, the Shop Drawings, or return for corrections as required. The review and approval shall be for conformance with the design concept of the Project and for compliance with the information given in the Contract Documents. The approval of a separate item will not indicate approval of the assembly in which the item functions.

**'5.2.3 The Contractor shall make any corrections required** by the A-E for compliance to the Contract and shall return the required number of corrected copies of Shop Drawings and resubmit new samples until approved. The Contractor shall direct specific attention, in writing, or on resubmitted Shop Drawings, to revisions other than the corrections called for by the A-E on previous submissions.

**'5.2.4 Where a Shop Drawing or sample submission is required** by the specifications, no related work shall be commenced until the submission has been approved by the A-E. A copy of each approved Shop Drawing and each approved sample shall be kept in good order by the Contractor at the site and shall be available to the A-E, Owner and Resident Observer.

**'5.2.5 The A-E's approval of Shop Drawings or samples** shall not relieve the Contractor from his responsibility for any deviations from the requirements of the Contract Documents unless the Contractor has in writing called the A-E's attention to such deviation at the time of submission and the A-E has given written approval to the specific deviation, nor shall any approval by the A-E relieve the Contractor from responsibility for errors or omissions in the Shop Drawings.

**'5.2.5.1 Conflicting Requirements:** If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to the A-E for decision before proceeding with the work.

**'5.2.6 The Contractor shall maintain a submittal log** which shall include, at a minimum, the date of each submittal, the date of any resubmittal, the date of any approval or rejection, and the reason for any approval or rejection. The Contractor shall provide copies of this submittal log with the current status of submittals clearly indicated therein to the A-E and the Owner at each progress meeting until such time as all submittals are complete and accepted.

**'5.3 Photographic Documentation:** Provide Pre-Construction Photographs, Construction Progress Photographs and Substantial Completion construction photographs. Submit photographs in the Owner's Document Collaboration System with a key plan or description of the location of the photograph taken.

**'5.3.1 Pre-Construction Photographs:** Take a minimum of 20 photographs to show existing conditions of the project site and adjacent property prior to the start of construction activities. Take additional photographs as necessary to adequately document the existing physical conditions of all improvements to the project site or adjacent property that might be affected by the activities of construction.

**'5.3.2 Construction Progress Photographs:** Take a minimum of 10 photographs DAILY to document the progress of construction. Take additional photographs as necessary to adequately document the progress of construction indicating all key elements of the construction and any significant progress.

**'5.3.3 Substantial Construction Photographs:** Take a minimum of 20 photographs to show conditions of the project site and adjacent property at the time of substantial completion of the work at the conclusion of construction activities. Take additional photographs as necessary to adequately document the current physical conditions of all improvements to the project site or adjacent property that might have been affected by the activities of construction.

## **'6. Documents and Samples at the Site**

**Unless otherwise provided in the Contract Documents, the General Contractor shall print and copy any drawings and specifications as are reasonably necessary for the execution of the Work.** Each Subcontractor shall have the ability to download the entire set of drawings and specifications at its option, however, every Subcontractor shall be responsible for the scope of their work indicated in any location throughout the drawings and specifications. There is NO GUARANTEE of the division of the scope of work to specific specifications sections or specific drawings.

**'6.1 The Contractor shall maintain at the site** one record copy of the drawings, specifications, addenda, Change Orders and other modifications, in good order and marked currently to record changes and selections made during construction. Unless otherwise directed, the Contractor shall also keep approved Shop Drawings, product data, samples and similar required submittals on hand. These shall be available to the A-E, Owner, and Resident Observer as requested.

**'6.1.1 When the Contractor fails to maintain the record copies indicated in paragraph 6.1 above,** payment of the Contractor's General Conditions costs may be suspended until this provision is complied with satisfactorily.

**'6.2 Upon completion of the Work,** the record documents described above shall be delivered to the A-E for submittal to the Owner along with the as-built drawings.

## **'7. Contract Documents Property of Owner**

**The Contract Documents, and each of them, as well as any other documents furnished by the Owner, shall remain the property of the Owner.** The Contractor shall have the right to keep one (1) copy of the Contract Documents upon completion of the Project; provided, however, that in no event shall the Contractor use, or permit to be used, any portion or all of such Contract Documents on other projects without the Owner's prior written authorization.

## **'8. Supervision and Construction Procedures**

**'8.1 Supervision of the Work.** The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention so as to ensure expeditious, workmanlike performance in accordance with the requirements of the Contract Documents. The Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences



and procedures. He shall be responsible for the acts and omissions of persons directly employed by him, as he is for Subcontractors and others under Article 17. He shall be responsible for coordinating all portions of the Work under the Contract unless the Contract Documents give other specific instructions concerning these matters.

**'8.2 Obligation to Follow Contract Requirements.** The Contractor shall not be relieved of obligations to perform the Work in accordance with the Contract Documents by the activities or duties of the A-E in the A-E's administration of the Contract, or by tests, inspections or approvals required or performed by persons other than the Contractor.

**'8.3 The Contractor shall not perform Work without adequate plans and specifications,** or, as appropriate, approved Shop Drawings, or other submittals. If the Contractor performs Work knowing or believing it involves an error, inconsistency or omission without first providing written notice to the A-E and Owner, the Contractor shall be responsible for such Work and pay the cost of correcting same.

**'8.4 All Work shall strictly conform** to the requirements of the Contract Documents. The Contractor shall not commence or continue any portion of the Work where there is not a complete understanding of the requirements of the Contract Documents. When the Contractor believes that he does not have a complete understanding of the requirements of the Contract Documents, he shall immediately notify the A-E of this fact and shall issue a Request for Information to obtain this complete understanding of the requirements.

**'8.4.1 All branches of work shown on the plans or specified,** whether specifically mentioned or not, shall be executed in strict compliance with all local, state or federal regulations and codes, where the same have jurisdiction. Where the Contractor may be in doubt as the application of a state regulation or code on a specific branch of work, the Contractor shall ask for an interpretation from the A-E prior to proceeding with the work.

**'8.5 The Work shall be continually supervised,** the Contractor bearing full responsibility for any and all acts or omissions of those engaged in the Work on behalf of the Contractor

**'8.5.1 The Contractor shall prepare Daily Construction Reports** and submit these reports through the Owner's Document Collaboration System a minimum of weekly. Failure to submit these Daily Construction Reports in a timely manner shall be reason for withholding of General Conditions amounts from the Contractor's payment requests until such submittal is completed.

**8.5.2 The Contractor's Daily Construction Report shall contain as a minimum** the following information in enough detail as to provide an accounting of the construction site conditions, activities and issues:

- Contractor's Name
- Job Superintendent's Name
- Date of Report
- Weather Conditions – precipitation, temperature, etc.
- Manpower – by trade including number of workmen.
- Brief description of work performed that day.
- Conditions which delay progress of the work.
- Issues that arose needing resolution.
- Resolution of prior issues that were implemented.
- Project Photographs, where appropriate.

**'8.6 The Contractor shall at all times enforce strict discipline and good order** among his employees and Subcontractors and shall not employ on the Work any person not skilled in the Work assigned to him. Strict discipline shall include a prohibition of the use of drugs, alcohol or

any other controlled substance; prohibition of firearms or other weapons; prohibition of unnecessary contact with building occupants; and other objectives of good discipline.

**'8.7** The Contractor shall employ and maintain at the Project site only competent supervisory personnel. Failure to provide proper job site supervision AT ALL TIMES THAT WORK IS IN PROGRESS shall be reason for a change order deduction of a portion of the General Conditions amounts from the Contractor's payment requests for the period of time that job site supervision is not provided.

**'8.8 The Contractor shall have a continuing duty** to read, examine, review, compare and contrast each of the Contract Documents, Shop Drawings, and other submittals and shall give written notice to the Owner and the A-E of any potential conflict, ambiguity, error or omission which the Contractor may find with respect to these documents and their adequacy and sufficiency for construction as required by the Contract before proceeding with the affected Work. The express or implied approval by the Owner or the A-E of any Shop Drawings or other submittals shall not relieve the Contractor of the continuing duties imposed hereby, nor shall any such approval be evidence of the Contractor's compliance with the resulting Contract.

**'8.8.1 The Owner has relied upon the A-E to prepare** documents for the Project, including the plans and specifications for the Project, which are accurate, adequate, consistent, coordinated and sufficient for construction, and in issuing the Contract to the Contractor, the Owner's established legal duties to the Contractor notwithstanding, the Owner has relied upon the A-E's professional expertise in fulfilling its legal duty to the Owner in addition to the Contractor's full and good faith compliance with its duties set forth above.

**'8.9 Superintendent.** The Contractor shall employ a qualified, competent full-time superintendent and any necessary assistants. This superintendent shall be present on site at all times that Work of this contract is underway except with prior written consent of the A-E. It shall be the responsibility of the superintendent to coordinate the work of all the Subcontractors.

**'8.9.1 The Owner reserves the right to accept the Superintendent** selected by the Contractor. This full-time Project Superintendent shall be qualified and experienced to supervise the work of this Contract. The Contractor shall notify the A-E and Owner in writing for acceptance prior to any change in supervisory personnel. This change shall be for reasons outlined below.

**'8.9.1.1 The Contactor shall immediately replace a Superintendent upon written notice from the Owner that the current Superintendent is unsatisfactory.** The Owner has the right to require replacement of a Superintendent at any time that the Owner loses confidence in the Superintendent: to adequately perform the duties required of the Contract Documents; to complete the Work in strict adherence to the Contract Documents; to maintain the project schedule; or to be present at the project site at all times Work is in progress, except as authorized by the A-E. The Owner also has the right to require the replacement of the Superintendent for inappropriate or unprofessional conduct either on the project site or directed toward the A-E/ Engineer, the Owner's Representatives (DECA personnel), the Using Agency Representatives, or the general public.

**'8.9.2 This Superintendent shall have full and complete authority** to act on behalf of the Contractor in all matters related to this project, except as defined in written form by the Contractor and accepted in writing by the Owner. All instructions given to the superintendent shall be considered as given to the Contractor.

**'8.9.3 The superintendent shall not be changed** except under the following circumstances:

**'8.9.3.1** where the superintendent proves to be unsatisfactory to the Contractor or ceases to be in his employ, in which case the Contractor shall give timely prior written notice to the Owner of the impending change in superintendent and a reasonable explanation for the change; or

**'8.9.3.2** where the Owner has reasonable grounds for dissatisfaction with the performance of the superintendent and gives written notice to the Contractor of these grounds. The Contractor, upon receiving such written notice, shall replace the existing superintendent with a successor, to whom the Owner has no objection.

**'8.9.4 Should the Contractor not provide the superintendent as required by the Contract Documents to oversee all work being performed on this Contract,** the Owner has the right to deduct by Change Order the amount of General Conditions costs from the Contract Sum for the period in which proper Superintendence of the Work is not provided. This amount is determined by dividing the complete amount of General Conditions indicated in the approved Schedule of Values by the number of months of project duration according to the approved Project Schedule.

**'8.10 Contractor's Project Manager.** In addition to the Superintendent required in article '8.9, the Contractor may employ a qualified, competent Project Manager. In the absence of an assigned Project Manager, the principal owner of the Contractor's Company shall be considered as the Project Manager. This Project Manager is not required be present on site at all times that Work of this contract is underway, but shall be intimately familiar with the status of the Work of the Project at all times. It shall be the responsibility of the Project Manager to supervise the Superintendent and represent the Contractor in all matters.

**'8.10.1 The Owner reserves the right to accept the Project Manager** selected by the Contractor. This Project Manager shall be qualified and experienced to manage the work of this Contract and represent the Contractor in all matters. The Contractor shall notify the A-E and Owner in writing for acceptance prior to any change in project management personnel. This change shall be for reasons outlined below.

**'8.10.1.1 The Contactor shall immediately replace a Project Manager upon written notice from the Owner that the current Project Manager is unsatisfactory.** The Owner has the right to require replacement of a Project Manager at any time that the Owner loses confidence in the Project Manager to adequately perform the duties required of the Contract Documents: to manage the Work in strict adherence to the Contract Documents; to maintain the project schedule; or to supervise the Superintendent. The Owner also has the right to require the replacement of the Project Manager for inappropriate or unprofessional conduct either on the project site or directed toward the A-E/ Engineer, the Owner's Representatives (DECA personnel), the Using Agency Representatives, or the general public.

**'8.10.2 This Project Manager shall have full and complete authority** to act on behalf of the Contractor in all matters related to this project. All instructions given to the Project Manager shall be considered as given to the Contractor.

**'8.10.3 The Project Manager shall not be changed** except under the following circumstances:

**'8.10.3.1** where the Project Manager proves to be unsatisfactory to the Contractor or ceases to be in his employ, in which case the Contractor shall give timely prior written notice to the Owner of the impending change in Project Manager and a reasonable explanation for the change; or

**'8.10.3.2** where the Owner has reasonable grounds for dissatisfaction with the performance of the Project Manager and gives written notice to the Contractor of these grounds. The Contractor, upon receiving such written notice, shall replace the existing Project Manager with a successor, to whom the Owner has no objection.

**'8.10.4 Should the Contractor fail to replace an unsatisfactory Project Manager as required by written notice of the Owner,** the Owner has the right to deduct by Change Order the amount of General Conditions costs from the Contract Sum for the period in which there is a refusal to make the required replacement. This amount is determined by dividing the complete amount of General Conditions indicated in the approved Schedule of Values by the number of months of project duration according to the approved Project Schedule.

**'8.11 Temporary Support Facilities Required:** The Contractor shall provide temporary job offices for use by the Job Superintendent, A-E, Resident Observer (if applicable) and the Owner during the course of construction from the time of commencement of the Work until Substantial Completion. Provide electric, water, HVAC internet access and telephone for all areas of the temporary job office. This job office shall be large enough to accommodate project meetings and to provide for construction management operations. Where a Resident Observer is utilized on the project, a separate office shall be provided for the Resident Observer's use with electric, water, HVAC, telephone and internet access.

## **'9. Labor, Material, and General Contractor Warranty**

**'9.1 Contractor Provisions.** Unless otherwise stipulated, the Contractor shall provide and pay for all materials, supervision, labor, water, tools, equipment, light, power, temporary heat, hoist, supplies, appliances, transportation, and other facilities and things necessary for the execution and completion of the Work.

**'9.1.1 In the event the Owner elects to make available the electric power or domestic water, at no cost, to the Contractor for construction purposes,** the election to do so will be spelled out in the Special Conditions for this project. Available electric power provided by the Owner, at his election, shall not be utilized as a means for temporary heat without specific approval from the Owner in writing.

**'9.1.2 Additionally, the Owner reserves the right to cease to provide this available electric power and/or domestic water, at no cost to the Contractor,** should it be found that the electric power and/or domestic water is not reasonably used economically.

**'9.2 General Contractor Warranty.** The Contractor warrants to the Owner and A-E that materials and equipment furnished under the Contract will be of good quality and new unless otherwise required or permitted by the Contract Documents, that the Work will be free from defects not inherent in the quality required or permitted, and that the Work will strictly conform with the requirements of the Contract Documents.

**'9.2.1** The Contractor shall warrant all equipment, materials, products, and workmanship provided by the Contractor under these Contract Documents not only during the Contract period but also for a period of twelve (12) months after the Date of Final Completion.

**'9.2.1.1 The One Year Warranty period for correction of Work shall be extended with respect to portions of the Work first performed after the Date of Substantial Completion** by the period of time between Substantial Completion and the actual completion of that portion of the Work.

**'9.2.2 Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective.** While, the Contractor's warranty excludes remedy for damage or defect caused by abuse by the Owner or building occupants, modifications not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear under normal usage, if the Work is not conforming to the requirements of the Work and that has been determined to be defective, is not excluded from the Contractor's One Year Warranty.

**'9.2.3 If, during the Contract Period or during the One Year Warranty period** (a) any equipment, materials or products furnished and/or installed by the Contractor are found to be defective in service by reason of the Contractor's faulty process, structural and/or mechanical design or specification, or (b) any equipment, materials, or products furnished and/or installed by the Contractor are found to be defective by reason of defects in material or workmanship, the Contractor shall, promptly after receipt of written notice from the Owner or A-E, repair or cause to be repaired such defective equipment, materials or products, or replace such defective equipment, materials, or products.

**'9.2.3.1 During the One Year Warranty Period for correction of the Work, if the Owner fails to notify the Contractor** and give the Contractor the opportunity to make correction, the Owner waives the right to require correction by the Contractor and to claim a breach of Warranty. However, this inaction during the Warranty Period by the Owner does not imply any limitation of the Contractor's liability as indicated in paragraph '9.2.7.

**'9.2.3.2 During the One Year Warranty Period for correction of the Work, if the Owner notifies the Contractor** and gives the Contractor the opportunity to make correction, and the Contractor fails to correct the Work with reasonable promptness, the Owner has the right to claim a breach of Warranty.

**'9.2.4 The Contractor's warranty shall not exclude** remedy for damage or defect caused by abuse by the Contractor, his subcontractors, or others within his control during the construction period or during work related to Contractor warranty.

**'9.2.4.1 Any portion of the Work required by the Contract Documents shall not be waived as a requirement for Completion of the Work, except by specific written authorization from the Associate Director of the Division of Engineering and Contract Administration for reasons where, by no fault of the Contractor, could not be completed within the time established for Completion of the Work.**

**'9.2.5 If during the Contractor's warranty period, there is a question concerning the quality or kind of materials and equipment installed in this project,** and requested by the A-E, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

**'9.2.6 In the event of multiple failures of major consequence in similar equipment, products, components or systems, prior to the expiration of the one-year warranty** described above, the affected equipment, product, component or system shall be disassembled, inspected, and modified or replaced as necessary to prevent further occurrences. All related components which may have been damaged or rendered non-serviceable as a consequence of the equipment, product, component or system failure shall be replaced.

**'9.2.6.1 As used herein, multiple equipment, product, component or system failures shall be interpreted to mean two (2) or more successive failures of the same kind in the same item of equipment, product, component or system or**

failures of the same kind in two (2) or more items of equipment or product, or in a specific building system or component.

**'9.2.6.2 Major equipment failures may include**, but are not limited to, cracked or broken housings, piping, or vessels, excessive deflections, bent or broken shafts or structural members, broken or chipped gear teeth overheating, premature bearing failure, excessive wear, or excessive leakage around the seals.

**'9.2.6.2.1 Equipment failures which are directly and clearly traceable to operator abuse**, such as substitution of unauthorized replacement parts, use of incorrect lubricants or chemicals, flagrant over or under lubrication and using maintenance procedures not conforming with published maintenance instructions, shall be exempted from the scope of the one-year warranty.

**'9.2.6.3 Major product, component or system failures may include**, but are not limited to, failure of the item to perform as intended, excessive wear, discoloration due to defective finish application, leakage, or inadequacy of performance as specified.

**'9.2.6.3.1 Product, component, or system failures which are directly and clearly traceable to building user or operator abuse**, such as substitution of unauthorized replacement parts, use of incorrect lubricants or chemicals, flagrant over or under lubrication, using maintenance procedures not conforming with published maintenance instructions, and abuse or vandalism, shall be exempted from the scope of the one-year warranty.

**'9.2.6.4 Should multiple equipment, product, component or system failures occur** in a given item or type of equipment, product, component or system, all items of the same size and type shall be disassembled, inspected, modified or replaced, as necessary, and re-warranted for one year.

**'9.2.6.5 A new twelve (12) month warranty against defective or deficient design, workmanship, and materials** shall commence on the day that the item of equipment is reassembled and placed back into operation.

**'9.2.7 No specific provision of this Article nor any provision in the Contract Documents, nor any special guarantee time limit** implies any limitation of the Contractor's liability with the laws of the Commonwealth of Kentucky.

**'9.3 Substitution - Materials and Equipment.** Substitution of previously approved equipment and materials shall be submitted to the A-E for acceptance and will be considered only for the following reasons:

**'9.3.1** unavailability of the material or equipment due to conditions beyond the control of the Contractor

**'9.3.2** inability of the supplier to meet Contract schedule; or

**'9.3.3** technical and immaterial noncompliance to specifications.

Inclusion of a certain, make or type of materials or equipment by the Contractor shall not obligate the A-E or Owner to accept such material or equipment if it does not meet the requirements of the plans and specifications.



Substitutions not properly approved and authorized by the A-E and Owner may be considered defective work. The Contractor shall, if required, furnish satisfactory evidence as to the kind and quality of materials and equipment.

**'9.4 Recycled Content:** KRS 45A.520 mandates that every state agency require a minimum recycled content for those materials it purchases. In accordance with 200 KAR 5:330, all listed products are to be offered by the awarded contractor ONLY as a recycled product. Except as provided in KRS 45A.510, construction related materials requiring a minimum recycled content include Building Insulation, Aluminum products, concrete, cement and steel products. For a complete listing of those items requiring minimum recycled content please refer to 200 KAR 5:330 <http://www.lrc.state.ky.us/kar/200/005/330.htm>

## **'10. Surveys, Permits, Fees, Notices, and Tests**

**'10.1 Owner-Furnished Surveys.** The Owner shall furnish whatever surveys are specifically required by the Contract Documents. Approvals, assessments, easements for permanent structures or permanent changes in existing facilities, and utility tap-on fees shall be secured and paid for by the Owner, unless otherwise provided in the Contract Documents.

**'10.1.1 Prior to start of Construction, the Owner will furnish all land and rights-of-way** necessary for the carrying out and completion of the Work to be performed under this Contract, except as outlined in the Special Conditions should any conditions exist at the start of construction which does not make this possible at the start of construction.

**'10.2 Permits.** Building, sewer, and water permits and similar kinds of permits required by local ordinances shall be obtained by the General Contractor. Note: no building permit fee shall be charged to or paid by the Contractor as the Commonwealth is exempt from such charges levied by Local Government Jurisdictions. The Contractor shall procure and pay for any necessary licenses to do business in the locale of the Work.

**'10.3 Notices.** The Contractor shall comply with and give notices required by laws, ordinances, rules, regulations and lawful orders of public authorities bearing on the performance of the Work.

**'10.4 Required Regulatory Tests and Inspections.** Regulatory agencies of the State and Federal governments having jurisdiction may require any Work to be inspected, tested or approved. The Contractor shall assume full responsibility therefore, including related costs, unless otherwise noted, and shall furnish the A-E the required certifications of inspection, testing or approval.

**'10.4.1 The Contractor shall pay the electrical inspection fees** directly to the Commonwealth of Kentucky, Department for Housing and Building Construction. The Electrical subcontractor is responsible for the payment of this fee. The Electrical subcontractor is responsible for coordination of the required electrical inspections as required by the Department for Housing and Building Construction.

**'10.5 Any delays by governmental agencies in obtaining Permits, Notices, Required Regulatory Tests and Inspections (10.2, 10.3, 10.4)** and not the fault of one of the parties shall be shared by the Contractor and Owner with appropriate time extensions only. Liquidated damages and Contractor compensation for such delays or impact are not applicable and shall not be payable.

**'10.6 Payment for Tests.** Tests of materials, products and equipment in place, required by the A-E or the Owner, to prove quality standards shall be paid by the Contractor. Should results of testing indicate that construction is not in compliance with Contract Documents, the Contractor shall bear the cost of any additional tests of the materials, products or equipment.

**'10.6.1 The Contractor shall give the A-E timely notice** of readiness of the Work for all inspections, tests or approvals. This timely notice of readiness shall be no less than 72 hours except by prior agreement between the A-E and the Contractor.

**'10.7 Local Building Permits and fees.** The Commonwealth's Construction projects are exempt from Building Permit requirements of Local Governments. The Contractor is not obligated to obtain a local building permit or to pay a building permit fee. However, this exemption does not waive the requirement for fees to make connection to utilities owned by a local municipality, Local Health Department Fees, or other such requirements.

## **'11. Protection of Work, Property, Employees and Public**

**'11.1 Safety Precautions and Programs.** The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Project. The Contractor shall be responsible for compliance with all State and Federal OSHA rules and regulations.

**'11.2 Safety of Persons and Property.** The Contractor shall continuously maintain adequate protection of all Work from damage and shall protect the Owner's property from injury or loss arising in connection with this Contract. He shall make good any such damage, injury, or loss, except such as may be directly due to errors in the Contract Documents or caused by agents or employees of the Owner. He shall adequately protect adjacent property as provided by law and the Contract Documents.

**'11.2.1 The Contractor shall take all necessary precautions** for the safety of his employees and the employees of his subcontractors on the Work site, and shall comply with all applicable provisions of federal, state, and municipal safety laws and building codes to prevent accidents or injury to persons on, about, or adjacent to the premises where the Work is being performed.

**'11.2.2 The Contractor shall provide and maintain a Work environment** and procedures which will safeguard the public and State personnel and agents, property, material, supplies and equipment exposed to Contractor operations and activities; avoid interruptions of user agency operations; and avoid delays in Contract completion dates.

**'11.2.2.1 Utilities which serve occupied building(s) shall not be interrupted unless absolutely necessary.** When temporary utility interruptions are necessary, the Contractor shall provide the A-E and Owner a notice seven (7) calendar days prior to the temporary interruption. Where it is not practical to provide a seven (7) calendar day notice, the Contractor shall notify the A-E and Owner of the temporary interruption in advance and confirm the actual utility outage/ interruption a MINIMUM of seventy-two (72) hours ahead of the outage/ interruption.

**'11.2.2.2 When utilities are accidentally interrupted that serve occupied building(s),** the Contractor shall immediately notify the A-E, the Owner and the Building Operations Representative, and work consistently and persistently to restore the utilities immediately. The Contractor will be responsible for any costs or damages incurred by the Owner or adjacent property owners in the event of an accidental interruption.

**'11.2.3 For the purposes of protecting the safety of persons and property,** the Contractor shall provide appropriate safety barricades, signs and signal lights; Comply with any safety requirement published by any governmental authority with jurisdiction over the



site, including Federal, State or local jurisdictions; and ensure that any additional measures which are reasonably necessary for these purposes are taken.

**'11.2.4 The Contractor shall designate a responsible member** of his organization present on the Work site as safety officer whose duty shall be to enforce safety regulations. The name and position of the person so designated shall be reported to the A-E by the Contractor at the beginning of the project. Should the Contractor have reason to change the responsible member designated with this task, he shall immediately inform the A-E in writing.

**'11.2.5 In an emergency affecting the safety** of life, or of the Work, or of adjoining property, the Contractor, without special instruction or authorization from the A-E or Owner, shall act at his discretion to prevent such threatened loss or injury. Immediately following the emergency, the Contractor shall file a written report to the A-E and Owner detailing the incident and the actions taken to mitigate the condition.

**'11.2.6 If the A-E or the Owner becomes aware of any noncompliance** by the Contractor with the safety conditions of this Contract or of any condition caused by the Contractor, which poses a serious or imminent danger to the health or safety of the public or to State personnel, they shall notify the Contractor orally, with written confirmation, and direct immediate initiation of corrective action.

**'11.2.6.1 This provision of providing notice to Contractor** for noncompliance with safety issues does not in any way relieve the Contractor from his responsibilities, either in part or in full, to provide adequate precautions to insure the safety of persons and property.

**'11.2.6.2 This Notice**, when given to the Contractor or his representative at the Work site, shall be deemed sufficient notice of noncompliance and that corrective action is required.

**'11.2.6.3 After receiving the Notice**, the Contractor shall immediately take corrective action. If the Contractor fails or refuses to promptly take corrective action, the A-E may issue an order stopping all or part of the Work until satisfactory corrective action has been taken.

**'11.2.6.3.1 The Contractor shall not be entitled** to an equitable adjustment of the Contract price or an extension of the performance schedule by reason of the issuance of any stop Work order under this Article.

**'11.3 Hazardous Materials.** In the event the Contractor unexpectedly encounters on the site material reasonably believed to be asbestos, lead based paint, polychlorinated biphenyl (PCB) or other classified hazardous substances/materials which have not been rendered harmless, the Contractor shall immediately stop Work in the area affected and report the condition to the Owner and A-E in writing. The Work in the affected area shall not thereafter be resumed except by written agreement of the Owner and Contractor if in fact the material is asbestos, lead based paint, polychlorinated biphenyl (PCB), or other classified hazardous substances/materials which have not been rendered harmless. The Work in the affected area shall be resumed in the absence of any classified hazardous substances/materials or when it or they have been rendered harmless.

**'11.3.1 The Contractor shall at all times safely guard the Owner's property and adjacent property from injury and/or loss** resulting from the release of hazardous or toxic materials, or similar damage in connection with the Contract Documents or the performance of the Work hereunder. The Contractor shall replace or make good any damage, loss or injury caused as a result of failure to comply with Contract Documents.

## **'12. Inspection of Work / Defective or Incomplete Work / Special Inspections**

The Owner, the A-E, Special Inspector Agency and their representatives shall at all times have access to the Work whenever it is in preparation or progress and the Contractor shall provide proper facilities for such access and for inspection. This access shall include access to approved Construction Documents and Submittals. The Contractor shall be given timely notification in order to arrange for proper inspection of any Work performed outside of the normal working day or week.

**'12.1 If the specifications, the A-E's instructions, laws, ordinances, or any public authority require any Work to be specially tested or approved,** the Contractor shall give the A-E timely notice of its readiness for inspection. Inspections by the A-E shall be made promptly, as defined by the Contract between the Owner and the A-E.

**'12.2 In the event that the Contractor covers, conceals or obscures its Work in violation of the Contract** or in violation of a directive from the Owner or the A-E, such Work shall be uncovered and displayed for the Owner's or A-E's inspection upon request, and shall be reworked at no cost in time or money to the Owner.

**'12.2.1 If any of the Work is covered, concealed or obscured in a manner not covered by the above paragraph,** it shall, if directed by the Owner or the A-E be uncovered and displayed for the Owner's or A-E's inspection. If the uncovered Work conforms strictly to the Contract, the costs incurred by the Contractor to uncover and subsequently, replace such Work shall be borne by the Owner. Otherwise, such costs shall be borne by the Contractor.

**'12.3 The Contractor shall, at no cost in time or money to the Owner,** correct Work rejected by the Owner or by the A-E as defective or failing to conform to the Contract. Additionally, the Contractor shall reimburse the Owner for all testing, inspections and other expenses incurred as a result thereof.

**'12.4 The Owner may, but shall in no event be required to, choose to accept defective or nonconforming Work.** In such event, the Contract Price shall be reduced by the greater of (1) the reasonable costs of removing and correcting the defective or nonconforming Work, and (2) the difference between the fair market value of the Project as constructed and the fair market value of the Project had it not been constructed in such a manner as to include defective or nonconforming Work. If the remaining portion of the unpaid Contract Sum, if any, is insufficient to compensate the Owner for the acceptance of defective or nonconforming Work, the Contractor shall, upon written demand from the Owner, pay the Owner such remaining compensation for accepting defective or nonconforming Work.

**'12.5 When Special Inspections are required** by Section 1704 of the Kentucky Building Code for any portion of the work, the following provisions shall apply:

**'12.5.1 Special Inspector Agency or Special Inspector:** An independent agency/ registered professional Contracted by the Owner, required by the Kentucky Building Code Chapter 17, and responsible for conducting special inspections and testing defined as such in the technical specifications for this project.

**'12.5.1.1 The costs of the initial special inspections and testing** shall be borne by the Owner by separate contract with the Special Inspection Firm.

**'12.5.1.2 The costs of re-inspections and/or re-testing, should discrepancies be found,** shall be paid by the Owner, but is recoverable by the Owner from the Contractor by a credit change order.

**'12.5.1.3 The costs of re-scheduling inspections and/or testing**, where the Contractor through his lack of reasonable control of scheduling causes the Special Inspector to spend time in preparation for an inspection and/or test that did not occur as scheduled, shall be paid by the Owner, but is recoverable by the Owner from the Contractor by a credit change order.

**'12.5.2 Contract Document Compliance:** Special Inspection and testing as defined in the technical specifications is for the purpose of verifying compliance with requirements specified or indicated. This does not relieve the Contractor of the responsibility for compliance with the Contract Document requirements.

**'12.5.2.1 Should the Special Inspector identify through inspection and testing that a portion of the Work is not in compliance with the technical specifications**, the Special inspector is to provide notice to the A-, Owner and Contractor concurrently that a deviation exists. The Special Inspection Firm does not possess the authority to modify the requirements of the technical specifications, but to inspect, test and notify of any non-compliance or deficiencies.

**'12.5.2.2 When a non-compliance or deficiency exists** as reported by the Special Inspection Firm, the A-E is to review the Special Inspection Report and, when necessary, issue a "Defective Work in Place Notice" to the contractor to require correction or modification.

**'12.5.2.3 Should the Special Inspector consider that there are a potential issue with the requirements of the technical specifications due to discovered existing field conditions**, the Special Inspector is to include such consideration in the Special Inspection Report for review and interpretation by the A-E. The decision of the A-E is final.

**'12.5.3 Notify the Special Inspector:** The Contractor shall be responsible for notifying the Special Inspector and/or Special Inspection Agency regarding individual inspections required by the Contract Documents and coordinating the schedule of inspections and testing with the Contractor's approved construction schedule. Adequate notice shall be provided so that the Special Inspector has time to become familiar with the project.

**'12.5.4 Deficiencies:** The Contractor shall be responsible to ensure that deficiencies are corrected and shall coordinate with the Special Inspector to ensure that the Special Inspector has observed the corrected deficiency prior to the work involved in the discrepancy being concealed or made inaccessible by subsequent work. Concealing or making inaccessible such deficiencies shall constitute another deficiency subject to removal to allow observation of the work involved in the initial discrepancy.

**'12.5.5 Reporting Requirements:** The Special Inspection Agency/ Special Inspector shall keep records of all inspections and testing, re-inspections and re-testing, and other related events. The Special Inspector shall furnish inspection and testing reports to the Owner, Contractor, and A-Eing concurrently and as construction progresses. Reports shall be submitted immediately following each site visit, inspection and when determinations of results of off-site testing are available.

**'12.5.5.1 Reports shall include** date of issue; project title and number; name/ address/ telephone number of testing agency; dates and locations of samples and tests or inspections; names of individuals making tests and inspections; description of the work being tested or inspected; test and inspection method; specification section related to work; complete test or inspection data; test and inspection results; interpretation of results; all non-conforming items/ discrepancies observed and corrective actions implemented by the Contractor; re-testing and re-inspection

performed; ambient conditions at time of sampling, testing or inspection; comments or professional opinion on whether tested or inspected work complies with the Contract Documents and name/ signature of inspector with registration number.

**'12.5.6 Notification of non-conforming or deficiency of the Work:** The Special Inspection Firm/ Special Inspector shall immediately bring non-conforming or discrepancy work to the attention of the Owner, A-E and Contractor. The A-E shall make a determination as to the need for correction.

**'12.5.6.1 If non-conforming or deficiency work is** not corrected in a timely manner or are about to be incorporated into the Work, the Special Inspector shall bring the non-conforming or discrepancy work to the immediate attention of the Authority Having Jurisdiction, Owner, Contractor, and the A-E, and that item shall be highlighted in the Special Inspector's written report.

**'12.5.6.2 Defective Work in Place Notice:** The A-E is to review the Special Inspector's report and when necessary shall issue a "Defective Work in Place Notice" and issue it through the Document Collaboration System. The Special Inspector shall cause the Notice to be posted at the Project Site regarding the noted discrepancies and which shall contain, at a minimum, the following information about the non-conforming item: 1) Description and exact location; 2) Reference to applicable detail of the approved Construction Documents (Drawings and Specifications); 3) name and title of each individual notified and method of notification; and, 4) Resolution or corrective action taken or to be taken.

### **'13. Royalties and Patents**

The Contractor shall pay all royalties and license fees and shall defend all suits or claims for infringement of any patent rights and shall save the Owner harmless from loss on account thereof.

### **'14. Changes in the Work/ Change Orders**

**'14.1 Change Orders.** One or more changes to the Work within the general scope of the Contract may be ordered by Change Order. The Contractor shall proceed with any such changes, (including additions, reductions, deletions, other revisions), and same shall be accomplished in strict accordance with the following:

**'14.1.1 Change Order means a written order to the Contractor** executed by the Owner and the A-E after execution of the Contract, directing a change in the Work and may include a change in the Contract Price, or the Contract Time, or any combination thereof. There shall be no authorized changes in the Work which affect either Contract Price or Contract Time without a fully executed Change Order.

**'14.1.1.1 In specific instances where the progress of the Work would be negatively affected** by a delay in the Work while a fully executed Change Order is being processed.. Upon approval by the Associate Director of the Division of Engineering, and with an agreed to Contract Sum/Contract Time adjustment, the A-E may issue a written authorization to proceed with the proposed change (with the change in Contract Sum/ Contract Time clearly indicated) prior to the issuance and execution of the formal Change Order. Following this written authorization to proceed with the proposed change, the A-E will prepare and process for execution the required Change Order.

**'14.1.1.2 In these specific instances where a written authorization to proceed is provided prior to execution of the required Change Order**, the action of the Contractor to proceed with the authorized work shall be deemed as agreement to the change for the Amount and Time extension indicated in the written notice to proceed with the change.

**'14.1.2 Any change in the Contract Sum or Contract Time resulting from a Change Order shall be determined by one of the following methods:**

(1) **by mutual agreement of a lump sum amount** and/or Time adjustment between the Owner and the Contractor as evidenced by (a) the Change in the Contract Sum or Contract Time being set forth in the Change Order, (b) such change in the Contract Sum or Contract Time, together with any conditions or requirements relating thereto, being initialed by both parties and (c) the Contractor's execution of the Change Order;

(2) **by unit prices stated in the Contract Documents** or subsequently agreed upon by the Owner and the Contractor

(3) **on a time and materials basis with a not to exceed price limitation**, when the scope of the Work is not readily determined prior to the execution of the Work. Prior to the use of a time and materials basis, approval of the Associate Director of the Division of Engineering is required. Additionally, the Contractor must provide detailed labor and materials documentation of the Work once performed for the reconciliation of the time and materials basis cost of the work. The A-E shall monitor the Work performed by this basis during the execution of the work; or

(4) **If no mutual agreement occurs** between the Owner and the Contractor, the Change in the Contract Sum, if any, shall be derived by determining the reasonable actual costs or savings achieved resulting from revisions in the Work. This determination shall be made by the A-E, who has the responsibility of interpretation of the Contract Documents.

**'14.1.2(4).1 When a determination by the A-E is required for a Change Order** due to no mutual agreement being reached between the Owner and the Contractor, the provisions of paragraph '14.1.3 and '14.1.4 shall apply. Additionally, the Contractor shall not refuse to perform the Work indicated by the Change Order and shall execute the Work in a timely manner, even if the Contractor intends to protest the determination as provided in paragraph '3.4

**'14.1.3 Items (1), (3), and (4) above shall include a component for all overhead, profit, indirect costs or other items not to exceed fifteen percent (15%).** Any such costs or savings shall be documented in the format and with such content and detail as the Owner or the A-E requires. The Contractor shall only receive one fifteen percent (15%) for the "jobsite overhead and profit" component whether such work be done by the Contractor or by his Subcontractor.

**'14.1.3.1 Contractor's Overhead and Profit percentages** shall be considered to include bonds and insurance, field and office supervisors and assistants (including Project Manager(s), Job Site Superintendent(s), Project Engineers and assistants, and Crew Foremen), Job Office and storage Trailers, sanitary facilities, communications (telephone and internet), temporary utilities, temporary facilities, testing, security, use of small tools, incidental job burdens, and general home office expenses and no separate allowance shall be made therefore.

**'14.1.3.2 Assistants to field and office supervisors include all clerical, stenographic and general office help.** Incidental job burdens include, but are not

necessarily limited to, office equipment and supplies, and conformance to OSHA requirements and no separate allowance shall be made therefore.

**'14.1.3.3** Items such as, but not necessarily limited to, review and coordination, estimating and expediting relative to contract changes are associated with field and office supervision and are considered to be included in the contractor's overhead and/or fee percentage.

**'14.1.4 For all charges relating to any Change Order, whether determined under subparagraph (2), (3) or (4) above, the following provisions shall apply:**

(1) **The Contractor shall keep and present in such form as the A-E may direct, a correct account of all items in such form comprising the net cost of such Work, together with vouchers.**

(2) **The determination of the A-E shall be final (except as provided in paragraph '3.4) upon all questions of the amount and cost of Changes in the Work, and it shall include in such cost, the cost to the Contractor of all materials used, of all labor, common and skilled, or foremen, trucks and teams, and the fair rental of all machinery used and for the period of such use.**

(3) **If said Work requires the use of machinery not already upon the work or to be otherwise used upon the Work, then the cost of transportation of such machinery to and from the Work shall be added to the fair rental, but said transportation shall not cover a distance exceeding one hundred (100) miles.**

(4) **The A-E shall not include in the net cost of Work any cost or rental or small tools, or any portion of time of the Contractor or his Superintendent, or any allowance for the use of capital, or any additional bond premium, insurance cost applicable to the Work or any actual or anticipated profit, or any job or office overhead not previously mentioned, these items being considered as being covered by the added fifteen (15%) percent for the jobsite overhead and profit component.**

(5) **In all cases where Changes in the Work are covered by unit prices set forth in the Contract, the value of such Work shall be determined only upon the basis of such unit prices.**

(6) **Pending final determination of value, payments on Changes in Work shall be made only upon the estimate of the A-E.**

**'14.1.5 If the Contractor claims that any instructions by the A-E involve additional cost and/or time extension, he shall give the A-E written notice thereof within a reasonable time after the receipt of such instructions and before proceeding to execute the change in Work.**

**'14.1.6 No work related to a Change Order shall be undertaken without a fully executed Change Order.** However, should the Owner and Contractor agree that time is of the essence for the execution of said work, the Owner will issue through the A-E in writing a notice to proceed with the said work prior to the full execution of the Change Order. This notice is to be upon acceptance by the Associate Director of the Division of Engineering. This notice to proceed with said work will include an acceptance of the proposed pricing of the work or will indicate that the pricing of the work is still being negotiated.



**'14.1.7 If the Owner and Contractor cannot agree on the effect of an ordered change on the adjustment to the Contract Sum or Contract Time**, this matter may also be referred to the A-E for determination.

**'14.1.7.1 If the Owner and/or Contractor do not agree with the A-E's determination regarding the valuation of a change**, the related adjustment to the Contract Sum or to the Contract Time, the matter shall be subject to the disputes procedure set out in Article 3.4 and Article 26.

**'14.1.8 The execution of a Change Order by the Contractor shall constitute conclusive evidence of the Contractor's agreement to the ordered changes in the Work, the resulting Contract as thus amended, the Contract Sum and the Contract Time for performance by the Contractor.** The Contractor, by executing the Change Order, waives and forever releases any claim against the Owner for additional time or compensation for matters relating to or arising out of or resulting from the Work included within or affected by the executed Change Order.

**'14.1.9 The Contractor shall notify and obtain the consent and approval of the Contractor's Payment and Performance Bond sureties with reference to all Change Orders** if such notice, consent or approval are required by the Owner, the A-E, the Contractor's sureties or by law. The Contractor's execution of the Change Order shall constitute the Contractor's warranty to the Owner that the sureties have been notified of, and consent to, such Change Order and the sureties shall be conclusively deemed to have been notified of such Change Order and to have expressly consented thereto.

**'14.2 Cash Allowance:** It is understood that the Contractor has included in the Contract Price all allowances (see Article '30 for more information) so named in the Contract Documents and shall cause the Work so covered to be furnished and performed for such sums as may be acceptable to A-E and the Owner. The Contractor agrees that:

**'14.2.1 The allowances include the cost to Contractor** (less any applicable trade in counts) of materials and equipment required by the allowances to be delivered at the site, and all applicable taxes; and

**'14.2.2 The Contractor's cost for** unloading and handling on the site, labor, installation costs, overhead, profit and other expenses contemplated for the allowances have been included in the Contract Price and not in the allowances and no demand for additional payment on account of any of the foregoing will be valid; and

**'14.2.3 Prior to final payment of the full amount of the allowance** (on the schedule of values), an appropriate Change Order will be issued as recommended by A-E reflect actual amounts due the Contractor on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

**'14.3 Minor Changes.** The A-E may authorize minor changes in the Work which do not involve additional cost or extension of the Contract Time, and which are not inconsistent with the intent of the Contract Documents. Such changes shall be effected by a Field Order issued by the A-E to the Contractor and Owner concurrently, which shall be binding on the Owner and Contractor. The Contractor shall carry out such orders promptly.

**'14.3.1 However, if the Contractor claims that a Field Order involves additional cost or a delay to completion of the Work**, he shall give the A-E written notice thereof within a reasonable time after receipt of the Field Order. Otherwise, he shall be deemed to have waived any right to claim an adjustment to the Contract Sum or to the Contract Time.

## **'15 Project Records**

**'15.1 All documents relating in any manner whatsoever to the Project**, or any designated portion thereof, which are in the possession of the Contractor, or any Subcontractor of the Contractor, shall be made available to the Owner or the A-E for inspection and copying upon written request by the Owner.

Furthermore, said documents shall be made available, upon request by the Owner, to any state, federal or other regulatory authority and any such authority may review, inspect and copy such records.

Said records include, but are not limited to all drawings, plans, specifications, submittals, correspondence, minutes, memoranda, tape recordings, videos, or other writings or things which document the Project, its design, and its construction.

Said records expressly include those documents reflecting the cost of construction to the Contractor.

**'15.2** The Contractor shall maintain and protect these documents for no less than ten (10) years after final completion of the Project, or for any longer period of time as may be required by law or good construction practice.

## **'16. Delays and Extensions of Time**

**'16.1 It is agreed that time is of the essence for each and every portion of the resulting Contract** and where under the Contract an additional time is allowed for the completion of any Work, the new time limit fixed by such extension shall be of the essence of the Contract. Provided, that the Contractor shall not be charged with liquidated damages or any excess cost when the delay in completion of the Work is due to:

- (1) any preference, priority, or allocation order duly issued by the government;
- (2) unforeseeable cause beyond the control and without the fault or negligence of the Contractor, including, but not restricted to, acts of God, or of the public enemy, acts of the Owner, acts of another contractor in the performance of a contract with the Owner, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes and unusually severe weather; or
- (3) any delays of Subcontractors or suppliers occasioned by any of the causes specified in subsections (1) and (2) of this Article.

**16.1.1 Delay that is NOT caused by the Owner or Contractor**, that delays the critical path of the project schedule, may result in extension of Contract Time but not an increase in Contract Sum. Such delay includes: Acts of God; Labor disputes/ Strikes; Freight embargoes; Fire (when not attributable to act of Contractor); Unusual delays in deliveries (when not attributable to act of Contractor); Health epidemics that affect Contractor forces; and, Other causes beyond the control of the Contractor or Owner. Note: an increase of time caused by a delay that is NOT caused by the Owner or Contractor, does not constitute reason for an increase in Contract Sum.

**'16.1.1.1 The Contractor shall, within fifteen (15) calendar days of the occurrence** of the event that caused a delay not caused by the Owner or Contractor, notify the A-E and Owner in writing. The A-E shall ascertain the facts and extent of the delay and notify the Contractor within a reasonable time of its decision in the matter. Any change in the Contract Time resulting from any such claim shall be incorporated in a Change Order. Such a claim shall not result in an increase in Contract Sum.



**'16.1.1.1.1 Should the Contractor NOT provide written notification to the A-E and Owner** within the prescribed period of time indicated above, the Contractor, by his failure to properly notify, forfeits the right to seek a Contract Time Extension for said occurrence.

**'16.1.1.2 Should the Owner determine that it is in the Owner's best interest to avoid an extension of Contract time** due to a delay not caused by the Owner or Contractor, the Owner, through the A-E, may request the Contractor to provide a plan of action to mitigate the delay through changes in the sequence of operations or through an extended workday for specific trades that will mitigate the delay. In such instances, the Owner may elect to pay the Contractor reasonable and justified additional costs required to mitigate the delay in lieu of a contract time extension. This additional costs shall be limited to the overtime premium of the extended workday for specific trades or shall be limited to actual and proven costs of a change in sequence of operations.

**16.1.2 Delay due to adverse weather conditions:** The Contractor shall have incorporated into the Project Schedule at the time of execution of the Contract for Construction all anticipated delay caused by normally occurring adverse weather. Adverse weather is that which normally occurring (as defined as the average of the preceding ten (10) years) according to the records of the National Oceanic Atmospheric Administration (NOAA).

**'16.1.2.1 When adverse weather exceeds** that which is normally expected, as defined above, and the Contractor is making a claim for delay due to adverse weather, the Contractor shall submit to the A-E and Owner the following at the Project Progress Meeting immediately following the month in which the excessive adverse weather occurred:

- 1) Current weather data from NOAA for the project site which documents and proves that the adverse weather occurred at the project site on days in which work was scheduled to occur.
- 2) Historical weather data from NOAA for the project site which documents and proves that the adverse weather that occurred at the project site was more than anticipated.
- 3) Contractor's daily field reports showing that the adverse weather that was experienced at the project site caused delay in the work that was scheduled to be performed on during the period in which adverse weather was experienced.
- 4) Contractor's written detailed explanation of the delay in the work and how it was caused by the abnormal adverse weather that was experienced at the project site and was beyond the ability of the Contractor to control or mitigate the delay for each occurrence.

**'16.1.2.1.1 Should the Contractor NOT provide the information indicated above to the A-E and Owner,** within the prescribed period of time indicated above, the Contractor, by his failure to properly notify, forfeits the right to seek a Contract Time Extension for said occurrence.

**'16.1.2.1.2 When the Contractor is behind the critical path of the schedule,** it shall be the determination of the A-E as to whether the Contractor should be eligible for a time extension due to adverse weather delay. In making this determination, the A-E shall determine and conclude that the Contractor would have been delayed by adverse weather had the Contractor been on schedule of the critical path before determining that the Contractor is eligible for a time extension due to adverse weather delay. The Contractor shall provide evidence to the A-E for the A-E's use in making such determination.

**'16.1.2.2 When adverse weather is significantly less** than that which is normally expected, as defined above, the A-E will prepare for the Owner, at its request, a claim for a reduction in Contract Time by providing current and historical weather data from NOAA for the project site which documents and proves that the adverse weather was less than anticipated at the Project Progress Meeting immediately following the month in which the adverse weather that occurred was significantly less than anticipated. The number of days in the claim shall be added to the project float and is made available to the Contractor and/or Owner to mitigate other types of delay in the project completion. Generally, a reduction of time caused by less than anticipated adverse weather does not constitute reason for a decrease in Contract Sum.

**16.1.2.3 When the A-E determines that adverse weather has delayed** the project and that the claim of the Contractor for delay due to adverse weather is justified, the Contractor will provide an accounting of float held in the project (see Article 16.2.1.4.1) that may be applied to the weather delay. Should the amount of weather delay exceed the available amount of float held on the project, the A-E will issue a Change Order extending the Contract Time by the number of days in which the Contractor was actually delayed due to adverse weather. Generally, an extension of time for delays caused by adverse weather does not constitute reason for an increase in Contract Sum.

**'16.1.2.3.1 Should the Owner determine that it is in the Owner's best interest to avoid an extension of Contract time** due to a delay caused by adverse weather, the Owner, through the A-E, may request the Contractor to provide a plan of action to mitigate the delay through changes in the sequence of operations or through an extended workday for specific trades that will mitigate the delay. In such instances, the Owner may elect to pay the Contractor reasonable and justified additional costs required to mitigate the delay in lieu of a contract time extension. This additional costs shall be limited to the overtime premium of the extended workday for specific trades or shall be limited to actual and proven costs of a change in sequence of operations.

**'16.2.1 Delay that is caused by the Owner**, that delays the critical path of the project schedule, may result in extension of Contract Time and may result in an increase in Contract Sum. Generally, delays of this type which do not delay the critical path of the project schedule shall not result in extension of Contract Time nor result in an increase in Contract Sum.

**'16.2.1.1** The Contractor shall, within seven (7) calendar days of the occurrence of the event, notify the A-E in writing. The A-E shall ascertain the facts and extent of the delay and notify the Contractor within a reasonable time of its decision in the matter. Any change in the Contract Time resulting from any such claim shall be incorporated in a Change Order.

**'16.2.1.1.1 Should the Contractor NOT provide the information indicated above to the A-E and Owner**, within the prescribed period of time indicated above, the Contractor, by his failure to properly notify, forfeits the right to seek a Contract Time Extension for said occurrence.

**'16.2.1.2 An extension of time shall not be construed as cause for extra compensation under the Contract.** Extensions of time relating to concealed conditions as defined in Article 26 shall be governed by the provisions of that Article.

**'16.2.1.3 Should the Contractor claim that an extension of time is cause for extra compensation under the Contract**, he shall make such claim in writing to the A-E within fifteen (15) calendar days of the occurrence of the event. This claim shall be in sufficient detail to support the Contractor's claim. In instances where the final determination of the costs associated with such delay is not readily calculable, the Contractor shall provide an ESTIMATED cost of the delay per day of delay. If this estimated cost of delay per day is

accepted by the Owner, the actual amount compensable by the delay will be based on this estimate.

**16.2.1.3.1 A Contractor's claim for extra compensation under the Contract may include:** Job Office expenses (for a delay in access of sixteen (16) calendar days in any given month / each month considered separately), extended equipment-left-idle costs (rented or owned), increased labor and material costs (for extended delays), loss of efficiency (for extended delays), increased insurance premiums, excess storage costs, etc.

**16.2.1.3.2 A Contractor's claim for extra compensation under the Contract shall not include:** home office costs, equipment-not-left-idle costs (rented or owned), increased labor or material costs (for short delays), job site forces costs, loss of efficiency (for short delays), etc.

**16.2.1.4 When the Contractor experiences a delay caused by the Owner,** the Contractor shall work to mitigate the delay to be best of his ability and to make a claim for the delay must prove that he mitigated the delay to the greatest extent possible.

**16.2.1.4.1 Since the Owner and Contractor share as a commodity, all float (including Total Float, Free Float and Sequestered Float) (See Article '4.2),** this float is available to the Owner to mitigate the effect of events that may delay performance or completion of all or part of the Work that has been caused by the Owner.

**16.2.1.5 When the Contractor experiences a delay caused by the Owner,** the delay must result in a delay to the critical path of the project schedule which is not readily recoverable by the Contractor without actual damage. In making a claim for the delay the Contractor must prove that the delay was a delay to the critical path of the project schedule and that he was not readily able to recover without actual damage.

**16.2.1.6 When the Contractor experiences a delay caused by the Owner,** the Contractor may not be entitled to a claim for the delay if a concurrent delay is present that is caused by the actions or inaction of the Contractor. When a concurrent Contractor caused delay exists, both delays shall be reviewed together and the Contractor is only eligible to make a claim for a delay caused by the Owner that extends beyond the concurrent delay caused by the Contractor.

**16.2.1.7 When there is a delay caused by the Contractor that is concurrent with a delay caused by the Owner,** there may be an extension of Contract Time, if found warranted, but no compensation to the Contractor will be made.

**16.2.1.8 When the Contractor is behind the accepted Project Schedule (related to the Critical Path),** and there occurs a delay caused by the Owner (that would have affected the Critical Path had the Contractor been on schedule), no time extension or compensation will be due the Contractor during the period of time that he is behind schedule.

**16.2.1.9 When the Contractor fails to plan his work in a manner than permits him to ask questions of the A-E/Owner reasonable ahead of the time he requires to the answer to avoid a delay caused by the Owner,** the delay will be a considered a concurrent delay and while an extension of time may be found as reasonable to grant the Contractor, no compensation for the delay will be provided. This situation is considered a concurrent delay since the Contractor participated in creation of the delay by his failure to plan the work adequately to avoid or reduce the delay.

## **'17 Subcontractors**

**'17.1 Contractor Fully Responsible for Subcontractors.** The Contractor is fully responsible to the Owner for the acts and omissions of his Subcontractors and of persons and entities either directly or indirectly employed by them. Nothing contained in the Contract Documents shall create any contractual relationship between the Owner and a Subcontractor.

**'17.1.1 The Contractor has the contractual obligation to adjust differences** between his several Subcontractors. Attempts to have the A-E and/or Owner settle disputes between the Contractor and his Subcontractors or between Subcontractors will not be given consideration.

**'17.1.2 The Contractor shall not submit any claim from a Subcontractor** to the A-E and/or Owner. Should the Contractor receive a claim from a Subcontractor, it is his obligation to satisfy the claim with his subcontractor. Should the Contractor determine that a claim from a Subcontractor is valid and should be considered by the A-E and/or Owner, the Contractor shall make the claim as himself with the subcontractor's claim as supporting documentation. The Contractor shall also provide documentation and reason for supporting the claim to the A-E and/or Owner.

**'17.1.2.1 The A-E and/or Owner have no responsibility or obligation** to meet with a subcontractor to resolve a dispute or claim. Should the Contractor desire to have a subcontractor accompany the Contract in a meeting to resolve a dispute or claim, a request shall be made prior to the meeting requesting the Owner's acceptance of such accompaniment. Granting of this acceptance shall be solely at the discretion of the Owner and does not establish any contractual relationship of the Owner with the subcontractor in any respects.

**'17.1.3 The Contractor is responsible for the performance of his several subcontractors** including, but not necessarily limited to: any delay in completion of the work of a subcontractor; sequencing of work among his several subcontractors; covering up of work requiring inspection or observation; and/or the quality of workmanship in completing the Work.

**'17.1.4 The Contractor shall not submit to the A-E and/or Owner any document,** submittal, manual, or price proposal directly from his several Subcontractors without first having reviewed such and determined that it is reasonable, complete, and compliant with the Contract Documents.

**'17.2 Flow-down Requirement.** By contract, the Contractor shall require each Subcontractor:

(1) to be bound to the Contractor by the terms of the Contract Documents insofar as they apply to the Work to be performed by the Subcontractor; and

(2) to assume toward the Contractor all the obligations which the Contractor, by the Contract Documents, assumes toward the Owner.

**'17.3 Contracts with Subcontractors.** The Contractor shall contract with those Subcontractors listed in the Contractors Bid Response and deemed acceptable by the Owner in accordance with the procedure outlined in the Instruction to Bidders. All subcontracts shall afford the Contractor rights against the Subcontractor which correspond to those rights afforded to the Owner against the Contractor herein, including those rights of Contract termination as set forth herein.

**'17.4 Substitution of Subcontractors.** The Contractor shall not contract with any substitute Subcontractor or change a Subcontractor without providing timely written notice of the

proposed substitution to the A-E and Owner. The substitution shall not be made if the A-E and Owner object in writing to such change.

**17.4.1 Release required of original Subcontractor.** When the Contractor finds it necessary to propose a substitute Subcontractor or change a Subcontractor he shall provide to the Owner a written release from the Subcontractor being substituted or changed indicating that they are not able, or not willing to, provide the work in which they were originally contracted to provide.

**17.4.1.1 This written release shall be on the official letterhead of the Subcontractor,** when obtainable, stating that the Subcontractor is agreeable to being substituted on the project and that the Subcontractor waives all current and future claims resultant from the substitution.

**17.4.1.2 When the Contractor cannot obtain the release required of original Subcontractor** he shall provide in written form a statement, on the letterhead of the Contractor with proof that the Contractor has attempted to obtain such a release, that the Subcontractor is non-responsive in not only providing the release but is also non-responsive in providing the work being subcontracted, and that the Contractor fully accepts any future liability from the original subcontractor making a claim related to being substituted.

**17.4.1.3 Prior to the substitution being made,** the Contractor shall obtain written approval from the Purchasing Officer indicating that the Commonwealth has reviewed the documents provided as indicated above and has concluded that it is in the best interests of the Commonwealth that such a substitution is accepted.

## **'18. Payment**

The Owner shall make payments, less held retainage (defined in paragraph 18.5), to the Contractor on the amount of the Work performed or materials furnished for the Work in accordance with the following procedures:

**'18.1 Schedule of Values.** At the same time it submits a construction schedule, within fifteen (15) days of the Date of Commencement, as provided in Article 4, the Contractor shall submit a Schedule of Values apportioning the Contract Sum among the different elements of the Project for purposes of periodic and final payment, prepared in such form and supported by such data to substantiate its accuracy as the A-E may require. The Contractor shall not imbalance its Schedule of Values, nor artificially inflate any element thereof. The violation of this provision by the Contractor shall constitute a material breach of the Contract. Upon written approval by the A-E and the Owner, the Schedule of Values and construction schedule shall become the basis for the Contractor's Payment Requests during construction.

**'18.2 Application for Progress Payment.** Not more often than once a month (except as provided in paragraph 3.8), the Contractor shall submit to the A-E a signed application for payment (sometimes referred to as Payment Request), for the Work completed as of the date of the application and accompanied by such data and schedules as the A-E may reasonably require.

**'18.2.1 Therein, the Contractor may request payment less held retainage,** of that part of the Contract Sum allocable to Contract requirements properly provided, labor, materials and equipment properly incorporated in the Project.

**'18.2.2 If payment is requested on the basis of materials and equipment not incorporated in the Project,** but delivered and suitably stored at the Project site or at another location agreed to in writing by the Owner, the application for payments shall also

be accompanied by such data, satisfactory to Owner, as will establish the Owner's title to the material and equipment and protect his interest therein, including written documentation of full insurance against loss or damage and the bonding of the storage sites. Storage sites must be bonded.

**'18.2.3 Each subsequent application for payment** shall include an affidavit of the Contractor stating that all previous progress payments received on account of the Work have been applied to discharge in full all of the Contractor's obligations reflected in prior applications for payment.

**'18.2.4 Each Payment Request shall be signed by the Contractor** and shall constitute the Contractor's representation that the quantity of Work has reach the level for which payment is requested, that the Work has been properly installed or performed in strict compliance with this Contract, and that the Contractor knows of no reason why payment should not be made as requested.

**'18.3 Approval of Payments.** The A-E shall review the application for payment and shall review the work at the Project site or elsewhere to determine whether the quantity and quality of the Work is as represented in the application for payment and is as required by this Contract.

**'18.3.1 The A-E shall, within ten (10) business days** after receipt of each application for payment, approve in writing the amount which, in the opinion of the A-E, is properly owing to the Contractor.

**'18.3.1.1 When there is reasonable justification that causes the A-E to be unable to perform this review, approval and submission of his recommendation to the Owner within the time prescribed in paragraph 18.3.1 above,** the A-E will notify the Contractor in writing as to the justification and as to the time that will be required for this review, approval and submission of his recommendation to the Owner.

**'18.3.2 The Owner shall make payment to the Contractor within twenty (20) business days following the A-E's written approval** of each application for payment. A reasonable delay on the part of the Owner in making payment to the Contractor for any given payment shall not be a breach of contract.

**'18.3.2.1 When there is reasonable justification that causes the Owner to be unable to make payment within the time prescribed in paragraph 18.3.2 above,** the Owner will notify the Contractor in writing as to the justification as to why this payment cannot be made.

**'18.3.2.2 The Owner will not be required to make payment to the Contractor within the time prescribed in paragraph 18.3.2 above,** when the Owner has justification for the holding of this payment such as when the Owner's payment is conditional on submission of required documents from the Contractor.

**'18.3.3 The amount of each such payment shall be the amount approved for payment by the A-E less such amounts,** if any, otherwise owing by the Contractor to the Owner or which the Owner shall have the right to withhold as authorized by this Contract. The A-E's approval of the Contractor's application for payment shall not preclude the Owner from the exercise of any of its rights as set forth herein. The Contractor warrants and represents that, upon payment of the application for payment, title to all Work included in such payment shall be vested in the Owner.

**'18.4 Contractor's Warranty of Title.** The Contractor warrants and guarantees that title to all Work, materials and equipment covered by any application for payment, whether incorporated



in the project or not, will pass to Owner at the time of payment free and clear of all encumbrance.

**'18.5 Held Retainage/ Retainage Reduction.** Until fifty percent (50%) of the construction work has been completed in accordance with the contract, the Owner may withhold no more than ten percent (10%) retainage from the amount of any undisputed payment due, and retainage held after fifty-one percent (51%) of the construction project has been completed shall not be more than five percent (5%) of the total Contract Sum.

**'18.5.1 Subsequently, the Contractor shall withhold no more than ten percent (10%) retainage from the amount of any undisputed payment due to a subcontractor, and retainage held after fifty-one percent (51%) of the construction project has been completed shall not be more than five percent (5%) of the total amount contracted with a subcontractor.**

**'18.6 Completion, Acceptance and Final Payment.** Upon certification by the A-E of Substantial Completion of the Work, the Contractor shall continue to make normal pay requests as defined within this document.

**'18.6.1 Within thirty (30) calendar days after substantial completion or within twenty (20) calendar days after receipt of the A-E's recommendation for payment (whichever comes last), the Owner shall release the retainage less an amount equal to two hundred percent (200%) of the Owner's reasonably estimated cost of the balance of any contractor's contractually obligated, yet uncompleted, work remaining plus the following:**

**'18.6.1.1 Should the Contractor not fulfill the requirements for Substantial Completion by the date established by the Contract Documents for Substantial Completion, the Owner may withhold an additional amount of retainage to cover the anticipated application of "Liquidated Damages" or "Damages for Untimely Performance".**

**'18.6.2 Final payment shall be made by the Owner to the Contractor when the Contract has been fully performed by the Contractor in accordance with the Contract Documents and a final Certificate of Payment is submitted by the A-E to the Owner.** Such final payment shall be made by the Owner not more than twenty (20) calendar days after the submittal by the A-E of the final Certificate of Payment, except:

**'18.6.2.1** when the Owner is anticipating applying "Liquidated Damages" or "Damages for Untimely Performance", the amount of this anticipated application of damages may be withheld from Final Payment until such damages are resolved between the Owner and the Contractor.

**'18.6.3 The Contractor shall submit with the application for final payment an affidavit that all payrolls, bills for materials, supplies and equipment, and other indebtedness connected with the Work have been paid or otherwise satisfied, along with such supporting evidence of payment as the A-E requires. Final payment is conditioned on satisfactory compliance with this requirement.**

**'18.7 Waiver of Claims.** The making of final payment shall constitute a waiver of all claims by the Owner except those arising from:

**'18.7.1** unsettled liens;

**'18.7.2** faulty or defective Work appearing after Substantial Completion;

**'18.7.3** failure of the Work to comply with the requirements of the Contract Documents; or

**'18.7.4** terms of any special warranties required by the Contract Documents.

The acceptance of final payment by the Contractor shall constitute a waiver of all claims except those previously made in writing and identified by the Contractor as unsettled at the time of the final application for payment.

**'18.8 Contractor's Payment to Subcontractors.** Within fourteen (14) calendar days of when payment is received from the Owner, the Contractor shall pay all Subcontractors, materialmen, laborers and suppliers the amounts they are due for the Work covered by such payment.

**'18.8.1 In the event the Owner becomes informed that the Contractor has not paid a Subcontractor,** material-man, laborer, or supplier as provided herein, the Owner shall have the right, but not the duty, to issue future checks and payment to the Contractor of amounts otherwise due hereunder naming the Contractor and any such Subcontractor, material-man, laborer, or supplier as joint payees. Such joint check procedure, if employed by the Owner, shall create no rights in favor of any person or entity beyond the right of the named payees to payment of the check and shall not be deemed to commit the Owner to repeat the procedure in the future.

**'18.8.2** The Contractor shall, by an appropriate agreement with each Subcontractor, require each Subcontractor to make payment to his subcontractors in similar manner.

**'18.8.3** The A-E or Owner may, on request, furnish to any Subcontractor information regarding the percentage of completion of the amounts applied for by the Contractor and the action thereon by the A-E.

**'18.8.4** Neither the Owner nor the A-E shall have any obligation to make payment to any Subcontractor except as may otherwise be required by law.

**'18.9 Owner's Rights Relating to Payments.** Neither payment to the Contractor, utilization of the project for any purpose by the Owner, nor any act or omission by the Owner shall be interpreted or construed as an acceptance of any Work of the Contractor not strictly in compliance with this Contract.

**'18.9.1 The Owner shall have the right to refuse to make payment** and, if necessary, may demand the return of a portion or all of the amount previously paid to the Contractor due to:

**'18.9.1.1** The quality of a portion, or all, of the Contractor's Work not being in accordance with the requirements of this Contract;

**'18.9.1.2** The quantity of the Contractor's Work not being as represented in the Contractor's Payment Request, or otherwise;

**'18.9.1.3** The Contractor's rate of progress being such that, in the Owner's opinion, substantial or final completion, or both, may be inexcusably delayed;

**'18.9.1.4** Claims made, or likely to be made, against the Owner;

**'18.9.1.5** Loss caused by the Contractor;

**'18.9.1.6** The Contractor's failure or refusal to perform any of its obligations to the Owner under this Contract.

In the event that the Owner makes written demand upon the Contractor for amounts previously paid by the Owner as contemplated in this Paragraph, the Contractor must promptly comply with such demand.

## **'19. Completion**

**'19.1 Commencement and Completion of Work.** The Contractor shall begin the Work on the Date of Commencement as specified in the Contract issued by the Owner.



**'19.1.1 The Contractor is expected to mobilize on site and begin work no later than fifteen (15) calendar days after the Date of Commencement,** unless he has notified the A-E and Owner in writing of acceptable reasons why it is not in the best interest of the Commonwealth and the Project that he will not mobilize by that date.

**'19.1.2 The Contractor shall diligently and expeditiously continue the performance** of the Contract continuously to and until Substantial Completion and Final Completion of the Project. All time limits stated in the Contract Documents are the essence of the Contract.

**'19.1.3 The Contractor shall accomplish the Work in accordance** with the construction schedule (as provided in Article 4) so as to achieve Substantial Completion and Final Completion dates as defined in the Contract Documents.

**'19.2 Date for Commencement of Commissioning.** Commissioning of specified building systems shall be scheduled to allow for the completion of the commissioning process by the Date of Substantial Completion. The Contractor shall work to complete the initial installation and startup of equipment involved in these building systems early enough in the project that the complete and properly conducted commissioning process can be completed including any corrective work and verification identified by the commissioning process. (See the associated sections of the technical specifications for the commissioning requirements and procedures for each building system which is to be commissioned).

**'19.3 Date for Commencement of Testing and Balancing.** Testing and Balancing of HVAC systems shall be scheduled to allow for the completion of the Testing and Balancing process by the Date of Substantial Completion. The Contractor shall work to complete the initial installation and startup of HVAC equipment early enough in the project that the complete and properly conducted testing and balancing process can be completed including any corrective work and verification identified by the testing and balancing process.

**'19.4 Substantial Completion of the Work.** The Substantial Completion Date shall be that date certified by the A-E, in consultation with the Owner, in accordance with the following procedures.

**'19.4.1 "Substantial Completion"** or "Substantially Complete" means the point in time when:

**'19.4.1.1 The progress of the Work,** or designated portion of the Work (as agreed in writing advance by the Owner, A-E and Contractor), is fully complete and functional in accordance with the requirements of the Contract Documents such that only items listed in the Punch list remain and the Work, or designated portion thereof, is ready to be occupied and/or utilized for its intended purpose;

**'19.4.1.2 The applicable Governmental Authorities** have issued a certificate of occupancy (or where Substantial Completion only applies to a designated portion of the Work, a temporary certificate of occupancy) and/or any other applicable approvals, licenses, certifications or other written evidence from the applicable Governmental Authority that said Work, or designated portion of the Work, has been completed to such authority's satisfaction and is ready to be occupied and/or used for its intended purpose.

**'19.4.1.2.1 Where the project requires specialized Governmental Authorities to inspect and accept the construction (i.e. Office of Inspector General, Federal Agencies, etc.)** a determination is to be made in the 'Special Conditions' of this Contract as to the timing of these

inspections or acceptances and how they affect the Date of Substantial Completion, Date of Final Completion or an Extended Date for Compliance for that specific inspection or acceptance requirement.

**'19.4.1.3 The A-E has issued an Owner approved certificate of Substantial Completion for the Work,** or designated portion of the Work, in accordance with the terms of the Contract Documents;

**'19.4.1.4 Operations and Maintenance Manuals,** have been received for review by the A-E and the A-E has determined that the Operations and Maintenance Manuals are complete.

**'19.4.1.4.1** Note that the Contractor shall submit Operations and Maintenance Manuals prior to the anticipated Date of Substantial Completion in order to allow the A-E reasonable time to review and approve or reject the submittal.

**'19.4.1.4.2** The A-E shall review and approve or reject the Operations and Maintenance Manuals within fourteen (14) calendar days of receipt from the Contractor. The Date of Substantial Completion shall not be earlier than the date of approval of the Operations and Maintenance Manuals by the A-E.

**'19.4.1.5 Warranty Samples,** have been reviewed and approved by the A-E.

**'19.4.1.5.1** Note that the Contractor shall submit samples of each required Warranty prior to the anticipated Date of Substantial Completion in order to allow the A-E reasonable time to review and approve or reject the submittal.

**'19.4.1.5.2** The A-E shall review and approve or reject the sample Warranties within fourteen (14) calendar days of receipt from the Contractor. The Date of Substantial Completion shall not be earlier than the date of approval of the samples of Warranties by the A-E.

**'19.4.1.6** With respect to all of the Project's building systems, including, without limitation, all systems being Commissioned, the Work, or designated portion of the Work (as agreed in writing in advance by the Owner, A-E and Contractor), is fully commissioned, balanced, tested and operational in compliance with the Contract Documents and applicable Laws ("Systems Commissioning"); The Date of Substantial Completion shall not be earlier than the date in which Systems Commissioning is completed.

**'19.4.1.7** All required initial and follow-up orientation and training has been accomplished in accordance with the requirements of the Contract Documents ("Systems Training"). The Date of Substantial Completion shall be no earlier than the date in which the final training session has been satisfactorily completed.

**'19.4.1.8** The Contractor shall have advised the Owner of insurance requirements including a list of all fixed and non-fixed equipment provided under the Work including replacement values for each item of equipment.

**'19.4.2** When the Contractor determines that Substantial Completion has been achieved, the Contractor shall notify the Owner and the A-E in writing. The notification shall be accompanied by a Contractor prepared list of those items of Work still to be completed or corrected. The failure of the Contractor to include any item or items on such list not completed or needing correction shall not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

**'19.4.3 The A-E shall**, within a reasonable time after receipt of notification from the Contractor of Substantial Completion, make such inspection, with consultation of the Owner, to confirm that the Work has achieved Substantial Completion. If the Contractor's notification is not accompanied by the list provided in paragraph '19.2.1, the A-E and Owner may elect to postpone this inspection until receipt of the list proscribed.

**'19.4.4 Upon its confirmation** that the Contractor's work is substantially complete, the A-E shall prepare a Certificate of Substantial Completion which shall establish the Substantial Completion Date and the responsibilities between the Owner and Contractor for security, maintenance, heat, utilities and insurance, if not otherwise provided for in the Contract Documents, and a tentative list of items to be completed or corrected, within thirty (30) calendar days from the Substantial Completion Date. The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of the responsibilities assigned to them in the certificate.

**'19.4.4.1 Should the A-E confirm that the Work has achieved Substantial Completion on the date of his inspection**, the A-E shall derive that the Contractor was Substantially Complete on the date of receipt of the notification from the Contractor indicated above.

**'19.4.4.2 When the Owner accepts Substantial Completion and occupies a building**, all operations, maintenance, utilities and insurance become the responsibility of the Owner, except those items specifically identified in the Certificate of Substantial Completion as remaining to be completed by the Contractor.

**'19.4.4.3** If, after making the inspection, the A-E fails to find that the Contractor's Work has achieved Substantial Completion, he will notify the Contractor in writing, giving the reasons therefore.

**'19.4.4.4** If the A-E through its inspection fails to find that the Contractor's Work has not achieved Substantial Completion and is required to repeat all, or any portion, of its inspection, the Contractor shall bear the cost of such repeat inspections which cost may be deducted by the Owner from any payment then or thereafter due the Contractor. This deduction by the Owner from any payment for this reason will be by a credit to the Contract Sum by Change Order.

**'19.5 Final Completion of the Work.** The A-E, upon receipt of written notice from the Contractor that the Work is finally complete and is ready for final inspection and acceptance, will promptly make such inspection and when he finds the Work completed and acceptable under the Contract Documents and the Contract fully performed, he will so notify the Contractor in writing, and the Contractor shall promptly issue a final Certificate of Payment to the Owner.

**'19.5.1** "Final Completion or "Finally Complete" means the point in time when:

**'19.5.1.1 The progress of the Work**, is fully complete and functional in accordance with the requirements of the Contract Documents such that no items listed in the Punch list remain uncorrected;

**'19.5.1.2 The applicable Governmental Authorities** have issued a final certificate of occupancy;

**'19.5.1.3 The A-E** has issued an Owner approved certificate of Final Completion for the Work, in accordance with the terms of the Contract Documents;

**'19.5.1.4 Warranty Binder**, have been reviewed and approved by the A-E.

**'19.5.1.4.1** Note that the Contractor shall submit a binder with original copies of all required Warranties prior to the anticipated Date of Final Completion in order to allow the A-E reasonable time to review and approve or reject the submittal.

**'19.5.1.4.2** The A-E shall review and approve or reject the Warranties within a reasonable time after receipt from the Contractor. The Date of Final Completion shall not be earlier than the date of receipt of the Warranty Binder by the A-E where the Warranty Binder is subsequently approved by the A-E.

**'19.5.1.5 With respect to all of the Project's building systems, including, without limitation, all systems being Commissioned**, the Work, is fully commissioned without "Corrective Actions" remaining to be completed in compliance with the Contract Documents and applicable Laws ("Systems Commissioning"); The Date of Final Completion shall not be earlier than the date in which Systems Commissioning is fully completed including all "Corrective Actions".

**'19.5.1.6 The Contractor has submitted a final Application for Payment** including a Final Affidavit as required by the Commonwealth.

**'19.5.1.7 The Contractor and the A-E** have submitted to the Owner a report of the status of LEED Certification documentation when required by a project that is under LEED Certification. Included in these reports is a listing of documentation that will be required for the final LEED Certification during the one year warranty period.

**'19.5.2 Should the A-E confirm that the Work has achieved Final Completion** on the date of his inspection, the A-E shall derive that the Contractor was Finally Complete on the date of receipt of the notification from the Contractor indicated above.

**'19.5.3 If the A-E is unable to issue its final Certificate of Payment** and is required to repeat its final inspection of the Project, the Contractor shall bear the cost of such repeat inspection(s), which costs may be deducted by the Owner from the Contractor's final payment;

**'19.6 Use of Adequately Complete Portions.** The Owner may use or occupy a specified portion of the Work at any stage, provided that:

**'19.6.1** such use or occupancy is consented to by insurers and

**'19.6.2** it is authorized by the issuance of a Temporary Certificate of Occupancy or a Certificate of Occupancy by public regulatory bodies having jurisdiction over the Work; and

**'19.6.3** prior to such use or occupation, the affected portion of the Work is jointly inspected by the Owner, Contractor and A-E to determine the precise stage of completion.

**Such possession and use shall not be deemed an acceptance of any Work not completed in accordance with the Contract Documents. The Owner's use of adequately completed portions (with the Contractor's agreement), while the Work of**

**the Project is not actually Substantially Complete, shall not be deemed as a defining factor in determining that the Project has reached Substantial Completion.**

**'19.7 Liquidated Damages/ Damages from Untimely Performance**

**'19.7.1 The Contractor shall pay the Owner an amount identified in the Contract Documents** for each and every calendar day of unexcused delay in achieving Substantial Completion and Final Completion beyond the date set for each.

**'19.7.1.1 Any sums due and payable hereunder by the Contractor** shall be payable, not as a penalty, but as liquidated damages representing delay damages sustained by the Owner, estimated at the time of executing this Contract.

**'19.7.1.2 When the Owner is able to determine an actual sum of Damages** from Untimely Performance, and that sum is less than the predetermined "Liquidated Damages", the Owner may, upon review of the particular circumstances of this specific Project, elect to apply the lesser amount of damages.

**'19.7.2 When the Owner reasonably believes that Substantial Completion will be inexcusably delayed, the Owner shall be entitled, but not required, to withhold from any amounts otherwise due the Contractor an amount then believed by the Owner to be adequate to recover liquidated damages applicable to such delays.** If and when the Contractor overcomes the delay in achieving Substantial Completion, or any part thereof, for which the Owner has withheld payment, the Owner shall promptly release to the Contractor those funds withheld, but no longer applicable, as liquidated damages.

**'19.7.3 The Contractor shall not have the right without justifiable cause** to contest the Owner's assessment of Liquidated Damages as defined by this Article and as indicated in the Special Conditions.

**'19.7.3.1 Should the Contractor believe he has justifiable cause for contesting the Owner's assessment of Liquidated Damages,** once the project work has achieved FINAL COMPLETION, the Contractor may submit to the Director of the Division of Engineering and Contract Administration written detailed explanation of the justifiable cause for contesting the Owner's assessment of Liquidated Damages.

**'19.7.3.1.1 Within fifteen (15) calendar days of the issuance of a Change Order which includes the Owner's assessment of Liquidated Damages,** the Contractor shall provide written notification to the Director of the Division of Engineering and Contract Administration of the Contractor's intent to contest the Owner's assessment of Liquidated Damages. Failure of the Contractor to make such written notification shall cause the Owner to execute the Change Order which includes the Owner's assessment of Liquidated Damages.

**'19.7.3.1.2 The Contractor's submission of the Final Application for Payment shall be evidence that the Contractor does not desire to contest the Owner's assessment of Liquidated Damages** and shall be evidence of the Contractor's agreement with the Owner's assessment of Liquidated Damages.

**'19.7.3.1.3 When the Director of the Division of Engineering and Contract Administration has reviewed** the submitted evidence from the Contractor, gathered other evidence and information related to the Contractor's contesting of the Owner's assessment of Liquidated Damages, and made a determination as to the, reasonableness, validity

and standing of the Contractor's contesting, the Director shall issue a final determination in the matter.

## **'20. Correction of Work**

**'20.1 Correction of Work Prior to Final Payment.** The Contractor shall promptly correct Work which is rejected by the A-E as failing to conform to the requirements of the Contract Documents. Such correction shall be required regardless of whether or not the nonconformities are observed before or after Substantial Completion, or whether or not the work has been fully fabricated, installed or completed.

**'20.2 Correction of Work After Final Payment.** Neither the Final Certificate of payment nor any provisions in the Contract Documents shall relieve the Contractor of responsibility for failure to conform to the requirements of the Contract Documents.

**'20.2.1 If within one year after the date of Final Completion** of the Work or designated portion thereof or after the date for commencement of warranties, or by terms of an applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct the Work promptly after receipt of written notice from the Owner to do so unless the Owner has previously given the Contractor a written acceptance of such condition.

**'20.2.1.1 This period of one year shall be extended with respect to portions of Work first performed after Final Completion** by the period of time between Final Completion and the actual performance of the Work. This obligation under this paragraph shall survive acceptance of the Work under the Contract and termination of the Contract. The Owner shall give such notice promptly after discovery of the conditions.

**'20.3 Responsibility for Related Costs.** In addition to being responsible for correcting the Work and removing any nonconforming Work or materials which are not corrected from the jobsite, the Contractor shall bear all other costs of bringing the affected Work into compliance with the Contract Documents. These include costs of any required additional testing and inspection services, A-E's services, and any resulting damages to property or to construction Work of other contractors or of the Owner.

**'20.4 Correction by Owner.** If the Contractor fails to correct nonconforming Work within a reasonable time, the Owner may take steps to correct the Work itself. If, within a ten (10) business day period after receipt of written notice to correct the nonconformity, the Contractor has not made serious efforts to correct the nonconformity, the Owner may without prejudice to any other remedies it may have, proceed to correct the non-conforming Work.

**'20.4.1** In such cases a Change Order shall be issued by the Owner with the approval of the A-E reflecting an equitable deduction from the Contract Sum to cover the cost of correcting the Work, including compensation for the A-E's additional services and other related expenses and damages. The amount of the Change Order shall be deducted from payments then or thereafter due the Contractor. If final payment has already been made, the Contractor shall pay the difference within a reasonable time, which is generally defined as 30 calendar days from the date of written request for such reimbursement by the Owner.

**'20.5 Ongoing Liability of Contractor for Defective Work.** The foregoing provisions establishing the specific obligation of the Contractor to perform corrective Work do not establish a period of limitations on other obligations of the Contractor under the Contract Documents. Even after the Contractor is no longer specifically obligated to perform corrective Work itself, it



shall still be held liable for nonconforming Work and for other breaches of its obligations under the Contract Documents.

**'20.6 Deduction for Uncorrected Work.** If the Owner deems it not expedient to correct Work which is not in accordance with the requirements of the Contract Documents, an appropriate Change Order shall be issued by the Owner with the approval of the A-E reflecting an equitable deduction from the Contract Sum on account of the uncorrected Work. The amount of the Change Order shall be deducted from payments then or thereafter due the Contractor. If final payment has already been made, the Contractor shall be responsible for paying the difference to the Owner within a reasonable time, which is generally defined as 30 calendar days from the date of written request for such reimbursement by the Owner.

## **'21. Suspension of Work**

**'21.1 Suspension by the Owner.** The Owner shall have the right at any time to direct the contractor to suspend its performance, or any portion thereof for a period of not more than thirty (30) calendar days. The notice of suspension shall be in writing and shall set forth the reason for the suspension. The written notice shall fix the approximate date on which Work is contemplated to be resumed. The Owner shall pay the Contractor as full compensation for such suspension the Contractor's Direct Job Expenses.

**'21.1.1 Should the Contractor believe that the Owner, by its actions, has suspended the Work,** but has not received a written notice of suspension from the Owner, the Contractor shall notify the Owner in writing that he believes a suspension of the Work has occurred and seek clarification from the Owner that such suspension of the Work is the Owner's intent by its actions. The Owner will promptly clarify for the Contractor its intentions related to suspension of the Work.

**'21.1.2 Without such written notice of suspension of the Work by the Owner,** the Contractor shall proceed with the Work as if it was not suspended and shall not be eligible for compensation as indicated in paragraph '21.1 above.

**'21.2 Other Suspension.** In the event the Owner should be prevented from proceeding with the work due to a bid protest, or enjoined by court order from proceeding with the Work or from authorizing its prosecution, either before or after the award, for a period up to ninety (90) calendar days, the delay shall not constitute cause for termination by the Contractor and the Contractor shall not be entitled to make or assert claim for damage by reason of said delay, but time for completion of Work shall be extended to such reasonable time as the Owner may determine will compensate for time lost by such delay. Such determination shall be set forth in a Change Order shall be final and binding upon both parties, and shall not require the signature of the Contractor to be in effect.

The Owner shall pay the Contractor as full compensation for such suspension the Contractor's reasonable costs actually incurred and paid as follows:

- '21.2.1** demobilization and remobilization, including such costs paid to subcontractors;
- '21.2.2** preserving and protecting work in place;
- '21.2.3** storage of materials or equipment purchased for the Project, including insurance thereon;
- '21.2.4** performing in a later, or during a longer, time frame than contemplated by this Contract.

**'21.3 Termination by the Contractor due to Suspension of the Work by the Owner.** If, through no act or fault of the Contractor, the Work is suspended for a period of more than thirty (30) calendar days by the Owner, or more than ninety (90) calendar days under an Order of

the Court or other public authority, then the Contractor may, after ten (10) business days from delivery of a written notice to the Owner and the A-E, terminate the Contract and recover from the Owner payment for all Work executed and reasonable expenses sustained.

**'21.3.1 If the A-E has failed to act on a request for payment,** within thirty (30) calendar days of submission, or if the Owner has failed to make any payment, within forty-five (45) calendar days of receipt of an approval application for payment, the Contractor may, upon ten (10) business days written notice to the Owner and the A-E stop the Work until he has been paid all amounts then due, in which event and upon resumption of the Work, a Change Order shall be issued adjusting the Contract Price or extending the Contract Time, or both, to compensate for the costs and delays attributable to the stoppage of the work, any such compensation being subject to the provisions, conditions and limitations contained in Article 26.

## **'22. Termination**

**'22.1 Termination of Contract for Convenience of Owner.** The Owner, for any reason whatsoever, may terminate the Contract for its own convenience when it determines that such termination will be in the best interest of the Commonwealth of Kentucky. The Owner shall give written notice of such termination to the Contractor specifying when termination becomes effective. The Contractor shall incur no further obligations in connection with the Work and the Contractor shall stop Work when such termination becomes effective. The Contractor shall also terminate outstanding orders and subcontracts. The Contractor shall settle the liabilities and claims arising out of the termination of Subcontracts and orders. The Owner may direct the Contractor to assign the Contractor's right, title and interest under termination orders or subcontracts to the Owner or its designee. The Contractor shall transfer title and deliver to the Owner such completed or partially completed Work and materials, equipment, parts, fixtures, information and Contract rights as the Contractor has. The Commonwealth shall negotiate a fair and just settlement with the Contractor in accordance with 200 KAR 5:312 Section 2. In such event, the following procedure shall be required:

**'22.1.1 The Contractor shall submit a termination claim to the Owner and the A-E** specifying the amounts due because of the termination for convenience together with costs, pricing or other data required by the Owner or the A-E. If the Contractor fails to file a termination claim within one (1) year from the effective date of termination, the Owner shall pay the Contractor, an amount derived in accordance with paragraph (3) below;

**'22.1.2 The Owner and the Contractor may agree to the compensation,** if any, due to the Contractor hereunder pursuant to 200 KAR 5:312 Section 2;

**'22.1.3 Absent agreement to the amount due to the Contractor,** the Owner shall pay the Contractor the following amounts:

**'22.1.3.1 Contract prices** for labor, materials, equipment and other services accepted under this Contract;

**'22.1.3.2 Reasonable costs** incurred in preparing to perform and in performing the terminated portion of the Work and in terminating the Contractor's performance, plus a fair and reasonable allowance for direct jobsite overhead and profit thereon (such profit shall not include anticipated profit or consequential damages); provided however, that if it appears that the Contractor would have not profited or would have sustained a loss if the entire Contract would have been completed, no profit shall be allowed or included and the amount of compensation shall be reduced to reflect the anticipated rate of loss, if any;



**'22.1.3.3 Reasonable costs** of settling and paying claims arising out of the termination of subcontracts or orders pursuant to the initial Paragraph of 22.1. These costs shall not include amounts paid in accordance with other provisions hereof.

**'22.1.3.4 The total sum to be paid the Contractor under 22.1** shall not exceed the total Contract Sum, as properly adjusted, reduced by the amount of payments otherwise made, and shall in no event include duplication of payment.

**'22.2 Termination of Contract for Cause.** If the Contractor should be adjudged as bankrupt, or if he should make a general assignment for the benefit of his creditors, or if a receiver should be appointed on account of his insolvency or, if the Contractor does not perform the Work, or any part thereof, in a timely manner, supply adequate labor, supervisory personnel or proper equipment or materials, or if it fails to timely discharge its obligations for labor, equipment and materials, or proceeds to disobey applicable law, or otherwise commits a violation of a material provision of the resulting Contract, then the Owner, in addition to any other rights it may have against the Contractor or others, may terminate the performance of the Contractor upon ten (10) days written notice by registered mail of declaration of default and assume possession of the Project site and of all materials and equipment at the site and may complete the Work.

**'22.2.1 In such case, the Contractor shall not be paid further until the Work is complete.** After final completion has been achieved, if any portion of the Contract Sum, as it may be modified hereunder, remains after the cost to the Owner of completing the Work, including all costs and expenses of every nature incurred, has been deducted by the Owner, such remainder shall belong to the Contractor. Otherwise, the Contractor shall pay and make whole the Owner for such cost. This obligation for payment shall survive the termination of the Contract. In the event the employment of the Contractor is terminated by the Owner for cause pursuant to this Paragraph 22.2 and it is subsequently determined by a Court of competent jurisdiction that such termination was without cause, such termination shall thereupon be deemed a Termination for Convenience under Paragraph 22.1 and the provisions of Paragraph 22.1 shall apply.

### **'23. Indemnification**

**The Contractor shall indemnify and hold the Owner harmless** from any and all claims, liability, damage, loss, cost and expense of every type whatsoever, regardless of whether such liability, claim, damage, loss, cost or expense is caused in part by the Owner, including, without limitation, attorneys' fees and expenses, in connection with the Contractor's performance of this Contract, provided that such claims, liability, damage, loss, cost or expense is due to sickness, personal injury, disease or death, or to loss or destruction of tangible property (other than the Work itself), including loss of use resulting therefrom, to the extent caused by the Contractor, or anyone for whose acts the Contractor may be liable.

### **'24. Insurance**

**'24.1 The Contractor shall furnish the Owner with certificates evidencing the required insurance coverage** prior to commencing work. Contractor shall keep up-to-date copies of such certificates on file with Owner until work is completed. Owner may require Contractor to submit policy endorsements or complete policy copies of the required insurance.

**'24.2 Contractor shall procure and maintain for the duration of the contract insurance** against claims for injuries to persons or damages to property which may arise from or in connection with the performance of the work hereunder by Contractor, its agents, representatives, employees or subcontractors.

**'24.3 Minimum Scope of Insurance** Coverage shall be at least as broad as:

**24.3.1** Insurance Services Office commercial general liability coverage (“occurrence” Form CG 0001, Ed. 10/93).

**24.3.2** Insurance Services Office Form CA 0001 (Ed. 12/93) covering automobile liability, Code 1 “any auto.”

**24.3.3** Workers’ compensation insurance as required by the Workers’ Compensation Act (as contained in KRS Chapter 342) and employers liability insurance.

**’24.4 Minimum Limits of Insurance** Contractor shall maintain limits no less than:

**24.4.1 Commercial General Liability:**

\$1,000,000 combined single limit per occurrence for bodily injury, personal injury and property damage with a \$3,000,000 annual aggregate. The deductible or Self-Insured Retention per occurrence shall not be more than \$10,000.

**24.4.2 Automobile Liability:** \$500,000 combined single limit per accident for bodily injury and property damage.

**24.4.3 Workers’ Compensation and Employers Liability:** Workers’ compensation with statutory benefits without limit, as required by the Kentucky Workers Compensation Act, and employer’s liability limits of \$1,000,000 per accident.

**’24.5 Other Insurance Provisions** The policies are to contain, or be endorsed to contain, the following provisions:

**’24.5.1 Commercial General Liability and Automobile Liability Coverages.**

**’24.5.1.1 Owner, its officers and employees are to be covered as insureds as respects:** liability arising out of activities performed by or on behalf of the Contractor; general supervision of the work by Owner; products and completed operations of the Contractor; premises owned, occupied or used by the Contractor, or automobiles owned, leased, hired or borrowed by the Contractor. The coverage shall contain no special limitations on the scope of protection afforded to Owner, its officers or employees.

**’24.5.1.2 The Contractor’s insurance coverage shall be primary insurance as respects Owner,** its officers and employees. Any insurance of self-insurance maintained by Owner shall be excess of the Contractor’s insurance and shall not contribute to it.

**’24.5.1.3** Any failure to comply with reporting provisions of the policies shall not affect coverage provided to Owner, its officers or employees.

**’24.5.1.4** The Contractor’s insurance shall apply separately to each insured against whom claim is made or suit is brought except with respect to the limits of the insurer’s liability.

**’24.5.2 All Coverages.** Each insurance policy required by this clause shall be endorsed to state that coverage shall not be suspended, voided, canceled by either party, reduced in coverage or in limits except after thirty (30) days’ prior written notice by certified mail, return receipt requested, has been given to Owner.

**’24.6 Acceptability of Insurers** Insurance is to be placed with insurers with an A.M. Best’s rating of no less than A VII, authorized to write insurance in the Commonwealth of Kentucky.

**’24.7 Verification of Coverage** The Contractor shall furnish the Owner with certificates evidencing the required insurance coverage prior to commencing work. Contractor shall keep up-to-date copies of such certificates on file with Owner until work is completed. Owner may

require Contractor to submit policy endorsements or complete policy copies of the required insurance.

**'24.8 Subcontractors** Contractor shall include all subcontractors as insureds under its policies or shall furnish separate certificates and endorsements for each subcontractor. All coverages for subcontractors shall be subject to all of the requirements stated herein.

**'24.9 The Contractor shall provide all Risks Insurance** in an amount of not less than one hundred percent (100%) of the insurable value of all the work. The coverage, is to be written on CP 00 20 06 95 or equivalent acceptable to the Commonwealth. All coinsurance clauses in the Risks Insurance policy will be waived. All rights of subrogation against the Owner (i.e. the Commonwealth) will be waived by the insurer. Such insurance shall be for the benefit of the Contractor, Owner and any Subcontractor engaged on this project, as the Owner shall find their respective interest may appear. The Risks Insurance must be dated and in force on the date indicated in the Contract to begin work.

**'24.10 The insurance coverage required by the contract documents shall be in compliance with the laws of the Commonwealth of Kentucky** and shall be placed with a licensed resident or non-resident agent who represents insurance companies authorized to do business in Kentucky.

**'24.11** The Certificate of Insurance or Certificates of Insurance will have the following endorsements as an attachment to the Certificate or Certificate's.

**'24.11.2** The Commonwealth of Kentucky, Division of Engineering and Contract Administration will be named as an additional insured.

**'24.11.3** The policy is primary coverage and any insurance or self-insurance maintained by the Commonwealth of Kentucky shall be excess.

**'24.11.4** Any failure of the named insured to comply with the reporting provisions of the policy shall not affect coverage provided to the Commonwealth of Kentucky, it's officers or employees.

**'24.11.5** All Coverages. Each insurance policy required by this clause shall be endorsed to state that coverage shall not be suspended, voided, cancelled by either party, reduced in coverage or in limits except after thirty (30) days' prior written notice by certified mail, return receipt requested, has been given to Owner.

## **'25. Performance and Payment Bonds**

**The Contractor shall furnish separate performance and payment bonds to the Owner.** The Contractor shall furnish a performance bond satisfactory to the Owner in an amount equal to one hundred percent (100%) of the Contract Sum as security for the faithful performance of the Contract. The Contractor shall also furnish a payment bond satisfactory to the Owner in an amount equal to one hundred percent (100%) of the Contract Sum for the protection of all persons performing labor or furnishing materials, equipment or supplies for the Contractor or his Subcontractor for the performance of the Work provided for in the Contract, including security for payment of all unemployment contributions which become due and payable under Kentucky Unemployment Insurance Law.

**'25.1 Each bond furnished by the Contractor shall incorporate** by reference the terms of the Contract as fully as though they were set forth verbatim in such bonds. In the event the Contract Sum is adjusted by Change Order executed by the Contractor, the penal sum of both the performance bond and the payment bond shall be deemed increased by like amount.

**'25.2 The performance and payment bonds shall be executed** by a surety company authorized to do business in this Commonwealth, and the contract instrument of bonds must be countersigned by a duly appointed and licensed resident agent.

## **'26. Claims by the Contractor/ Concealed Conditions/ Disputes**

**'26.1** Claims by the Contractor against the Owner are subject to the following:

**'26.1.1 All Contractor claims against the Owner shall be initiated by a written claim** submitted to the Owner and the A-E. Such claim shall be filed with the Owner and the A-E no later than seven (7) calendar days after the event, or the first appearance of the circumstances, causing the claim, and same shall set forth in detail all known facts and circumstances supporting the claim;

**'26.1.2 The Contractor and the Owner shall continue their performance** regardless of the existence of any claims submitted by the Contractor.

**'26.1.3 In the event the Contractor discovers previously concealed and unknown site conditions** which differ materially from those indicated in the Contract Documents, or unknown site conditions which are materially at variance from those typically and ordinarily encountered in the general geographical location of the Project, the Contract Sum shall be modified, either upward or downward, upon the written claim made by either party within seven (7) calendar days after the first appearance to such party of the circumstances.

**'26.1.3.1 As a condition precedent** to the Owner having any liability to the Contractor due to concealed and unknown conditions, the Contractor must give the Owner and the A-E written notice of, and an opportunity to observe, such condition prior to disturbing it.

**'26.1.3.2 The failure by the Contractor to give the written notice** and make the claim as provided by this paragraph shall constitute a waiver by the Contractor of any rights arising out of or relating to such concealed and unknown condition;

**'26.1.4 In the event the Contractor seeks to make a claim** for an increase in the Contract Sum, as a condition precedent to any liability of the Owner therefor, the Contractor shall strictly comply with the requirements of the first paragraph of this Article and such claim shall be made by the Contractor before proceeding to execute any additional or changed Work. Failure of the condition precedent to occur shall constitute a waiver by the Contractor of any claim for additional compensation;

**'26.1.5 In connection with any claim by the Contractor** against the Owner for compensation in excess of the Contract Sum, any liability of the Owner for the Contractor's cost shall be strictly limited to direct cost incurred by the Contractor and shall in no event include indirect cost or consequential damages of the Contractor. The Contractor shall provide a detailed breakdown of the direct cost incurred by the Contractor. The inclusion of the Contractor's 15% OHP to this direct cost shall constitute the Owner's reimbursement to the Contractor for all indirect cost and consequential damages.

**'26.1.6 The Owner shall not be liable to the Contractor** for claims of third-parties including subcontractors, unless and until liability of the Contractor has been established therefor in a court of competent jurisdiction;

**'26.2 In the event the Contractor should be delayed in performing any task** which at the time of the delay is then critical, or which during the delay becomes critical, as the sole result of any act or omission by the Owner or someone acting in the Owner's behalf, or by Owner-authorized Change Orders, unusually bad weather not reasonably anticipatable, fire or other

Acts of God, the date for achieving Substantial Completion, or, as applicable, final completion, shall be appropriately adjusted by the Owner upon the written claim of the Contractor to the Owner and the A-E.

**'26.2.1 An extension of time shall not mean** that the Contractor is entitled to additional compensation.

**'26.2.2 A task is critical within the meaning of this paragraph** if, and only if, said task is on the critical path of the Project schedule so that a delay in performing such task will delay the ultimate completion of the Project.

**'26.2.3 Any claim for an extension of time by the Contractor** shall strictly comply with the requirements of the first paragraph of this Article above. If the Contractor fails to make such claim as required in this paragraph, any claim for an extension of time shall be waived.

**'26.3 All claims under this Contract shall be made in accordance** with KRS 45A.225 to 45A.290. The provisions of these statutes do not toll the running of the Statute of Limitations set forth in KRS 45A.260. Any suit pursuant to KRS 45A.245 shall be commenced within one (1) year of the Substantial Completion Date specified in the Contract. If the Contractor does not commence suit within one (1) year of the date specified in the Contract, the Contractor shall be foreclosed from proceeding in court pursuant to KRS 45A.245.

**'26.3.1 The Owner and Contractor agree** that any suit, action or proceeding with respect to this Contract may only be brought in or entered by the courts of the Commonwealth of Kentucky situated in Frankfort, Franklin County, Kentucky, or the United States District Court for the Eastern District of Kentucky, Frankfort Division, and the parties hereby submit to the non-exclusive jurisdiction of such courts for the purpose of any such suit, action, proceeding or judgment and waive any other preferential jurisdiction by reason of domicile or location. The parties hereby agree that any such legal action shall be tried by the court sitting without a jury. The parties hereby irrevocably waive any objection that they may now or hereafter have to the laying of venue of any suit, action or proceeding arising out of or related to this Contract brought in the courts of the Commonwealth of Kentucky situated in Frankfort, Franklin County, Kentucky, or the United States District Court for the Eastern District of Kentucky, Frankfort Division, and also hereby irrevocably waive any claim that any such suit, action or proceeding brought in any one of the above-described courts has been brought in an inconvenient forum.

## **'27 Liens**

The filing and perfection of liens for labor, materials, supplies and rental equipment supplied on the work are governed by KRS 376.195 to 376.260.

**'27.1 The lien shall attach only to any unpaid balance** or retainage due the Contractor for the improvement from the time a copy of statement of lien, attested by the County Clerk, is delivered to the Owner, pursuant to the provisions of KRS 376.240

**'27.2 Statements of lien shall be filed with the Franklin County Clerk** and action to enforce the same must be instituted in the Franklin Circuit Court, Frankfort, Kentucky, pursuant to KRS 376.250(2).

## **'28 Assignments**

Neither party to the Contract shall assign the Contract, or any portion thereof without the written consent of the other, nor shall the Contractor assign any monies due or to become due to him hereunder without notification to the Owner. Notification of Assignments, shall be given on State

forms and in accordance with the procedures and regulations of the Finance and Administration Cabinet.

### **'29 Separate Contracts**

**'29.1 Owner's Right to Perform Construction and to Award Separate Contracts.** The Owner reserves the right to let other contracts in connection with the Project or to perform Work with its own forces. The Contractor shall afford other contractors reasonable opportunity for the introduction and storage of their materials and the execution of their Work and shall properly connect and coordinate his Work with theirs.

**'29.1.1 If any part of the Contractor's Work depends** for proper execution or results upon the Work of any other contractor, the Contractor shall promptly report to the A-E any observed defects in such Work that render it unsuitable for proper execution or connection. His failure to inspect and report shall constitute an acceptance of the other contractor's Work as fit and proper for the reception of his Work, except as to defects which may develop in the other contractor's Work after the execution of his Work.

**'29.1.2 If any part of another contractor's work depends on the Contractor's Work for proper** execution, the Contractor shall promptly perform that Work as required to allow the other contractor's work to progress as originally intended by the Owner's separate contract with that contractor.

**'29.1.3** Whenever Work being done by the Owner's forces or by other Contractors work under separate agreement with the Owner is contiguous to Work covered by this Contract, the respective rights of the various interests involved shall be established by the A-E to secure the completion of the various portions of the Work in general harmony.

**'29.2 Mutual Responsibility of Contractors.** Should the Contractor cause damage to any separate contractor on the Work, the Contractor agrees, upon due notice, to settle with such contractor if he will so settle. If such separate contractor sues the Owner on account of any damage alleged to have been so sustained, the Owner shall notify the Contractor who shall defend such proceedings at the Contractor's expense and if any judgment against the Owner arises therefrom, the Contractor shall pay or satisfy it and pay all costs incurred by the Owner.

### **'30 Allowances**

**'30.1 The Contractor shall have included in the Contract Sum all allowances stated in the Contract Documents** and shall cause the Work so designated to be done as the Owner may direct. If the actual price for purchasing the "allowed material" is more or less than the "cash allowance," the Contract Sum shall be adjusted accordingly.

**'30.2 The adjustment in Contract Sum shall be made on the basis** of the purchase price without additional charges for overhead, profit, insurance or any other incidental expenses. The cost of installation of the "allowed materials" shall be included in the applicable sections of the Contract specifications covering this Work. (see Article 14, paragraph 14.2 for more information).

### **'31 Project Meetings**

**'31.1 Pre-Construction Conference:** No later than 10 calendar days after execution of the Contract a Pre-Construction Conference will be held at the Project Site or another convenient location. This meeting will be scheduled by the Owner through the A-E.

**'31.1.1 Attendance at the Pre-Construction conference is mandatory for the following personnel:** Authorized Representatives of the Owner; A-E and their



consultants; Contractor and his Project Manager, Job Superintendent and key personnel; all major subcontractors; Using Agency on-site personnel; and other persons designated by the A-E, Owner, or Contractor to be critical to the project.

'31.1.2 All participants shall be familiar with the Project and authorized to conclude matters relating to the Work.

'31.1.3 Agenda for the meeting will include all matters indicated in the DECA Capital Construction Procedures Manual related to the project. The meeting will be conducted by the A-E and minutes distributed within three working days following the meeting.

'31.2 **Pre-Installation Conferences:** Pre-installation Conferences shall be held at the Project Site or another convenient location for any item of the work requiring a pre-installation conference. The conference is required PRIOR to each construction activity that requires coordination with other construction.

'31.2.1 **Attendance at the Pre-Installation Conference is mandatory for the following personnel:** Authorized Representatives of the Owner; A-E and their consultants who have responsibilities related to the installation; Contractor and his Project Manager, Job Superintendent and key personnel; all subcontractors with work related to the installation; Installers of the work; Manufacturer's and Fabricator's Representatives related to the installation; and other persons designated by the A-E, Owner, or Contractor to be critical to the project.

'31.2.2 All participants shall be familiar with the up-coming installation and authorized to conclude matters relating to the Work.

'31.2.3 Agenda for the meeting will include all matters indicated in the DECA Capital Construction Procedures Manual related to the project. The meeting will be conducted by the Contractor and minutes distributed within three working days following the meeting.

'31.3 **Project Progress Meetings:** At regular intervals during the construction (a minimum of monthly, but may be more frequently at the discretion of the A-E/ Owner, Project Progress Meetings will be held at the Project Site or another convenient location. This meeting will be scheduled at the Pre-Construction Conference or when more frequently needed by the Owner through the A-E.

'31.3.1 **Attendance at the Project Progress Meeting is mandatory for the following personnel:** Authorized Representatives of the Owner; A-E and their consultants; Contractor and his Project Manager, Job Superintendent and key personnel; all major subcontractors who have work completing, continuing or commencing; Using Agency on-site personnel; and other persons designated by the A-E, Owner, or Contractor to be critical to the project.

'31.3.2 All participants shall be familiar with the Project and authorized to conclude matters relating to the Work.

'31.3.3 Agenda for the meeting will include all matters indicated in the DECA Capital Construction Procedures Manual related to the project. The meeting will be conducted by the A-E and minutes distributed within three working days following the meeting.

**'31.3.4** Elsewhere in these General Conditions are submittals and other requirements of the Contractor that are to be provided at each Project Progress Meeting (i.e. updated Project Schedule, updated submittal log; updated RFI log, etc.

## **'32. Miscellaneous Provisions Regarding Contractor's Work**

**'32.1 Project Site Limits.** The Contractor shall confine his apparatus, the storage of materials, and the operations of his workmen to Project site limits indicated by the Contract Documents.

**'32.2 Points of Reference.** The Contractor shall carefully preserve bench marks, reference points and stakes, and in case of willful or careless destruction, he shall be charged with the resulting expense of replacement and shall be responsible for any mistake that may be caused by their unnecessary loss or disturbance.

**'32.3 Cutting and Patching.** The Contractor shall be responsible for cutting, fitting or patching required to complete the Project or make its parts fit together in a proper manner. The Contractor shall not endanger other parts of the Project, including work by the Owner or other contractors as provided in Article 29, by cutting, patching, or excavation. The Contractor shall not cut or otherwise alter construction by the Owner or a separate contractor without written consent of the Owner or such separate contractor. Such consent shall not be unreasonably withheld.

**'32.4 Cleanup.** The Contractor shall at all times keep the Project premises and surrounding area free from the accumulation of waste materials or rubbish caused by his operations in connection with the Project. Upon completion of the Work, and prior to final inspection and acceptance, the Contractor shall remove all remaining waste materials, rubbish, Contractor's construction equipment, tools, machinery, and surplus materials and leave the Project (including but not limited to glass, hardware, fixtures, masonry, tile and marble) in a clean and usable condition satisfactory to the A-E. Floors shall be cleaned and waxed in accordance with the requirements of the Contract specifications. If the Contractor fails to clean up as provided in the Contract Documents, the Owner may perform the cleaning tasks and charge the cost to the Contractor by Change Order.

### **'32.5 Guarantees, Warranties and "As-Built" Drawings.**

**'32.5.1** Prior to final payment for the Work, the Contractor shall assemble and present to the A-E all guarantees and warranties required by the Contract Documents.

**'32.5.2** All warranties for materials, equipment and installations constructed by this project shall commence on the Date of Substantial Completion and continue for the period of time indicated for the specific material, equipment or installation.

**'32.5.3** Additionally the Contractor shall provide "Record" Drawings prior to final payment.

**'32.6 Governing Law.** The Contract shall be governed by the laws of the Commonwealth of Kentucky.

**'32.6.1 Statutory Limitation Periods.** Statutes of Limitations are governed by KRS 45A.260(2).

**'32.6.2 Written Notice.** Written notice shall be deemed to have been given if delivered in person to the individual or to a member of the organization or entity or to an officer of the corporation for which it was intended, or if delivered at or sent by registered or certified mail to the last known business address known to the notifying party.



**'33. Apprentices**

Apprentices (for all classifications of work) shall be permitted to work only under an apprenticeship agreement approved by the Kentucky Supervisor of Apprenticeship and by the Kentucky Apprenticeship Council which is recognized by the Bureau of Apprenticeship and Training, U. S. Department of Labor.

**'34. Nondiscrimination in Employment**

During the performance of the Contract, the Contractor agrees as follows:

**'34.1** The Contractor shall not discriminate against any employee or applicant for employment because of race, color, religion, sex, age, national origin, or disability in employment.

**'34.2** The Contractor will take affirmative action in regard to employment, upgrading, demotion, transfer, recruitment, recruitment advertising, layoff, termination, rates of pay or other forms of compensation, and selection for training, so as to ensure that applicants are employed and that employees during employment are treated without regard to their race, color, religion, sex, age, or national origin; however, when layoffs occur, employees shall be laid off according to seniority with the youngest employees being laid off first. When employees are recalled, this shall be done in the reverse way the employees were laid off;

**'34.3** The Contractor shall, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, age, or national origin;

**'34.4** The Contractor will post notices in conspicuous places, available to employees and applicants for employment, setting forth the provisions of the nondiscrimination clauses required by this section;

**'34.5** The Contractor shall send to each labor union or representatives of workers with which he has a collective bargaining agreement or other contract or understanding, a notice advising the labor union or workers' representatives of the Contractor's commitments under this section.

Failure to comply with the above nondiscrimination clause constitutes material breach of Contract.

**'35 Affirmative Action; Reporting Requirements**

**'35.1** The Contractor and Subcontractors are exempt from any affirmative action or reporting requirements, under the Kentucky Equal Employment Act of 1978, KRS 45.560 to 45.640 hereinafter referred to as The Act, if any of the following conditions are applicable:

(1) the Contract or subcontract awarded is in the amount of five hundred thousand dollars (\$500,000) or less, and the amount of the contract is not a subterfuge to avoid compliance with the provisions of The Act; or

(2) the Contractor or Subcontractor utilizes the services of fewer than eight (8) employees during the course of the Contract ; or

(3) the Contractor or subcontractor employs only family members or relatives; or

(4) the Contractor or Subcontractor employs only persons having a direct Ownership interest in the business and such interest in not a subterfuge to avoid compliance with the provisions of The Act.

**'35.2 The Contractor or Subcontractor not otherwise exempted** shall for the duration of the Contract, hire minorities from within the drawing area to satisfy the agreed upon goals and timetables set out in addenda to the Contract. Should the union with which the Contractor has collective bargaining agreements be unwilling to provide sufficient minorities to satisfy the goals and timetables, the Contractor shall hire minorities from other sources within the drawing area to satisfy the goals and timetables in the addenda to the Contract.

**'35.3** The equal employment provisions of The Act may be met in part by the Contractor subcontracting to a minority contractor or subcontractor. A minority contractor or subcontractor shall be defined by the addenda to this Contract, or if none, by the Act.

**'35.4** Each Contractor shall, for the length of the Contract, furnish such information as required by The Act and by such rules, regulations and orders issued pursuant thereto and will permit access to all books and records pertaining to his employment practices and work sites by the contracting agency and the department for purposes of investigation to ascertain compliance with The Act and such rules, regulations and orders issued pursuant thereto.

**'35.5** If the Contractor is found to have committed an unlawful practice against a provision of The Act during the course of performing under this Contract, (if covered by The Act), the Owner may cancel or terminate the Contract, conditioned upon a program for future compliance approved by the Owner. The Owner may also declare such Contractor ineligible to bid on further contracts until such time as the Contractor complies in full with the requirements of The Act.

**'35.6** The Contractor shall not be required to terminate an existing employee, upon proof that employee was employed prior to the date of the Contract nor hire anyone who fails to demonstrate the minimum skills required to perform a particular job.

### **'36 Access to Records**

**'36.1 The contractor, as defined in KRS 45A.030(7), agrees that the contracting agency, the Finance and Administration Cabinet, the Auditor of Public Accounts, and the Legislative Research Commission, or their duly authorized representatives, shall have access to any books, documents, papers, records, or other evidence, which are directly pertinent to this contract for the purpose of financial audit or program review.**

**'36.2 Furthermore, any books, documents, papers, records, or other evidence provided to the contracting agency, the Finance and Administration Cabinet, the Auditor of Public Accounts, or the Legislative Research Commission which are directly pertinent to the contract shall be subject to public disclosure regardless of the proprietary nature of the information, unless specific information is identified and exempted and agreed to by the Secretary of the Finance and Administration Cabinet as meeting the provisions of KRS 61.878(1)(c) prior to the execution of the contract.**

**'36.3 The Secretary of the Finance and Administration Cabinet shall not restrict the public release of any information which would otherwise be subject to public release if a state government agency was providing the service. (22 Ky.R. 1510; eff. 5-16-96.)**

### **'37 Commonwealth Project Forms and other weblinks:**

**'37.1 The Commonwealth of Kentucky does not recognize any project forms from third party sources** (i.e. American Institute of A-Es; Association of Construction and Development; Association of General Contractors; etc.) unless the Commonwealth has not adopted specific documents.

**'37.1.1 When the Commonwealth has not adopted specific documents for a construction document purpose**, other documents may be used provided that they do not conflict with these General Conditions and other documents and contracts of the Commonwealth in any respect.

**'37.1.2 Any conflict between a construction document utilized** and any provision of these General Conditions or other documents and Contracts of the Commonwealth, shall be immediately considered null and void.

**'37.2 The weblink to the State Planroom site where Commonwealth Construction forms, contracts, and manuals are located is:**

<https://finance.ky.gov/services/stateplan/Pages/ConstructionFormsandInformation.aspx>

**37.2.1 A listing of documents available on this site includes the following:**

Required Affidavits and Statements

- Affidavit for Final Payment (B-210-13)
- Affidavit for Bidder, Offerors and Contractors
- Vendor Report of Prior Violations

Invoices and Change Order Form

- DOA-24 Invoice \*For contracts greater than \$400,000 (05-06-08)
- SAS-25 Invoice Short Form \*For contracts less than \$400,000 (09-29-11)
- SAS-25 A-Eing Consultants Form (11-19-10)
- SAS-42 Change Order Form (09-27-06)

Example Invoice Forms

- DOA-24 Continuation Sheet (Example)
- DOA-24 Long Form (Example) (09-27-06)
- SAS-25 Short Form (Example) (09-29-11)

EEO Forms

- Affidavit of Intent to Comply
- EEO-1: Employer Information Report
- Subcontractor Reporting Part

Manuals

- Capital Construction Project Procedures Manual (Updated 6-22-13)
- Technical Guidelines and Specifications - Complete Version (12-15-13)
- Capital Construction Project Procedures manual (Full collection)

**'37.3 The weblink to the State's Document Collaboration System is:**

<https://www.stateofkyprojects.com/>

**'37.3.1 This Document Collaboration System shall be used** for all official and/or required communication and documentation of any Capital Construction Project where these General Conditions apply.

**END OF GENERAL CONDITIONS**

Bond Number: \_\_\_\_\_

**Commonwealth of Kentucky  
Finance and Administration Cabinet  
Department for Facilities and Support Services  
Division of Engineering and Contract Administration**

**Performance Bond - Part V**

**CONTRACTOR** (Name and Address):

**SURETY** (Name and Principal Place of Business):

**OWNER** (Name and Address):  
Commonwealth of Kentucky  
Finance and Administration Cabinet  
Bush Building 1<sup>st</sup> Floor  
403 Wapping Street  
Frankfort, KY 40601-2638

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
Phone: \_\_\_\_\_

**CONSTRUCTION CONTRACT -**

DATE:  
AMOUNT:

AGENT or BROKER information:

DESCRIPTION (Name and Location)

Name: \_\_\_\_\_  
Title: \_\_\_\_\_  
License Number: \_\_\_\_\_  
Address: \_\_\_\_\_  
Phone: \_\_\_\_\_  
Email: \_\_\_\_\_

**BOND**

DATE:  
AMOUNT:

**CONTRACTOR AS PRINCIPAL**

Company: \_\_\_\_\_

(Corporate Seal)

**SURETY**

(Corporate Seal)

Signature: \_\_\_\_\_

Signature: \_\_\_\_\_

\_\_\_\_\_  
Name

\_\_\_\_\_  
Name

\_\_\_\_\_  
Title

\_\_\_\_\_  
Title

Whereas, the Owner has required the Contractor to furnish this Performance Bond containing the terms and conditions set forth herein as a condition to executing the Construction Contract with the Contractor;

Now therefore, the Surety and the Contractor, both severally, and for themselves, their heirs, administrators, executors and successors agree:

1. The Construction Contract is hereby incorporated herein and by reference made a part hereof to the same extent and effect as though it were copied verbatim herein. The Surety and the Contractor are bound for the full performance of the Construction Contract including without exception all of its terms and conditions, both express and implied.

2. If the Contractor is in default of the Construction Contract and the Owner, by written notice to the Contractor and the

Surety, declares the Contractor to be in default and terminates the right of the Contractor to proceed, the Surety shall thereupon promptly notify the Owner in writing as to which of the actions permitted to the Surety in Paragraph 3 it will take.

3. Upon the default and termination of the Contractor and notice to the Contractor and Surety as provided in Paragraph 2 above, the Surety shall within 30 days proceed to take one or, at its option, more than one of the following courses of action:

(A) Proceed itself, or through others acting on its behalf, to complete full performance of the Construction Contract including, without limitation, correction of defective and nonconforming work performed by or on behalf of the Contractor. During such performance by the Surety the Owner shall pay the Surety from its own funds only such sums as would have been due and payable to the Contractor in the absence of the default and termination.

(B) Applicable law permitting, and with the prior written consent of the Owner, obtain bids or proposals from contractors previously identified as being acceptable to the Owner, for full performance of the Construction Contract. The Surety shall furnish the Owner a copy of such bids or proposals upon receipt of same. The Surety shall promptly select, with the agreement of the Owner, the best responsive bid or proposal and shall promptly tender the contractor submitting it, together with a contract for fulfillment and completion of the Construction Contract executed by the completing contractor, to the Owner for the Owner's execution. Upon execution by the Owner of the contract for fulfillment and completion of the Construction Contract, the completing contractor shall furnish to the Owner a Performance Bond and a separate payment bond, each in the form of those bonds previously furnished to the Owner for the project by the Contractor. Each such bond shall be in the penal sum of the (1) fixed price for completion, (2) guaranteed maximum price for completions, or (3) estimated price for completion, whichever is applicable. The Owner shall pay the completing contractor from its own funds only such sums as would have been due and payable to the Contractor under the Construction Contract as and when they would have been due and payable to the Contractor in the absence of the default and termination. To the extent that the Owner is obligated to pay the completing contractor sums which would not have then been due and payable to the Contractor under the Construction Contract, the Surety shall provide the Owner with such sums in a sufficiently

timely manner that the Owner can utilize such sums in making timely payment to the completing contractor; or.

(C) Take any and all other acts if any, mutually agreed upon in writing by the Owner and the Surety.

4. In addition to those duties set forth hereinabove, the Surety shall promptly pay the Owner all loss, costs and expenses resulting from the Contractor's default(s), including, without limitation, fees, expenses and costs for architects, engineers, consultants, testing, surveying and attorneys, liquidated or actual damages, as applicable, for delay in completion of the Project, and fees, expenses and costs incurred at the direction, request, or as a result of the acts or omissions of the Surety.

5. In no event shall the Surety be obligated to the Owner hereunder for any sum in excess of the Penal Sum as it may be modified by addendum.

6. The Surety waives notice of any changes to the Construction Contract including, without limitation, changes in the contract time, the contract price, or the work to be performed.

7. This Performance Bond is provided by the Surety for the sole and exclusive benefit of the Owner, and, if applicable, any dual obligee designated by rider attached hereto, together with their heirs, administrators, executors, successors or assigns. No other party, person or entity shall have any rights against the Surety hereunder.

8. No action shall be commenced hereunder after the passage of the longer of two (2) years following the date on which the final payment of the contract falls due or, if this bond is provided in compliance with applicable law, any limitation period provided therein. If the limitation period contained in the Paragraph is unenforceable, it shall be deemed amended to provide the minimum period for an action against the Surety on a performance bond.

9. Any and all notices to the Surety, the Contractor or the Owner shall be given by Certified Mail, Return Receipt Requested, to the address set forth for each party above.

10. Any statutory limitation, which may be contractually superseded, to the contrary notwithstanding, any action hereon may be instituted so long as the applicable statute of limitations governing the Construction Contract has not run or expired.

Bond Number: \_\_\_\_\_

**Commonwealth of Kentucky  
Finance and Administration Cabinet  
Department for Facilities and Support Services  
Division of Engineering and Contract Administration**

**Payment Bond - Part IV**

**CONTRACTOR** (Name and Address):

**SURETY** (Name and Principal Place of Business):

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**OWNER** (Name and Address):  
Commonwealth of Kentucky  
Finance and Administration Cabinet  
Bush Building 1<sup>st</sup> Floor  
403 Wapping Street  
Frankfort, KY 40601-2638

Phone: \_\_\_\_\_

**CONSTRUCTION CONTRACT -**

DATE:  
AMOUNT:

AGENT or BROKER information:

DESCRIPTION (Name and Location)

Name: \_\_\_\_\_

Title: \_\_\_\_\_

License Number: \_\_\_\_\_

Address: \_\_\_\_\_

**BOND**

DATE:  
AMOUNT:

Phone: \_\_\_\_\_

Email: \_\_\_\_\_

**CONTRACTOR AS PRINCIPAL**

Company: \_\_\_\_\_

(Corporate Seal)

**SURETY**

(Corporate Seal)

Signature: \_\_\_\_\_

Signature: \_\_\_\_\_

\_\_\_\_\_  
Name

\_\_\_\_\_  
Name

\_\_\_\_\_  
Title

\_\_\_\_\_  
Title

Whereas, the Owner has required the Contractor to furnish this Payment Bond containing the terms and conditions set forth herein as a condition to executing the Construction Contract with the Contractor;

Now therefore, the Surety and the Contractor, both severally, and for themselves, their heirs, administrators, executors and successors agree:

1. The Construction Contract is hereby incorporated herein and by reference made a part hereof to the same extent and effect as though it were copied verbatim herein. The Surety and the Contractor are bound for the full performance of the Construction Contract including without exception all of its terms and conditions, both express and implied, and, without limitation, specifically including Contractor's obligation to pay for labor, materials, services and equipment provided in connection with the Construction Contract performance.

Bond Number: \_\_\_\_\_

2. For purposes of this Payment Bond, Beneficiary is defined as person or entity who has actually provided labor, material, equipment, services or other items for use in furtherance of the Construction Contract, and having:

- (A) a direct contract with the Contractor; or
- (B) a direct contract with a subcontractor of the Contractor; or
- (C) rights, under the laws of the jurisdiction where the Project is located, to file a lien, a claim or notice of lien, or otherwise make a claim against the Project or against funds held by the Owner, if the Project is, or were, subject to such filing.

3. The Surety shall not be obligated hereunder to a Beneficiary other than a Beneficiary having a direct contract with the Contractor unless such Beneficiary has given written notice of its claim to the Contractor and the Surety as follows:

- (A) the period of time provided by the jurisdiction wherein the Project is located for (1) filing a lien, claim of lien, notice of lien, if the Project is, or were, subject to such filing (KRS 376.230), or (2) otherwise making a claim against the Project or against funds held by the Owner;
- (B) address, the person or entity to whom such labor, material, equipment, services or other items were provided.

4. In no event shall the Surety be obligated hereunder for sums in excess of the Penal Sum as it may be modified by addendum.

5. Upon receipt of claim from a Beneficiary hereunder, the Surety shall promptly, and in no event later than 30 days after receipt of such claim, respond to such claim in writing (furnishing a copy of such response to the owner) by:

- (A) making payment of all sums not in dispute; and
- (B) stating the basis for disputing any sums not paid.

6. No action shall be commenced by a Beneficiary hereunder after the passage of the longer of two (2) years following the date on which the final payment of the contract falls due or, if this bond is provided in compliance with applicable law, any limitation period provided therein. If the limitation period contained in this Paragraph is unenforceable, it shall be deemed amended to provide the minimum period for an action against the Surety on a payment bond by a third-party beneficiary thereof.

7. Any and all notices to the Surety or the Contractor shall be given by Certified Mail, Return Receipt Requested, to the address set forth for each party above.

SAMPLE  
DO NOT USE FOR BIDDING

**PART VI**

**FINANCE AND ADMINISTRATION CABINET  
DEPARTMENT FOR FACILITIES AND SUPPORT SERVICES  
DIVISION OF ENGINEERING AND CONTRACT ADMINISTRATION**

**AGREEMENT BETWEEN OWNER AND CONTRACTOR**

This **AGREEMENT**, between the Owner, the **COMMONWEALTH OF KENTUCKY**, and the Contractor: \_\_\_\_\_  
The Architect is: \_\_\_\_\_

This Agreement, properly by the parties, shall be final and binding only upon the issuance of the Finance and Administration Cabinet Construction Contract.

The Owner and Contractor agree as set forth below.

**Article No. 1 THE CONTRACT DOCUMENTS:**

The Contract Documents consist of the Agreement, the Official Bid Document, the Request for Bids, the Instructions to Bidders, the General Conditions, Supplement Conditions, Drawings, Specifications, and Addenda issued prior to the execution of this Agreement, and modifications made after the execution of this Agreement. The Contract Documents represent the entire and integrated agreement between the parties. All of these documents are as fully a part of this Agreement as if attached to this Agreement or repeated herein.

**Article No. 2 SCOPE OF WORK:**

The Contractor shall execute the entire work described in the Contract Documents entitled:

**REQUEST FOR BID NO.:**  
**SOLICITATION NO.:**

A listing of the Specifications, Drawings and Addenda are contained in Article 11 of this Agreement.

**Article No. 3 TIME OF COMPLETION:**

The date of commencement for the work shall be the date upon which the Owner issues the Contract Documents. The Contractor shall achieve substantial completion of the entire work (as defined by Article 19.4 of the General Conditions) not later than



\_\_\_\_\_ calendar days/date after the date of commencement for the work, subject to adjustments of contract time as provided in the Contract Documents. Final completion of the work shall be achieved \_\_\_\_\_ calendar days/date after the scheduled date of substantial completion.

**Article No. 4 LIQUIDATED DAMAGES:**

It is understood by the parties that time is of the essence of this contract, and that the Owner will sustain substantial financial damages and other injuries in the event of a failure of the Contractor to complete the work in a timely manner. In light of these foreseeable losses, and the difficulty of proof of loss, the Contractor shall be assessed liquidated damages in the amount of \$ \_\_\_\_\_ for each calendar day between the date set for substantial completion of this work and the actual date upon which substantial completion is achieved in accordance with Article 19.4 of the General Conditions. The Contractor shall be assessed liquidated damages in the amount of \$ \_\_\_\_\_ for each calendar day between the date set for final completion of this work and the actual date upon which final completion is achieved in accordance with Article 19.5 of the General Conditions. In the event that the Contractor abandons the work prior to the substantial completion or is terminated for default under Article 22.2 of the General Conditions, the Owner may upon completion of the work recover liquidated damages for the entire period of delay to substantial completion or final completion under this Article. This recovery will be in addition to any other rights and remedies the Owner may have against the Contractor.

**Article No. 5 CONTRACT SUM:**

The Owner shall pay the Contractor for the Contractor's performance of the contract the sum of \_\_\_\_\_, ( \_\_\_\_\_ ) subject to additions and deductions as provided in the Contract Documents. The Contract Sum is based upon the alternates, if any, which are described in the Contract Documents and are hereby accepted by the Owner.

**Article No. 6 PROGRESS PAYMENTS:**

Based upon applications for payment submitted to the Architect by the Contractor, the Owner shall make progress payments on the account of the Contract Sum to the Contractor in accordance with Article 18 of the General Conditions.

**Article No. 7 ACCEPTANCE AND FINAL PAYMENT:**

Final payment shall be due in accordance with Article 18.7 of the General Conditions provided, that all work has been fully completed in accordance with the plans and specifications as evidenced by a certificate by the Architect for the project, and it has been accepted by the Owner. Further, final payment is contingent upon receipt of

"As-Built" drawings from the Contractor. The Contractor shall submit with his final payment application evidence satisfactory to the Architect that all payrolls, material bills and other indebtedness connected with the work have been paid or that provisions for the satisfaction thereof have been made.

**Article No. 8 CHANGES IN THE WORK:**

The Owner, without invalidating the contract, may delete, add to or modify the work in accordance with Article 14 of the General Conditions.

**Article No. 9 SPECIAL NOTICE REGARDING PAYROLL TAXES, ETC:**

The Contractor hereby certifies that he has fully informed himself of the conditions relating to construction and labor under which the work under this contract is to be performed, and accepts liability for payment of all payroll taxes on deductions required by local, state, and federal law, including but not limited to old age pension, social security, or annuities, and agrees that he shall employ, so far as is predictable, methods and means in carrying out his work as will not interfere with or interrupt the work of any other contractor working on or adjacent to the site for this work.

**Article 10 TERMINATION OR SUSPENSION:**

The contract may be terminated by the Owner upon the default of the Contractor and terminated for convenience of the Owner as provided for in Article 22 of the General Conditions.

**Article No. 11 ENUMERATION OF SPECIFICATIONS, DRAWINGS AND ADDENDA:**

The Contract Documents, except for Modifications issued after the execution of this Agreement, include the following specifications, drawings and addenda:

**SPECIFICATIONS:**

**DOCUMENT:**

**TITLE:**

**DRAWINGS:**

**SHEET NUMBERS:** See eCommunications

**ADDENDA:**

**NUMBERS:**

PROJECT MANAGER:.

PHONE:

AGENCY CONTACT:

PHONE:

ARCHITECT:

PHONE:

Date for Substantial Completion: \_\_\_\_\_

Date for Final Completion: \_\_\_\_\_

SAMPLE  
DO NOT USE FOR BIDDING

# Special Conditions for Commonwealth of Kentucky Projects - 10000

## Contents

<u>Article</u>	<u>Title</u>
'1	<u>Special Conditions Supplement</u>
'2	<u>The Project</u>
'3	<u>Project Contacts</u>
'4	<u>Times for Completion</u>
'5	<u>Liquidated Damages</u>
'6	<u>Temporary Facilities and Controls</u>
'7	<u>Special Inspections and Testing</u>
'8	<u>Allowances</u>
'9	<u>Unit Prices</u>
'10	<u>Schedule of Additive Alternates</u>
'11	<u>Additional Project Completion or Close-out Requirements</u>
'12	<u>Special Project Site Security or Access Required</u>
'13	<u>Special Delegated Design Requirements</u>
'14	<u>Other Special Conditions of Contract</u>

## Articles

### '1 Special Conditions:

These Special Conditions are provided as a supplement to the General Conditions in the Specifications. Special Conditions will also supersede General Conditions where changes are necessary to coordinate with specific project requirements.

### '2 The Project:

These specifications and drawings accompanying them describe the work to be performed and materials to be furnished for the:

**Future Farmers of America HVAC Renovations  
Recreation Hall  
#540CBANFF2500**

#### Project Description:

The following Project Narrative describes Mechanical, Electrical, and Architectural work associated with the HVAC renovation of the **Recreation Hall** on the Future Farmers of America campus.

#### Mechanical:

All existing window air conditioning units and floor finned tube radiators are to be removed. The new mechanical system is a variable refrigerant flow (VRF) system that will utilize refrigerant as the method of cooling/heating. Each classroom will have two (2) wall-mounted indoor units to adequately cool or heat the

## Special Conditions for Commonwealth of Kentucky Projects - 10000

classroom. The recreation hall will have three (3) fan coil units installed for cooling or heating the space. Condensing units will be installed exterior to the building in two separate locations to decrease the distance of piping installation. A VRF monitoring system will be installed in the recreation hall and can be utilized to control the individual units that are installed. The VRF system will also connect to the campus BAS enabling users to log-in online to view system performance and set any parameters needed.

### Electrical:

The existing panelboard will be replaced with a new panelboard to ensure safety and reliability of electrical systems when the building is utilized.

Existing lighting will be upgraded from fluorescent to LED improving not only the aesthetic of the spaces but has increased lower occupant stimulation levels and provides opportunity to lower operational cost. New exterior lighting will replace the existing exterior lighting. Lighting controls will be upgraded to meet current code requirements.

The existing fire alarm system is not compliant with current code requirements. There will be a new voice evacuation fire alarm system and devices for the safety of occupants within the building.

### Architectural:

The existing windows and doors will be replaced with new windows and doors which will improve thermal comfort and building energy efficiency. The exterior and interior finishes are remaining to keep the initial aesthetic of the building.

## **'3 Project Contacts:**

**(Refer to Drawings for Company Addresses / Phone Numbers)**

**In the roles defined by the General Conditions as "Architect" and as used throughout the Contract Documents as the Architect of the work being constructed, the following firm and its sub-consultants are working under separate contract with the Owner to provide the services under this role:**

### **MEP Engineer:**

**CMTA, Inc.**

Principal-In-Charge: Paul Graves \_\_\_\_  
Project Manager: Paul Graves \_\_\_\_

### **Structural Engineer:**

**Structural Services Inc.**

Principal-In-Charge: Nick Carter  
Project Manager: Nick Carter \_\_\_\_

### **Architect:**

**Studio Kremer Architects**

Principal-In-Charge: Steven Ward \_\_\_\_  
Project Manager: Steven Ward

## Special Conditions for Commonwealth of Kentucky Projects - 10000

In the roles defined by the General Conditions as “Owner” and as used throughout the Contract Documents as the Owner of the work being constructed, is the Commonwealth of Kentucky, acting through the Finance and Administration Cabinet, Department for Facilities Management and Support Services, Division of Engineering and Contract Administration. The Owner is solely represented by the following:

**Owner:**                                      **Finance and Administration Cabinet                      Facilities and Support Services**  
**Division of Engineering and Contract Administration**

Project Manager:                              Tony Yates  
Executive Director:                              Scott Baker

In the role defined by General Conditions, “Agency or Using Agency”, is a state government entity which utilizes the work being constructed. This agency is a client of the Owner and advises the Owner on matters related to the project. This Using Agency does not possess the legal authority of Owner:

**Using Agency:**                                      **Future Farmers of America**

Project Manager:  
FFA Representative:                              Josh Mitcham

In the roles defined by the General Conditions as “Commissioning Authority” and as used throughout the Contract Documents as the Commissioning Agent of the work being constructed, the following firm is working under separate contract with the Owner to provide the services under this role:

**Commissioning Authority:**      N/A

Principal-In-Charge:                              N/A  
Project Manager:                                      N/A

In the roles defined by the General Conditions as “Special Inspector” and as used throughout the Contract Documents as the firm performing Special Inspections as required by the Kentucky Building Code for the work being constructed, the following firm is working under separate contract with the Owner to provide the services under this role:

**Special Inspector:**                              N/A

Principal-In-Charge:                              N/A  
Project Manager:                                      N/A

### **‘4 Times of Completion:**

Subject to the conditions of Article ‘16 – “Delays and Extension of Time” of the General Conditions, the work to be performed under this Contract shall be completed as follows:

**Substantial Completion 1** is 5/2/2025. Substantial Completion includes the completion of all contracted scopes of work.

**Article ‘19.4 of the General Conditions set forth specific requirements of the Commonwealth of Kentucky that are necessary to be fulfilled by the Contractor in order to be determined to have accomplished**

## Special Conditions for Commonwealth of Kentucky Projects - 10000

**Substantial Completion by this date. Refer to Article '11 of these Special Conditions for additional requirements of this specific project required to accomplish Substantial Completion.**

**Final Completion is 5/16/2025.** Final Completion includes all work.

**Article '19.5 of the General Conditions set forth specific requirements of the Commonwealth of Kentucky that are necessary to be fulfilled by the Contractor in order to be determined to have accomplished Final Completion by this date. Refer to Article '11 of these Special Conditions for additional requirements of this specific project required to accomplish Final Completion.**

**As indicated in Article '4 of the General Conditions, "Construction Schedule", the following limitations of work times are set forth herein that are to be accounted for by the Contractor in scheduling and sequencing of the work:**

**Work Restrictions and "Black-Out" Dates: N/A**

**Project Phasing (Separate start and completion dates): Refer to the provided exhibit of Project Phasing.**

**Limitations on daily work times:**

Site:

Work shall occur between 7 am –9 pm, seven (7) days a week. Noisy activity to end at 6pm.

**Work being Performed by the Owner or by Others:** Owner to remove all furniture and vending before construction begins.

**Products ordered by the Owner in Advance/ Anticipated Delivery Dates: N/A**

**Construction Contract Time required for Commissioning: N/A**

**Construction Contract Time required for Testing and Balancing: As required per 230593.**

### **'5 Liquidated Damages / Damages from Untimely Performance:**

**In accordance with Article '19.7 of the General Conditions, the Contractor shall pay the Owner the following identified amount for each and every calendar day of unexcused delay in achieving Substantial Completion and Final Completion beyond the date set for below for each:**

**Substantial Completion I/II Liquidated Damages** are \$500/calendar day for each day beyond the established Date of Substantial Completion until the Actual Date of Substantial Completion is achieved. (See Article '19.4 of the General Conditions and Article '11 of these Special Conditions for requirements for Substantial Completion).

## Special Conditions for Commonwealth of Kentucky Projects - 10000

**Final Completion I Liquidated Damages** are \$250/calendar day for each day beyond the established Date of Final Completion until the Actual Date of Final Completion is achieved. (See Article '19.5 of the General Conditions and Article '11 of these Special Conditions for requirements for Final Completion).

### '6 Contractor Provided Temporary Facilities and Controls:

**Construction Office/Trailer:** To be coordinated and located with the FFA team with during the construction periods. Contractor shall clean and restore temporary construction office to previous condition prior to each substantial completion.

**Staging / Parking:** Staging to be located on campus and coordinated with the campus's facility/maintenance staff. Parking to be coordinated with campus upon award.

**Temporary Fencing and Signage:** Portable chain link with concrete blocks.

**Portable Toilet Facilities:** Contractor may use toilets in the respective buildings of construction during construction; contractor to clean & restore toilets to original condition upon completion of project.

**Utilities:** N/A

### '7 Special Inspections and Testing:

**Article '12 of the General Conditions and the technical specifications of the Contract Documents define and establish the requirements and provisions for Inspection of the Work, Special Inspections performed by others working under separate contract with the Owner, and testing to be provided by the Contractor.**

**Structural Special Inspections and Testing:** N/A

**Site Special Inspections and Testing:** N/A

**Contractor Provided Testing:** All other testing required by the Contract Documents are Contractor Provided Testing.

### '8 Allowances included in the Contract Amount:

**The Contractor is required by Article '30 of the General Conditions to include in the Contract Amount the following Allowances:**

**Allowances shall include all necessary materials, costs of delivery, installation labor, tools and equipment necessary to provide the item or services indicated in the Allowance. When the item of work or service is completed, the Contract Amount is modified by Change Order to reconcile the Allowance with the actual cost of the item or service provided. The contractor's overhead, profit, insurance and bonds, and administrative costs are included in the prescribed markup permitted by Article '14 of the General Conditions "Changes in the Work" and are not to be included in the Allowance.**



## Special Conditions for Commonwealth of Kentucky Projects - 10000

### **'9 Unit Prices established by the Form of Proposal:**

The Contractor is required at time of submitting a bid proposal for this work to provide specific Unit Prices that will be used to add or deduct those specific work items or services by an established unit of measure and the stated price per unit.

Unit prices include all necessary materials, costs of delivery, installation labor, tools and equipment necessary to provide the unit measured item. If a unit price is used in a change to the work by Change Order, the contractor's overhead, profit, insurance and bonds, and administrative costs are included in the prescribed markup permitted by Article '14 of the General Conditions "Changes in the Work" and are not to be included in the unit price.

For a schedule of Unit Prices see the "Unit Prices" section of the Bid Form of Proposal.

Refer to Bid tab form.

### **'10 Schedule of Additive Alternates:**

The Bid Form of Proposal includes Additive Alternates that, if accepted by the Owner during review of bids, become a part of the Contract Amount. Additive Alternates are listed in the order which they will be considered and may be accepted by the Owner to be included in the base Contract of the Work. The following is the sequential listing and description of Additive Alternates:

N/A

Additive Alternates include all necessary materials, costs of delivery, installation labor, tools and equipment, contractor's overhead, profit, insurance and bonding, and administrative costs. All work necessary to provide the work described in the Additive Alternate is to be included.

### **'11 Additional Project Completion or Project Close-Out Required:**

Article '19.4 of the General Conditions "Substantial Completion" defines the specific MANDATORY requirements to be accomplished or provided to achieve Substantial Completion of the Project. In addition to those requirements, the following requirements are also MANDATORY requirements to be accomplished or provided to achieve Substantial Completion of this Project:

- N/A

Article '19.5 of the General Conditions "Final Completion" defines the specific MANDATORY requirements to be accomplished or provided to achieve Final Completion I of the Project. In addition to those requirements, the following requirements are also MANDATORY requirements to be accomplished or provided to achieve Final Completion I of this Project:

- N/A

### **'12 Special Project Site Security or Access Requirements:**

## Special Conditions for Commonwealth of Kentucky Projects - 10000

A. The Owner and the operating agency for this facility have very specific requirements that the Contractor must meet to gain access to the Site or to work in a specific area. All Contractor personnel shall be approved by the standard process in place at the time.

B. Workers shall abide by a code of conduct, to include wearing shirts, at all times. Alcohol, smoking, drugs, firearms, foul language, and fraternizing with students, staff or campus visitors are strictly prohibited.

C. The Contractor shall be responsible for ensuring no Contractor employee or subcontractor on its behalf appears on the campus property who has been charged or convicted of a sex crime or violent crime like those covered in KRS 160.380(3) or KRS 17.545. All contractors who perform work on campus property shall undergo state and federal criminal background checks that satisfy KRS 160.380(7). These background checks are to be submitted to the FFA leadership for their record. The contractor shall conduct these background checks before its employees or contractors come onto campus property and shall warrant that no employees or subcontractors appearing on campus property on its behalf have a history of criminal charges or convictions of violent offenses or sex crimes. The leadership of the campus has full rights to prohibit the Contractor, their employees or subcontractor from coming onto campus property, when students are present on the campus's property, if there is reasonable cause to do so including, but not limited to, the following: the campus leadership learns the Contractor, their employee or their contractor has failed a criminal background check as specified in this agreement, or the campus leadership learns the Contractor, Contractor employee or subcontractor has been charged with a sex crime or violent offense crime like those covered in KRS 160.380(4) or KRS 17.545. Additionally, pursuant to KRS 160.380(7), the provisions of KRS 160.380 that shall be in effect starting July 1, 2018 shall apply at that time as well to require a letter from the Cabinet for Health and Family Services (CHFS) indicating the Contractor, Contractor employee or Subcontractor working on site has no substantiated child abuse or neglect records maintained by CHFS. After July 1, 2018, the Contractor shall confirm to the campus leadership that no employee or subcontractor appearing on campus property on behalf of the Contractor has a substantiated finding of child abuse or neglect from CHFS.

D. Contractor, Contractor employees and all Subcontractors shall wear identification at all times while on campus. ID badges should be visible and have Photo, Company Name, Employee Name. Workers are also to wear their company logo visible at all times on clothing.

### **'13 Special Delegated Design Requirements:**

#### **13.1**

- N/A

### **'14 Other Special Conditions of Contract:**

All submittals shall be submitted independently by building.

**END OF SPECIAL CONDITIONS**

## INDEX

### **DIVISION 06 – WOODS, PLASTICS and COMPOSITES**

061000 – ROUGH CARPENTRY

062000 – FINISH CARPENTRY

### **DIVISION 07 – THERMAL and MOISTURE PROTECTION**

079200 – JOINT SEALANTS

### **DIVISION 08 – OPENINGS**

082210 – SWINGING ALUMINUM CLAD DOORS

085610 – ALUMINUM CLAD WOOD WINDOWS

087100 – DOOR HARDWARE

### **DIVISION 09 – FINISHES**

099000 – PAINTING

### **DIVISION 23 – HVAC**

230500 – COMMON WORK RESULTS FOR HVAC

230501 – SCOPE OF THE HVAC WORK

230502 – SHOP DRAWINGS MECHANICAL

230505 – DEMOLITION

230517 – SLEEVING

230529 – HANGERS

230553 – IDENTIFICATIONS FOR HVAC PIPING AND EQUIPMENT

230593 – TESTING, ADJUSTING AND BALANCING FOR HVAC

230719 – HVAC PIPING INSULATION

230900 – INSTRUMENTATION AND CONTROL FOR HVAC

230910 – FACILITY MONITORING SYSTEM

232113 – HYDRONIC PIPING

232300 – REFRIGERANT PIPING

233113 – METAL DUCTS

233300 – AIRDUCT ACCESSORIES

233713 – GRILLES, REGISTERS & DIFFUSERS

238150 – VARIABLE REFRIGERANT VOLUME SYSTEM

### **DIVISION 26 – ELECTRICAL**

260010 – GENERAL REQUIREMENTS FOR ELECTRICAL SYSTEMS

260500 – COMMON WORK RESULTS FOR ELECTRICAL SYSTEMS

260519 – LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

260526 – GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

260533 – RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

260543 – UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

260553 – IDENTIFICATION FOR ELECTRICAL SYSTEMS

260573 – POWER SYSTEM STUDIES

262416 – PANELBOARDS

262726 – WIRING DEVICES

262813 – FUSES

262816 – ENCLOSED SWITCHES AND CIRCUIT BREAKERS

262900 – MOTOR CONTROLLERS

264300 – SURGE PROTECTIVE DEVICES

265000 – LIGHTING

### **DIVISION 28 – ELECTRONIC SAFETY AND SECURITY**

Future Farmers of America – HVAC Renovations  
Recreation Hall

CMTA Project: VKYS23-08

283100 – FIRE ALARM

**SECTION 06 10 00 – ROUGH CARPENTRY**

**PART 1 GENERAL**

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes the following:
  - 1. Wood blocking and nailers.
  - 2. Modification of door and window casings and other running trim to prepare for installation of doors and windows.
  - 3. Wood nailers, plywood nailers/substrate, roof curbs, expansion joint framing, coping blocking, cant strips, and other carpentry associated with roofing assemblies.
  - 3. Plywood backing panels.
  - 4. Preservative treatment, borate type.
  - 5. Installation of mineral fiber at pipe sleeves.

1.03 DEFINITIONS

- A. Dimension Lumber: Lumber that is cut to certain pre-determined sizes, that is sawn, planed and smooth, ready for building applications.
- B. Lumber grading agencies, and the abbreviations used to reference them, include the following:
  - 1. NeLMA: Northeastern Lumber Manufacturers' Association.
  - 2. NLGA: National Lumber Grades Authority.
  - 3. SPIB: The Southern Pine Inspection Bureau.
  - 4. WWPA: Western Wood Products Association.
- C. Mineral-Fiber Insulation: Insulation composed of rock-wool fibers or slag-wool fibers; produced in boards and blanket with latter formed into batts (flat-cut lengths) or rolls.
  - 1. Glass fiber will not be permitted.

1.04 SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
  - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
    - a. Manufacturer's Certificate: Certify that Products conform to specified requirements.
  - 2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
  - 3. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

- B. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:
  - 1. Wood-preservative-treated wood.
  - 2. Power-driven fasteners.
  - 3. Expansion anchors.
  - 4. Metal framing anchors.

#### 1.05 QUALITY ASSURANCE

- A. Source Limitations for Engineered Wood Products: Obtain each type of engineered wood product through one source from a single manufacturer.
- B. Source Quality: Obtain each type of treated wood from a single manufacturer.
  - 1. Surface Burning Characteristics: ASTM E84.
    - a. Flame Spread Index: 25, maximum.
    - b. Smoke Developed Index: 450, maximum.
  - 2. Moisture Content after Treatment:
    - a. Lumber: Maximum 19-percent.
    - b. Structural Panels: Maximum 15-percent.
- C. Apply label from agency approved by authority having jurisdiction to identify each fire retardant treated material. Include the following identification:
  - 1. Inspection agency.
  - 2. Standard to which the material was treated.
  - 3. Treating facility.
  - 4. Treatment material and retention.
  - 5. End use for which the product is suitable.
  - 6. Kiln dried after treatment.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

### **PART 2 PRODUCTS**

#### 2.01 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
  - 1. Factory mark each piece of lumber with grade stamp of grading agency.
  - 2. For exposed lumber indicated to receive a stained or natural finish, omit grade stamp and provide certificates of grade compliance issued by grading agency.

3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
4. Provide dressed lumber, S4S, unless otherwise indicated.

## 2.02 WOOD-PRESERVATIVE-TREATED LUMBER

- A. Preservative Treatment by Pressure Process: AWPA U1, using preservative chemicals acceptable to authorities having jurisdiction and containing no arsenic or chromium. Use Category UC4a for items in contact with the ground.
- B. Kiln-dry lumber after treatment to a moisture content of 19% or less. Do not use material that is warped or does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
- D. Application: Treat items indicated on Drawings, and the following:
  1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
  2. Wood sills, sleepers, blocking, and similar concealed members in contact with masonry or concrete.
  3. Within 18-inches of grade.
- E. Note that some treated wood materials cannot be installed in direct contact with some metals without danger of corrosion.
  1. Fasteners shall be hot-dipped galvanized or stainless steel. Follow wood and metal suppliers' recommendations in selection of fasteners.
  2. Follow wood and metal suppliers' recommendations to isolate treated lumber from metal materials (flashings, fittings, etc.) where necessary.

## 2.03 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
  1. Blocking.
  2. Nailers.
  3. Furring.
  4. Hanging strips.
- B. For items of dimension lumber size, provide Construction or No. 2 grade lumber with 19-percent maximum moisture content of any species.
- C. For concealed boards, provide lumber with 19-percent maximum moisture content and any of the following species and grades:
  1. Mixed southern pine, No. 2 grade; SPIB.
  2. Eastern softwoods, No. 2 Common grade; NeLMA.
  3. Northern species, No. 2 Common grade; NLGA.
  4. Western woods, Standard or No. 2 Common grade; WCLIB or WWPA.
- D. For roof curbs, expansion joint framing, coping cover blocking and nailers, provide preservative treated construction-grade Douglas Fir or Yellow Pine.



- E. For blocking not used for attachment of other construction, Utility, Stud, or No. 2 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
- F. For blocking, nailers, and furring used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

#### 2.04 MINERAL WOOL/FIBER INSULATION

- A. Manufacturers
  - 1. Acceptable Manufacturer:
    - a. Johns Manville
    - b. Roxul
    - c. Thermafiber
    - d. Knauf
  - 2. Mineral wool batts made of inorganic fibers derived from basalt. Batts are to be inorganic, noncombustible, moisture resistant, non-deteriorating; will not mildew or support corrosion.
    - a. Materials incorporating glass fibers will not be permitted.
  - 3. Thermal Resistance, ASTM C518: 3 ½” = R-15; 5 ½” = R-23.
  - 4. Surface Burning, ASTM E84: Flame spread 5/Smoke 0
  - 5. Acoustical Separation: 2” material used where shown as part of wall assemblies to achieve STC ratings of 58 or better.

#### 2.05 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
  - 1. Where rough carpentry is exposed to weather, in ground contact, in pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A-153 / A-153M, or Type 304 stainless steel fasteners.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: NES NER-272.
- D. Wood Screws: ASME B18.6.1.
- E. Screws for Fastening wood blocking or nailers to Metal Roof Deck: Steel drill screws, in type and length recommended by screw manufacturer for thickness of material to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117. Countersink fastener flush with surface of furring.
- F. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).
- G. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.
- H. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies

and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.

1. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 (ASTM F 738M and ASTM F 836M, Grade A1 or A4).

## 2.06 PLYWOOD

- A. Trademark: Identify each plywood panel with appropriate APA trademark.
- B. Concealed Performance-Rated Plywood: Where plywood panels will be used for concealed types of applications, provide APA performance-rated panels complying with requirements indicated for grade designation, span rating, exposure durability classification, edge detail (where applicable) and thickness.
  1. Wall and Roof Exterior Sheathing: APA Rated Sheathing
    - a. Exposure durability classification: Exterior
    - b. Span rating: As required to suit structure/support spacing indicated.
    - c. Basis of Design: 3/4" CDX, unless noted otherwise.

## 2.07 MISCELLANEOUS MATERIALS

- A. Sill-Sealer Gaskets: Mineral fiber or other non-glass-fiber insulation, fabricated in strip form, for use as a sill sealer; 1-inch nominal thickness, compressible to 1/32-inch; selected from manufacturer's standard widths to suit width of sill members indicated.

## PART 3 EXECUTION

### 3.01 INSTALLATION, GENERAL

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking, grounds, furring, and similar supports to comply with requirements for attaching other construction.
- B. Framing Standard: Comply with AF&PA's "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- C. Do not splice structural members between supports, unless otherwise indicated.
- D. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
- E. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- F. Comply with AWWA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
- G. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. NES NER-272 for power-driven fasteners.
2. Table 2304.9.1, "Fastening Schedule," in Kentucky Building Code.

- H. Use common wire nails, unless otherwise indicated (as in case of treated lumber applications). Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; do not countersink nail heads, unless otherwise indicated.

### 3.02 WOOD BLOCKING, AND NAILER INSTALLATION

- A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
1. Even if not specifically noted, provide 2x6 blocking at frame partitions where markerboards and tackboards are to be installed.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.

### 3.03 FIELD TREATMENT

- A. Treat cuts and bored holes in pressure treated lumber and plywood with field treatment materials in accordance with wood treatment manufacturer's instructions.

### 3.04 MINERAL FIBER

- A. As indicated in drawings, after sleeves are installed for piping penetrations, pack free area in sleeve tight with mineral fiber insulation so that no gaps or leakage is allowed.

### 3.045 PROTECTION

- A. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

**END OF SECTION 06 10 00**

## **SECTION 06 20 00 – FINISH CARPENTRY**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### **1.2 DESCRIPTION OF WORK**

- A. Definition: Finish carpentry includes carpentry work which is exposed to view, is concealed but related to detailed work of tight tolerance, is non-structural and/or which is not specified as part of other sections.

Types of finish work in this section include:

1. Interior running and standing trim.
2. Exterior running and standing trim.

- B. Rough carpentry is specified in another section within Division 06.
- C. Door Hardware and doors are specified in section within Division 08.

#### **1.3 QUALITY ASSURANCE**

- A. Factory-mark each piece of lumber and plywood with type, grade, mill and grading agency identification; except omit marking from surfaces to receive transparent finish and submit mill certification that material has been inspected and graded in accordance with requirements if it cannot be marked on a concealed surface.

#### **1.4 SUBMITTALS**

- A. Shop Drawings: Provide drawing of any assemblies that are not running trim.
- B. Samples: Submit the following samples for each species and cut or pattern of finish carpentry.
  1. Standing and running trim, siding, and paneling: one piece for boards and for each type of worked product required, 1'-0" long x full board width, finished on one side and one edge.

#### **1.6 PRODUCT DELIVERY, STORAGE AND HANDLING**

- A. Protect finish carpentry and associated materials during transit, delivery, storage and handling to prevent damage, soiling and deterioration.
- B. Do not deliver finish carpentry materials, until painting, wet work, grinding and similar operations which could damage, soil or deteriorate woodwork have been completed in installation areas. If, due to unforeseen circumstances, finish carpentry materials must be stored in other than installation areas, store only in areas meeting requirements specified for installation areas.

#### **1.7 JOB CONDITIONS**

- A. Conditioning: Installer shall advise Contractor of temperature and humidity requirements for interior finish carpentry installation areas. Do not install interior finish carpentry until required temperature and relative humidity have been stabilized and will be maintained in installation areas.

- B. Maintain temperature and humidity in installation area as required to maintain moisture content of installed interior finish carpentry within a 1.0 percent tolerance of optimum moisture content, from date of installation through remainder of construction period. The fabricator of woodwork shall determine optimum moisture content and required temperature and humidity conditions.

## 1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install interior woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

## PART 2 - PRODUCTS

### 2.1 WOODWORK FABRICATORS

- A. Softwood Lumber Standards: Comply with PS 20 and with applicable grading rules of the respective grading and inspecting agency for the species and product indicated.
- B. Plywood Standard: Comply with PS 1.
- C. Hardwood Lumber Standard: Comply with PS 51.
- D. Hardwood Lumber Standard: Comply with PS 51.
- E. Woodworking Standards: Where indicated for a specific product comply with specified provision of the following:
  - 1. Architectural Woodworking Institution (AWI) “Quality Standards”.
- F. Glued-up Lumber Standard: Comply with PS S6.

### 2.2 MATERIALS

- A. General:
  - 1. Provide materials that comply with requirements of AWI's quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.
  - 2. Moisture Content of Softwood Lumber: Provide kiln-dried (KD) lumber having a moisture content from time of manufacture until time of installation not greater than values required by the applicable grading rules of the respective grading and inspecting agency for the species and product indicated.
  - 3. Moisture Content of Hardwood Lumber: Provide kiln-dried (KD) lumber having a moisture content from time of manufacture until time of installation with the ranges required in the referenced woodworking standard.
  - 4. Lumber for Transparent Finish: Use pieces made of solid lumber stock
  - 5. Lumber of Painted Finish: At Contractor's option, use pieces which are either glued up lumber or made of solid lumber stock.
  - 6. Non-wood elements: Provide listed Basis-of-Design manufacturer or equal approved in advance by Architect.
- B. Finish Carpentry
  - 1. Interior Standing and Running Trim for stained finish and sealant, as indicated in drawings:
    - a. Southern Yellow Pine, Grade 1. Manufacture to sizes and pattern/profile shown; complying with premium grade requirements of referenced woodworking standards, for quality of

- materials and manufacture: Clear A, fewer/tight knots, figure in grain similar to existing, smooth-planed.
2. Exterior Standing and Running Trim for painted finish and sealant, as indicated in drawings:
    - a. Clear A Western Red Cedar (WWPA or WCLB) for boards, worked products and dimension lumber 2” and thinner in nominal thickness. Kiln-dried. Manufacture to sizes and pattern/profile shown; complying with premium grade requirements of referenced woodworking standards, for quality of materials and manufacture.
- C. Miscellaneous Materials
1. Fasteners and Anchorages: Provide nails, screws and other anchoring devices of the proper type, size, material and finish for application indicated to provide secure attachment, concealed where possible, and complying with applicable Federal Specifications.

### **PART 3 – EXECUTION**

#### **3.1 PREPARATION**

- A. Condition wood materials to average prevailing humidity conditions in installation areas prior to installing.
- B. Pre-Installation Meeting: Review conditions at project site prior to delivery of finish carpentry materials and review coordination and environmental controls required for proper installation and ambient conditions in areas to receive work. Include in meeting the General Contractor, Architect and Installer of finish carpentry, and persons responsible for continued operation (whether temporary or permanent) of HVAC systems as required to maintain temperature and humidity conditions. Proceed with finish carpentry on interior only when everyone concerned agrees that required ambient conditions can be properly maintained.

#### **3.2 INSTALLATIONS**

- A. Discard units of material which are unsound, warped, bowed, twisted, improperly treated, not adequately seasoned or too small to fabricate work with minimum of joints or optimum jointing arrangements, or which are of defective manufacturer with respect to surfaces, sizes or patterns.
- B. Install the work plumb, level, true and straight with no distortions. Shim as required using concealed shims. Install to a tolerance of 1/8” in 8’-0” for plumb and level countertops; and with 1/16” maximum offset in flush adjoining 1/8” maximum offsets in revealed adjoining surfaces.
- C. Scribe and cut work to fit adjoining work and refinish cut surfaces or repair damaged finish at cuts.
- D. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to the greatest extent possible. Stagger joints in adjacent and related members. Cope at returns, miter at corners, to produce tight fitting joints with full surface contact throughout length of joint. Use scarf joints of end-to-end joints.
- E. Anchor finish carpentry work to anchorage devices or blocking built-in or directly attached to substrates. Secure to ground, stripping, and/or blocking with countersunk, concealed fasteners heads as required. Use fine finishing nail for exposed nailings, countersunk and filled flush, transparent.

#### **3.3 INSPECTION**

- A. Finish carpentry work is to be of highest quality, installed by skilled carpenters. Cracking, misalignments, open joints, splintered edges, damage incurred before or during installation, and other visible imperfections will be reviewed thoroughly by the Architect and unacceptable installations will be required to be corrected.

3.4 ADJUSTMENT, CLEANING, FINISHING AND PROTECTION

- A. Repair damaged and defective finish carpentry work wherever possible to eliminate defects functionally and visually; where not possible to repair properly, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean finish carpentry work on exposed and semi-exposed surfaces. Touch up shop applied finishes uniform appearance.
- C. Refere to Division 09 sections for final finishing of installed finish carpentry work.
- D. Protection: Installer of finish carpentry work shall advise Contractor of final protection and maintained conditions necessary to ensure that the work will be without damage or deterioration at time of acceptance.

**END OF SECTION 06 20 00**

## **SECTION 07 92 00 – JOINT SEALANTS**

### **PART 1 GENERAL**

#### **1.01 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Refer to the Drawings for locations of work to be performed.

#### **1.02 SUMMARY**

- A. This Section includes joint sealants for the following applications, including those specified by reference to this Section:
  - 1. Exterior joints in vertical surfaces and horizontal non-traffic surfaces.
  - 2. Interior joints in vertical surfaces and horizontal non-traffic surfaces.

#### **1.03 WORK INCLUDED**

- A. Furnish labor and materials to complete caulking work indicated, as specified herein, or both, including but not limited to:
  - 1. Clean out and caulk exterior and interior joints around louvers and other wall openings with urethane base caulking.
  - 2. Caulk joints between dissimilar materials.

#### **1.04 PERFORMANCE REQUIREMENTS**

- A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.
- B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.
- C. Install sealants when temperature is within the range recommended by the manufacturer. Do not proceed with sealants in unfavorable weather conditions.

#### **1.05 SUBMITTALS**

- A. Product Data: For each joint sealant product indicated.
- B. Samples: For each type and color of joint sealant required.
  - 1. Color: As selected by Architect from manufacturer's full range.
  - 2. Install 12-inch long sample of selected colors for approval prior to proceeding with caulking work.
- C. Preconstruction field test reports.
- D. Compatibility and adhesion test reports.
- E. Product certificates and test reports.



## 1.06 QUALITY ASSURANCE

- A. Preconstruction Compatibility and Adhesion Testing: Submit samples of materials that will contact or affect joint sealants to joint sealant manufacturers for testing according to manufacturer's standard test method to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
- B. Preconstruction Field-Adhesion Testing: Before installing elastomeric sealants, field test their adhesion to Project joint substrates according to the method in ASTM C 1193 that is appropriate for the types of Project joints.
- C. Single Source: Joint sealants within each type to be one product from a single manufacturer.

## 1.07 DELIVERY AND STORAGE

- A. Deliver, store, and handle materials to prevent inclusion of foreign materials, damage of materials by water and breakage. Deliver and store packaged materials in original packages until ready for use. Do not use packages or materials showing evidence of water or other damage.

## 1.08 GUARANTEE

- A. Guarantee that specified work will be free from defects of materials, workmanship for one year from date of Substantial Completion.
- B. Repair and replace such defective work and other work damaged thereby, which becomes defective during guarantee term, without extra cost to the Owner.
- C. The following types of failures are considered defective work: leakage, hardening, cracking, crumbling, melting, shrinking, or running of caulking; or staining of adjacent work joint sealant.

## PART 2 PRODUCTS

### 2.01 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.
- B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.
- C. Acrylic caulking materials are not acceptable.

### 2.02 MATERIALS

- A. Bond Breaker Tape:
  - 1. 3M's 470 or 481 tape, as applicable.
- B. Joint Sealant Backing:
  - 1. General:
    - a. Backer Rod: Resilient closed cell polyethylene foam backer rod designed for use with cold applied joint sealants.

- b. Provide sealant backings of material and type that are non-staining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
  2. Available Products:
    - a. Sonneborn Building Products: Sonofoam Backer Rod
    - b. Dow Chemical Company: Ethafoam
    - c. Tremco
  3. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), O (open-cell material), B (bi-cellular material with a surface skin), or any of the preceding types, as approved in writing by joint sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
  4. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.
- C. Urethane Base Caulking (typical at interior and exterior joints):
1. One-component urethane non-sag grade sealant, including perimeter of gypsum board / hard surfaced ceilings.
  2. Available Products:
    - a. Sonneborn Building Products: Sonolastic NP-1
    - b. Sika Corporation: Sikaflex 1A
    - c. Tremco, Inc.: Vulkem 921 or 931
  3. Type: S (single component)
  4. Grade: NS (nonsag)
  5. Class: 25
  6. Use Related to Exposure: NT (non-traffic)
  7. Uses Related to Joint Substrates: M, A, and, as applicable to joint substrates indicated, O.
- E. Self-Leveling, Traffic Grade Sealant (typical at exterior concrete joints):
1. Polyurethane, slope grade, traffic grade, urethane sealant.
  2. Available Products:
    - a. Pecora Corporation: Dynatrol II-SG
    - b. Sonneborn Building Products: SL 2
    - c. Sika Corporation, Inc.: Sikaflex-2c SL
  3. Type: M (multi-component)
  4. Grade: P (pourable / self-leveling)
  5. Class: 25
  6. Uses Related to Exposure: T (traffic) and NT (non-traffic)
  7. Uses Related to Joint Substrates: M, A, and, as applicable to joint substrates indicated, O.
- F. Primers: As required and recommended by sealant manufacturer.

## 2.04 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates

and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

- C. Masking Tape: Non-staining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

## **PART 3 EXECUTION**

### **3.01 PREPARATION**

- A. Preparation of surfaces, joint packing, and application shall be by workers trained in preparation and application of materials proposed for use.
- B. Examine joints and areas to be sealed. Do not proceed until unsatisfactory conditions are corrected. Masonry, mortar joints, and concrete shall be dry and fully cured in areas to be sealed.
- C. Surfaces to be sealed shall be clean, dry, and dust free. Surface and air temperature shall be greater than 30-degrees F and less than 100 degrees F.
- D. Pack deep joints with back-up material specified. Shallow joints shall use non-bonding tape at bottom of joint. Joints shall be approximately 1/2 depth to width when ready for caulking. Generally, minimum depth shall be 1/4" and maximum depth 1/2", unless otherwise indicated.
- E. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants.
  - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant.
    - a. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air.
  - 2. Remove laitance and form-release agents from concrete.
    - a. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
- F. Joint Priming: Prime joint substrates, where recommended in writing by joint sealant manufacturer, based on preconstruction joint sealant-substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's written instructions. Confine primers to areas of joint sealant bond; do not allow spillage or migration onto adjoining surfaces.
- G. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

### **3.02 APPLICATION**

- A. Prime surfaces and install materials in strict accordance with manufacturer's written directions. Backer rods shall be compression fit.
- B. Compound shall not adhere to back of joints.
- C. Gun sealant from bottom of joint to prevent air bubbles from forming below surface.

### 3.03 INSTALLATION

- A. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- B. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
  - 1. Do not leave gaps between ends of sealant backings.
  - 2. Do not stretch, twist, puncture, or tear sealant backings.
  - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- C. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- D. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
  - 1. Place sealants so they directly contact and fully wet joint substrates.
  - 2. Completely fill recesses in each joint configuration.
  - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
  - 1. Remove excess sealant from surfaces adjacent to joints.
  - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
  - 3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.
- F. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

### 3.04 JOINTS

- A. Neatly point finish of caulking joints on flush surfaces with tool; remove excess material. Leave joints uniform and slightly concave.
- B. Neatly point finish of caulking joints in internal corners with coving tool; remove excess material.
- C. Caulking where exposed: Free of wrinkles and uniformly smooth. Make caulk joints watertight.

### 3.05 CLEANING

- A. Immediately clean adjacent materials which have been soiled; leave work in neat, clean condition.

**END OF SECTION 07 92 00**

## **SECTION 08 22 10 – SWINGING ALUMINUM CLAD DOORS**

### **PART 1 GENERAL**

#### 1.1 SUMMARY

- A. Related Documents: Provisions established within the General and Supplementary Conditions of the Contract, Division 01 and the Drawings are collectively applicable to this Section.
- B. Section Includes:  
Aluminum clad wood doors, outswing.
- C. Related Sections:
  - 1. Section 08 56 10 – Clad Wood Windows
  - 2. Section 08 71 00 – Door Hardware
  - 3. Section 09 90 00 – Painting: Field finishing.

#### 1.2 REFERENCES

- A. American Architectural Manufacturers Association (AAMA):
  - 1. AAMA 2604 “Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.”
  - 2. AAMA 2605 “Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.”
- B. American National Standards Institute (ANSI):
  - 1. ANSI Z97.1 “Safety Glazing Materials Used in Buildings – Safety Performance Specifications and Methods of Test.”
- C. American Society for Testing and Materials (ASTM):
  - 1. ASTM B 136 “Standard for Measurement of Stain Resistance of Anodic Coatings on Aluminum.”
  - 2. ASTM B 137 “Standard for Measurement of Coating Mass Per Unit Area on Anodically Coated Aluminum.”
  - 3. ASTM B 244 “Standard for Measurement of Thickness of Anodic Coatings on Aluminum and of Other Nonconductive Coatings or Nonmagnetic Basis Metals with Eddy Current Instruments.”
  - 4. ASTM C 1036 “Standard Specification for Flat Glass.”
  - 5. ASTM C 1048 “Standard Specification for Heat-Treated Flat Glass – Kind HS, Kind FT Coated and Uncoated Glass.”
  - 6. ASTM D 3359 “Standard Test Methods for Measuring Adhesion by Tape Test.”
  - 7. ASTM D 5235 “Standard Test Method for Microscopical Measurement of Dry Film Thickness of Coatings on Wood Products.”
  - 8. ASTM D 5572 “Standard Specification for Adhesives Used for Finger Joints in Nonstructural Lumber Products.”
  - 9. ASTM D 5751 “Standard Specification for Laminate Joints in Nonstructural Lumber Products.”
- D. National Fenestration Rating Council (NFRC):
  - 1. NFRC 100 “Procedure for Determining Fenestration Products U-Factors.”
  - 2. NFRC 200 “Procedure for Determining Fenestration Product Solar Heat Gain Coefficients at Normal Incidence.”
  - 3. NFRC 300 “Procedure for Determining Solar Optical Properties of Simple Fenestration Product.”
- E. Consumer Products Safety Commission:
  - 1. 16 CFR, Part 1201 “Safety Standard for Architectural Glazing Material.”
- F. Window and Door Manufacturers Association (WDMA):
  - 1. WDMA I.S.4 “Industry Standard for Water Repellant Preservative Non-Pressure Treatment for Millwork.”

#### 1.3 DEFINITIONS

- A. SHGC: The solar heat gain coefficient of the total fenestration system represents the solar heat gain through the system relative to the incident solar radiation striking the exterior surface. Solar Heat Gain Ratings are determined in accordance with NFRC 200.

- B. Vtc: The visible transmittance of the total fenestration system is the transmittance across the visible portion of the solar spectrum where sensitivity to each wave length is weighted by the eye's response. Visible Transmittance Ratings are determined in accordance with NFRC 300.

#### 1.4 THERMAL PERFORMANCE RATING

- A. Glazing Type and Finish: Low-E 366; clad.
  - 1. U Factor, NFRC 100: 0.29.
  - 2. Solar Heat Gain Coefficient (SHGC), NFRC 200: 0.28.
  - 3. Visible light transmission (Vtc), NFRC 300: 0.47.
  - 4. Condensation Resistance (CR): 56

#### 1.5 COATING PERFORMANCE

- A. Primer shall comply with testing in accordance with ASTM D 3359 and ASTM D 5235.

#### 1.6 SUBMITTALS

- A. Provide submittals under provisions of Division 01.
- B. Product Data: Include the following for each type of door required.
  - 1. Construction details and fabrication methods.
  - 2. Profiles and dimensions of individual components.
  - 3. Data on hardware, accessories, and finishes.
  - 4. Recommendations for maintenance and cleaning of exposed surfaces.
- C. Shop Drawings: Include information not fully detailed in manufacturer's product data and include the following for each type of door required.
  - 1. Fabrication, layout and installation details, including anchors.
  - 2. Typical door elevations.
  - 3. Full size section details of typical composite members, including reinforcement.
  - 4. Glazing details.
  - 5. Accessories.
- D. Samples: Submit one corner section. Submit color samples as appropriate.

#### 1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer shall have produced types of doors specified for not less than ten years, with similar projects that have been in successful use for not less than ten years.
- B. Obtain aluminum clad wood door units through one source from a single manufacturer.
- C. Safety Glass Standard: Provide products complying with testing requirements of United States Consumer Product Safety Commission's 16 CFR, Part 1201 for Category II materials or as prescribed by local codes. Provide products complying with ANSI Z97.1.
  - 1. Subject to compliance with project requirements, provide safety glass permanently marked with certification label of Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction.
- D. Insulated Glass Certification: Provide insulated glass units permanently marked on spacers or on at least one component pane of units with appropriate certification label of inspecting agency.
- E. Wood Components Sustainability Standards: Provide products that have been certified by independent third parties and labeled as having been produced in compliance with the accepted principles of sustainable forest management. Current certification systems that meet this standard of sustainability include the SFIT<sup>TM</sup> or Sustainable Forestry Initiative (independent third-party verification), the ISO 14001 EMS program, the FSC (Forest Stewardship Council) system, and the CSA (Canadian Standards Association) certification system.

#### 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver in original packaging, undamaged, with instructions.

- B. Store off ground and protect from weather.

## 1.9 LIMITED WARRANTY

- A. Insulated Glass: Provide manufacturer's limited warranty against failure of air seal due to defects in materials or workmanship for period of 20 years from date of manufacture.
- B. Wood Components, Hardware, and Weatherstripping: Provide manufacturer's ten year limited warranty against defects in workmanship or materials which might unreasonably affect product's normal functioning.
- C. Metal Clad Warranty:
  - 1. Commercial 2605 Metal Clad Warranty: Provide manufacturer's 20 year limited warranty on metal clad coating against cracking, checking, color change, chalking or peeling (adhesion loss) in normal conditions; 10 year limited warranty on metal clad coating against cracking, checking, color change, chalking or peeling (adhesion loss) in extreme conditions.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

- A. Acceptable Manufacturers:
  - 1. Basis of Design: Sierra Pacific Windows
  - 2. Kolbe Windows
  - 3. Weather Shield

### 2.2 MATERIALS

- A. Wood: Douglas fir, kiln dried to moisture content of 6 to 12 percent at time of fabrication; water-repellent preservative treated in accordance with WDMA I.S.4.
  - 1. Grade and Grain:
    - a. Interior Exposed Wood: Solid clear, suitable for painting.
- B. Aluminum Cladding: Extruded 6063 T5 grade aluminum.
  - 1. Frame Cladding Thickness: 0.062 inch.
  - 2. Panel Cladding Thickness: 0.075 inch.
- C. Glazing: Provide manufacturer's standard glazing material.
  - 1. Float Glass: ASTM C 1036, glazing select quality, 1/8inch thick minimum.
  - 2. Safety Glass: ASTM C 1048, glazing select quality, Kind FT (Fully Tempered) 1/8" thick minimum.
  - 3. Insulated Glass (IG): Outer pane – 1/8"; inner pane of 1/8"; 3/4" total thickness separated by 1/2" silicone foam spacer system; Low E coating.

### 2.3 COMPONENTS

- A. Hardware: No handleset, trim set, locking hardware or closers provided as part of this clad wood out-swinging door system specification. Hardware to be supplied via Section 08 71 00 – Door Hardware.
  - 1. Hinges: 4 inches by 4.5 inches ball-bearing, stainless steel [oil rubbed bronze finished], non-removable pin.
    - a. Provide three hinges on doors up to 87" in height.
  - 2. Adjustable astragal: Provide standard adjustable astragal weather-strip (finish: dark bronze anodized) at pairs of doors.
- B. Sill: Extruded low profile (1/2 inch) aluminum sill (ADA compliant).
- C. Weatherstripping:
  - 1. Head and Side Jambs: Vinyl-covered foam weatherstrip.
  - 2. Panel Tops: Leaf type weatherstrip.
  - 3. Panel Bottoms: Mohair weatherstrip.
- D. Drip Cap: Extruded aluminum clad drip cap factory mounted to frame.
- E. Airspace Grille: 3/4 inch wide aluminum airspace grille between glass.

## 2.4 FABRICATION

- A. Fabricate units that are reglazable from interior without dismantling.
- B. Factory assemble unit to include frame, panels, weatherstripping, applied jamb extension, astragal weather-strip (as required), drip cap.
- C. Basic Jamb:
  - 1. Basic Jamb Width: 4-9/16 inches.
  - 2. Factory apply clear extension jambs.
- D. Panels:
  - 1. Stile and Rail Thickness: 1-3/4 inches.
  - 2. Stile Width: 5-5/8 inches.
  - 3. Top Rail Width: 6-13/16 inches.
  - 4. Bottom Rail Width: 12 inches (ADA compliant).
  - 5. Attach solid, edge-glued rails to laminated engineered stiles with 5/8 inch by 4 inch fluted dowels. Seal with exterior glue.
  - 6. Fabricate with phenolic high density laminate moisture vapor barrier laminated to both sides of stiles.
- E. Glued and Laminated Components: Comply with ASTM D 5572 and ASTM D 5751.
- F. Cladding:
  - 1. Clad exterior wood surfaces with extruded aluminum.
  - 2. Fabricate frame cladding to meet frame weatherstripping.
  - 3. Seal clad frame corners with silicone, along with butyl pads, and secure with stainless steel screws.
  - 4. Fabricate frame extrusion with continuous integral nail flange.
  - 5. Fabricate exterior of frame with accessory groove to accept retrofit trim system or clad brickmould.
- G. Glazing:
  - 1. Fabricate insulated glass with internal shadow bar to create appearance of true divided lites (TDL).
- H. Muntins:
  - 1. Fabricate exterior simulated divided lite (simulate) bars of aluminum clad.
  - 2. Permanently apply muntins to both interior and exterior of glass surface using VHB acrylic adhesive tape.
  - 3. Muntin Profile and Width:
    - a. Traditional: 7/8 inch.
    - b. Putty: 5/8 inch.
- I. Sill:
  - 1. Fabricate low profile sill to comply with ADA requirements.

## 2.5 FINISHES

- A. Exterior Wood Surfaces: Factory apply acrylic latex primer.
- B. Interior Exposed Wood: Unfinished for field staining at wood paneled rooms.
- C. Interior Exposed Wood: Factory apply acrylic latex primer at painted rooms.
- D. Exterior Finish Cladding: Manufacturer's pre-treated aluminum surface with baked on, electrostatically applied super durable polyester powder paint, zero-VOC finish conforming to specified AAMA 2604 or AAMA 2605 test procedures. Color specified from manufacturers full range of available selections.
  - 1. Manufacturer's 100% fluoropolymer powder; 1.5 to 2.5 mil dry film thickness.
    - a. Factory finish to comply with AAMA 2605.
      - 1) Full range of standard colors. (Basis of Design: Color Stay Collection)
- E. Drip Cap: Match frame color.
- F. Sill:
  - 1. Low-Profile, ADA compliant, 1/2" tall with 3 degree slope to the exterior.
  - 2. Exposed Aluminum: Anodized bronze tone.
- G. Airspace Grille: White.



## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

- A. Site Verification of Conditions: Verify installation conditions previously established under other sections are acceptable for product installation in accordance with manufacturer's instructions.
- B. Remove existing doors, door casing, and jambs. Prepare openings for new installation, including installation of necessary blocking for doors and for scheduled hardware.
- C. Verify that field measurements are acceptable to suit door unit tolerances.
- D. Verify sill plate is level.
- E. Verify supports and anchors are correctly and securely positioned.
- F. Verify masonry surfaces are dry and free of excess mortar, sand, and other debris.
- G. Verify wood frame walls are dry, clean, sound, well-nailed, free of voids, and without offsets at joints. Ensure that nail heads are driven flush with surfaces in opening and within 3 inches of the corner.
- H. Scheduling of installation implies that substrate and conditions are prepared and ready for product installation. Proceeding with installation implies installer's acceptance of substrate and conditions.

### **3.2 PREPARATION**

- A. Coordinate door installation with wall flashings and other built-in components.

### **3.3 INSTALLATION**

- A. Install door units, hardware (as provided by others), and components in accordance with manufacturer's instructions and approved shop drawings, in compliance with specified performance requirements, and to provide weathertight construction.
- B. Anchor components rigidly and securely to building structure, plumb and level, accurately fitted, and free from distortion or defects.
- C. Fit exposed connections to form tight hairline joints.

### **3.4 ADJUSTING**

- A. Adjust doors, hardware, and weatherstripping to provide tight fit at contact points, smooth operation, and weather-tight closure.

### **3.5 CLEANING**

- A. Clean interior and exterior surfaces immediately after installation in accordance with manufacturer's recommendations for cleaning and maintenance.
- B. Remove temporary labels from surfaces.
- C. Remove and replace glass damaged during construction period.

### **3.6 PROTECTION**

- A. Protect door units from damage or deterioration until Substantial Completion.

**END OF SECTION 08 22 10**

## **SECTION 08 56 10 – ALUMINUM CLAD WOOD WINDOWS**

### **PART 1 GENERAL**

#### 1.1 SUMMARY

- A. Related Documents: Provisions established within the General and Supplementary Conditions of the Contract, Division 01 and the Drawings are collectively applicable to this Section.
- B. Section Includes:  
Aluminum clad wood awning windows with outward opening sash installed in frame.
- C. Related Sections:
  - 1. Section 08 22 10 – Swinging Aluminum Clad Doors
  - 2. Section 09 90 00 – Painting: Field finishing.

#### 1.2 REFERENCES

- A. American Architectural Manufacturers Association (AAMA):
  - 1. AAMA/WDMA/CSA 101/I.S.2/A440-08 “NAFS - North American Fenestration Standard/Specification for windows, doors and skylights.”
  - 2. AAMA/WDMA/CSA 101/I.S.2/A440-11 “NAFS 2011 – North American Fenestration Standard/Specification for windows, doors and skylights.”
  - 3. AAMA 702 “Combined Voluntary Specifications for Pile Weatherstripping and Replaceable Fenestration Weather-seals.”
  - 4. AAMA 901.1 “Voluntary Specification for Rotary Operators in Window Applications.”
  - 5. AAMA 2604 “Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.”
  - 6. AAMA 2605 “Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.”
- B. American National Standards Institute (ANSI):
  - 1. ANSI Z97.1 “Safety Glazing Materials Used in Buildings – Safety Performance Specifications and Methods of Test.”
  - 2. ANSI/AAMA/NWDA 101/I.S.2 “Voluntary Specification for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors.”
- C. American Society for Testing and Materials (ASTM):
  - 1. ASTM B 137 “Standard for Measurement of Coating Mass Per Unit Area on Anodically Coated Aluminum.”
  - 2. ASTM B 244 “Standard for Measurement of Thickness of Anodic Coatings on Aluminum and of Other Nonconductive Coatings or Nonmagnetic Basis Metals with Eddy Current Instruments.”
  - 3. ASTM C 509 “Standard Specification for Elastomeric Cellular Preformed Gasket and Sealing Material.”
  - 4. ASTM C 1036 “Standard Specification for Flat Glass.”
  - 5. ASTM C 1048 “Standard Specification for Heat-Treated Flat Glass – Kind HS, Kind FT Coated and Uncoated Glass.”
  - 6. ASTM D 3359 “Standard Test Methods for Measuring Adhesion by Tape Test.”
  - 7. ASTM D 4272 “Standard Test Method for Total Energy Impact of Plastic Films by Dart Drop.”
  - 8. ASTM D 5235 “Standard Test Method for Microscopical Measurement of Dry Film Thickness of Coatings on Wood Products.”
  - 9. ASTM D 5572 “Standard Specification for Adhesives Used for Finger Joints in Nonstructural Lumber Products.”
  - 10. ASTM D 5751 “Standard Specification for Laminate Joints in Nonstructural Lumber Products.”
  - 11. ASTM E 283 “Standard Test Method for Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors.”
  - 12. ASTM E 330 “Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.”
  - 13. ASTM E 547 “Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Cyclic Static Air Pressure Differential.”

14. ASTM E 1424 “Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure and Temperature Differences Across the Specimen.”
15. ASTM F 588 “Standard Test Methods for Measuring the Forced Entry Resistance of Window Assemblies, Excluding Glazing Impact.”
16. ASTM G 87 “Standard Practice for Conducting Moist SO<sub>2</sub> Tests.”
- D. Canadian Standards Association
  1. AAMA/WDMA/CSA 101/I.S.2/A440-08 “NAFS – North American Fenestration Standard/Specification for windows, doors and skylights.”
  2. CSA A440S1-09 “Canadian Supplement to AAMA/WDMA/CSA 101/I.S.2/A440, NAFS – North American Fenestration Standard/Specification for windows, doors and skylights.”
- E. Consumer Products Safety Commission:
  1. 16 CFR, Part 1201 “Safety Standard for Architectural Glazing Material.”
- F. National Fenestration Rating Council (NFRC):
  1. NFRC 100 “Procedure for Determining Fenestration Products U-Factors.”
  2. NFRC 200 “Procedure for Determining Fenestration Product Solar Heat Gain Coefficients at Normal Incidence.”
  3. NFRC 300 “Procedure for Determining Solar Optical Properties of Simple Fenestration Product.”
- G. Window and Door Manufacturers Association (WDMA):
  1. AAMA/WDMA/CSA 101/I.S.2/A440-08 “NAFS - North American Fenestration Standard/Specification for windows, doors and skylights.”
  2. AAMA/WDMA/CSA 101/I.S.2/A440-11 “NAFS 2011 – North American Fenestration Standard/Specification for windows, doors and skylights.”
  3. WDMA I.S.4 “Industry Standard for Water Repellant Preservative Non-Pressure Treatment for Millwork.”

### 1.3 DEFINITIONS

- A. SHGC: The solar heat gain coefficient of the total fenestration system represents the solar heat gain through the system relative to the incident solar radiation striking the exterior surface. Solar Heat Gain Ratings are determined in accordance with NFRC 200.
- B. Vtc: The visible transmittance of the total fenestration system is the transmittance across the visible portion of the solar spectrum where sensitivity to each wavelength is weighted by the eye’s response. Visible Transmittance Ratings are determined in accordance with NFRC 300.

### 1.4 PERFORMANCE REQUIREMENT

- A. Class CW-PG50, AAMA/WDMA/CSA 101/I.S.2/A440-08:
  1. Air Infiltration, ASTM E 283: Maximum 0.3 cfm/ft<sup>2</sup> at 1.57 psf. (25 mph).
  2. Water Resistance, ASTM E 547: No leakage at 7.50 psf. (54.13 mph).
  3. Structural Performance, ASTM E 330: Withstands up to +/-50 psf. (139.75 mph).

### 1.5 THERMAL PERFORMANCE RATING

- A. Glazing Type and Finish: Low-E 366; clad.
  1. U Factor, NFRC 100: 0.29.
  2. Solar Heat Gain Coefficient (SHGC), NFRC 200: 0.28.
  3. Visible light transmission (Vtc), NFRC 300: 0.47.
  4. Condensation Resistance (CR): 56

### 1.6 COATING PERFORMANCE

- A. Primer shall comply with testing in accordance with ASTM D 3359 and ASTM D 5235.

## 1.7 SUBMITTALS

- A. Provide submittals under provisions of Division 01.
- B. Product Data: Include the following for each type of window required.
  - 1. Construction details and fabrication methods.
  - 2. Profiles and dimensions of individual components.
  - 3. Data on hardware, accessories, and finishes.
  - 4. Recommendations for maintenance and cleaning of exposed surfaces.
- C. Shop Drawings: Include information not fully detailed in manufacturer's product data and include the following for each type of window required.
  - 1. Layout and installation details, including anchors.
  - 2. Elevations at 1/4 inch = 1 foot (1:50) scale and typical window unit elevations at 3/4 inch = 1 foot (1:20) scale.
  - 3. Full size section details of typical composite members, including reinforcement and stiffeners.
  - 4. Hardware, including operators.
  - 5. Glazing details.
  - 6. Accessories.
- D. Samples: Submit one corner section. Submit color samples as appropriate.

## 1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer shall have produced types of windows specified for not less than ten years, with similar projects that have been in successful use for not less than ten years.
- B. Obtain wood window units through one source from a single manufacturer.
- C. Safety Glass Standard: Provide products complying with testing requirements of United States Consumer Product Safety Commission's 16 CFR, Part 1201 for Category II materials or as prescribed by local codes. Provide products complying with ANSI Z97.1.
  - 1. Subject to compliance with project requirements, provide safety glass permanently marked with certification label of Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction.
- D. Insulated Glass Certification: Provide insulated glass units permanently marked on spacers or on at least one component pane of units with appropriate certification label of inspecting agency.
- E. WDMA Hallmark Certification: Provide products that have been certified as having been manufactured in accordance with WDMA Hallmark standards. Compliance is verified through independent third party product testing and semi-annual inspections of the manufacturing facility.
- F. Wood Components Sustainability Standards: Provide products that have been certified by independent third parties and labeled as having been produced in compliance with the accepted principles of sustainable forest management. Current certification systems that meet this standard of sustainability include the SFI™ or Sustainable Forestry Initiative (independent third-party verification), the ISO 14001 EMS program, the FSC (Forest Stewardship Council) system, and the CSA (Canadian Standards Association) certification system.

## 1.9 DELIVERY, STORAGE, AND HANDLING

- A. Ship units with both temporary and permanent NFRC labeling.
  - 1. Temporary label shall indicate that the unit is NFRC certified and include brief product description and thermal or energy performance values.
  - 2. Permanent label shall include manufacturer identification and performance tracking for life of product.
- B. Deliver in original packaging, undamaged, with instructions.
- C. Store off ground and protect from weather.

## 1.10 WARRANTY

- A. Insulated Glass: Provide manufacturer's limited warranty against failure of air seal due to defects in materials or workmanship for period of 20 years from date of manufacture.
- B. Wood Components, Hardware, Weatherstripping, Screens: Provide manufacturer's 10 year limited warranty against defects in workmanship or materials which might unreasonably affect product's normal functioning.
- C. Metal Clad Warranty:

1. Commercial 2605 Metal Clad Warranty: Provide manufacturer's 20 year limited warranty on metal clad coating against cracking, checking, color change, chalking or peeling (adhesion loss) in normal conditions; 10 year limited warranty on metal clad coating against cracking, checking, color change, chalking or peeling (adhesion loss) in extreme conditions.

## **PART 2 PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Acceptable Manufacturers:
  1. Basis of Design: Sierra Pacific Windows
  2. Kolbe Windows
  3. Weather Shield

### **2.2 MATERIALS**

- A. Wood:
  1. Species: Ponderosa Pine, kiln dried to moisture content of 6 to 12 percent at time of fabrication; water-repellent preservative treated in accordance with WDMA I.S.4.
    - a. Interior Exposed Wood: Solid clear, suitable for staining or painting.
- B. Aluminum Cladding: 0.062 inch thick extruded 6063 T5 grade aluminum.
- C. Glazing: Provide manufacturer's standard glazing material.
  1. Float Glass: ASTM C 1036, glazing select quality, 1/8inch thick minimum.
  2. Safety Glass: ASTM C 1048, glazing select quality, Kind FT (Fully Tempered) 1/8" thick minimum.
  3. Insulated Glass (IG): Outer pane – 1/8"; inner pane of 1/8"; 3/4" total thickness separated by 1/2" silicone foam spacer system; Low E coating.

### **2.3 COMPONENTS**

- A. Hardware:
  1. Hinge Arms: Manufacturer's standard design for use with track.
  2. Hinge Arm Stud: Stainless steel base with brass post, cam system to allow field adjustment.
  3. Track: Aluminum track integrally designed in frame extrusion.
  4. Sash cover and handle: High quality molded cover with high-pressure zinc casting handle with black finish.
  5. Lock handle and escutcheon: Die-cast zinc housing with black finish.
  6. Concealed Snubbers: Window manufacturer's standard type.
  7. Locking system: Stainless steel locking hooks with glass-filled nylon keepers, stainless steel tape drive; all in an integrated, concealed system.
  8. Roto Operator: High pressure zinc die-cast base with hardened steel drive worm, gears and arms; tested in accordance with AAMA 901.1, ASTM B 117, and ASTM G 87.
- B. Weatherstripping:
  1. Frame Weatherstrip: Closed cell foam encapsulated in seamless elastomeric skin; tested in accordance with ASTM C 509, ASTM D 4272, ASTM E 1424, and AAMA 702.
  2. Sash Weatherstrip: Rigid base of 5 percent glass-filled polypropylene with a slip coated thermal plastic elastomer seal.
- C. Drip Cap: Extruded aluminum clad drip cap factory mounted to frame.
  1. Provide at windows where not under cover of canopy or porch.
- D. Screens: Aluminum framed , Phifer BetterVue screen cloth or similar improved visibility screen with finer material at tighter density.
- E. Airspace Grille: 5/8" wide aluminum airspace grille between glass.

### **2.4 FABRICATION**

- A. Fabricate units that are reglazable from interior without dismantling.

- B. Frame detail: Traditional Contemporary.
- C. Basic Jamb: Fabricate with interior kerf for recessed bull nosed window applications.
  - 1. Basic Jamb Width: 4-9/16 inches.
  - 2. (Extension jambs in Rough Carpentry, if required. Not part of window procurement.)
- D. Sash: Fabricate sash corners with mortise and tenon joints, sealed and screwed.
- E. Glued and Laminated Components: Comply with ASTM D 5572 and ASTM D 5751.
- F. Cladding:
  - 1. Clad exterior wood surfaces with extruded aluminum.
  - 2. Fabricate frame cladding to meet frame weatherstripping.
  - 3. Seal clad frame corners with nylon corner keys and silicone, along with butyl pads, and secure with stainless steel screws.
  - 4. Fabricate frame extrusion with continuous integral nail flange and with interior wall for increased stability.
- G. Glazing:
  - 1. Fabricate insulated glass with internal shadow bar to create appearance of true divided lites (TDL).
- H. Muntins:
  - 1. Muntin Profile and Width:
    - a. Traditional: 7/8".
    - b. Putty: 5/8".
- I. Hardware:
  - 1. Fabricate window units to 48" in height with one lock per side jamb; units over 48" in height with two per side jamb.
  - 2. Operator: Apply operator designed to be unlatched from sash to facilitate cleaning or removal of sash.
  - 3. Apply concealed snubbers at top of sash.
- J. Weatherstripping: Dual weatherstrip entire perimeter of window unit.
- K. Screens: Fabricate as spring loaded units for secure installation and with pull tabs for easy removal.

## 2.5 FINISHES

- A. Exterior Wood Surfaces: Factory apply acrylic latex primer.
- B. Interior Exposed Wood: Unfinished for field staining at wood paneled rooms.
- C. Interior Exposed Wood: Factory apply acrylic latex primer at painted rooms.
- D. Exterior Finish Cladding: Manufacturer's pre-treated aluminum surface with baked on, electrostatically applied super durable polyester powder paint, zero-VOC finish conforming to specified AAMA 2604 or AAMA 2605 test procedures. Color specified from manufacturers full range of available selections.
  - 1. Manufacturer's 100% fluoropolymer powder; 1.5 to 2.5 mil dry film thickness.
    - a. Factory finish to comply with AAMA 2605.
      - 1) Full range of standard colors. (Basis of Design: Color Stay Collection)
- E. Drip Cap: Match frame color.
- F. Exposed Hardware:
  - 1. Manufacturer's recommended finish
  - 2. Color: Black.
- G. Screens:
  - 1. Frame: Black.
  - 2. Mesh: Charcoal.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify that field measurements are acceptable to suit window unit tolerances.
- B. Verify sill plate is level.
- C. Verify supports and anchors are correctly and securely positioned.
- D. Verify wood frame walls are dry, clean, sound, well-nailed, free of voids, and without offsets at joints. Ensure that nail heads are driven flush with surfaces in opening and within 3 inches of corner.
- E. Scheduling of installation implies that substrate and conditions are prepared and ready for product installation. Proceeding with installation implies installer's acceptance of substrate and conditions.

### 3.2 PREPARATION

- A. Remove wood casings and any other trim that requires removal for window installation. Protect and save for reuse or provide materials to replace in kind.
- B. Coordinate window installation with wall flashings and other built-in components.

### 3.3 INSTALLATION

- A. Install window units, hardware, and components in accordance with manufacturer’s instructions and approved shop drawings, in compliance with specified performance requirements, and to provide weathertight construction.
- B. Anchor components rigidly and securely to building structure, plumb and level, accurately fitted, and free from distortion or defects.
- C. Fit exposed connections to form tight hairline joints.
- D. If any gaps remain between window assembly and rough opening, seal with foam sealant (see Section “Joint Sealants” such that sealant will be concealed behind trim.

### 3.4 ADJUSTING / FINISHING

- A. Adjust operating sash, hardware, and weatherstripping to provide tight fit at contact points, smooth operation, and weathertight closure.
- B. Reinstall wood casings and other trim removed before installation.

### 3.5 CLEANING

- A. Clean interior and exterior surfaces immediately after installation in accordance with manufacturer’s recommendations for cleaning and maintenance.
- B. Remove temporary labels from surfaces.
- C. Remove and replace glass damaged during construction period.

### 3.6 PROTECTION

- A. Protect window units from damage or deterioration until Substantial Completion.

**END OF SECTION 08 56 10**

**SECTION 08 71 00 - DOOR HARDWARE**

**PART 1 - GENERAL**

1.1 SUMMARY

- A. This Section includes the following:
  - 1. Commercial door hardware for the following swinging doors:
    - a. Aluminum clad wood doors.

1.2 ALTERNATE PRICING

- A. Provide alternate pricing to include the Owner's preferred hardware manufacturers and series as indicated below:
  - 1. Key Cylinders: Best; keyway as directed by Owner.
  - 2. Exit Devices: Precision Apex 2000 series.
  - 3. Closers: Detex D4550 series.

1.3 SUBMITTALS

- A. Product Data: Include construction and installation details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Qualification Data:
  - 1. Finish Hardware Installers: Company specializing in the installation of commercial door hardware with minimum of five years documented experience in commercial hardware installation.
  - 2. Hardware Supplier
    - a. Established contract hardware firm which maintains and operates an office, display, and stock in project area and which is a factory authorized distributor of the lock being furnished.
    - b. Hardware detailed, scheduled and furnished by or under direct supervision an Architectural Hardware Consultant.
    - c. All schedules submitted to the Architect for approval and job use must carry the signature and certified seal of this Architectural Hardware Consultant.
  - 3. Architectural Hardware Consultant
    - a. Currently certified by the Door and Hardware Institute.
    - b. Full-time employee of the Hardware Supplier or an individual having no contractual ties to any supplier/manufacturer entity.
    - c. Available at reasonable times to Architect, Owner, and Contractor during course of work.
- C. Maintenance Data Submittal: For each type of door hardware. Include final hardware schedule, keying schedule, product data sheets for each item, manufacturers' published warranties, riser diagrams, and point-to-point wiring diagrams.
- D. Warranty: Special warranty specified in this Section.
- E. Other Action Submittals:
  - 1. Door Hardware Sets: Prepared by or under the supervision of a DHI certified Architectural Hardware Consultant, detailing fabrication and assembly of door hardware, as well as procedures



and diagrams. Coordinate the final door hardware sets with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

- a. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule". Double space entries, and number and date each page.
  - b. Door Numbers: Identical to those used in the contract documents.
  - c. Number of Digital Copies: (1).
  - d. Content: Include the following information:
    - 1) Identification number, location, hand, fire rating, and material of each door and frame.
    - 2) Type, style, function, size, quantity, and finish of each door hardware item.
    - 3) Complete designations of every item required for each door or opening including name and manufacturer.
    - 4) Degree of opening for closer and overhead stop and holder installation.
    - 5) Keying information.
    - 6) Fastenings and other pertinent information.
    - 7) Location of each door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
    - 8) Explanation of abbreviations, symbols, and codes contained in schedule.
    - 9) Mounting locations for door hardware.
    - 10) Door and frame sizes and materials.
    - 11) Items referenced but not furnished.
    - 12) List of related door devices specified in other Sections for each door and frame.
2. Keying Schedule: Prepared by or under the supervision of Architectural Hardware Consultant, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations.

#### 1.4 QUALITY ASSURANCE

- A. Furnish proper hardware types and quantities for proper door function, hardware mounting and clearances, aesthetics, and to meet applicable codes. Bring discrepancies to the attention of the Architect a minimum of (10) days prior to bid date so that an addendum may be issued and costs included in the bid. No additional compensation will be allowed after bidding for hardware changes required for proper function, hardware mounting or clearances, aesthetics or to meet codes. The specification is not a detail from which products should be ordered; detailing the project is the responsibility of the Contract Hardware Supplier.
- B. Source Limitations: All items listed by model number in hardware sets are to be furnished by one supplier. Obtain each type and variety of door hardware from a single manufacturer, unless otherwise indicated.
- C. Regulatory Requirements: Comply with NFPA 70, NFPA 80, NFPA 101 and ANSI A117.1 requirements and guidelines as directed in the model building code including, but not limited to, the following:
  1. Where indicated to comply with accessibility requirements, comply with Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," ANSI A117.1 as follows:
    - a. Handles, Pulls, Latches, Locks, and other Operating Devices: Shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist.
    - b. Door Closers: Comply with the following maximum opening-force requirements indicated:
      - 1) Interior Hinged Doors: 5 lbf applied perpendicular to door.

- 2) Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
- c. Thresholds: Not more than 1/2 inch high. Bevel raised thresholds with a slope of not more than 1:2.
2. NFPA 101: Comply with the following for means of egress doors:
  - a. Latches, Locks, and Exit Devices: Not more than 15 lbf to release the latch. Locks shall not require the use of a key, tool, or special knowledge for operation.
  - b. Thresholds: Not more than 1/2 inch high.
3. Fire-Rated Door Assemblies: Provide door hardware for assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252 (neutral pressure at 40" above sill) or UL-10C.
  - a. Test Pressure: Positive pressure labeling. Delete first paragraph and subparagraph below if not applicable.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.
- B. Tag each item or package separately with identification related to the final door hardware sets, and include basic installation instructions, templates, and necessary fasteners with each item or package.
- C. Deliver keys to Owner by registered mail or overnight package service. Obtain Owner's contact name and address from Architect.

#### 1.6 COORDINATION

- A. Templates: Distribute door hardware templates for doors, frames, and other work specified to be factory prepared for installing door hardware. Distribute templates in a timely manner so as not to delay suppliers. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- B. Existing Openings: Where new hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, contract hardware supplier shall field verify existing conditions and coordinate procurement and installation of door hardware to suit opening conditions, aesthetic matters of form and finish, issues of clearance, function and fitup with existing door and frame preps, and to provide for proper operation and code compliance.

#### 1.7 WARRANTY

- A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:
  1. Structural failures including excessive deflection, cracking, or breakage.
  2. Faulty operation of the hardware.
  3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

- C. Standard Warranty Period: Two years from date of Substantial Completion, unless otherwise indicated.
- D. Special Warranty Periods:
  - 1. Ten years for mortise locks and latches.
  - 2. Seven years for heavy duty cylindrical (bored) locks and latches.
  - 3. Five years for panic/exit hardware.
  - 4. Twenty years for manual door closers.

## 1.8 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.
- B. Maintenance Service: Beginning at Substantial Completion, provide (6) months' full maintenance by skilled employees of door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door hardware operation. Provide parts and supplies same as those used in the manufacture and installation of original products.

## PART 2 - PRODUCTS

### 2.1 SCHEDULED DOOR HARDWARE

- A. General: Provide door hardware for each door to comply with requirements in this and door hardware sets indicated in Part 3 "Door Hardware Sets" Article.
  - 1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and named manufacturers' products.
- B. Designations: Requirements for design, grade, function, material, finish, size and other distinctive qualities of each type of door hardware are indicated in Part 3 "Door Hardware Schedule" Article. Products listed by model number establish a basis of design for that product genre. Other products manufactured by available manufacturers listed in other Part 2 articles may be provided as long as they are equal in all aspects to the basis of design product listed for that particular product genre.
  - 1. Named Manufacturers' Products: Manufacturer and product designation are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in Part 3 "Door Hardware Schedule" Article.
  - 2. References to BHMA Standards: In addition to other requirements in this section, provide products complying with or exceeding these standards and requirements for description, quality, and function.
- C. Substitutions: Requests for substitution and product approval, in compliance with specifications, must be submitted in writing prior to the bid date and in accordance with the procedures and time frames outlined in Division 01 "Substitution Procedures". Approval of requests is at the discretion of the architect, owner, and their designated consultants.

## 2.2 LOCKS AND LATCHES, GENERAL

- A. Accessibility Requirements: Where indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)."
  - 1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf (22 N).
- B. Latches and Locks for Means of Egress Doors: Comply with NFPA 101. Latches shall not require more than 15 lbf (67 N) to release the latch. Locks shall not require use of a key, tool, or special knowledge for operation.
- C. Lock Trim:
  - 1. Levers: Cast.
    - a. Best 15 model with full angled return.
  - 2. Roses: Forged.
    - a. Best H model.
  - 3. Lockset Designs: Provide design indicated in hardware sets, or, if sets are provided by another manufacturer, provide designs that match those designated.
- D. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:
  - 1. Mortise Locks: Minimum 3/4-inch (19-mm) latchbolt throw.
- E. Backset: 2-3/4 inches (70 mm), unless otherwise indicated.
- F. Strikes: Manufacturer's standard strike with strike box for each latchbolt or lock bolt, with curved lip extended as needed to protect frame, finished to match door hardware set, and as follows:
  - 1. Strikes for Mortise Locks and Latches: BHMA A156.13.

## 2.3 MECHANICAL LOCKS AND LATCHES

- A. Lock Functions: Function numbers and descriptions indicated in door hardware sets comply with the following:
  - 1. Mortise Locks: BHMA A156.13.
- B. Mortise Locks: Stamped steel case with steel or brass parts; BHMA A156.13 Grade 1.
  - 1. Available Manufacturers:
    - a. Best; Div. of DormaKaba (BES).
    - b. Corbin Russwin Architectural Hardware; an ASSA ABLOY Group company (COR).
    - c. SARGENT Manufacturing Company; an ASSA ABLOY Group company (SAR).

## 2.4 EXIT DEVICES

- A. Exit Devices: BHMA A156.3, Grade 1.

- B. Accessibility Requirements: Where handles, pulls, latches, locks, and other operating devices are indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)."
  - 1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf (22 N).
- C. Exit Devices for Means of Egress Doors: Comply with NFPA 101. Exit devices shall not require more than 15 lbf (67 N) to release the latch. Locks shall not require use of a key, tool, or special knowledge for operation.
- D. Panic Exit Devices: Listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.
- E. Fire Exit Devices: Devices complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire and panic protection, based on testing according to UL 305 and NFPA 252.
- F. Removable Mullions
  - 1. BHMA A156.3.
  - 2. Key removable.
  - 3. Provide head cap spacers, angle brackets, and other mounting accessories as needed for proper mounting, and anchoring and support of screws, as needed for top jamb configuration.
  - 4. Provide mullion stabilizer sets for mullions at exterior openings.
- G. Outside Trim: As specified in hardware sets; material and finish to match locksets, unless otherwise indicated.
  - 1. Match design for locksets and latchsets, unless otherwise indicated.
- H. Fasteners. Manufacturer's standard, except furnish sex bolts for attachments to doors, unless doors have sufficient hardwood or other blocking to properly secure all required screws.
- I. Shims: Provide shims if needed for clearance.
- J. Available Manufacturers:
  - 1. Detex, Inc. (DTX)
  - 2. Precision Hardware; Div. of DormaKaba (PHI).
  - 3. Von Duprin; an Allegion Company (VON).

## 2.5 KEY CYLINDERS

- A. Cylinders: Provide cylinders for all devices requiring key cylinders to properly function: constructed from brass or bronze, stainless steel, or nickel silver, and complying with the following:
  - 1. Number of Pins: Six or seven as directed by Owner.
  - 2. Keyway: Best patented or non-patented as directed by Owner.
  - 3. Mortise Type: Threaded cylinders with rings and straight- or clover-type cam.
  - 4. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.

- B. Permanent Cores: Manufacturer's standard; finish face to match lockset; complying with the following:
  - 1. Small-format Interchangeable Cores: Core insert, removable by use of a special key; usable with other manufacturers' cylinders.
- C. Construction Keying: Comply with the following:
  - 1. Construction Cores: Provide keyed brass construction cores that are replaceable by permanent cores for locking devices on exterior doors plus (6) extra. Provide 6 construction master keys.
    - a. Replace construction cores with permanent cores as directed by Owner.
- D. Supplemental Items: Provide cylinder spacers, collars, and correct cams as needed for proper function of locking devices.
- E. Available Manufacturers:
  - 1. Best; Div. of DormaKaba (BES).
  - 2. Schlage Commercial Lock Division; an Allegion Company (SCH).
  - 3. Medeco (MDC).

## 2.6 KEYING

- A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, Appendix A.
  - 1. Existing System: Master key or grand master key locks to Owner's existing system.
- B. Keys: Nickel silver.
  - 1. Stamping: Permanently inscribe each key with a visual key control number and include the following notation:
    - a. Notation: "DO NOT DUPLICATE."
  - 2. Quantity: Provide the following:
    - a. Cylinder Change Keys: Three per cylinder.
    - b. Control Keys: Two.
    - c. Construction Control Keys: Two.

## 2.7 SURFACE CLOSERS

- A. Accessibility Requirements: Where handles, pulls, latches, locks, and other operating devices are indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)."
  - 1. Comply with the following maximum opening-force requirements:
    - a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf (22.2 N) applied perpendicular to door.
    - b. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.

- B. Door Closers for Means of Egress Doors: Comply with NFPA 101. Door closers shall not require more than 30 lbf (133 N) to set door in motion and not more than 15 lbf (67 N) to open door to minimum required width.
- C. Fasteners: Manufacturer's standard for arms, shoes and brackets. Sex bolts for fastening closers to doors, unless doors have sufficient hardwood or other blocking to properly secure all required screws.
- D. Mounting Accessories: Provide shoes, brackets, drop plates, spacers, etc., as needed for proper mounting of closers and arms to door and frame.
- E. Spring Size of Units: Provide field-sizable closers, adjustable for spring sizes 1-6, plus 50% extra spring power at spring size 6, to meet field conditions and requirements for opening force.
- F. Cylinders: 1-1/2" minimum diameter; cast iron or high-silicon alloy aluminum.
- G. Mounting Configuration: Unless otherwise indicated by model number in the hardware sets:
  - 1. Do not furnish closers capable of being mounted on the corridor side of doors.
  - 2. If tri-pack closers are furnished for regular arm applications, remove parallel arm shoe from closer box before delivering to job.
  - 3. Parallel Arm closers are to be manufacturer's double forged rigid models.
- H. Available Manufacturers and Series for Rack and Pinion Surface Closers:
  - 1. LCN Closers; an Allegion Company (LCN): 4040XP series.
  - 2. Corbin-Russwin (COR): DC8000 series.
  - 3. Detex (DTX): D4550 series.

## 2.8 PROTECTIVE TRIM UNITS

- A. Size:
  - 1. Width
    - a. Singles, and pairs with removable mullions or surface applied astragals: 2 inches (38 mm) less than door width on push side and 1 inch (13 mm) less than door width on pull side
    - b. Other pairs: 1 inch (13 mm) less than door width
  - 2. Height: as specified in door hardware sets; or, if constrained by door bottom rail height, 1" less bottom rail height.
- B. Fasteners: Manufacturer's machine or self-tapping countersunk screws.
- C. Metal Protective Trim Units: BHMA A156.6; beveled 4 sides; fabricated from 0.050-inch- (1.3-mm-) thick stainless steel.
- D. Available Manufacturers:
  - 1. Hager Companies (HAG).
  - 2. IVES Hardware; an Allegion Company (IVE).
  - 3. Hiawatha (HIW).
  - 4. Burns (BRN).
  - 5. Rockwood Manufacturing Company (ROC).
  - 6. Trimco (TRI).

## 2.9 FABRICATION

- A. **Manufacturer's Nameplate:** Do not provide products that have manufacturer's name or trade name displayed in a visible location except in conjunction with required fire-rated labels and as otherwise approved by Architect.
  - 1. Manufacturer's identification is permitted on rim of lock cylinders only.
- B. **Base Metals:** Produce door hardware units of base metal, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18. Do not furnish manufacturer's standard materials or forming methods if different from specified standard.
- C. **Fasteners:** Manufacturer's standard, except as noted in product sections of this specification.

## 2.10 FINISHES

- A. **Standard:** BHMA A156.18, as indicated in door hardware sets.
- B. **Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.**
- C. **Appearance of Finished Work:** Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## PART 3 - EXECUTION

### 3.1 EXAMINATION PRIOR TO INSTALLATION OF DOORS AND HARDWARE

- A. **Prior to installing doors, examine frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance. Verify frames are plumb, level, square and dimensioned properly for the installation of doors.**
- B. **Prior to installing hardware other than hanging means, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction and other conditions affecting performance.**
- C. **Proceed with installation only after unsatisfactory conditions have been corrected.**

### 3.2 PREPARATION

- A. **Wood Doors:** Comply with DHI A115-W Series.

### 3.3 INSTALLATION

- A. **Mounting Heights:** Mount door hardware units at heights indicated and as required to comply with governing regulations.



- B. Mounting Locations:
  - 1. Closers and Overhead Stop/Holders: Template and mount closers and overhead stops for maximum degree of opening before door encounters obstruction or so as to interface with specified wall stops and holders. When used with closers, template and locate overhead stops so that closer arm does not fully extend and bottom out. These functionality requirements override any degree of opening information in the specifications or submittals.
  
- C. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 09 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
  - 1. Set units level, plumb, and true to line and location. Hardware designed for mortised installation shall be mortised in flush with adjoining surfaces. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
  - 2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

### 3.4 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
  
- B. Door Closers:
  - 1. Unless otherwise required by authorities having jurisdiction, adjust sweep period so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches (75 mm) from the latch, measured to the leading edge of the door.
  - 2. Adjust latch period so that door does not slam nor injure fingers.
  - 3. Adjust spring power so that door properly latches. Per the ADA, 5 lbf is the maximum allowed on an interior non-rated door; 8.5 lbf is the maximum allowed on a non-rated exterior door. On smoke or fire rated doors, adjust the closer to the minimum spring power needed to reliably latch the door. If the Installer is having difficulty properly adjusting the closer due to improper door-frame clearances or air pressure differentials, they are to immediately notify the Contractor so that corrections may be quickly made.
  - 4. Adjust backcheck to not be noticeable when door is moving slowly, but to slow door down when accelerating due to human force or wind before hitting stop point so as to prevent damage to closer, arm, door, frame, and fasteners.
  
- C. Occupancy Adjustment: Approximately six months after date of Substantial Completion, Installer shall examine and readjust, including adjusting operating forces, each item of door hardware as necessary to ensure function of doors and door hardware.

### 3.5 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
  
- B. Clean operating items as necessary to restore proper function and finish.

- C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.6 DOOR HARDWARE SCHEDULE

**Hardware Set 001**

(6)	Hinges	with door		
(1)	Key Removable Mullion	KR-822 x ST989	689	PHI
(1)	Panic Device, Rim, 03, LD	2103LD x 1703A	630	PHI
(1)	Panic Device, Rim, 01, LD	2101LD	630	PHI
(2)	Rim Cylinder	SFIC 7-pin	626	BES
(2)	Closer, w/Spring Stop	D-4550 CS	689	DTX
(2)	Kick Plate	KO050 10 x 2LDW x CS x B4E	630	TRI
(1)	Overhead Rain Drip	16A	628	NGP
(1)	Cat H Adhesive Mullion Seal/Mute	MS-SA/75	Black	DHS
(2)	Cat H Jamb Seal Set	with door		
(2)	Threshold	with door		

**Hardware Set 002**

(3)	Hinges	with door		
(1)	Panic Device, Rim, 03, LD	2103LD x 1703A	630	PHI
(1)	Rim Cylinder	SFIC 7-pin	626	BES
(1)	Closer, w/Spring Stop	D-4550 CS	689	DTX
(1)	Kick Plate	KO050 10 x 2LDW x CS x B4E	630	TRI
(1)	Cat H Jamb Seal Set	with door	628	NGP
(1)	Threshold	with door	628	NGP

**END OF SECTION 08 71 00**

## **SECTION 09 90 00 - PAINTING**

### **PART 1 - GENERAL**

#### **1.01 RELATED DOCUMENTS**

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to work specified in this section.

#### **1.02 DESCRIPTION OF WORK**

- A. Extent of painting work is shown on drawings and schedules and described herein. Furnish labor and materials to complete painting work as indicated, as specified herein, or both.
- B. The work includes painting and finishing of interior and exterior exposed items and surfaces throughout project including all back-priming, except as otherwise indicated.
  - 1. Surface preparation, priming and coats of paint specified are in addition to shop-priming and surface treatment specified under other sections of work.
- C. The following specifications cover all painting; finishing of concrete masonry, unfinished metal, mechanical and electrical items, and other surfaces at the exterior and interior work areas of the building, except otherwise specified.
- D. Work includes field painting of exposed new ductwork, piping (insulated or not insulated) installed under mechanical plumbing or fire protection or electrical work, unless otherwise shown. Where located on wall, paint to match wall. Where occurring at ceilings, paint to match adjacent surfaces. (Coordinate with Architect.)
- E. The exterior work shall include items attached to the building, including but not limited to the following:
  - 1. Ferrous pipe rails, brackets, etc.
  - 2. Telephone or electrical panel boxes, conduit, weather heads, cover plates, etc.
- F. "Paint" as used herein means all coating systems materials, including primers, emulsions, enamels, sealers and fillers, and other applied materials whether used as primer, intermediate or finish coats.
- G. Surfaces to be Painted: Except where natural finish of material is specifically noted as a surface not to be painted, paint exposed surfaces at and contiguous with work areas, whether or not colors are designated in "schedules". Where items or surfaces are not specifically mentioned, paint the same as similar adjacent materials or areas. If color or finish is not designated, Architect will select these from standard colors or finishes available.
- H. Examine Specifications for various other trades; become familiar with their provisions regarding their painting; paint or finish surfaces that are left unfinished by requirements for other Sections.
- I. Following categories of work are not included as part of field-applied finish work.
  - 1. Pre-finished Items: Unless otherwise indicated, do not include painting when factory-finishing or installer-finishing is specified for such items as (but not limited to) metal toilet enclosures, prefinished partition systems, acoustic materials, architectural woodwork and casework, and finished mechanical and electrical equipment, including light fixtures, switchgear and distribution cabinets.
  - 2. Concealed Surfaces: Unless otherwise indicated, painting is not required on surfaces such as walls or

ceilings in concealed areas and generally inaccessible areas, foundation spaces, furred areas, utility tunnels, pipe spaces and duct shafts.

3. Finished Metal Surfaces: Metal surfaces of anodized aluminum, stainless steel, chromium plate, copper, bronze and similar finished materials will not require finish painting, unless otherwise indicated.
4. Operating Parts: Unless otherwise indicated, moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sensing devices, motor and fan shafts will not require finish painting.
- J. Do not paint over any code-required labels, such as Underwriters' Laboratories and factory Mutual, or any equipment identification, performance rating, name, or nomenclature plates.
- K. If metal or any other surface to be finished cannot be put in proper condition for finishing by customary cleaning, sanding, puttying operations, notify Architect in writing, or assume responsibility for and rectify any unsatisfactory finish resulting.
- L. Furnish tools, ladders, drip cloths, masking, scaffolding and other equipment necessary for complete work.
- M. Coordinate with Mechanical and Electrical Contractors to determine whether painting scope directed by MEP documents shall be performed by painting contractor or individual mechanical, electrical, and/or plumbing contractors.

#### 1.03 WORK NOT INCLUDED

- A. Shop coat specified under other trades.
- B. Surfaces outside the specific work areas of the project that will not otherwise be affected by the Work.

#### 1.03 QUALITY ASSURANCE

- A. Single Source Responsibility: Provide primers and other undercoat paint produced by same manufacturer and use any within recommended limits.
- B. Coordination of Work: Review other sections of these specifications in which prime paints are to be provided to ensure compatibility of total coatings system for various substrates. Upon request from other trades, furnish information or characteristics of finish materials provided for use, to ensure compatible prime coats are used.
- B. Applicator Qualifications: A firm with (3) years' experience in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

#### 1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's technical information including paint label analysis and application instructions for each material proposed for use.
- B. Samples for Initial Selection: For each type of topcoat product indicated.
- C. Samples for Verification: For each type of paint system and in each COLOR and GLOSS of topcoat indicated.
  1. Submit Samples on rigid backing, 8-inches square.
  2. Step coats on Samples to show each coat required for system.

3. Label each coat of each Sample.
4. Label each Sample for location and application area.

D. Product List: For each product indicated, include the following:

1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.

#### 1.05 DELIVERY AND STORAGE

A. Deliver materials to job site in original, new and unopened packages and containers bearing manufacturer's name and label and the following information:

- Name or title of material.
- Fed. Spec. number, of applicable.
- Manufacturer's stock number and date of manufacture.
- Manufacturer's name.
- Contents by volume, for major pigment and vehicle constituents.
- Thinning instructions.
- Application instructions.
- Color name and number.

B. Store materials not in actual use in tightly covered containers. Maintain containers used in storage of paint in a clean condition, free of foreign materials and residue.

1. Protect from freezing where necessary. Keep storage area neat and orderly. Remove oily rags and waste daily. Take all precautions to ensure that workmen and work areas are adequately protected from fire hazards and health hazards resulting from handling, mixing and application of paints.

#### 1.06 JOB CONDITIONS

A. Apply water-based paints only when temperature of surfaces to be painted surrounding air temperatures are between 50 and 90 degrees F, unless otherwise permitted by paint manufacturer's printed instructions.

B. Apply solvent-thinned paints only when temperature of surfaces to be painted and surrounding air temperatures are between 45 and 95 degrees F, unless otherwise permitted by paint manufacturer's printed instructions.

C. Do not apply paint in snow, rain, fog or mist; or when relative humidity exceeds 85%; or to damp or wet surfaces, unless otherwise permitted by paint manufacturer's printed instructions.

1. Painting may be continued during inclement weather if areas and surfaces to be painted are enclosed and heated within temperature limits specified by paint manufacturer during application and drying periods.

#### 1.07 EXTRA MATERIALS

A. Deliver to Owner two (2) gallons of each finish paint in each color required for Project.

1. Mark each container with color and room names or numbers where paint was used, without obscuring manufacturer's label.

## **PART 2 - PRODUCTS**

### 2.01 ACCEPTABLE MANUFACTURERS

- A. Basis of Design (General): As noted on Schedule at the end of this Section.
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include the following:
    - Benjamin Moore and Co. (Moore).
    - PPG (PPG)
    - Dehart Paint & Varnish Co.
    - The Sherwin-Williams Company (S-W).
- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include the following:

### 2.02 PAINT AND FINISH PRODUCTS

- A. Paint specified in this Section is based on products manufactured by the manufacturer listed for that item. Other manufacturer's products may be used provided they are approved as equals. Paint products shall be fresh and well ground; shall not settle readily, cake, or thicken in the container; shall be broken up readily with paddle to a smooth consistency; and shall have easy application properties. Other materials such as linseed oil, turpentine, mineral spirits, miscellaneous thinners, varnish, and shellac shall be the highest quality of an approved manufacturer.
- B. Colors: Match colors indicated by reference to the manufacturer's standard color designations. If products other than those by the specified manufacturer are used, color shall be matched to the color designation of the manufacturer specified.

### 2.03 MATERIALS

- A. Material Quality: Provide best quality grade of various types of coatings as regularly manufactured by acceptable paint materials manufacturers for professional application. Materials not displaying the manufacturer's identification as a standard, best-grade product will not be acceptable.
  - 1. Proprietary names used to designate colors or materials are not intended to imply that products of named manufacturers are required to exclusion of equivalent products of other manufacturers.
- B. All paints used on this project shall be "water-based" or "alkyd" type. LEAD BASED PAINTS ARE UNACCEPTABLE.
  - 1. Manufacturer's products which comply with coating qualitative requirements of applicable Federal Specifications, yet differ in quantitative requirements, may be considered for use when acceptable to Architect. Furnish material data and manufacturer's certificate of performance to Architect for any proposed substitutions.
- C. Color Pigments: Pure, non-fading, applicable types to suit substrates and service indicated.
- D. Lead content in pigment, if any, is limited to not more than 0.06% lead, as lead metal based on the total non-volatile (dry-film) of paint by weight.
- E. Painting materials, such as linseed oil, shellac, turpentine, etc.: pure, highest quality, bear identifying label on container.
- F. Materials not otherwise specified shall be equal to the first quality products of brands listed in the paint

schedule 3.06 and 3.07 below.

### **PART 3 - EXECUTION**

#### **3.01 INSPECTION**

- A. Applicator must examine areas and conditions under which painting work is to be applied and notify Contractor in writing of conditions detrimental to proper and timely completion of the work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Applicator.
- B. Starting painting work will be construed as Applicator's acceptance of surfaces and conditions within any particular area.
- C. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to formation of a durable paint film.
- D. Verify that shop applied primers are compatible with specified finish coats.
- E. Measure moisture content of surfaces using an electronic moisture meter. Do not begin application of coatings unless moisture content of surfaces is below the following maximum values:
  - 1. Masonry surfaces: 12 percent.
  - 2. Wood surfaces: 15 percent.
  - 3. Vertical concrete surfaces: 12 percent.
  - 4. Horizontal concrete surfaces: 8 percent.

#### **3.02 SURFACE PREPARATION**

- A. General: Perform preparation and cleaning procedures in accordance with paint manufacturer's instructions and as herein specified for each particular substrate condition.
  - 1. Clean walls of existing tape, adhesives prior to painting, unless tape is specifically in place to protect part of the substrate from receiving paint.
  - 2. Provide barrier coats over incompatible primers or remove and reprime as required. Notify Architect in writing of any anticipated problems in using the specified coating systems with substrates primed by others.
  - 3. Remove hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and similar items in place and not to be finish-painted, or provide surface-applied protection prior to surface preparation and painting operations. Remove, if necessary, for complete painting of items and adjacent surfaces. Following completion of painting of each space or area, reinstall removed items.
  - 4. Clean surfaces to be painted before applying paint or surface treatments. Scrape and sand as necessary to properly prepare surfaces. Remove oil and grease prior to mechanical cleaning. Program cleaning and painting so that contaminants from the cleaning process will not fall onto wet, newly painted surfaces.
  - 5. Remove plastic or metal anchors and fill holes, prime walls not previously primed and build up with multiple coats to achieve uniform surface with adjacent surfaces.
- B. Cementitious Materials: Prepare cementitious surfaces of concrete, concrete block, and cement plaster to be painted by removing efflorescence, chalk, dust, dirt, grease, oils, and by roughening as required to remove glaze.

1. Determine alkalinity and moisture content of surfaces to be painted by performing appropriate tests. If surfaces are found to be sufficiently alkaline to cause blistering and burning of finish paint, correct this condition before application of paint. Do not paint over surfaces where moisture content exceeds that permitted in manufacturer's printed directions.
- C. Wood: Clean wood surfaces to be painted of dirt, oil, or other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sandpaper smooth those finished surfaces exposed to view and dust off. Scrape and clean small, dry, seasoned knots and apply a thin coat of white shellac or other recommended knot sealer before application of priming coat. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sandpaper smooth when dried.
  1. Prime or seal wood required to be job-painted immediately upon delivery to job. Prime edges, ends, faces, undersides, and backsides of such wood, including cabinets, counters, cases, and paneling.
- E. Ferrous Metals: Clean ferrous surfaces which are not galvanized or shop-coated of oil, grease, dirt, loose mill scale and other foreign substances by solvent or mechanical cleaning.
- F. Galvanized Surfaces: Clean free of oil and surface contaminants and non-petroleum based solvent.
  1. Apply prep material (thinner or Galva Prep) for paint adhesion before applying primer.
- G. Prior to first coat, do all necessary puttying of holes, cracks, etc., with putty color that matches finish. Bring putty flush with adjoining surfaces in neat, workmanlike manner.

### 3.03 MATERIALS PREPARATION

- A. Mix and prepare painting materials in accordance with manufacturer's directions.
- B. Maintain containers used in mixing and application of paint in a clean condition, free of foreign materials and residue.
- C. Stir materials before application to produce a mixture of uniform density, and stir as required during application. Do not stir surface film into material. Remove film and, if necessary, strain material before using.

### 3.04 APPLICATION

- A. General: Apply paint in accordance with manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied.
  1. Surface treatments and finishes are indicated in "schedules" of the contract documents. Colors will be selected by the Architect during construction.
  2. Provide finish coats which are compatible with prime paints used.
  3. Tint undercoats of paint and enamel to same or approximate final coat shade.
  4. Apply additional coats when undercoats or other conditions show through final coat of paint, until paint film is of uniform finish, color and appearance. Give special attention to insure that surfaces including edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
  5. Omit first coat (primer) on metal surfaces which have been shop-primed and touch-up painted, unless otherwise indicated.



6. Paint mechanical, electrical piping and conduit, plumbing, etc. as indicated in Division 20 – 28 Sections.
- B. Scheduling Painting: Apply first-coat material to surfaces that have been cleaned, pretreated or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
  1. Allow sufficient time between successive coatings to permit proper drying. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and application of another coat of paint does not cause lifting of less of adhesion of the undercoat.
- C. Minimum Coating Thickness: Apply materials at not less than manufacturer's recommended spreading rate to establish a total dry film thickness as indicated or, if not indicated, as recommended by coating manufacturer.
- D. Prime Coats: Apply prime coat of material which is required to be painted or finished and which has not been prime coated by others.
  1. Recoat primed and sealed surfaces where there is evidence of suction spots or unsealed areas in first coat to assure a finish coat with not burn-through or other defects due to insufficient sealing.
- E. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance and coverage. Cloudiness, spotting, laps, brush marks, runs, sags, or other surface imperfections will not be acceptable.
- F. All exterior metals are to be painted, unless pre-finished, even if galvanized.

### 3.05 CLEAN-UP AND PROTECTION

- A. Clean-Up: During progress of work, remove from site discarded paint materials, rubbish, cans and rags at end of each work day.
- B. Upon completion of painting work, clean glass and other paint-spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.
- C. Protection: Protect work of other trades, whether to be painted or not, against damage by painting and finishing work. Correct any damage by cleaning, repairing or replacing, and repainting, as acceptable to Architect.
  1. Provide "Wet Paint" signs as required to protect newly-painted finishes. Remove temporary protective wrappings provide by others for protection of their work after completion of painting operations.
  2. At the completion of work of other trades, touch-up and restore all damaged or defaced painted surfaces.

### 3.06 EXTERIOR PAINT SCHEDULE

- A. Paint Exterior Ferrous Metals (Gloss), except at roof level:

First Coat:	S-W:	Kem Bond HS Primer, DFT: 2.3 mils
Second Coat:	S-W:	Pro Industrial Urethane Alkyd Enamel, DFT: 2.0-3.0 mils per coat
Third Coat:	S-W:	Pro Industrial Urethane Alkyd Enamel

B. Paint Exterior Aluminum (Gloss), except at roof level:

First Coat: S-W: DTM Wash Primer  
Second Coat: S-W: Pro Industrial Urethane Alkyd Enamel, DFT: 2.0-3.0 mils per coat  
Third Coat: S-W: Pro Industrial Urethane Alkyd Enamel

C. Paint Exterior Concrete Block and Brick (Semi-Gloss):

First Coat: S-W: Heavy Duty Block Filler, DFT: 10.0 mils minimum, may require multiple coats to be PIN-HOLE FREE  
Second Coat: S-W: Pro Industrial Urethane Alkyd Enamel, DFT: 1.5 mils per coat  
Third Coat: S-W: Pro Industrial Urethane Alkyd Enamel

D. Paint Exterior Galvanized Metal (Gloss):

First Coat: Wash coat of 8 oz. copper acetate or copper sulphate in one gallon of water.  
Second Coat: S-W: Galvite HS  
Third Coat: S-W: Pro Industrial Urethane Alkyd Enamel, DFT: 2.0-3.0 mils per coat  
Fourth Coat: S-W: Pro Industrial Urethane Alkyd Enamel

E. Paint Exterior Concrete (Semi-Gloss):

First Coat: S-W: Loxon Concrete & Masonry Primer Sealer, DFT: 10.0 mils minimum, may require multiple coats to be PIN-HOLE FREE  
Second Coat: S-W: A-100 Exterior Latex Satin, DFT: 1.5 mils per coat  
Third Coat: S-W: A-100 Exterior Latex Satin

F. PVC [Roof vents, piping, etc] (Flat):

Primer : n/a – Finish paint is a self-priming product.  
Finish Coats (3) PPG: Break-Through! 250 Interior/Exterior Satin Water-Borne Acrylic Series: V50-410, DFT: 2.0-4.0 mils per coat.

G. Paint Exterior Wood (Flat):

First Coat: S-W: Duration Exterior Acrylic  
Second Coat: S-W: Duration Exterior Acrylic

3.07 INTERIOR PAINT SYSTEMS

A. Paint Interior Galvanized Metal (Semi-Gloss):

First Coat: Wash coat of 8 oz. copper acetate or copper sulphate in one gallon of water.  
Second Coat: S-W: DTM Wash Primer (B71Y1) DFT: 2.3 mils  
Third Coat: S-W: Promar Alkyd Semi-Gloss Enamel (34 Series), DFT: 2.0-3.0 mils per coat  
Fourth Coat: S-W: Promar Alkyd Semi-Gloss Enamel (34 Series)

B. Paint Interior Ferrous Metals (Semi-Gloss):

First Coat (on unprimed metal):  
S-W: DTM Acrylic Primer/Finish (B66W1) , DFT: 2.3 mils  
Second Coat: S-W: DTM Acrylic Semi-Gloss Coating (B66-200), DFT: 2.0-3.0 mils per coat  
Third Coat: S-W: DTM Acrylic Semi-Gloss Coating (B66-200)

- C. Paint Exterior Metal at Roof Level (including painted roof ventilator units, electrical conduit and connections, ferrous metal ladders, and other ferrous metal installations):

Primer: PPG: 6-208 Red or 6-212 White Speedhide Rust Inhibitive Primer  
First Coat: PPG: 95-812 Series, Pitthane Ultra Gloss Urethane Enamel  
Second Coat: PPG: 95-812 Series, Pitthane Ultra Gloss Urethane Enamel

- D. Paint Interior Wood (latex system / eggshell finish):

First Coat: S-W: ProMar 200 Zero VOC Interior Latex Primer  
Second Coat: S-W: ProMar 200 Zero VOC Interior Latex Eggshell  
Third Coat: S-W: ProMar 200 Zero VOC Interior Latex Eggshell

- E. Paint Interior CMU (Semi-Gloss):

First Coat: S-W: Prep Rite Masonry Primer, B28W300, DFT: 10.0 mils minimum, may require multiple coats to be PIN-HOLE FREE  
Second Coat: S-W: Prop Mar 200 Interior Latex, DFT: 1.5 mils per coat  
Third Coat: S-W: Pro Mar 200 Interior Latex

- F. Paint Exposed Structure, Wood:

First Coat: S-W: ProMar 200 Zero VOC Interior Latex Primer  
Second Coat: S-W: ProMar 200 Zero VOC Interior Latex Eggshell  
Third Coat: S-W: ProMar 200 Zero VOC Interior Latex Eggshell

- G. Stain Wood:

First Coat: S-W / Minwax: Pre-Stain Wood Conditioner  
Second Coat: S-W / Minwax: Wood Finish Penetrating Stain  
Third Coat: S-W / Minwax: Fast-Drying Polyurethane

**END OF SECTION 09 90 00**

SECTION 23 05 00 - COMMON WORK RESULTS FOR HVAC

PART 1 – GENERAL:

1.1 RELATED DOCUMENTS

- A. The Contractor's attention is directed to the General and Special Conditions, COMMON WORK RESULTS FOR HVAC and to all other Contract Documents as they apply to this branch of the work. Attention is also directed to all other sections of the Contract Documents which affect the work of this section, and which are hereby made a part of the work specified in this section.

1.2 SCOPE

- A. The Advertisement for Bid, Instructions to Bidders, Bidding Requirements, General, Special and Supplementary Conditions, and all other Contract Documents shall apply to the Contractor's work as well as to each of their Sub-Contractor's work.
- B. All manufacturers, suppliers, fabricators, contractors, etc. submitting proposals for any part of the work, services, materials, or equipment to be used on or applied to this project are hereby directed to familiarize themselves with the Contract Documents. In case of conflict between these General Provisions and the General and/or Special Conditions, the Contractor shall contact the Engineer for clarification and final determination prior to the Bid.
- C. The work included in this Division consists of the furnishing of all labor, equipment, transportation, excavation, backfill, supplies, material, appurtenances, and services necessary for the satisfactory installation of the complete and operating Mechanical Systems indicated or specified in the Contract Documents.
- D. Any materials, labor, equipment, or services not mentioned specifically herein which may be necessary to complete any part of the Mechanical Systems in a substantial manner, in compliance with the requirements stated, implied, or intended in the Plans and/or Specifications, shall be included in the Bid as part of this Contract.
- E. It is not the intent of this Section of the Specifications to make any Contractor, other than the Construction Manager responsible to the Owner. All transactions such as submittal of shop drawings, claims for extra costs, requests for equipment or materials substitution, shall be routed through the Construction Manager to the Engineer of Record. Also, this Section of the Specifications shall not be construed as an attempt to arbitrarily assign responsibility of work, material, equipment or services to a particular trade or Contractor. Unless stated otherwise, the subdivision and assignment of work under the various sections shall be optional.
- F. The Architect and Engineer do not define the scope of individual trades, subcontractors, material suppliers and vendors. Any sheet numbering system or specification numbering system used which identifies disciplines is solely for the Architect and Engineer's convenience and is not intended to define a subcontractor's scope of work. Information regarding individual trades, subcontractors, material suppliers and vendors may be detailed, described, and indicated at different locations throughout the Contract Documents. No consideration will be given to requests for change orders for failure to

obtain and review the complete set of Contract Documents when preparing Bids, prices, and quotations. Unless stated otherwise, the subdivision and assignment of work under the various sections shall be the responsibility of the Contractor holding the prime contract.

- G. It is the intent of the Contract Documents to deliver to the Owner a new, complete, and operational project once the work is complete. Although Plans and Specifications are complete to the extent possible, it shall be the responsibility of the Contractors involved to remove and/or relocate or re-attach any existing or new systems which interfere with new equipment or materials required for the complete installation without additional cost to the Owner.
- H. In general, all work shall be accomplished without interruption of existing facilities operations. The Contractor shall advise the Owner at least seven (7) days prior to the interruption of any services (gas, domestic water, heating, etc.). The Owner shall be advised of the exact time that interruption will occur and the length of time the interruption will last. Failure to comply with this requirement may result in complete work stoppage for the Contractors involved until a complete schedule of interruptions can be developed.
- I. Whenever utilities are interrupted, either deliberately or accidentally, the Contractor shall work continuously to restore said service. The Contractor shall provide tools, materials, skilled journeymen of Bidder/Proposer's own and other trades as necessary, premium time as needed and coordination with all applicable utilities, including payment of utility company charges (if any), all without requests for extra compensation from the Owner.
- J. Each Bidder/Proposer shall also be governed by any unit prices and Addenda insofar as they may affect part of their work or services.

### 1.3 DEFINITIONS AND ABBREVIATIONS

- A. Contractor - Any Contractor whether bidding, proposing, or working independently or under the supervision of a Construction Manager and who installs any type of Mechanical Work as specified in the Contract Documents or, the Construction Manager.
- B. Engineer - The Consulting Mechanical-Electrical Engineer either consulting to the Owner, Architect, or Other, etc. In this case: CMTA, Inc., Consulting Engineers.
- C. Architect - The Architect of Record for the project.
- D. Contract Documents - All documents pertinent to the quality and quantity of work to be performed on this project. Includes, but not limited to: Plans, Specifications, Instructions to Bidders, General and Special Conditions, Addenda, Alternates, Lists of Materials, Lists of Sub-Contractors, Unit Prices, Shop Drawings, Field Orders, Change Orders, Cost Breakdowns, Schedules of Value, Periodical Payment Requests, Construction Contract with Owner, etc.
- E. Bidder/Proposer - Any person, agency or entity submitting a proposal to any person, agency, or entity for any part of the work required under this contract.

- F. The Project - All of the work required under this Contract.
- G. Furnish - Deliver to the site in good condition and turn over to the Contractor who is to install.
- H. Provide - Furnish and install complete, tested, and ready for operation.
- I. Install - Receive and place in satisfactory operation.
- J. Indicated - Listed in the Specifications, shown on the Plans or Addenda thereto.
- K. Typical or Typ.- Where indicated repeat this work, method or means each time the same or similar condition occurs whether indicated or not.
- L. ADA - Americans with Disabilities Act.
- M. AGA – American Gas Association.
- N. ANSI - American National Standards Institute.
- O. ASHRAE - American Society of Heating, Refrigeration and Air Conditioning Engineers.
- P. ASME - American Society of Mechanical Engineers.
- Q. IBC - International Building Code.
- R. NEC - National Electrical Code.
- S. NEMA - National Electrical Manufacturers Association.
- T. NFPA - National Fire Protection Association.
- U. OSHA - Office of Safety and Health Administration.
- V. SMACNA - Sheet Metal and Air Conditioning Contractors National Association.
- W. UL - Underwriters Laboratories.

#### 1.4 INTENT AND INTERPRETATION

- A. It is the intention of the Contract Documents to call for a complete and operational system, including all components, accessories, finish work, etc as necessary for trouble free operation, tested and ready for operation. Anything that may be required, implied, or inferred by the Contract Documents shall be provided and included as part of the Bid.
- B. All Contractors and Vendors providing a bid for this project shall review the Plans and Specifications and determine any modifications and/or adjustments necessary relative to the proposed equipment and materials with specific manufacturer's installation requirements. Include in the bid any necessary installation methods, features, options, accessories, etc. necessary to install the proposed equipment and materials, regardless

of whether used as basis of design or being offered as a substitution in accordance with the specific manufacturer's installation requirements whether specifically detailed or not within the Plans and Specifications.

- C. Details not usually shown or specified, but necessary for the proper installation and operation of systems, equipment, materials, etc., shall be included in the work, the same as if herein specified or indicated.
  - D. The Bidder/Proposer shall completely review the Contract Documents. Any interpretation as to design intent or scope shall be provided by the Engineer / Architect. Should an interpretation be required, the Bidder/Proposer shall request a clarification not less than ten (10) days prior to the submission of the proposal so that the condition may be clarified by Addendum. In the event of any conflict, discrepancy, or inconsistency develops; the interpretation of the Engineer shall be final.
  - E. The Contractor shall give written notice of any materials or apparatus believed inadequate or unsuitable; in violation of laws, ordinances, rules, or regulations of authorities having jurisdiction; and any necessary items of work omitted a minimum of ten (10) days prior to bid. In the absence of such written notice and by the act of submitting a bid, it shall be understood that the Contractor has included the cost of all required items in the bid, and that will be responsible for the approved satisfactory functioning of the entire system without extra compensations.
- 1.5 INDEMNIFICATION: The Contractor shall hold harmless and indemnify the Engineer, employees, officers, agents and consultants from all claims, loss, damage, actions, causes of actions, expense and/or liability resulting from, brought for, or on account of any personal injury or property damage received or sustained by any person, persons, (including third parties), or any property growing out of, occurring, or attributable to any work performed under or related to this contract, resulting in whole or in part from the negligence of the Contractor, any subcontractor, any employee, agent or representative.

#### 1.6 PLANS AND SPECIFICATIONS

- A. The Plans are diagrammatic only and indicate the general arrangement of the systems and are to be followed. If deviations from the layouts are necessitated by field conditions, detailed layouts of the proposed departures shall be submitted to the Engineer for approval before proceeding with the work. The Plans are not intended to show every item which may be necessary to complete the systems. All Bidder/Proposers shall anticipate that additional items may be required and submit their Bid accordingly.
- B. The Plans and Specifications are intended to supplement each other. No Bidder/Proposer shall take advantage of conflict between them, or between parts of either. Should this condition exist, the Bidder/Proposer shall request a clarification not less than ten (10) days prior to the submission of the proposal so that the condition may be clarified by Addendum. In the event that such a condition arises after work is started, the interpretation of the Engineer shall be final.
- C. The Plans and Specifications shall be considered to be cooperative and anything appearing in the Specifications which may not be indicated on the Plans or conversely,

shall be considered as part of the Contract and must be executed the same as though indicated by both.

- D. Contractor shall make all of their own measurements in the field and shall be responsible for correct fitting. The work shall be coordinated with all other branches of work in such a manner as to cause a minimum of conflict or delay.
- E. The Engineer shall reserve the right to make adjustments in location of piping, ductwork, equipment, etc. where such adjustments are in the interest of improving the project.
- F. Should conflict, overlap or duplication of work between the various trades become evident, this shall be called to the attention of the Engineer. In such event neither trade shall assume to be relieved of the work which is specified under their branch until instructions in writing are received from the Engineer.
- G. Unless dimensioned, the Plans only indicate approximate locations of equipment, piping, ductwork, etc. Dimensions given in figures on the Plans shall take precedence over scaled dimensions and all dimensions, whether given in figures or scaled, shall be verified in the field to insure no conflict with other work.
- H. Each Bidder/Proposer shall review all Plans in the Contract Documents to ensure that the work they intend to provide does not create a conflict with or affect the work of others in any way. Where such an effect does occur, it shall be the Bidder/Proposer's responsibility to satisfactorily eliminate any such conflict or effect prior to the submission of their proposal. Each Bidder/Proposer shall in particular ensure that there is adequate space to install their equipment and materials. Failure to do so shall result in the correction of such encroachment conflict or effect of any work awarded the Bidder/Proposer and shall be accomplished fully without expense to others and that they are reasonably accessible for maintenance. Check closely all mechanical and electrical closets, chases, ceiling voids, wall voids, crawl spaces, etc., to ensure adequate spaces.
- I. Where on the Plans a portion of the work is drawn out and the remainder is indicated in outline, or not indicated at all, the parts drawn out shall apply to all other like portions of the work. Where ornamentation or other detail is indicated by starting only, such detail shall be continued throughout the courses or parts in which it occurs and shall also apply to all other similar parts of the work, unless otherwise indicated.
- J. Details not usually shown or specified, but necessary for the proper installation and operation of systems, equipment, materials, etc., shall be included in the work, the same as if herein specified or indicated.
- K. Where within the Contract Documents the word "typical" or "typ." is used, it shall mean that the work method or means indicated as typical shall be repeated in and each time it occurs whether indicated or not.
- L. Each Contractor shall evaluate ceiling heights specified on Architectural Plans. Where the location of equipment or systems may interfere with ceiling heights or maintenance and access of equipment or systems, the Contractor shall call this to the attention of the Engineer in writing prior to making the installation. Do not install equipment or systems in the affected area until the conflict is resolved. Any such changes shall be anticipated



and requested sufficiently in advance so as to not cause extra work or cost incurred on the part of the Contractor or unduly delay the work.

#### 1.7 EQUIPMENT AND MATERIALS SUBSTITUTIONS OR DEVIATIONS

- A. When any Contractor requests approval of materials and/or equipment of different physical size, weight, capacity, function, color, access, that the design allows for it shall be understood that such substitution, if approved, will be made without additional cost to anyone other than the Contractor requesting the change regardless of changes in connections, space requirements, electrical characteristics, etc. from that indicated, electrical service, etc. In all cases where substitutions affect other trades, the Contractor requesting such substitutions shall advise all such Contractors of the change and shall compensate them for all necessary changes in their work. Any Plans, Specifications, Diagrams, etc., required to describe and coordinate such substitutions or deviations shall be professionally prepared at the responsible Contractor's expense. Review of Shop Drawings by the Engineer does not in any way absolve the Contractor of this responsibility.
- B. Notwithstanding any reference in the Specifications to any article, device, product, material, fixture, form, or type of construction by name, make or catalog number, such reference shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition; any devices, products, materials, fixtures, forms, or types of construction which, in the judgment of the Engineer, are equivalent to those specified are acceptable, provided the provisions of this Part are met. Requested substitutions shall be submitted to the Engineer a minimum of ten (10) days prior to Bid. If this procedure is not followed, the substitution will be rejected. If prevailing laws of cities, towns, states, or countries are more stringent than these specifications regarding such substitutions, then those laws shall prevail over these requirements.
- C. Wherever any equipment and material are specified exclusively only such items shall be used unless substitution is accepted in writing by the Engineer.
- D. Each Bidder/Proposer shall furnish along with their proposal a list of specified equipment and materials which is to be provided. Where several makes are mentioned in the Specifications and the Contractor fails to state which, they propose to furnish, the Engineer shall choose any of the makes mentioned without change in price. Inclusion in this list shall not ensure that the Engineer will approve shop drawings unless the equipment, materials, etc., submitted in shop drawings are satisfactorily comparable to the items specified and/or indicated.

#### 1.8 QUALIFICATIONS OF CONTRACTOR/WORKERS

- A. All Mechanical Contractors and their subcontractors bidding this project must have been a licensed company for a minimum of three (3) years to qualify to Bid this project. Individual employee experience does not supersede this requirement.
- B. All mechanical subcontractors bidding the mechanical work must have completed one project of 70% this subcontract cost size and two projects of 50% this subcontract cost size.

- C. All mechanical work shall be accomplished by qualified workers competent in the area of work for which they are responsible. Untrained and incompetent workers, as evidenced by their workmanship, shall be summarily relieved of their responsibilities in areas of incompetency. The Engineer shall reserve the right to determine the quality of workmanship of any workers and unqualified or incompetent workers shall refrain from work in areas not deemed satisfactory. Requests for relief of workers shall be made through the normal channels of Architect, Contractor, etc.
- D. The Contractor shall hold all required licenses in the State which the work is to be performed.
- E. The installation of all Heating, Ventilating and Air-Conditioning Systems (HVAC) by any Contractor, whether in existing or new building construction shall be performed by a Licensed Master HVAC Contractor. This includes any Contractor installing HVAC systems, piping, and ductwork.
- F. All sheet metal, insulation and pipe fitting work shall be installed by workers normally engaged in this type of work.
- G. All automatic control systems shall be installed by workers normally engaged or employed in this type work, except in the case of minor control requirements (residential type furnaces, packaged HVAC equipment with integral controls, etc.) in which case, if a competent worker is the employee of this Contractor, the worker may be utilized subject to review of their qualifications by the Engineer and after written approval from same.
- H. All electrical work shall be accomplished by Licensed Journeymen electricians under the direct supervision of a licensed Electrician. All applicable codes, utility company regulations, laws and permitting authority of the locality shall be fully complied with by the Contractor.

#### 1.9 HAZARDOUS MATERIALS

- A. The Contractor is hereby advised that it is possible that asbestos and/or other hazardous materials are or were present in this building or site.
- B. Any worker, occupant, visitor, inspector, etc., who encounters any material of whose content they are not certain shall promptly report the existence and location of that material to the Contractor and/or Owner. The Contractor shall, as a part of their work, ensure that their workers are aware of this potential and what they are to do in the event of suspicion. The Contractor shall also keep uninformed persons from the premises during construction. Furthermore, the Contractor shall insure that no one comes near to or in contact with any such material or fumes therefrom until its content can be ascertained to be non-hazardous.
- C. CMTA, Inc., Consulting Engineers, have no expertise in the determination of the presence of hazardous materials. Therefore, no attempt has been made by them to identify the existence or location of any such material. Furthermore, CMTA nor any affiliate thereof will neither offer nor make any recommendations relative to the removal, handling, or disposal of such material.

- D. If the work interfaces, connects or relates in any way with or to existing components which contain or bear any hazardous material, asbestos being one, then, it shall be the Contractor's sole responsibility to contact the Owner and so advise them immediately.
- E. The Contractor by execution of the contract for any work and/or by the accomplishment of any work thereby agrees to bring no claim relative to hazardous materials for negligence, breach of contract, indemnity, or any other such item against CMTA, its principals, employees, agents, or consultants. Also, the Contractor further agrees to defend, indemnify, and hold CMTA, its principals, employees, agents, and consultants, harmless from any such related claims which may be brought by any subcontractors, suppliers or any other third parties.
- F. No asbestos or mercury containing materials shall be installed in this project.

PART 2 - PRODUCTS (NOT APPLICABLE):

PART 3 – EXECUTION:

3.1 EXAMINATION OF SITE CONDITIONS

- A. Each Bidder/Proposer shall inform themselves of all of the conditions under which the work is to be performed, the site of the work, the structure of the ground, above and below grade, the obstacles that may be encountered, the availability and location of necessary facilities and all relevant matters concerning the work.
- B. Each Bidder/Proposer shall also fully acquaint themselves with all existing conditions as to ingress and egress, distance of haul from supply points, routes for transportation of materials, facilities and services, availability of utilities, etc. A proposal shall cover all expenses or disbursements in connection with such matters and conditions. No allowance will be made for lack of knowledge concerning such conditions after Bids are accepted.

3.2 CODES, RULES, PERMITS, FEES, INSPECTIONS, REGULATIONS, ETC.

- A. The Contractor shall give all necessary notices, obtain, and pay for all permits, government sales taxes, fees, inspections, and other costs, including all utility connections, meters, meter settings, taps, tap fees, extensions, etc. in connection with their work. They shall also file all necessary plans, prepare all documents, and obtain all necessary approvals of all governmental departments and/or the appropriate municipality or utility company having jurisdiction, whether indicated or specified or not. They shall also obtain all required certificates of inspection for their work and deliver same to the Engineer before request for acceptance and final payment for the work.
- B. Ignorance of Codes, Rules, regulations, utility company requirements, laws, etc., shall not diminish or absolve Contractor's responsibilities to provide and complete all work in compliance with such.
- C. The Contractor shall include in their work, without extra cost, any labor, materials, services, apparatus and Plans in order to comply with all applicable laws, ordinances, rules and regulations, whether or not indicated or specified.

- D. All materials furnished and all work installed shall comply with the National Fire Codes of the National Fire Protection Association, with the requirements of local utility companies, or municipalities and with the requirements of all governmental agencies having jurisdiction.
- E. All materials and equipment so indicated and all equipment and materials for the electrical portion of the mechanical systems shall bear the approval label of or shall be listed by the Underwriters' Laboratories (UL), Incorporated. Each packaged assembly shall be approved as a package. Approval of components of a package shall not be acceptable.
- F. All Heating, Ventilation and Air Conditioning work shall be accomplished in accordance with the Building Code and amendments thereto, the latest standards recognized by the American Society of Heating, Refrigerating and Air Conditioning and the National Fire Protection Association.
- G. The Contractor shall furnish three (3) copies of all Final Inspection Certificates obtained to the Engineer when work is complete. Final payment for work will be contingent upon compliance with this requirement.
- H. Where minimum code requirements are exceeded in the Design, the Design shall govern.
- I. The Contractor shall insure that their work is accomplished in accord with the OSHA Standards and that they conduct their work and the work of their personnel in accord with same.
- J. All work relating to the handicapped shall be in accord with regulations currently enforced by the Authority Having Jurisdiction and the American Disabilities Act.
- K. All pressure vessel installations shall comply with the State, and/or Federal Code applicable. A Certificate of Final Boiler Inspection shall be required.
- L. Discharge of any toxic, odorous, or otherwise noxious materials into the atmosphere or any system shall be subject to regulations of the Environmental Protection Agency (EPA) and/or the air pollution control commission. If in doubt, contact the State Department for Environmental Protection.
- M. Where conflict arises between any code and the Plans and/or Specifications, the code shall apply except in the instance where the Plans and Specifications exceed the requirements of the code. Any changes required as a result of these conflicts shall be brought to the attention of the Engineer at least ten (10) days prior to bid date, otherwise the Contractor shall make the required changes at their own expense.

### 3.3 SUPERVISION OF WORK

- A. The Contractor shall personally supervise the work for which they are responsible or have a competent superintendent, approved by the Engineer, on the work at all times during progress with full authority to act on behalf of the Contractor.

### 3.4 CONDUCT OF WORKERS

- A. The Contractor shall be responsible for the conduct of all workers under their supervision. Misconduct on the part of any worker to the extent of creating a safety hazard, or endangering the lives and property of others, shall result in the prompt removal of that worker. The consumption of alcoholic beverages or other intoxicants, narcotics, barbiturates, hallucinogens or debilitating drugs on the job site is strictly forbidden.

### 3.5 COOPERATION AND COORDINATION WITH OTHER TRADES

- A. The Contractor shall give full cooperation to all other trades and shall furnish in writing with copies to the Engineer, any information necessary to permit the work of other trades to be installed satisfactorily and with the least possible interference or delay.
- B. Where any work is to be installed in close proximity to, or will interfere with work of other trades, each shall cooperate in working out space conditions to make a satisfactory adjustment. If so, directed by the Engineer, the Contractor shall prepare composite working drawings and sections at a suitable scale not less than  $\frac{1}{4}'' = 1'-0''$ , clearly indicating how their work is to be installed in relation to the work of other trades, or so as not to cause any interference with work of other trades. Make the necessary changes in the work to correct the condition without extra charge.
- C. The Contractor shall furnish to other trades, as required, all necessary templates, patterns, setting plans, and shop details for the proper installation of work and for the purpose of coordinating adjacent work.

### 3.6 GUARANTEES AND WARRANTIES

- A. The Contractor shall guarantee all equipment, apparatus, materials, and workmanship entering their Contract to the best of its respective kind and shall replace all parts at their own expense, which are proven defective within the time frame outlined in the General Conditions of the Contract. The effective date of completion of the work shall be the date of the Project's Statement of Substantial Completion. Items of equipment which have longer guarantees, as called for in these Specifications, shall have warranties and guarantees completed in order, and shall be in effect at the time of final acceptance of the work by the Engineer. The Contractor shall present the Engineer with such warranties and guarantees at the time of final acceptance of the work. The Engineer shall then submit these warranties, etc. to the Owner. The Owner reserves the right to use equipment installed by the Contractor prior to date of final acceptance. Such use of equipment shall not invalidate the guarantee except that the Owner shall be liable for any damage to equipment during this period, due to negligence of their operator or other employees. Refer to other sections for any special or extra warranty requirements.
- B. The complete HVAC system shall have a minimum of a 2 year warranty. Provide a complete maintenance and service contract for the entire HVAC system, encompassing two years from project completion (warranty start date).
- C. All compressors shall have six year warranty. (1<sup>st</sup> years parts and labor, 2<sup>nd</sup> thru 5<sup>th</sup> year compressor parts only).

- D. Provide all warranty certificates to Owner. All warranties begin starting at the substantial completion date, submit warranty certificates accordingly.

### 3.7 COST BREAKDOWNS (SCHEDULE OF VALUES)

- A. Within thirty (30) days after acceptance of the Contract, the Contractor shall furnish to the Engineer, one copy of a detailed cost breakdown on each respective area of work. These cost breakdowns shall be made in a format approved by the Engineer. Payments will not be made until satisfactory cost breakdowns are submitted.

- B. The breakdown shall be minimally as follows. Material and labor shall be listed separately. Pay special attention to required withholding percentages for startup, testing, documentation, acceptance, owner training, etc.:

- Mechanical Shop Drawings
- Motor Load Coordination with other subcontractors
- Mechanical Record Drawings & Acceptance
- Mechanical O&M Manuals & Acceptance
- Mechanical Owner Training & Acceptance
- Spare Parts
- HVAC Piping Materials & Labor
- HVAC Piping Testing, Cleaning, Documentation, Acceptance, etc.
- Insulation (Piping) Materials & Labor
- Sheetmetal Inclusive of all Materials & Labor
- Ductwork Air Leakage Testing, Documentation, Acceptance, etc.
- VRF Equipment & Labor
- VRF Startup, Testing, Documentation, Training, Acceptance, etc.
- Controls Front-end Interface
- Controls Commissioning Plan
- Controls Shop Drawings
- Controls Materials & Labor
- Controls Graphics
- Controls Record Drawings
- Controls Startup, Commissioning, Testing, Documentation, etc.
- Controls Training and Acceptance
- Test and Balance Materials & Labor
- Test and Balance Initial Report, Final Report and Acceptance

### 3.8 CHANGES IN MECHANICAL WORK

- A. REFER TO GENERAL AND SPECIAL CONDITIONS.

### 3.9 CLAIMS FOR EXTRA COST

- A. REFER TO GENERAL AND SPECIAL CONDITIONS.

### 3.10 MATERIALS AND WORKMANSHIP

- A. All equipment, materials and articles incorporated in the work shall be new and of comparable quality to that specified. Each Bidder/Proposer shall determine that the

materials and/or equipment they propose to furnish can be brought into the building(s) and installed within the space available. In certain cases, it may be necessary to remove and replace walls, floors and/or ceilings and/or disassemble/reassemble the materials and equipment and this work shall be the responsibility of the Contractor, whether specifically initiated or not.

- B. All equipment shall be installed so that all parts are readily accessible for commissioning procedures, field test access / testing and balancing, inspection, maintenance, and replacement of miscellaneous components including fans, motors, coils, filters, etc. Extra compensation will not be allowed for relocation of equipment for accessibility or for dismantling equipment to obtain entrance into the building(s). Insure, through coordination that no other Contractor seals off access to space required for equipment materials, etc.
- C. Materials and equipment shall bear Underwriters' Laboratories label where such a standard has been established, where applicable.
- D. All equipment shall bear the manufacturer's name and address. All electrically operated equipment shall bear a name plate indicating required horsepower, voltage, phase, and ampacity. Pumps and fans shall have a data plate indicating horsepower, pressure, and flow rate.

### 3.11 TEMPORARY SERVICES

- A. The Contractor shall arrange any temporary water, electrical and other services which may be required to accomplish the work. Refer also to General and Special Conditions.
- B. All temporary services shall be removed by Contractor prior to completion of work.

### 3.12 SURVEY, MEASUREMENTS AND GRADE

- A. The Contractor shall lay out their work and be responsible for all necessary lines, levels, inverts, elevations, and measurements. The Contractor must verify the figures shown on the Plans before laying out the work and will be held responsible for any error resulting from failure to do so.
- B. The Contractor shall base all measurements, both horizontal and vertical from established benchmarks. All work shall agree with these established lines and levels. Verify all measurements at the site and check the correctness of same as related to the work.
- C. Should the Contractor discover any discrepancy between actual measurements and those indicated which prevents following good practice or the intent of the contract documents, the Contractor shall promptly notify the Engineer and shall not proceed with this work until the Contractor has received instructions from the Engineer on the disposition of the work.

### 3.13 PROTECTION OF EQUIPMENT

- A. The Contractor shall be entirely responsible for all material and equipment they furnish in connection with their work and special care shall be taken to properly protect all parts

thereof from damage during the construction period. Such protection shall be by a means acceptable to the Engineer. All piping, etc., shall be properly plugged or capped during construction in a manner approved by the Engineer. Equipment damaged, stolen, or vandalized while stored on site, either before or after installation, shall be repaired or replaced by the Contractor at their expense.

- B. All ductwork with open ends shall be covered with plastic during construction. Provide per SMACNA's Duct Cleanliness for New Construction Guideline 3.1. The level of cleanliness shall be a minimum of SMACNA Intermediate Level.

### 3.14 REQUIRED CLEARANCES FOR ELECTRICAL EQUIPMENT

- A. The NEC has specific required clearances above, in front, and around electrical gear, panels etc. The Contractor shall not install any piping, ductwork, etc., in the required clearance. If any appurtenance is located in the NEC required clearance, it shall be relocated at no additional cost. Coordinate with the Electrical Contractor prior to any work.

### 3.15 EQUIPMENT SUPPORT

- A. Each piece of equipment, apparatus, piping, or conduit suspended from the ceiling or mounted above the floor level shall be provided with suitable structural support, pipe stand, platform, or carrier in accordance with the best recognized practice. Such supporting or mounting means shall be provided by the Contractor for all equipment and piping. Exercise extreme care that structural members of building are not overloaded by such equipment. Provide any required additional bracing, cross members, angles, support, etc. Do not support items from roof/floor deck or bridging.

### 3.16 DUCT AND PIPE MOUNTING HEIGHTS

- A. All exposed or concealed ductwork, piping, etc., shall be held as high as possible unless otherwise noted and coordinated with all other trades. Exposed piping and ductwork shall, insofar as possible, run perpendicular or parallel to the building structure. Refer to Plans for minimum heights of ducts and piping. Minimum height above ceilings shall be 6" clear including insulation, unless otherwise noted.

### 3.17 BROKEN LINES AND PROTECTION AGAINST FREEZING

- A. No conduits, piping, etc. carrying water or any other fluid subject to freezing shall be installed in any part of the building where danger of freezing may exist without adequate protection being given by the Contractor whether or not insulation is specified or indicated on the particular piping. All damages resulting from broken and/or leaking lines shall be replaced or repaired at the Contractor's own expense. Do not install piping across or near openings to the outside whether or not they are carrying static or moving fluids. Insulation on piping does not necessarily ensure that freezing will not occur. If in doubt, contact the Engineer.

### 3.18 WEATHERPROOFING

- A. Where any work pierces waterproofing including waterproof concrete, the method of installation shall be as specified and approved by the Architect and Engineer before



work is performed. The Contractor shall furnish all necessary sleeves, caulking and flashing required to make openings permanently watertight.

- B. Wherever work penetrates roofing, it shall be done in a manner that will not diminish or void the roofing guarantee or warranty in any way. Coordinate all such work with the roofing installer.

### 3.19 FINAL CONNECTIONS TO EQUIPMENT

- A. The Contractor shall finally connect mechanical services (water, sanitary, gas, air, etc.), to any terminal equipment, appliances, kitchen equipment, etc., provided under this and/or other divisions of the work. Various equipment connections indicated are based upon "basis of design" equipment selections. Should alternate equipment be purchased by the Construction Manager, then this Contractor shall make the necessary provisions in the Bid for any and all differences. Change Orders shall not be considered for any differences due to alternate equipment purchase. Such connections shall be made in strict accord with current codes, safety regulations and the equipment manufacturer's recommendations. If in doubt, contact the Engineer prior to installation.

### 3.20 ACCESSIBILITY

- A. The Contractor shall be responsible for the sufficiency of the size of shafts and chases, the adequate clearance in double partitions and ceilings for the proper installation of their work. They shall cooperate with all others whose work is in the same space. Such spaces and clearances shall, however, be kept to the minimum size required.
- B. The Contractor shall locate and install all equipment so that it may be serviced and maintained as recommended by the manufacturer. Allow ready access and removal of the entire unit and/or parts such as valves, filters, fan belts, motors, prime shafts, controls, coils, etc.
- C. Whether shown on the Plans or not, the Contractor shall provide in the Bid access panels for each concealed shut-off valve, motorized control damper, manual air damper or other device requiring service as shown on Engineer's Plans or as required. Locations of these panels shall be identified in sufficient time to be installed in the normal course of work. Change orders for access panels will not be accepted.

### 3.21 SCAFFOLDING, RIGGING AND HOISTING

- A. The Contractor shall furnish all scaffolding, rigging, hoisting and services necessary for erection and delivery onto the premises of any equipment and apparatus furnished. All such temporary appurtenances shall be set up in strict accord with OSHA Standards and Requirements. Remove same from premises when no longer required.

### 3.22 CONCRETE WORK

- A. The Contractor shall be responsible for the provisions of all concrete work required for the installation of any of their systems or equipment. The Contractor may, at their option, arrange with the others to provide the work. This option, however, will not relieve the Contractor of their responsibilities relative to dimensions, quality of workmanship, locations, etc.

- B. In the absence of other concrete Specifications, all concrete related to Mechanical work shall be 3500 psi minimum compression strength at 28 days curing, slump: 4" ± 1", air entrainment 4.5% water to cement ratio 0.5 and shall conform to the standards of the American Concrete Institute Publication AC1-318. Heavy equipment shall not be installed on pads for at least seven (7) days after pour. Insert 6-inch steel dowel rods into new and existing floors to anchor pads.
- C. All concrete pads shall be complete with all pipe sleeves, anchor bolts, reinforcing steel, concrete, etc. as required. Pads larger than 18" in width shall be reinforced with ½" deformed round bars on 6" centers both ways. Bars shall be approximately 2" above the bottom of the pad. All parts of pads and foundations shall be properly rodded or vibrated. If exposed parts of the pads and foundations are rough or show honeycomb after removing forms, all surfaces shall be rubbed to a smooth surface. Chamfer all vertical edges ¾" and tool horizontal edges with ¾" radius.
- D. In general, unless otherwise noted, concrete pads for equipment shall be 4" thick, extend six (6) inches beyond the equipment's base dimensions. Where necessary, extend pads 30 inches beyond base or overall dimensions to allow walking and servicing space.
- E. Exterior concrete pads shall be 8" thick with four (4) inches minimum above grade and four (4) inches below grade on a compacted four (4) inch dense grade rock base unless otherwise indicated or specified. Surfaces of all foundations and bases shall have a smooth finish with one-half (½) inch chamfer on exposed edges. Turn down edges 18" below grade.

### 3.23 RESTORATION OF NEW OR EXISTING LANDSCAPING, PAVING, SURFACES, ETC.

- A. The Contractor shall at their expense restore to their original conditions all paving, curbing, surfaces, drainage ditches, structures, fences, landscaping, existing or new building surfaces and appurtenances, and any other items damaged or removed by their operations. Replacement and repairs shall be in accordance with good construction practice; by qualified tradesman and shall match materials employed in the original construction of the item and shall be to the satisfaction of the Owner and/or Engineer.

### 3.24 MAINTENANCE OF EXISTING UTILITIES AND LINES

- A. The locations of all piping, conduits, cables, utilities, and manholes existing, or otherwise, that comes within the contract construction site, shall be subject to continuous uninterrupted service with no other exception than the Owner of the utilities permission to interrupt same temporarily. Provide a seven (7) day written notice to Engineer, Architect and Owner prior to interrupting any utility service or line.
- B. Known utilities and lines as available to the Engineer are shown on the Plans. However, it is additionally required that, prior to any excavation being performed, each Contractor ascertain and mark all utilities or lines that would be endangered by the excavation. Hand dig if required to locate. Contractor shall bear costs of repairing damaged utilities.
- C. If utilities or lines occur in the earth within the construction site, the Contractor shall probe and locate the lines prior to machine excavation in the respective area. Hand dig if required to locate.

- D. Cutting into existing utilities and services shall be performed in coordination with and as designated by the Owner of the utility. The Contractor shall work continuously to restore service(s) upon deliberate or accidental interruption, providing premium time and materials as needed without extra claim to the Owner.
- E. The Contractor shall repair to the satisfaction of the Owner and Engineer, any surfaces or subsurface improvements damaged during the course of the work, unless such improvement is shown to be abandoned or removed.
- F. Machine excavation shall not be permitted within ten feet of gas lines, fuel lines, electrical lines or lines carrying combustible and/or explosive materials. Hand excavate only in accord with utility company, agency or other applicable laws, standards or regulations.
- G. Protect all new or existing lines from damage by traffic, etc. during construction. Repairs or replacement of such damage shall be at the sole expense of the party responsible.
- H. Protect existing trees, indicated to remain with fencing or other approved method. Hold all new subsurface lines outside the drip line of trees, offsetting as necessary to protect root structures. Refer to planting or landscaping plans, or in their absence, consult with the Architect.

### 3.25 CLEANING

- A. The Contractor shall, at all times, keep the area of their work presentable to the public and clear from rubbish and debris caused by their operations; and at the completion of the work, they shall remove all rubbish, debris, all of their tools, equipment, temporary work and surplus materials from and about the premises, and shall leave the area clean and ready for use. If the Contractor does not attend to such cleaning upon request, the Engineer may cause cleaning to be done by others and charge the cost of same to the Contractor. The Contractor shall be responsible for all damage from fire which originates in, or is propagated by, accumulations of their rubbish or debris.
- B. After completion of all work and before final acceptance of the work, the Contractor shall thoroughly clean all equipment and materials and shall remove all foreign matter such as grease, dirt, plaster, labels, stickers, etc., from the exterior of piping, equipment, fixtures and all other associated or adjacent fabrication.
- C. Ductwork and piping shall be kept clean at all times. Ductwork stored on the job site shall be placed a minimum of 4" above the floor and shall be completely covered in plastic. Installed ductwork shall be protected with plastic. Do not install the ductwork or insulation (pipe or duct) if the building is not "dried-in". If this is required, the entire lengths of duct shall be covered in plastic to protect. The Owner/Engineer shall periodically inspect that these procedures are followed. If deemed unacceptable, the Contractor shall be required to clean the duct system utilizing a NADCA certified Contractor.

### 3.26 TEMPORARY USE OF EQUIPMENT

- A. The permanent heating when installed, may be used for temporary services, with the consent of the Engineer. Should the permanent systems be used for this purpose the

Contractors shall make all temporary connections required at their expense. They shall also make any replacement required due to damage wear and tear, etc., leaving the same in "as new" condition.

- B. Permission to use the permanent equipment does not relieve the Contractors from the responsibility for any damages to the building construction and/or equipment which might result because of its use.
- C. Warranties shall begin at substantial completion regardless of temporary use of equipment or not.
- D. A pre-start-up conference shall be held in accordance with EQUIPMENT/CONTROLS START-UP AND VERIFICATION in this section.
- E. For VRF Units during all phases of construction
  - 1. At a minimum, four complete sets of filter media are required for each unit. In each unit, install two sets of filter media during construction (more shall be required if construction activities dictate more frequent changes). In each unit, install one set of filter media at substantial completion. Leave one set of filter media in boxes in appropriate mechanical room as a spare set for the Owner. All other filters shall be used by the Contractor during construction. Dispose of all construction filter media.
  - 2. On the outside of all return air openings install a minimum of two sets of fiberglass filter media, MERV 8, to be utilized as pre-filters for the "construction" filters. Install first set upon start-up and then install second set when first set is dirty. Dispose of all dirty construction filters. Change filters as often as necessary to keep units from becoming dirty at no additional cost.
  - 3. At substantial completion of the project the entire unit shall be cleaned to present a like "new" unit for the Owner and all filters shall be replaced with new.

### 3.27 NOISE, VIBRATION OR OSCILLATION

- A. All work shall operate under all conditions of load without any sound or vibration which is objectionable in the opinion of the Engineer. In case of moving machinery, sound, or vibration noticeable outside of room in which it is installed, or annoyingly noticeable inside its own room, will be considered objectionable. Sound or vibration conditions considered objectionable by the Engineer shall be corrected in an approved manner by the Contractor at their expense.
- B. All equipment subject to vibration and/or oscillation shall be mounted on vibration supports whether indicated or not suitable for the purpose of minimizing noise and vibration transmission and shall be isolated from external connections such as piping, ducts, etc. by means of flexible connectors, vibration absorbers, or other approved means.
- C. Unitary equipment, such as heat pumps, science exhaust fans, etc., shall be rigidly braced and mounted to wall, floor or ceiling as required and tightly gasketed and sealed to mounting surface to prevent air leakage and to obtain quiet operation. Flush and surface mounted equipment such as diffusers, grilles, etc., shall be gasketed and affixed tightly to their mounting surface.

- D. The Contractor shall provide supports for all equipment they furnish. Supports shall be liberally sized and adequate to carry the load of the equipment and the loads of attached equipment, piping, etc. All equipment shall be securely fastened to the structure either directly or indirectly through supporting members by means of bolts or equally effective means. If strength of supporting structural members is questionable, contact Engineer.

### 3.28 EQUIPMENT/CONTROLS STARTUP & VERIFICATION

- A. The Contractor and their Subcontractors shall include in the bid to provide equipment and controls startup and verification for ALL Mechanical Systems specified for this project.
- B. A pre-start-up conference shall be held with the Architect, Engineer, Commissioning Agent, Owner, Construction Manager, Mechanical Contractor, Electrical Contractor, Controls Contractor, Test and Balance Contractor, and the Manufacturer's providing startup services. The purpose of this meeting will be to discuss the goals, procedures, etc. for start-up.
- C. Specific line-items shall be included on the schedule of values by each Trade for "equipment and controls startup". These line-item values shall be approved by the Engineer. The Engineer, Owner and the Engineer's Field Inspector(s) shall closely monitor progress and quality of the equipment and controls startup and may withhold pay requests as deemed appropriate until satisfactorily completed.
- D. Specific startup/verification specifications are included throughout the Mechanical Specifications. In general, as part of the verification process, equipment suppliers shall perform start-up by their factory authorized technicians, not third party contractors, and shall complete and submit start-up reports/checklists. The Contractor shall have appropriate trades on site to correct all deficiencies noted by the factory representative. For each deficiency noted, documentation of corrective action (including date and time) shall be submitted to the Engineer and Owner. Where factory start-up is not specified for a particular piece of equipment or system, the Contractor shall be responsible to perform start-up. All information shall be completed by the Contractor and submitted to the Owner/Engineer prior to acceptance of the equipment.
- E. The Contractor shall be responsible for completion of System Verification Checklists/Manufacturer's Checklists. Factory startup is required for all HVAC equipment noted. Unless noted otherwise, as part of the verification process, equipment suppliers shall perform start-up by their factory authorized technicians and shall complete and submit start-up reports/checklists. This shall include the VRF units.
- F. Except for the specific equipment specified in this Specification Section, the manufacturer's recommended startup procedures and checklists will be acceptable for use in the project. Where "manufacturer" startup is not specified, then this Contractor shall perform startup services in strict accordance with manufacturer's instructions. All startup/verification process shall be thoroughly documented by the Contractor and shall include the time and date when performed.
- G. The Contractor shall "zip-tie" a start-up report to each piece of equipment in a clear plastic cover. Once start-up completion is verified by the Engineer the Contractor shall remove all reports and consolidate them into close-out documentation. The Contractor

shall be responsible for completion of System Verification Checklist (SVC) / Manufacturer's Checklists.

### 3.29 INSPECTION, APPROVALS AND TESTS

- A. Before requesting a final review of the installation from the Architect and/or Engineer, each Contractor shall thoroughly inspect their installations to assure that the work is complete in every detail and that all requirements of the Contract Documents have been fulfilled. Failure to accomplish this may result in charges from the Architect and/or Engineer for unnecessary and undue work on their part.
- B. The Contractor shall provide as a part of this Contract any required Agency inspection, licensed and qualified to provide such services. All costs incidental to the provisions of inspections shall be borne by the Contractor.
- C. The Contractor shall advise each Inspecting Agency in writing, with an informational copy of the correspondence to the Architect and/or Engineer, when they anticipate commencing the work. Inspections shall be scheduled for rough-in as well as finished work. The rough-in inspections shall be divided into as many inspections as may be necessary to cover all rough-in without fail. Failure of the Inspecting Agency to inspect the work in a timely manner and submit the related reports may result in the Contractor having to expose concealed work not so inspected. Such exposure will be at the expense of the responsible Contractor.
- D. Approval by an Agency Inspector does not relieve the Contractor from the responsibilities of furnishing equipment having a quality of performance equivalent to the requirements set forth in these Plans and Specifications. All work under this contract is subject to the review of the Architect and/or Engineer, whose decision is binding.
- E. Before final acceptance, the Contractor shall furnish the original and three (3) copies of the certificates of final approval by the Agency Inspector to the Engineer with one copy of each to the appropriate government agencies, as applicable. Final payment for the work shall be contingent upon completion of this requirement.

### 3.30 ABOVE-CEILING AND FINAL PUNCH LISTS

- A. The Contractor shall review each area and prepare and complete their own punch list for each of the subcontractors as required for the Project Schedule.
- B. Seven (7) days notice shall be given to the Engineer for review of above ceiling work that will be concealed by tile or other materials. Seven (7) days notice shall be given to the Engineer for review of below ceiling work and final inspection.
- C. When all work from the Contractor's punch list is complete at each of the major Project Stages and prior to completing ceiling installations (or at the final punch list stage), the Contractor shall request that the Engineer develop a punch list. This request is to be made in writing seven (7) days prior to the proposed date. After all corrections have been made from the Engineer's punch list, the Contractor shall review and initial off on each item. This signed-off punch list shall be submitted to the Engineer. The Engineer shall return to the site once to review each punch list and all work prior to the ceilings

being installed and at the final punch list review. The Contractor's representative may be requested at the inspections.

- D. If additional visits are required by the Engineer to review work not completed by this review, the Engineer shall be reimbursed directly by the Contractor by check or money order (due next 10 days from date of each additional visit) at a rate of \$125.00 per hour plus travel expense for extra trips required to complete either of the above ceiling, below ceiling or final punch lists.

### 3.31 OPERATING INSTRUCTIONS

- A. Upon completion of all work and all tests, each Contractor shall furnish the necessary skilled labor and helpers for operating the systems and equipment for a period of three (3) days of eight (8) hours each, or as otherwise specified. Refer to Section HVAC EQUIPMENT for additional requirements. During this period, instruct the Owner or their representatives fully in the operations, adjustment, and maintenance of all equipment furnished. Give at least seven (7) days written notice to the Owner, Architect and Engineer in advance of this training period. The Engineer may attend any such training sessions or operational demonstrations. The Contractor shall certify in writing to the Engineer that such demonstrations have taken place, noting the date, time and names of the Owner's representatives that were present.
- B. Each Contractor shall furnish three complete bound sets for approval to the Engineer instructions for operating and maintaining all systems and equipment included in this contract. All instructions shall be submitted in draft form, for approval, prior to final issue. Manufacturer's advertising literature or catalogs will not be acceptable for operating and maintenance instructions. Refer to Specification Section SHOP DRAWINGS for additional detail.
- C. Each Contractor, in the above-mentioned instructions, shall include the maintenance schedule for the principal items of equipment furnished under this contract and a detailed, easy to read parts list and the name and address of the nearest source of supply.

### 3.32 RECORD DRAWINGS

- A. The Contractor shall insure that any deviations from the Design are as they occur recorded in red, erasable pencil on record drawings kept at the jobsite. The Engineer shall review the record documents from time to time to ensure compliance with this specification. Compliance shall be a contingency of final payment. Pay particular attention to the location of under floor sanitary and water lines, shut-off valves, cleanouts, and other appurtenances important to the maintenance and operation of Mechanical Systems. Also, pay particular attention to Deviations in the Control Systems and all exterior utilities. Keep information in a set of drawings set aside at the job site especially for this purpose and deliver to the Engineer upon completion of the work.

### 3.33 BUILDING PRESSURE TESTING: CONTRACTOR RESPONSIBILITIES

- A. Contractor shall assign representatives with expertise and authority to act on its behalf and shall schedule them to participate in and perform building pressure testing process activities including, but not limited to, the following:

1. Provide a plan for sealing the mechanical systems to allow proper testing of the envelope system.
2. Sealing of all mechanical system envelope penetrations (ducts, louvers, etc.).
3. Cooperate with the CxA for monitoring the process.
4. Attend building pressure testing coordination meetings.

### 3.34 COORDINATION DRAWINGS

- A. Detailed electronic coordination drawings shall be required for this project. A specific line-item shall be included on the schedule of values by each Trade for “preparation of coordination drawings”. This line-item value shall be approved by the Engineer. The Engineer and the Engineer’s Field Inspector shall monitor progress and quality of the preparation of the electronic coordination drawings and may withhold pay requests as deemed appropriate.
- B. Coordination Drawings shall be provided on this project by each Trade. Drawings shall be 30x42 sheet size and shall be at ¼” scale and shall match the drawing setup as included in the Architectural Drawings. Drawings shall be prepared in electronic format utilizing Revit or AutoCad software. The Architect and Engineer will supply electronic drawings files of the Contract Documents upon the Contractor’s request and release.
- C. The basis for the Coordination Drawings shall be the sheet metal ductwork fabrication shop drawings, all electrical feeder conduits, and other conduits 2” and larger. The Coordination Drawings shall be prepared by the Mechanical Contractor. The Coordination Drawings shall indicate (1) systems above ceilings in finished areas, (2) systems supported from the structure in finished areas without ceilings, and (3) all wall, roof, floor penetrations. These drawings shall indicate all ductwork as double lined with bottom elevations noted.
- D. The sheet metal fabrication shop drawings shall be completed in a timely manner so as not to conflict with construction schedule and phasing plan. At the Prime Contractor’s discretion, these drawings shall be completed in phases to correspond with the project construction work sequencing. The Mechanical Contractor shall furnish an electronic copy of these ductwork shop drawings to all other Trades, specifically the Fire Protection and Electrical and other Contractors as requested by the Prime Contractor for the purpose of including other trades work on the Coordination Drawings.
- E. Pre-Coordination Meetings with all necessary trades shall occur. During these meetings, the Contractors shall discuss locations/elevations where piping, conduits, cable path, etc will be installed with respect to the sheetmetal fabrication drawings and other trades. The sheetmetal ductwork and gravity piping systems shall be given the first priority. Each Trade shall provide the Mechanical Contractor electronic drawings of all of their systems (with elevation noted), coordinated with the ductwork and other trades for them to incorporate into the Coordination Drawings. Coordination Meetings shall then occur so that all conflicts can be resolved between Trades. All conflicts shall be resolved between all Trades at these Coordination Meetings and the Mechanical Contractor shall then amend the Drawings to include the Final Coordinated Work.
- F. It is realized that not all systems can be completely detailed. The coordination drawings shall include the following at a minimum:
  1. All supply/return ductwork.



2. HVAC piping which is 1.5" in size and greater, excluding insulation.
  3. Electrical conduits which are 1.5" in size and greater.
  4. Cable tray and bridal ring paths.
  5. Multiple smaller piping/conduits hung on a common trapeze hanger.
  6. All wall, roof, floor penetrations.
- G. After completion of the Final Coordination Drawings, a Final Review with the all Trades shall occur to provide any final comments and approval by all Trades. Other interim coordination meetings will be required to ensure successful coordination drawings. Any additional coordination items will be updated by the Mechanical Contractor. The Final Approved Coordination Drawings shall be distributed electronically to each Trade by the Mechanical Contractor. The Mechanical Contractor shall also furnish a complete 30x42 paper set of drawings to the jobsite main office and shall utilize them for updates of field conditions/deviations that occur during construction. Final Approved Coordination Drawings shall also be distributed to the Prime Contractor, Owner, Architect and Engineer for their Records. This process shall be completed prior to starting any work.
- H. Each Contractor shall insure that any deviations from the Coordination Drawings are recorded as they occur, in red erasable pencil on Coordination Drawings kept at the jobsite. Upon completion of a particular phase, the Mechanical Contractor shall incorporate all field deviations into the Coordination Drawings to be utilized as Record Drawings. The Engineer shall review the Record Documents from time to time to ensure compliance with this specification. Compliance shall be a contingency of final payment. Pay particular attention to the location of under floor sanitary and water lines, shut-off valves, cleanouts, and other appurtenances important to the maintenance and operation of Mechanical Systems. Also, pay particular attention to Deviations in the Control Systems and all exterior utilities. Keep information in a set of drawings set aside at the job site especially for this purpose. The Record Drawings shall be distributed electronically to the Prime Contractor, Owner, Architect and Engineer for their Records.
- I. The mechanical contractor is responsible to the Construction Manager for the shop drawing layout of the following rooms and details:
1. Concrete pads and foundations
  2. Equipment room layouts with actual equipment
  3. Dimensioned ductwork shop drawings
- J. The electrical contractor is responsible to the Construction Manager for the shop drawing layout of the following rooms and details:
1. Equipment room layouts with actual equipment
  2. Routes of feeders conduits and all other conduits 1.5" and larger
  3. Bridle ring cabling paths
  4. Trench locations and size
  5. Congested areas above ceilings adjacent to mechanical and electrical rooms

END OF SECTION.

## SECTION 230501 - SCOPE OF THE HVAC WORK

### PART 1 – GENERAL:

#### 1.1 RELATED DOCUMENTS

- A. The Contractor's attention is directed to the General and Special Conditions, COMMON WORK RESULTS FOR HVAC and to all other Contract Documents as they apply to this branch of the work. Attention is also directed to all other sections of the Contract Documents which affect the work of this section, and which are hereby made a part of the work specified in this section.

#### 1.2 SCOPE

- A. The Mechanical work for this Contract shall include all labor, materials, equipment, fixtures, excavation, backfill and related items required to completely install, test, place in service and deliver to the Owner the complete mechanical systems in accordance with the accompanying plans and all provisions of these specifications. This work shall primarily include but is not necessarily limited to the following paragraphs.
- B. Installation of all equipment per the manufacturer's instruction, whether specifically detailed or not.
- C. Provide all required motor starters, etc. not provided under the electrical sections.
- D. Thorough instruction of the Owner's maintenance personnel in the operation and maintenance of all mechanical equipment.
- E. Thorough coordination of the installation of all piping, ductwork, equipment, and any other material with other trades to ensure no conflict in installation.
- F. Approved supervision of the mechanical work.
- G. Procurement of all required inspections, including fees for all inspection services and submission of final certificates of inspection to the Engineers.
- H. Cutting, patching, sleeving, concrete work, etc., required to construct the HVAC systems.
- I. Equipment and controls start-up, verification and documentation as specified.
- J. Record drawings, final inspection certificates, test results, O & M documentation, warranty certification, spare parts, and other specified closeout documentation.
- K. Required schedule of values breakdown.
- L. Pipe, duct and equipment identifications.
- M. Preinstallation meetings and equipment mockups.

- N. Complete heating, ventilation, and air conditioning systems.
- O. All insulation associated with mechanical systems.
- P. Condensate drainage systems.
- Q. All required pressure testing, flushing, purging, pressure, and flow testing requirements.
- R. All required controls, including self checkout and commissioning.

END OF SECTION.

SECTION 230502 - SHOP DRAWINGS, MAINTENANCE MANUALS AND PARTS LISTS FOR  
HVAC

PART 1 – GENERAL:

1.1 RELATED DOCUMENTS

- A. The Contractor's attention is directed to the General and Special Conditions, COMMON WORK RESULTS FOR HVAC and to all other Contract Documents as they apply to this branch of the work. Attention is also directed to all other sections of the Contract Documents which affect the work of this section, and which are hereby made a part of the work specified in this section.

1.2 SCOPE

- A. The Contractor shall prepare and submit to the Engineer, through the Prime Contractor and the Architect within thirty (30) days after the date of the Contract, required copies of all shop drawings, certified equipment drawings, installation, operating and maintenance instructions, samples, wiring diagrams, etc. on all items of equipment specified hereinafter. Refer to Division 1 requirements for shop drawing submittal requirements.
- B. The Engineer's review of shop drawings, schedules or other required submittal data shall not relieve the Contractor from responsibility for adaptability of the item to the project; compliance with applicable codes, rules, regulations and information that pertains to fabrication and installation; dimensions. weight and quantities; electrical characteristics; and coordination of the work with all other trades involved in this project.

PART 2 – PRODUCTS:

2.1 SHOP DRAWINGS

- A. Shop Drawings, descriptive literature, technical data and required schedules shall be submitted on the following:

- Diffusers, Register, and Grilles (2.3)
- VRF System and Accessories
- Piping Insulation
- System Verification Check Lists
- Facility Management System (2.2.B; 2.2.C)
- Instrumentation and Control for HVAC (2.2.B; 2.2.C)
- Sheetmetal
- Refrigerant and condensate piping
- Supports and hangers
- Condensate pumps
- Drain pans
- Air-cooled Condensing units

(Refer to the corresponding Special Notes.)

2.2 SPECIAL NOTES

- A. For all items above, upon substantial completion of the project, the Contractor shall deliver to the Engineer (in addition to the required Shop Drawings) three (3) complete copies of operation and maintenance instructions and parts lists for each item above. Where available, documents shall include at least:
1. Detailed operating instructions
  2. Detailed maintenance instructions including preventive maintenance schedules.
  3. Addresses and phone numbers indicating where parts may be purchased.
  4. Expanded parts drawings, parts lists, service manuals, schematics, wiring diagrams.
  5. Master air filter list including equipment identification, filter size, filter quantity, and supplier contact information.
  6. Start-up reports, service records and test reports.
- B. Shop drawings for the Facility Monitoring System & Instrumentation and Control for HVAC shall include detailed, scaled plans and schematic diagrams indicating the function and operation of the system.
1. The TCC shall not start the project installation until the shop drawing submittals have been reviewed by the Engineer.
  2. Submittals shall include hardware, end devices, ancillary control components, a written operating sequence, unitary control wiring, building floor plans showing communication cabling and labels as well as logic flow diagrams. All submittals shall be provided on paper and electronically in PDF format.
  3. Submittals shall contain one control drawing per specified system and equipment. Drawing shall include point descriptors (DI, DO, AI, AO), addressing, and point names. Each point names shall be unique (within a system and between systems). For example, the point named for the mixed air temperature for AHU #1, AHU #2, and AHU #3 shall not be MAT but should be named AHU#1MAT, AHU#2MAT, and AHU#3MAT. The point names should be logical and consistent between systems and AHU's. The abbreviation or shorthand notation (e.g., MAT) shall be clearly defined in writing by the TCC.
  4. Control diagrams shall identify: System being controlled (attach abbreviated control logic text, all digital points, analog points, virtual points, all functions (logic, math, and control) within control loop, legend for graphical icons or symbols, definition of variables or point names and detailed electric connections to all control devices and sensors.
  5. Points list shall include all physical input/output. Points list shall be provided in both hard copy and in electronic format and shall include Name, address, engineering units, high and low alarm values and alarm differentials for return to normal condition, default value to be used when the normal controlling value is not reporting, message and alarm reporting as specified, identification of all adjustable points and description of all points.
  6. Submittals shall contain floor plans depicting DDC control devices (control units, network devices, LAN interface devices, and power transformers as well as static pressure sensor in duct and temperature sensors in rooms) in relation to

mechanical rooms, HVAC equipment, and building footprint.

7. Submittals shall contain DDC system architecture diagram indicating schematic location of all control units, workstations, LAN Interface devices, gateways, etc. Indicate address and type for each control unit, Indicate protocol, baud rate, and type of LAN per control unit.
8. Electrical wiring diagrams shall include motor start, control, and safety circuits and detailed digital interface panel control point termination diagrams with all wire numbers and terminal block numbers identified. Indicate all required electrical wiring. Provide panel termination drawings on separate drawings. Clearly differentiate between portions of wiring that are existing, factory-installed and portions to be field-installed.
9. Show all electric connections of the controls system to equipment furnished by others complete to terminal points identified with manufacturer's terminal recommendations.
10. TCC shall provide one complete drawing that shows the control-wiring interface with equipment provided by others.
11. Submittals shall include project specific graphic screens for each system including a picture of the screen with a list of the variables to be placed on the screen.
12. Submittals shall include TCC's hardware checkout sheets and test reports.
13. Submittals shall include the agenda for approval by the engineer and owner of the specified training periods. See training section for requirements.
14. Provide complete panel drawings that are:
  - Clearly labeled and schematic or drawn to scale.
  - Show the internal and external component arrangement so that the operators can identify the components by their position if the labels come off.
  - Wiring access routes shall also be identified so that Class 1 wiring is separated from Class 2 and 3 and so high voltage wiring is segregated from low voltage wiring.
  - Complete identification of all control devices (manufacturer's type, number, and function).
  - Provide details for labeling all wiring, control devices, and controllers.
  - Material and equipment descriptive material such as catalog cuts, diagrams, performance curves, and other data to demonstrate conformance with specifications shall be provided.
15. Include room schedule including a separate line for each terminal unit, FCU, etc. indicating location and address.
16. Include control valve schedules including a separate line for each valve provided under this section and a column for each of the valve attributes: code number, configuration, fail position, pipe size, valve size, body configuration, close-off pressure, capacity, valve Cv, design pressure, and actuator type.

17. Include control damper schedule including a separate line for each damper provided under this section and a column for each of the damper attributes, including code number, fail position, damper type, damper operator, duct size, damper size, mounting, and actuator type.
- C. O&M manuals and closeout documents for facility monitoring systems and control for HVAC and variable frequency motor control.
1. Refer to Mechanical Specification Section – REQUIRED SHOP DRAWINGS, ETC. for additional requirements.
  2. Operating instructions, maintenance procedures, parts and repair manuals shall be supplied. Repair manuals shall include detailed instructions in the setup, calibration, repair, and maintenance of all equipment furnished. Also supplied with these manuals will be a complete parts listing of all devices supplied which is to include part numbers and model numbers of all parts and component parts along with exploded views of devices.
  3. All as built drawings (wiring diagrams, flowcharts, floor plans, etc.) shall also be supplied to the owner electronically in PDF format.
  4. System specific wiring, control diagrams, sequence of operation and points lists shall be as installed in each control panel. This means as-built drawings, not design (submittal) drawings.
  5. Supply all software necessary for configuration of, modification, editing or communicating to any of the unitary devices. Software shall be capable of uploading and downloading the entire unitary database or any part of the automated system for backup or archiving.
  6. Supply one copy of the software programming manual (hard copy and PDF format). The manual shall describe all furnished software. The manual shall be oriented to programmers and shall describe calling requirements, data exchange requirements, data file requirements, and other information necessary to enable proper integration, loading, testing, and program execution.
  7. Provide a Bill of Materials with each schematic drawing. List all devices/equipment and match to schematic and actual field labeling. Provide quantity, manufacturer, actual product ordering number, description, size, accuracy, operating ranges (voltage, temperature, pressure, etc.), input/output parameters, etc.
  8. Maintenance manual shall include copies of signed-off acceptance test forms, commissioning reports, start-up reports, etc.
  9. The TCC shall turn over to owner two (2) sets of computerized back-ups of the complete temperature control system.
- 2.3 Shop drawings for Diffuser, Registers and Grilles, shall include a room-by-room schedule indicating devices installed. Also note ceiling and installation.

- 2.4 The Contractor shall submit project specific UL listed firestopping installation drawings to the authority having jurisdiction where required for their approval as required.

PART 3 – EXECUTION:

- 3.1 Provide all shops in electronic/PDF format. The Engineer's comments will be returned in electronic format.
- 3.2 Each shop drawing and/or manufacturers descriptive literature shall have the proper notation indicated on it selecting equipment, accessories and features and shall be clearly referenced to the specifications, schedules, fixture numbers, etc., so that the Engineer may readily determine what the Contractor proposes to furnish. All data and information schedules indicated or specified shall be noted on each copy of each submittal.
- 3.3 Submittal data shall include specification data including metal gauges, finishes, accessories, etc. Also, the submittal data shall include certified performance data, wiring diagrams, dimensional data, and a spare parts list. Submittal data shall be reviewed by the Engineer before any equipment or materials is ordered or any work is begun in the area requiring the equipment.
- 3.4 All submittal data shall have the stamp of approval of the Contractor submitting the data as well as the Prime Contractor and the Architect to show that the drawings have been reviewed by the Contractor. Any drawings submitted without these stamps of approval may not be considered and will be returned for proper resubmission.
- 3.5 The Contractor shall make any corrections or changes required by the Engineer and shall re-submit for final review as outlined above.
- 3.6 It shall be noted that review of shop drawings by the Engineer applies only to conformance with the design concept of the project and general compliance with the information given in the Contract Documents. In all cases, the Contractor alone shall be responsible for furnishing the proper quantity of equipment and/or materials required, for seeing that all equipment fits the available space in a satisfactory manner and that piping, electrical and all other connections are suitably located. The Contractor shall also coordinate piping side connections.
- 3.7 Prior to ordering any materials or rough-in of any kind, the HVAC Contractor shall be responsible for final coordination of all electrical requirements (i.e. voltage, phase, circuit breaker, wire sizing, etc.) with the Electrical Contractor. There will be no change in the Contract Amount for any discrepancies. A final coordination meeting shall be held with the Architect, Owner, Engineer, Construction Manager, Mechanical Contractor, Electrical Contractor, and their sub-contractors.
- 3.8 Equipment shall not be ordered and no final rough-in connections, etc., shall be accomplished until reviewed equipment shop drawings are in the hands of the Contractor. It shall be the Contractor's responsibility to obtain reviewed shop drawings and to make all connections, etc. in the neatest and most workmanlike manner possible. The Contractor shall coordinate with all the other trades having any connections, roughing-in, etc. to the equipment.



- 3.9 If the Contractor fails to comply with the requirements set forth above, the Engineer shall have the option of selecting any or all items listed in the Specifications or on the Drawings; and the Contractor shall be required to furnish all materials in accordance with this list.
- 3.10 Colors for equipment in other than mechanical spaces shall be selected from the Manufacturer's standard and factory optional colors unless noted otherwise on the Plans. Color samples shall be furnished with the shop drawing submission for such equipment.
- 3.11 All submittals for HVAC equipment shall include all information specified and scheduled. This shall include air and water pressure drops, RPM, noise data, face velocities, horsepower, voltage motor type, steel or aluminum construction, and all accessories clearly marked.
- 3.12 All items listed in the schedules shall be submitted for review in a tabular form similar to the equipment schedule. All items submitted shall be designated with the same identifying tag as specified on each sheet.
- 3.13 Any submittals received in an unorganized manner without options to be provided specifically noted and with incomplete data will be returned for resubmittal.

END OF SECTION.

## SECTION 230505 - DEMOLITION AND SALVAGE FOR HVAC

### PART 1 – GENERAL:

#### 1.1 RELATED DOCUMENTS

- A. The Contractor's attention is directed to the General and Special Conditions, COMMON WORK RESULTS FOR HVAC and to all other Contract Documents as they apply to this branch of the work. Attention is also directed to all other sections of the Contract Documents which affect the work of this section, and which are hereby made a part of the work specified in this section.

#### 1.2 SCOPE:

- A. It is the intent of this Section to completely remove all components of any existing HVAC system indicated in the mechanical drawings and items associated with the required architectural demolition specified in the Contract Documents. Also, any mechanical systems that will be open to view, or will interfere with the operations of the completed building, or which will, in any way, interfere with project construction shall be removed. The Contractor shall field verify existing conditions prior to bid.

### PART 2 – PRODUCTS (NOT APPLICABLE)

### PART 3 – EXECUTION

#### 3.1 HVAC DEMOLITION

- A. The general scope of the HVAC system demolition is indicated on the drawings.
- B. Refer to the demolition drawings for equipment to be demolished or which shall remain. If other equipment is found during construction which is not indicated on the drawings, it must be determined if these systems serve other areas not being renovated. If the equipment piping and ductwork serve only renovated areas, the system shall be demolished. Verify this work with the Engineer prior to demolition.
- C. Remove all temperature controls, panels, accessories, etc. that are accessible or become accessible during construction that serves demolished systems. Remove all pneumatic control tubing, control wiring and conduits in the facility unless noted otherwise.
- D. The Contractor shall be responsible for the removal and/or relocation of any HVAC piping, equipment, fittings, valves, etc. which may, in the course of construction, interfere with the installation of any new and/or relocated Architectural, Structural, Mechanical or Electrical Systems specified in the Contract Documents at no increase in the contract price.
- E. Unless otherwise indicated, the Contractor shall be responsible for the patching and repairing by qualified tradesmen of all holes, etc. in the ceiling, wall, roof, and floors where HVAC equipment is removed.
- F. Contractor to properly dispose of demolished equipment and materials as required by regulatory agencies.

END OF SECTION.

## SECTION 230517 – SLEEVING AND SLEEVE SEALS FOR HVAC PIPING

### PART 1 – GENERAL:

#### 1.1 RELATED DOCUMENTS

- A. The Contractor's attention is directed to the General and Special Conditions, COMMON WORK RESULTS FOR HVAC and to all other Contract Documents as they apply to this branch of the work. Attention is also directed to all other sections of the Contract Documents which affect the work of this section, and which are hereby made a part of the work specified in this section.

#### 1.2 SCOPE

- A. The Contractor shall be responsible for all openings, sleeves, trenches, etc., that may be required in floors, roofs, ceilings, walls, etc., and shall coordinate all such work with the General Contractor and all other trades. Coordinate with the General Contractor any openings which they are to provide before submitting a bid proposal in order to avoid conflict and disagreement during construction. Improperly located openings shall be reworked at the expense of the Contractor.
- B. All work improperly performed or not performed as required in this section, shall be corrected by the General Contractor at the responsible Contractor's expense.

### PART 2 – PRODUCTS:

#### 2.1 SLEEVES

- A. Sleeves shall be flush with each face of the wall and shall be sufficiently larger than the entering pipe to permit thorough caulking between pipe and sleeve for water proofing. Horizontal sleeves passing through exterior walls or where there is a possibility of water leakage and damage shall be caulked watertight.
- B. In all cases, sleeves shall be at least two pipe sizes larger than nominal pipe diameter plus insulation. Sleeves through walls and floors shall be cut off flush with inside surface unless otherwise indicated.
- C. Vertical sleeves in roofs shall be flashed and counterflashed with lead (4 lb.) or 16 oz. copper and welded or soldered to piping, lapped over sleeve and properly weather sealed. Where sleeves pass through roof construction, sleeves shall extend minimum of 12" above the roof.

#### 2.2 FIRESTOPPING

- A. Firestopping materials include (but are not limited to) wraps, strips, caulks, moldable putties, restricting collars with steel hose clamps, damming materials, composite sheets, fire dam caulks, steel sleeves, etc.
- B. The following indicates the 3M penetration details for uninsulated pipe penetration of various wall and floor construction types (the list is not inclusive):

1. One-, two- or three-hour fire rated concrete floor - 3M #5300-MPC8.
2. One-, two- or three-hour fire rated solid or block concrete wall - 3M #5300-MPC16 or 3M #5300-MPC26.
3. One hour fire rated gypsum wallboard - 3M #5300-MPC7.
4. Two-hour fire rated gypsum wallboard - 3M #5300-MPC7.

C. The following indicates the 3M penetration details for insulated pipe penetrations of various wall and floor construction types (the list is not inclusive):

1. One-, two- and three-hour fire rated concrete floor - 3M #5300-IMP2.
2. One-, two- and three-hour concrete block wall - 3M #5300-IMP2.
3. One hour fire rated gypsum wallboard - 3M #5300-IMP4.
4. Two-hour fire rated gypsum wallboard - 3M #IMP7.

### PART 3 – EXECUTION:

- 3.1 The Contractor shall plan their work ahead and shall place sleeves, frames or forms through all walls, floors and ceilings during the initial construction, where it is necessary for piping, ductwork, conduit, etc., to route through; however, when this is not coordinated, the Contractor shall then do all cutting and patching required for the installation of their work, or pay other trades for doing this work when so directed by the Engineer. Any damage caused to the building by this Contractor shall be corrected or rectified at their expense.
- 3.2 The Contractor shall notify other trades in due time where they will require openings or chases in new concrete, masonry, etc. Set all concrete inserts and sleeves for their work. Failing to coordinate, Contractor shall cut openings for the work and patch same as required at their expense with qualified tradesman.
- 3.3 The Contractor shall be responsible for properly shoring, bracing, supporting, etc., any existing and/or new construction to guard against cracking, settling, collapsing, displacing, or weakening while openings are being made. Any damage occurring to the existing and/or new structures, due to failure to exercise proper precautions or due to action of the elements, shall be promptly and properly corrected to the satisfaction of the Engineer.
- 3.4 CUTTING
  - A. All openings in plaster, gypsum board or similar materials, shall be framed by means of plaster frames, casing beads, or angle members as required. The intent of this requirement is to provide smooth, even termination of wall, floor, and ceiling finishes as well as to provide a fastening means for devices, etc.
  - B. The Mechanical Contractor shall coordinate all openings in masonry walls with the General Contractor; and, unless otherwise indicated in the Contract Documents, shall provide lintels for all openings required for the mechanical work such as louvers, exhaust fans, etc. Prime paint all lintels. Lintels shall be sized as follows:
  - C. New Openings under 48" in width: Provide one 3½"x3½"x3/8" steel angle for each 4" of masonry width. Lintel shall have 8" bearing on each end.
  - D. New Openings over 48" in width: Consult with Structural Engineer.

- E. No cutting shall be performed at location that will weaken the structure and unnecessary cutting must be avoided. If in doubt, contact the Engineer.
- F. Pipe openings in slabs and walls shall be cut with core drill. Hammer devices will not be permitted. Edges of trenches and large openings shall be scribe-cut with a masonry saw.

### 3.5 PATCHING, REPAIRING AND FINISHING

- A. Patching and repairing made necessary by work performed under this Division shall be included as a part of the work and shall be done by skilled workers of the trade. The work shall be performed in strict accordance with the provisions herein before specified to match adjacent surfaces and in a manner acceptable to the Engineer.
- B. Where portions of existing sites, lawns, shrubs, paving, etc. are disturbed for installation of work of this Division, such items shall be repaired and/or replaced back to original or better condition to the satisfaction of the Engineer.
- C. Piping and ductwork passing through floors, ceilings and walls in finished areas shall be fitted with chrome plated brass escutcheon trim pieces of sufficient outside diameter to amply cover the sleeved openings and an inside diameter to closely fit the pipe/duct around which it is installed.
- D. Flanged metal collars shall be provided around all ducts, flues, pipes, etc. at all wall penetrations, both sides. Penetrations through any wall will require the installation of flanged collars. Openings shall not be any larger than 2" in any direction than the piping/duct passing through the wall. Openings larger than this requirement shall also be infilled to match adjacent construction. Fill void with insulation for sound reduction.

### 3.6 FIRESTOPPING

- A. Provide shop drawings indicating penetration detail for each type of wall and floor construction. Shop drawings must be specific for each individual type of penetration (one hour fire rated gypsum wall board with insulated metal pipe penetration, etc.) Provide copies to the authority having jurisdiction if required.
- B. All mechanical pipes and ducts penetrating fire-rated floors and walls shall be firestopped by this Contractor. All firestopping products and assemblies installed shall be UL listed.
- C. Where the installation of conduit, ducts, piping, etc. requires the penetration of fire or smoke rated walls, ceilings or floors, the space around such conduit, duct, pipe, etc., shall be tightly filled with an approved non-combustible fire insulating material and properly sealed to maintain the rating integrity of the wall, floor or ceilings affected.
- D. Where the installation of ductwork requires the penetration of non-rated floors, the space around the duct or pipe shall be tightly filled with an approved non-combustible material.
- E. The manufacturer of the firestopping materials shall provide on site training for the installing Contractor. The training session shall demonstrate to the Contractor the

proper installation techniques for all the firestopping materials.

- F. Multiple pipes penetrating fire rated floors and walls may be firestopped as a group. Submit details for specific applications if this method of firestopping is chosen.

END OF SECTION.

## SECTION 230529 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

### PART 1 – GENERAL:

#### 1.1 RELATED DOCUMENTS

- A. The Contractor's attention is directed to the General and Special Conditions, COMMON WORK RESULTS FOR HVAC and to all other Contract Documents as they apply to this branch of the work. Attention is also directed to all other sections of the Contract Documents which affect the work of this section, and which are hereby made a part of the work specified in this section.

#### 1.2 SCOPE

- A. This section includes, but is not limited to, furnishing, and installing supports, anchors, and accessories for piping, ductwork, equipment, etc. Furnishing and installing shall be by each trade for the completion of their work as directed in this Section.

### PART 2 – PRODUCTS:

#### 2.1 HANGERS, CLAMPS, ATTACHMENTS SCHEDULE:

- A. ACCEPTABLE MANUFACTURERS: Grinnell, Elcen, Fee & Mason.
- B. All hangers, clamps and attachments shall be manufactured products.
- C. Pipe Rings (2" pipe and smaller) – adjustable swivel split ring or split pipe ring.
- D. Pipe Clevis (2.5" pipe and larger) – adjustable wrought clevis type.
- E. Pipe Clevis (All pipe sizes) – steel clevis for insulated pipe.
- F. Riser Clamps (All pipe sizes) – extension pipe or riser clamp.
- G. Beam Clamps (All pipe sizes) – malleable beam clamp with extension piece.
- H. Brackets (All pipe sizes) – medium weight steel brackets.
- I. Concrete Inserts (All pipe sizes) – wrought or wedge type inserts.
- J. Concrete Fasteners (All pipe sizes) – self-drilling concrete inserts.
- K. Rod Attachments (All pipe sizes) – extension piece, rod coupling, forged steel turnbuckle
- L. U-bolts (All pipe sizes) – standard u-bolt.
- M. Welded Pipe Saddles (All pipe sizes) – pipe covering protection saddle sized for thickness of insulation.
- N. Pipe Roll (All pipe sizes) – adjustable swivel pipe roll.
- O. Protection Saddle (All pipe sizes) – 180 degree coverage, sheet metal pipe protection saddle.
- P. Hanger Rods (All pipe sizes) – Steel, diameter of hanger threading.
- Q. Concrete Channel Inserts (All pipe sizes) – continuous heavy duty slot inserts unistrut.
- R. Adjustable Spot Inserts (All pipe sizes) – continuous heavy duty spot insert unistrut.
- S. Miscellaneous steel such as steel angles, rods, bars, channels, etc used in framing for supports, fabricated brackets, anchors, etc. shall confirm to ASTM-A-7.

### PART 3 – EXECUTION:

- 3.1 Supporting and hanging shall be done so that excessive load will not be placed on any one hanger to allow for proper pitch and expansion of piping.



- 3.2 Hangers and supports shall be placed as near as possible to joints, turns, and branches.
- 3.3 For concrete construction, utilize adjustable concrete inserts for fasteners. Expansion anchors and power-driven devices may be used when approved in writing by the Architect/Engineer.
- 3.4 Utilize beam clamps for fastening to steel joists and beams. Expansion anchors in masonry construction. Do not support piping or ductwork from bridging or metal decking.
- 3.5 When piping is routed in joists, piping shall be top mounted on trapeze type hangers with each pipe individually clamped to trapeze hanger. Do not support piping or ductwork from bridging angles.
- 3.6 Trapeze hangers are not allowed, unless specifically approved by the Engineer.
- 3.7 Install all miscellaneous steel other than designed building structural members as required to provide means of securing hangers, supports, etc., where piping does not pass directly below or cross structural elements.
- 3.8 Piping shall not be supported by the equipment to which it is connected. Support all piping to remove any load or stress from the equipment.
- 3.9 Where piping, etc., is routed vertically, approved riser clamps, brackets or other means shall be utilized at approximately 10'-0" center to center minimum. An approved adjustable base stand or fitting on concrete support base shall be utilized at the base of the vertical run.
- 3.10 Where piping is routed along walls, knee braced angle frames, etc. pipe brackets with saddles, clamps, and rollers mounted on structural brackets fastened to walls or columns shall be used.
- 3.11 Support all ceiling hung equipment with approved vibration isolators.
- 3.12 Where copper tubing is specified, hangers shall be of copper clad type when piping is uninsulated.
- 3.13 Uninsulated piping hung from above shall be supported with ring and clevis type pipe hangers. Uninsulated piping mounted on trapeze (when allowed) and wall bracket type support shall be held in place with U-bolts. U-bolts shall allow for axial movement in the piping.
- 3.14 All insulated piping shall be supported with clevis type and pipe roll hangers. Hangers shall be sized to allow the pipe insulation to pass through the hangers. Install insulation protection saddles at all hanger locations. Welded pipe saddles shall be installed at all hangers on piping 5" and larger. The pipe saddles shall be sized for the thickness of insulation used. Hangers shall fit snugly around outside of insulation saddles.
- 3.15 Under no conditions will perforated band iron or steel wire driven hangers be permitted.

- 3.16 Support steel and copper piping at a minimum of eight (8) foot intervals for piping 3" and smaller and ten (10) foot intervals for larger piping. Provide additional support at end of the branches and change of direction.
- 3.17 Support plastic pipe at intervals not to exceed four (4) feet and at the end of the branches and at the change of direction and shall be installed as to permit freedom of movement. Vertical piping shall be supported at their bases and all upward movement shall not be restricted. Hangers shall be at least one (1) inch wide and shall not compress, distort, cut, or abrade the piping to allow free movement at all times.
- 3.18 Where fireproofing is dislodged/damaged from the building structure due to Contractor's installation of hangers, clamps, etc., it shall be the Contractor's responsibility to repair all dislodged/damaged fireproofing to original fireproofing rating. This shall also include all work performed by their contractors sub-contractors.
- 3.19 Ensure that all bolts and nuts are tightened.

END OF SECTION.

SECTION 230553 - IDENTIFICATIONS FOR HVAC PIPING AND EQUIPMENT

PART 1 – GENERAL:

1.1 RELATED DOCUMENTS

- A. The Contractor's attention is directed to the General and Special Conditions, COMMON WORK RESULTS FOR HVAC and to all other Contract Documents as they apply to this branch of the work. Attention is also directed to all other sections of the Contract Documents which affect the work of this section, and which are hereby made a part of the work specified in this section.
- B. The Contractor's attention is directed to the following Plans and the Specification Sections:
  - 1. HVAC PIPING INSULATION
  - 2. VRF UNITS

PART 2 – PRODUCTS:

2.1 Label all control panels and disconnect switches with service and equipment served.

2.2 PIPING AND DUCTWORK IDENTIFICATION:

- A. All piping and ductwork installed shall be identified according to the charts hereinafter specified. Provide stenciled markers and arrows indicating direction of flow on all piping and ductwork installed under this contract. Markers and arrows shall be painted on the piping and ductwork using machine cut stencils. All letters shall be sprayed using fast drying lacquer paint. All markers and arrows shall be properly oriented so that descriptive name may be easily read from the floor. Piping and ductwork shall be identified on twelve (12) foot centers. All piping and ductwork shall be minimally identified once above all room ceilings and where it passes thru walls or floors. At the Contractor's option, Setmark or equivalent manufactured marking system may be substituted for field marking.
- B. The following table describes the size of the color field and size of the identification letters which shall be used for pipes of different outside pipe diameters.

Outside Label Diameter	Length	Letter Size
3/4" – 1 1/4"	8"	1/2"
1 1/2" – 2"	8"	3/4"
2 1/2" – 6"	12"	1 1/4"
8" – 10"	24"	2 1/2"

- C. The following chart describes the pipe service and label identification which shall be used for various pipes.

PIPE	ABBREVIATION
a. Refrigerant Piping	RF or RS/RL
b. Condensate	C.D.

2.3 EQUIPMENT IDENTIFICATION

- A. Provide engraved equipment labels for the newly installed HVAC equipment. Lettering on labels shall be 3/4" tall for equipment designation and 1/2" tall for the installation date (mm/dd/yy format), warranty, and contact information. Plastic aengraved labels shall be black with white lettering and be permanently affixed in a conspicuous location approved by the BDCD Project Manager. Provide label submittal with full scale drawing(s) of labels for review prior to fabricating/ordering.

- B. All mechanical equipment and associated starters/disconnects shall have the electrical panel number and circuit number identified on a lamacoid plate. Coordinate with the Electrical Contractor.

PART 3 – EXECUTION:

3.1 All ductwork shall be identified as to the service of the duct and direction of flow. Include equipment designator on SA & RA ductwork. The letters shall be at least two inches high, and the flow arrow shall be at least six inches long. The letters and flow arrow shall be made by precut stencils and black oil base paint with aerosol can. Concealed ducts also need to be identified.

3.2	<u>DUCTWORK</u>	<u>ABBREVIATION</u>
	Supply Air Ductwork	SA + Equipment Identifier
	Return Air Ductwork	RA + Equipment Identifier

3.3 ACCESS THROUGH LAY-IN CEILINGS: Mark each lay-in ceiling panel which is nearest access to equipment, valves, dampers, filters, duct heaters, etc., with colored tape labels located on the ceiling grid.

END OF SECTION

## SECTION 230593 - TESTING, ADJUSTING, AND BALANCING SPECIFICATIONS

### PART 1 – GENERAL:

#### 1.1 RELATED DOCUMENTS

- 1.1.1 All Division 23 specification sections, drawings, and general provisions of the contract apply to work of this section, as do other documents referred to in this section.

#### 1.2 SCOPE OF WORK

- 1.2.1 The Division of Engineering and Contract Administration will directly contract with a certified testing, adjusting, and balancing contractor (“TAB Agency”) to test, adjust, and balance the HVAC systems.
- 1.2.2 This specification section is included herein to assist and inform the Contractor of the standards, requirements, and scope of the work to be performed by the Commonwealth’s TAB Agency.

#### 1.3 PREPARATION AND COORDINATION REQUIREMENTS – GENERAL

- 1.3.1 Shop drawings, submittal data, up-to-date revisions, change orders, and other data required for planning, preparation, and execution of the TAB work shall be provided to the TAB Agency no later than 30 days prior to the start of TAB work.
- 1.3.2 System installation and equipment startup shall be complete prior to the TAB Agency’s being notified to begin.
- 1.3.3 The building control system shall be complete and operational. The Building Control system (sub)contractor shall install all necessary computers and computer programs and make these operational. Assistance shall be provided as required for reprogramming, coordination, and problem resolution.
- 1.3.4 All test points, balancing devices, identification tags, etc. shall be accessible and clear of insulation and other obstructions that would impede TAB procedures.
- 1.3.5 Qualified installation or startup personnel shall be readily available for the operation and adjustment of the systems. Assistance shall be provided as required for coordination and problem resolution.

#### 1.4 PREPARATION AND COORDINATION REQUIREMENTS – HVAC CONTROLS

- 1.4.1 Written notice shall be submitted through the General Contractor to the Architect-Engineer stating that the Control System is operating and controlling the HVAC System. This letter is to be provided to the DECA Project Manager and the TAB Agency prior to any balancing.
- 1.4.2 The Contractor/Control (sub)contractor shall have entered all data needed for the TAB Agency to begin work.

- 1.4.3 The Contractor/Control (sub)contractor shall be available to correct any problems that the TAB Agency may encounter with the systems.
- 1.4.4 All costs for additional work by the TAB Agency due to the Contractor's failure to comply with the above shall be paid by the Contractor and any subcontractor(s) for HVAC controls.
- 1.5 PREPARATION AND COORDINATION REQUIREMENTS – MECHANICAL
  - 1.5.1 Written notice shall be submitted through the General Contractor to the Architect stating that the HVAC system is operational and ready for the TAB Agency. This letter is to be provided to the DECA Project Manager and the TAB Agency prior to any balancing.
  - 1.5.2 The Contractor/Mechanical subcontractor shall have proved all units operational and all air outlets in the full open position.
  - 1.5.3 The Contractor/Mechanical subcontractor shall be available to correct any problems that the TAB Agency might have with any equipment or systems.
  - 1.5.4 The Contractor/Mechanical subcontractor shall furnish and install any replacement sheaves, pulleys and drive belts required for flow adjustments, as determined by the TAB Agency. Adjustable sheaves shall be selected so that the final adjustment position is in the middle third of the total adjustment range.
  - 1.5.5 All costs for additional work by the TAB Agency due to the Contractor's failure to comply with the above shall be paid by the Contractor and any subcontractor(s) for mechanical work.
- 1.6 PREPARATION AND COORDINATION REQUIREMENTS – DUCTWORK
  - 1.6.1 Ductwork air leakage testing shall be performed by the TAB Agency.
  - 1.6.2 The ductwork/sheetmetal subcontractor shall promptly correct any related problems discovered by the leakage tests.
  - 1.6.3 All costs associated with retesting and/or delays or other problems which impede the TAB Agency from performing such testing shall be paid by the contractor and any subcontractor(s) for ductwork.
- 1.7 WORK BY TAB AGENCY
  - 1.7.1 The work included in the remainder of this section consists of furnishing labor, instruments, and tools required in testing, adjusting and balancing the HVAC systems, as described in these specifications or shown on accompanying drawings. Services shall include checking equipment performance, taking the specified measurements, and recording and reporting the results. This work shall be performed by the TAB Agency under direct contract to the owner. The remainder herein is also for the information of the Contractor and all subcontractors.
  - 1.7.2 The items requiring testing, adjusting, and balancing include the following:

- AIR SYSTEMS:
  - Zone branch and main ducts
  - Diffusers, Registers and Grilles
- VARIABLE REFRIGERANT FLOW SYSTEMS
  - Wall mounted units
  - Fan coil units

## 1.8 QUALIFICATIONS

- 1.8.1 Agency qualifications: The TAB Agency shall be a current member of a nationally recognized balance organization (“National Organization”). This Organization shall provide the owner with National Guarantee document certifying the work of the TAB Agency. Acceptable organizations are Associated Air Balance Council (AABC) or National Environmental Balancing Bureau (NEBB).
- The selected TAB Agency must provide proof of certification for the total project (air, water, sound, vibration, etc.).
  - The selected TAB Agency shall be provided access to computers, cables or any software needed to operate the building control system during the balancing phase.
- 1.8.2 All work shall be in accordance with the latest edition of the National Standards, as published by the National Organization affiliated with the TAB Agency.

## 1.9 SUBMITTALS

- 1.9.1 Qualifications: The TAB Agency shall submit a company resume listing personnel and project experience in air and hydronic system balancing and a copy of the agency’s test and balance engineer (TBE) certificate. Certification in noise, vibration, and air quality shall be submitted as the job requires. At minimum, the balance technician shall possess their technician certification.
- 1.9.2 Procedures and agenda: The TAB Agency shall submit the TAB procedures and agenda proposed to be used.

## 1.10 REPORTS

- 1.10.1 Final TAB Report – The TAB Agency shall submit the final TAB report for review by the engineer. All equipment including but not limited to fans, outlets, traverses, static pressure profiles, pumps, coils, etc. shall be identified in the report. The report must also include, at minimum, electronic drawings that correspond to all test points for additional report clarification. The TAB Agency shall submit an “National Project Performance Guaranty” assuring that the project systems were tested, adjusted, and balanced in accordance with the project specifications and National Standards.
- 1.10.2 Submit three (3) electronic copies of the Final TAB Report to the Architect-Engineer, and (1) electronic copy to the Project Manager from the Division of Engineering and Contract Administration. A maximum of three (3) additional hard copies shall be submitted on request.

1.10.3 Payments for the TAB work shall be contingent upon the proper submittal and approval of the TAB reports.

#### 1.11 DEFICIENCIES

1.11.1 Any deficiencies in the installation or performance of a system or component observed by the TAB Agency shall be brought to the attention of the appropriate responsible person. Also notify the mechanical project representative from the Division of Engineering and Contract Administration.

1.11.2 The work necessary to correct items on the deficiency listing shall be performed and verified by the affected contractor before the TAB Agency returns to retest. Unresolved deficiencies shall be noted in the final report.

### PART 2 – INSTRUMENTATION:

2.1 All instruments used for measurements shall be accurate and calibrated. Calibration and maintenance of all instruments shall be in accordance with the requirements of the National Standards.

### PART 3 – EXECUTION:

#### 3.1 GENERAL

3.1.1 The specific systems shall be reviewed and inspected for conformance to design documents. Testing, adjusting and balancing on each identified system shall be performed. The accuracy of measurements shall be in accordance with national Standards. Adjustment tolerances shall be + or – 10% unless otherwise stated.

3.1.2 Equipment settings, including manual damper quadrant positions, manual valve indicators, fan speed control levers, and similar controls and devices shall be marked to show final settings.

3.1.3 All information necessary to complete a proper TAB project and report shall be per National Organization's standards unless otherwise noted. The descriptions for work required, as listed in this section, are guides to the minimum information needed.

#### 3.2 AIR SYSTEMS

3.2.1 The TAB Agency shall verify that all ductwork, dampers, grilles, registers, and diffusers have been installed per design and set in the full open position. The TAB Agency shall perform the following TAB procedures in accordance with the National Standards:

- For supply fans:
  - Fan speeds – Test and adjust fan RPM to achieve maximum or design CFM. Confirm proper rotation direction.
  - Current and Voltage – Test and record motor voltage and amperage, and compare data with the nameplate limits to ensure fan motor is not in or above the service factor.



- Pitot-Tube Traverse – Perform a Pitot-tube traverse of main supply and return ducts, as applicable to obtain total CFM.
- Static Pressure – Test and record system static profile of each supply fan.
- For return fans:
  - Fan speeds – test and adjust fan RPM to achieve maximum or design CFM. Confirm proper rotation direction.
  - Current and Voltage – Test and record motor voltage and amperage, and compare data with the nameplate limits to ensure fan motor is not in or above the service factor.
  - Pitot-Tube Traverse – Perform a Pitot-tube traverse of the main return ducts to obtain total CFM.
  - Static Pressure – Test and record system static profile of each return fan.
- For zone, branch and main ducts:
  - Adjust ducts to within design CFM requirements. As applicable, at least one zone balancing damper shall be completely open. Multi-diffuser branch ducts shall have at least one outlet or inlet volume damper completely open.
- For diffusers, registers and grilles:
  - Tolerances – Test, adjust, and balance each diffuser, grille, and register to within 10% of design requirements. Minimize drafts.
  - Identification – Identify the type, location, and size of each grille, diffuser, and register. This information shall be recorded on air outlet data sheets.

### 3.3 OPTIONAL TAB SERVICES:

- 3.3.1 PRECONSTRUCTION PLAN CHECK AND REVIEW: The TAB Agency shall review the project documents and contractor submittals for their effect on the TAB process and overall performance of the HVAC system. It shall submit recommendations for enhancements or changes to the system within 30 days of document review.
- 3.3.2 JOB SITE INSPECTIONS: During construction, the TAB Agency shall inspect the installation of pipe systems, sheet metal work, temperature controls, and other component parts of the HVAC systems. Inspections shall be conducted a minimum of two times. (Typically, these are performed when 60% of the total system is installed and again when 90% of the total system is installed, prior to insulation of the duct and piping). The TAB Agency shall submit a written report of each inspection.
- 3.3.3 TAB VERIFICATION: The TAB Agency is to include time to verify a minimum of 10% of all readings or maximum of 1 day.

END OF SECTION.

## SECTION 230719 – HVAC PIPING INSULATION

### PART 1 – GENERAL:

#### 1.1 RELATED DOCUMENTS

- A. The Contractor's attention is directed to the General and Special Conditions, COMMON WORK RESULTS FOR HVAC and to all other Contract Documents as they apply to this branch of the work. Attention is also directed to all other sections of the Contract Documents which affect the work of this section, and which are hereby made a part of the work specified in this section.
- B. The Contractor directed to Specification Section SHOP DRAWINGS, MAINTENANCE, MANUALS AND PARTS FOR HVAC.

#### 1.2 SCOPE

- A. Work under this section shall include all labor, equipment, accessories, materials, and services required to furnish and install all insulation, fittings and finishes for all mechanical systems specified herein and/or as indicated.
- B. Application of insulation materials shall be performed in accordance with manufacturer's written recommendations. Where thickness of insulation is not specified, use applicable thickness recommended by manufacturer for specific use.
- C. Insulation thicknesses shall comply with the latest version of ASHRAE 90.1 and IECC at a minimum.
- D. All insulation materials shall be installed per the latest edition of the National Commercial and Industrial Insulation Standards.
- E. Insulation shall be installed by a company regularly engaged in the application of insulation and any work deemed unacceptable by the Engineer shall be removed and properly installed at the expense of the Contractor.
- F. "Concealed", where used herein, shall mean hidden from sight as in trenches, chases, furred spaces, pipe shafts, or above hung finished ceilings. "Exposed" shall mean that piping or equipment is not "concealed" as defined above. Piping in service tunnels, mechanical equipment rooms, storage areas, or unfinished rooms is to be considered "exposed".
- G. The Contractor shall photograph any installations prior to concealment. This includes duct risers in chases and rooftop equipment.

#### 1.3 FIRE RATINGS AND STANDARDS:

- A. Insulations, jackets, facings, adhesives, mastics, tapes, fitting materials, etc. shall have composite fire and smoke hazard ratings as tested by ASTM E-84, NFPA 255 and UL 723 procedures not exceeding Flame Spread 25, Smoke Developed 50 and Fuel Contributed 50.

- B. All products and their packaging shall bear a label indicating above requirements are not exceeded.
- C. Fiber glass duct wrap shall meet the requirements of Scientific Certification Systems Certification or Greenguard Validation of Formaldehyde Free.
- D. Fiber glass mechanical board shall meet the requirement of the Greenguard Standards for Low-Emitting Products.
- E. Fiber glass pipe insulation shall meet the requirement of the Greenguard Gold level standard.

PART 2 – PRODUCTS:

- 2.1 ACCEPTABLE MANUFACTURERS: Johns Manville, Knauf, Owens-Corning.
- 2.2 Unless otherwise specified or allowed, closed cell type insulation shall not be acceptable.
- 2.3 PIPE INSULATION MATERIAL: Insulation shall be Knauf "Earthwool 1000° Pipe Insulation ASJ+/SSL+" or approved equivalent fiberglass pipe insulation with an all service jacket. The insulation shall be a heavy density, pipe insulation with a K factor not exceeding 0.27 Btu per inch/h. ft<sup>2</sup> °F at 75°F mean temperature. The insulation shall be wrapped with a vapor barrier jacket. The jacket shall have an inside foil surface with self sealing lap and a water vapor permeability of 0.02 perm/inch. All circumferential joints shall be vapor sealed with butt strips. All insulation shall be installed in strict accordance with the manufacturer's recommendations. The following pipes shall be insulated with the minimum thickness of insulation as noted.
  - A. Refrigerant Liquid Lines:
    - 1. Piping 1-1/4" and less: 1/2" thick insulation
    - 2. Piping 1-1/2" and greater: 1" thick insulation
    - 3. All exterior piping: 1-1/2" thick with jacketing
  - B. Refrigerant Suction Lines:
    - 1. Piping 1-1/4" and less: 1/2" thick insulation
    - 2. Piping 1-1/2" and greater: 1" thick insulation
    - 3. All exterior piping: 1-1/2" thick with jacketing
  - C. Condensate Drain Lines: 1/2" thick insulation

PART 3 – EXECUTION:

- 3.1 The Contractor shall photograph any installations prior to concealment. This includes risers in chases and rooftop equipment.
- 3.2 Insulation shall be applied on clean, dry surfaces in a neat and workmanlike manner reflecting the best current practices in the trade. Insulation shall not be applied to piping, until tested, inspected, and released for insulation.

- 3.3 Where more than one thickness of insulation is required, joints (both longitudinal and transverse) shall be staggered.
- 3.4 All insulation shall be continuous through walls, ceiling openings and sleeves. However, insulation shall be broken through fire walls. All covered pipes are to be located a sufficient distance from walls, other pipe, ductwork, and other obstacles to permit the application of the full thickness of insulation specified. If necessary, extra fittings and pipe are to be used. No noticeable deformation of insulation or discontinuity of vapor seal, where required, will be accepted. Coordinate work with plumbers, pipe fitters, etc. to assure hanger locations agree with location of insulation inserts.
- 3.5 Existing and/or new insulation removed and/or damaged during course of construction shall be repaired or replaced by the Contractor at their expense.
- 3.6 Vapor barrier jackets shall be applied with a continuous unbroken vapor seal. Do not use staples through the jacket. NO EXCEPTIONS!
- 3.7 All insulation shall be installed with joints butted firmly together.
- 3.8 The Contractor shall insure that all piping insulation is completely continuous along all conduits, equipment, connection routes, etc. carrying cold fluids (water, refrigerant, other) and that condensation can, in no way, collect in or on the insulation, equipment, conduits, etc. Any such occurrence of condensation collection and/or damage therefrom shall be repaired solely at the expense of the Contractor.
- 3.9 Seal insulation and jacket at all points where insulation terminates at unions, flanges, valves, and equipment. This applies to hot water lines only as cold-water lines require continuous insulation and vapor barrier.
- 3.10 Pipe insulation shall extend around valve bodies to above drain pans in hydronic equipment over pumps, etc. to insure no condensation drip or collection.
- 3.11 Valves, flanges, and unions shall only be insulated when installed on cold fluid piping whose surface temperature will be at or below the dew point temperature of the ambient air.
- 3.12 Insulation shall not extend through fire and smoke walls. Pack sleeve at fire and smoke wall with approved fire-retardant packing similar to mineral wool and seal with approved sealant.
- 3.13 Metal insulation shields and inserts are required at all pipe hangers where the piping is insulated. Metal shields shall be constructed of galvanized steel, formed to a 180-degree arc. Insulation shields shall be the following size:
- |                  |        |        |
|------------------|--------|--------|
| i. Pipe          | Shield | Shield |
| ii. Size         | Gauge  | Length |
| iii. 2" and less | 20     | 12"    |
- 3.14 Insulated pipes 2" in diameter and larger shall be additionally supported with wood inserts of sufficient compressive strength to carry the weight of the pipe and fluid. Inserts shall extend beyond extend beyond the hanger and shall be at least 6" in length.

- 3.15 Provide premolded PVC insulated fitting covers on all pipe fittings, flanges, valves, and pipe terminations. Fittings shall be insulated by applying the proper factory precut insulation insert to the pipe fitting. The ends of the insulation insert shall be tucked snugly into the throat of the fitting and the edges adjacent to the pipe insulation tufted and tucked in, fully insulating the pipe fitting. The proper thickness of insulation must be applied to keep the jacket temperature less than 150°F. An approved vapor retarder mastic compatible with the PVC shall be applied around the edges of the adjoining pipe insulation and on the fitting cover throat overlap seam. The PVC fitting cover shall then be applied and secured with pressure sensitive tape along the circumferential edges. The tape shall extend over the adjacent pipe insulation and have an overlap on itself at least 2" on the downward side. On fittings where the operating temperature is below 50°F, two or more layers of insulation inserts shall be applied with the first layer being secured with a few wrappings of fiber glass yarn to eliminate voids. One additional insert shall be used for each additional 1" of pipe insulation above 1-1/2". All joints shall be fully sealed.

END OF SECTION.

## SECTION 230900 – INSTRUMENTATION AND CONTROL FOR HVAC

### PART 1 – GENERAL:

#### 1.1 RELATED DOCUMENTS

- A. The Contractor's attention is directed to the General and Special Conditions, COMMON WORK RESULTS FOR HVAC and to all other Contract Documents as they apply to this branch of the work. Attention is also directed to all other sections of the Contract Documents which affect the work of this section, and which are hereby made a part of the work specified in this section.
- B. The Contractor's attention is directed to Specification Section FACILITY MONITORING SYSTEM.

#### 1.2 SCOPE

- A. The Temperature Control Contractor (TCC) shall connect VRF system to existing BAS on campus through BACnet. All labor, materials, tools, interfaces, wiring, tubing, installation, labeling, engineering, calibration, documentation, samples, submittals, testing, commissioning, training services, permits and licenses, transportation, shipping, handling, administration, supervision, management, insurance, temporary protection, cleaning, cutting and patching, warranties, services, and items, even though these may not be specifically mentioned shall be included for the complete, fully functional and commissioned temperature controls system.
- B. The TCC shall provide all items, articles, materials, devices, operations, or methods listed, mentioned, or scheduled on the drawings including all labor, materials, equipment and incidentals necessary and required for their completion to provide a complete and operating temperature control system. This will include connecting to any mechanical equipment furnished with a control interface device and contacting the equipment suppliers and/or manufacturers for information for the proper interface to the equipment being furnished.
- C. These apparatuses shall consist of, but not limited to, all necessary thermostats, sensing devices, valves, damper motors, actuators, and with the necessary accessories for the complete control of all equipment hereinafter specified.
- D. Control sequences on plans. Provide all control equipment required to perform sequences described. Coordinate all dampers with the sheet metal contractor and equipment provider. It is the responsibility of the control contractor to ensure all required dampers in the sequence of operations are provided.
- E. Include all power wiring and cabling for the operation of the controls system. Refer to Electrical Division Specifications for additional requirements.
- F. APPROVED MANUFACTURER'S: Comfort Systems USA, Siemens, Honeywell, Alerton, Automated Logic.
- G. The installation shall comply with the Local Authorities and State Fire Marshal code requirements, including normal operating and smoke mode functions (where applicable).

The installation shall comply with the requirements of the NEC, NFPA, UL and the Building Codes, including referenced mechanical, electrical, energy codes, etc.

H. ABBREVIATIONS:

1. TCC – Temperature Control Contractor
2. I/O: Input/output.
3. LonWorks: A control network technology platform for designing and implementing interoperable control devices and networks.
4. MS/TP: Master slave/token passing.
5. PC: Personal computer.
6. PID: Proportional plus integral plus derivative.

I. The TCC shall list the following cost breakdowns, material, and labor, on the official project schedule of values:

1. Controls shop drawings
2. Controls graphics
3. Controls materials and labor
4. Controls startup, commissioning, testing, documentation (2.5% of controls contract value)
5. Controls training and Owner acceptance (2.5% of controls contract value)

PART 2 - PRODUCTS

2.1 SENSORS AND MISCELLANEOUS DEVICES

A. SENSOR RESOLUTION: All temperature sensors shall have a minimum resolution of 1/10th of 1 degree F. (0.1-degree F.) Sensor stability shall be 0.24 degrees over a year period. Space sensors shall be tested and accurate to within 0.75 degrees F. Outside air, water and duct sensors shall be tested and accurate to within 2.0 degrees F.

B. SPACE SENSORS AND THERMOSTATS:

1. Refer to the drawings for proper type and location.
2. All thermostat and sensors shall be provided with temperature indication, unless otherwise noted.
3. Programmed set-point shall be locally adjustable limited to 2 degrees above set-point and 2 degrees below set-point for supervised areas.
4. Unsupervised areas shall have non-adjustable set-point.
5. Generally, thermostats/sensors shall be installed 5'-0" above the finished floor.
6. Where thermostats/sensors are to be mounted next to a light switch, install at the same height as the light switch.
7. If there is a question consult engineer prior to rough-in.

C. DISCHARGE AIR AND DUCT ROOM RETURN AIR SENSORS: Shall be rigid insertion type. In all applications, care shall be taken to ensure that the sensors are securely mounted as not to allow any vibration and installed in such a manner as to indicate the truest possible temperature.

D. FREEZE/LOW-LIMIT THERMOSTAT: Provide a freeze/low-limit thermostat in each Air Handling Unit, Outside Air Unit, etc with a water coil for freeze protection. These devices shall be the manual reset type. This device shall be wired by using a normally closed contact in series with the motor starting circuit and a normally open set of contacts as an

input to the unitary controller. The element shall be constructed of copper and be at least 20 feet in length. It shall be installed serpentine across the air entering the coil. In some cases, it may require being installed after the coil. Each application should be closely evaluated before installation. The device shall sense the lowest temperature by any one-foot section of its element.

- E. COMBINATION TEMPERATURE/HUMIDITY SENSORS: All temperature sensors shall have a minimum resolution of 1/10th of 1 degree F. (0.1-degree F.) Sensor stability shall be 0.24 degrees over a year period. Space sensors shall be tested and accurate to within 0.75 degrees F. The humidity sensing device shall be 100% solid state, linear and temperature compensated with a 0-100% RH range. The response time shall be a minimum of 30 seconds for a 60% change. They shall have a minimum of 2% accuracy minimum accuracy of +/-2% RH minimum rangeability 5 to 95% RH non-condensing and maximum hysteresis +/-1.5% RH. – Do not submit products that do not meet this range. The output of the device must utilize a 0-10 VDC or 4-20mA signal as required. The device must use a power supply of 24 VAC or VDC. Duct mounted sensors shall have at least a 4" insertion probe with a 16-gauge steel enclosure. NIST traceable certification shall be provided to the Engineer as part of the shop drawings. For wall mounted sensors the enclosure shall be polystyrene plastic mounted next to and at the same height as the temperature sensor in that area. Both shall have the same appearance. Provide protective cages in fitness and common areas.
- F. LOW PRESSURE TRANSDUCERS: These devices shall be 100% solid state, linear and temperature compensated. Accuracy shall be no less than plus or minus 1% of its full range. Linearity, repeatability, and hysteresis shall be no less than plus or minus 0.1%. All pressure sensors shall utilize output averaging/output clipping to adjust and stabilize any fluctuations in the output. The output of the device shall utilize a 0 - 10 VDC signal. The device shall use a power supply of 24 VAC or VDC. The enclosure is 16-gauge steel. For sensing internal static pressure of air handling ducts utilize sensors with a range of 0 to 5 inches water column. For sensing building static pressures (building compared to atmospheric) utilize a sensor with a range of -0.25 to +0.25 inches water column.
- G. RELAYS: Relays for starting and stopping fractional horsepower motors shall be rated as follows:
1. 1/4 horsepower motors or less use 15 ampere rated relays,
  2. 1/3 horsepower motors use 20 ampere rated relays,
  3. 1/2 horsepower motors use 30 ampere rated relays,
  4. Relays used for pilot duty service shall be rated at a minimum of 10 amperes.
  5. Provide auxiliary pilot duty relays on motor starters as required for control function.
  6. Do not install control and status relays in packaged equipment control panel enclosures containing Class 1 starters.
- H. CURRENT SENSING DEVICES: Veris Industries model Hx08 Series and H701 or equal. All current sensors shall be capable of alarming to the BAS for belt losses, pump coupling shear or other mechanical failure on loads.
- I. DIFFERENTIAL PRESSURE TRANSMITTERS: Provide Rosemount (ITT Bell & Gossett ST-102R) or Johnson Controls Setra DPT 2302-050-V field mounted differential pressure sensor transmitters as indicated on the plans. Range shall be 0-25 psig. Accuracy shall be .025% full span.



## 2.2 VALVES, DAMPERS AND ACTUATORS

- A. Unless otherwise specified, valves shall be furnished and sized by the TCC. The valves are to provide the required capacity and the close off rating shall be in excess of the system pressures encountered (minimum 40 psi differential). Proportioning-type valve bodies shall be packed type with throttling type inner valve (quick close plug shall not be acceptable). Proportional type valves to be rated at 125 psi static pressure. Modulating control valves shall be selected within a 3-5 psig pressure drop range. Two position control valves (open/close) shall be line size.
- B. Dampers for various units requiring field mounting shall be tight closing, "ultra low leakage", opposed blade with side and edge seals. They shall be sized and furnished under this section. Installation of dampers shall be by the sheet metal contractor, coordinated by the TCC. Frames shall be no less than 16-gauge galvanized steel and furnished with mounting holes for duct mounting. Damper blades shall be no less than 14-gauge galvanized steel with maximum blade width of 8 inches. Blades shall be secured to 1/2-inch zinc plated axles and hardware with nylon bearings. Provide thrust bearings at the end of each blade. **All dampers shall have end switches to positively prove damper position. No Exceptions!**
- C. All damper and valve actuators shall be fail safe spring return type with sufficient force to operate the dampers or valves under all normal operating conditions. They shall return to the normally open position upon a loss of power. Actuators for fan coil units, terminal units, etc. shall fail in the last position.
- D. "ALL" Actuators shall be of the same manufacturer and have internal feedback circuitry to provide a positive action to insure proper positioning of the damper or valve through the entire sequence. Actuators shall have an adjustable starting point to accurately set the range of travel to the output of the controller. All actuators shall also utilize the same input signal (6-9 VDC, 0-010V, 2-10 VDC, 4-20 MA) in order to maintain some consistency in the control application. Analog actuation is 6-9 VDC, 0-010V, 2-10 VDC or 4-20 MA, floating point control with 2 digital outputs is NOT approved as analog actuation.
- E. Actuators may be factory installed. If not factory installed, they shall be installed as per instructions by the terminal equipment manufacturer.
- F. Locations mounted above ceiling shall be marked on ceiling grid.
- G. Install damper motors on the outside of the duct in warm areas where possible, not in air stream or locations exposed to outdoor conditions.

## 2.3 PRESSURE INDEPENDENT CONTROL VALVES:

- A. ACCEPTABLE MANUFACTURERS: Flow Control Industries, Inc. JCI, Honeywell or approved equal.
- B. All modulating control valves shall be from the same manufacturer. Actuators used with the valves may be from the vendor of choice provided they are approved for use by the valve manufacturer. The valve actuators are specified in the Control Section and shall be capable of opening and closing the valve against the rated shutoff head of the pump(s) serving the loop.

- C. All modulating control valves shall be of the fully modulating “pressure independent” type configured with one integrated valve body that incorporates one chamber with an adjustable Cv and a separate pressure regulating chamber used to maintain a constant differential pressure across the control surface.
- D. Each control valve shall be individually flow tested at the factory and verified to deviate no more than  $\pm 5\%$  through the selected operating pressure range. A calibrated performance tag shall be provided with each valve that verifies the flow rate in  $10^\circ$  rotation increments up to full rated flow. All testing shall be performed with instruments calibrated to the requirements of ANSI/NCSL Z540-1-1994 with traceability to NIST and/or ISO standards.
- E. In lieu of factory testing, manufacturers shall test each valve at an approved third-party testing facility with test equipment calibrated and verified with traceability to NIST standards. Testing to verify flow deviates no more than  $\pm 5\%$  when tested at 10-degree increments between 0 and 90 degrees and 5 PSID increments between 5 and 70 PSID. Test reports shall be provided. In addition to testing, each control valve shall have a calibrated performance tag listing the measured flow rate in  $10^\circ$  rotation increments.
- F. Control valve rangeability shall be a minimum of 100:1 through the operating pressure range, at 5 to 70 PSID.
- G. Each control valve shall be subjected to 70 psid and tested to exceed ANSI/FCI 70-2-1998 leakage ratings. Class IV leakage or better is required for control valves 2” nominal size and less. Class III leakage or better is required for control valves larger than 2”.
- H. The control valve bodies shall be cast iron, steel or bronze and rated at 150 psig working pressure or greater. All internal parts shall be stainless steel, steel, Teflon®, brass, or bronze. Plastic internal parts are not acceptable.
- I. In all control valves 8” and smaller, it shall be possible to modify the valve flow characteristics without removing the valve from the piping system. It shall also be possible to change seals without removing the valve from the piping system.
- J. The control valve actuator shall modulate all valves up to 8” in nominal size from 0 to 100% design flow while rotating the valve stem a maximum of  $90^\circ$ .
- K. Where DDC proportional actuators are utilized, it shall be possible to set the end stroke of the actuator on site with the software (limit control signal) at full design flow for the heating or cooling coil or from data listed on the performance tag.
- L. The control valve flow adjustment stem shall extend out from the control valve and have an indicator that may be used to verify valve position. The control valve shall have tapped mounting holes for mounting the control valve actuator bracket. The actuator shall rotate the valve stem to provide the required flow independent of pressure across the valve. Torque requirements for actuator selection shall be provided by the valve manufacturer.
- M. There shall be three ports installed at the factory integral to each valve and capable of being used to measure pressure or temperature. The first port shall be installed at the inlet to the valve. The second shall be installed between the Cv chamber and the pressure regulating chamber. The third shall be installed at the outlet of the valve. Should the ports not be

provided as part of the valve body then they shall be installed in a spool piece and attached to the body.

- N. It shall be possible to verify the flow rate through the control valve using the valve stem position and the differential pressure measurement between the first and second port in the valve. If these valve features are not available, a flow meter shall be installed to verify actual flow rate in operation through the valve.
- O. Valves located outside shall be provided with NEMA 4 rated actuators.
- P. WARRANTY: All valves shall be warranted by the manufacturer for no less than 5 full years from the date of Substantial Completion. The warranty provided by the actuator manufacturer shall apply to actuators.

### PART 3 – EXECUTION:

- 3.1 A mandatory pre-installation meeting shall occur prior to the TCC beginning any work on site. This meeting shall be attended minimally the prime contractor, mechanical contractor superintendent, TCC superintendent, Engineer, Owner, and Architect. The purpose of the meeting is to have the controls installer communicate their understanding of the system design and how the system is intended operate to the Engineer and get the Engineer's input and agreement. The agreement between the TCC and the mechanical engineer is to be thoroughly documented by the TCC for later reference.
- 3.2 The installation shall comply with the Local Authorities and State Fire Marshal code requirements, including normal operating and smoke mode functions (where applicable). The installation shall comply with the requirements of the NEC, NFPA, UL and the Building Codes, including referenced mechanical, electrical, energy codes, etc.
- 3.3 All labeling for this system shall utilize actual final room names and numbers. The room names and numbers on the Contract Documents may not be the Owner's exact requirements. Coordinate with the Owner to ensure compliance.
- 3.4 Include in the bid for the Controls Contractor to perform additional 40 on-site hours of on-site programming, adjustments, modifications, etc. as requested by the Engineer during the warranty period after the date of substantial completion for the project.
- 3.5 WIRE MANAGEMENT, ELECTRICAL POWER, ETC.
  - A. Refer to CABLING section of this specification for additional requirements.
  - B. Electrical work required for system interlock and installation of the temperature control system shall be included in the bid and installed per all applicable codes. Coordinate with other trades as required for installation of a complete system.
  - C. All wiring and cabling in mechanical and electrical rooms shall be in conduit. No wiring or conduit can be exposed to view in any other area. Conceal all wiring and cabling in conduit in wall from thermostats or other controls devices to above ceiling. Install conduit in wall from wall thermostats to above ceiling for cabling. Route wiring directly to cable tray from

control points above the ceiling. Rough-in for control devices shall be in compliance with the requirements of the ELECTRICAL SPECIFICATIONS.

- D. Any power for controls shall be fed from dedicated circuits in emergency electrical panels, when provided for a project, and shall not be obtained from receptacles, lighting, or equipment circuits. Unitary control power may be obtained from the equipment served. If power is obtained from the equipment served, the power may not be interrupted to the electronics if the equipment is off for any reason.
- E. The TCC shall be responsible for the power source to any control panels, unitary controllers, etc. on any controlled equipment and all other control power requirements. This includes circuit breakers, wiring, conduit, etc. installed in strict accordance with NEC. The TCC may contract with the electrical contractor for the power wiring installation.
- F. Prior to installation, insure through coordination with all trades, that appropriate clearances (36" minimum) as required by the N.E.C. are maintained at all control panels, including unitary controllers for VAV terminals, heat pumps, etc.
- G. The TCC shall provide all CAT5 or CAT6 cabling network cabling for a complete system. This shall include cabling to the Owner's data drop. The main system data drop will be provided by others.
- H. All control circuits within the electrical panels shall be marked to indicate equipment served.
- I. The TCC shall perform all temperature control interlock wiring. This shall include control valves, dampers, thermostats, indoor/outdoor HVAC systems, etc. Electrical work required for system interlock and installation of the temperature control system shall be included in the bid and installed per all applicable codes. Coordinate with other trades as required for installation of a complete system.
- J. The TCC shall be responsible for any power required for the unitary controls or control panels. This includes circuit breakers, wiring, conduit, etc. installed in strict accordance with NEC. The TCC may contract with the electrical contractor for the power wiring installation.
- K. Provide one duplex outlet mounted inside the control panel and separately fused with a non-time delay fuse at 15 A at any panel location containing electronic control components. This receptacle may be served from the control panel 120 VAC power source.
- L. All wiring shall be continuous runs. Any junctions must be made in metal enclosure.
- M. Grounding terminals shall be color coded green and yellow and shall be compatible with the other specialty terminals specified above and shall mount on the same DIN rail system. Units shall be arranged so that the wiring connected to them is grounded to the enclosure via the mounting rail. These terminals shall be provided for grounding cable shields at the points where the cables enter a control panel and terminate on the control panel terminal strip. Terminals shall be Entrelec M 4/5.3A. PI or equivalent by Weidmuller, Phoenix, or Allen Bradley.
- N. The Department of Housing, Building and Construction's Electrical Division requires that all new lighting control panels, new Building Automation Systems control panels, and new

conventional HVAC control panels be certified as being constructed and wired in accordance with NFPA 70 110.3 (a) (1) and article 409.

### 3.6 CABLING

- A. Refer to WIRE MANAGEMENT section of this specification for additional requirements.
- B. ALL CONTROL WIRING SHALL BE INSTALLED IN A WIRE MANAGEMENT SYSTEM TO INCLUDE CABLE TRAYS, BRIDLE RINGS, & CONDUITS. NO EXCEPTIONS! COORDINATE WITH ELECTRICAL CONTRACTOR TO INSURE A COMPLETE WIRE MANGEMENT SYSTEM.
- C. Acceptable cable manufacturers are Belden, West Penn, or Alpha.
- D. A complete cabling system shall be furnished and installed, which shall adhere to the highest workmanlike standard of quality and appearance. Cabling shall be installed square with building lines and contained within a wire management system.
- E. All sizing of cabling shall be according to manufacturer's recommendations but shall be a minimum of 18 AWG.
- F. Furnish a floor plan of the building indicating communication cable labeling and routing as well as addresses and branch wiring from the unitary devices. All cabling shall be labeled on both ends. The type, size and label of all cabling shall be indicated on submittal floor plan drawings.
- G. Wall space temperature sensor cabling (from the sensor to the unitary controller) shall have a minimum of four (4) conductors.
- H. All cabling shall be stranded. "NO" solid conductors will be accepted. All cabling shall be 100% shielded with appropriate drain wire and insulation.
- I. All cable connections shall be continuously run (including shield). Any junctions must be made in a metal enclosure, connections must be soldered, taped and the metal enclosure must be mechanically attached to the nearest ground. No wire nuts or crimped connections will be accepted. Note location of junction boxes on the as built floor plans. All cabling networking unitary controllers, and other networked equipment, shall be soldered.
- J. All shields must be terminated as per the manufacturer's recommendation. Shield termination requirements by the manufacturer must be provided with submittals.
- K. Wireless controllers are not approved unless specifically mentioned in the sequence of operations or noted on plans.

### 3.11 COMMISSIONING & VERIFICATION, FUNCTION PERFORMANCE TESTING & CHECKLISTS:

- A. 100% compliance with the requirements of this section is a condition of the Owner's acceptance and start of the warranty period.
- B. The TCC shall be responsible for completion of (1) their hardware checkout sheets and test

reports, (2) Point-by-point confirmations of ALL points – this includes visual inspection of installed components, and (3) sequence of operation confirmation.

- C. This documentation and process shall be complete, approved and accepted by Engineer and Owner prior to acceptance. This information shall be documented as completed. A copy shall be delivered to the Engineer and Owner and included in the O&M manuals. Each subcontractor shall be responsible for completion of their own System Verification Checklists/Manufacturer's Checklists. Sample checklists shall be submitted to the Engineer and Testing Agent for approval.
- D. Air and water balancing shall be completed (and discrepancies resolved) before the TCC's final system check and before the acceptance test to be conducted in the presence of the Engineer.
- E. This project will be commissioned and the TCC shall be responsible for completing the functional performance testing of the control system sequences and graphics with the Commissioning Agent.

### 3.12 WARRANTY

- A. Labor and materials for the control system specified shall be warranted free from defects for a period of 12 months after substantial completion and acceptance. Control system failures during the warranty period shall be adjusted, repaired, or replaced at no additional cost or reduction in service to the Owner.
- B. The TCC shall respond to the Owner's request for warranty service within 24 hours during normal business hours. The TCC shall respond to the Owner's request for Emergency service (defined as life-threatening or creating the potential to cause property damage) during the warranty period within 4 hours.
- C. The TCC shall provide technical phone support to the owner during the warranty period for warranty related issues and for two years after the warranty period. If the technical support location of the TCC is outside of the toll-free calling area for the customer, the TCC shall have a toll-free number or accept collect calls for the purpose of providing technical support.
- D. During the warranty period, standard parts for the DDC system shall arrive at the facility within 48 hours of placing an order. Non-standard parts (requiring re-manufacturing or ordering from another supplier) shall be shipped within 96 hours.

END OF SECTION.

## SECTION 230910 - FACILITY MONITORING SYSTEM

### PART 1 – GENERAL:

#### 1.1 RELATED DOCUMENTS

- A. The Contractor's attention is directed to the General and Special Conditions, COMMON WORK RESULTS FOR HVAC and to all other Contract Documents as they apply to this branch of the work. Attention is also directed to all other sections of the Contract Documents which affect the work of this section, and which are hereby made a part of the work specified in this section.
- B. The Contractor's attention is directed to Specification Section INSTRUMENTATION AND CONTROL FOR HVAC.

#### 1.2 SCOPE

- A. The controls system for this project shall be a web-based digital controls system. All controllers, control interface hardware, services, installation, warranty, training, etc., shall be included as hereinafter specified. The system shall utilize a network controller and unitary" type controllers. Including such minor details not specifically mentioned or shown, as may be necessary for the complete operation of the system.
- B. The Temperature Control Contractor (TCC) shall furnish all labor, materials, equipment, and service necessary for a complete and operating Building Automation System (BAS), utilizing Direct Digital Controls. All labor, materials, tools, equipment, software, software licenses, software configurations and database entries, interfaces, wiring, tubing, installation, labeling, engineering, calibration, documentation, samples, submittals, testing, commissioning, training services, permits and licenses, transportation, shipping, handling, administration, supervision, management, insurance, temporary protection, cleaning, cutting and patching, warranties, services, and items, even though these may not be specifically mentioned shall be included for the complete, fully functional and commissioned temperature controls system.
- C. The TCC shall provide all items, articles, materials, devices, operations or methods listed, mentioned or scheduled on the drawings including all labor, materials, equipment and incidentals necessary and required for their completion to provide a complete and operating temperature control system. This will include connecting to any mechanical equipment furnished with a control interface device and contacting the equipment suppliers and/or manufacturers for information for the proper interface to the equipment being furnished.
- D. Control sequences on plans. Provide all control equipment required to perform sequences described. Coordinate all dampers with the sheet metal contractor and equipment provider. It is the responsibility of the control contractor to ensure all required dampers in the sequence of operations are provided.
- E. Include all power wiring and cabling for the operation of the controls system. Refer to Electrical Division Specifications for additional requirements.

F. APPROVED MANUFACTURER'S: Comfort Systems USA, Siemens, Honeywell, Alerton, Automated Logic, or approved equal.

G. APPROVED MANUFACTURER'S:

1. The installation shall comply with the Local Authorities and State Fire Marshal code requirements, including normal operating and smoke mode functions (where applicable). The installation shall comply with the requirements of the NEC, NFPA, UL and the Building Codes, including referenced mechanical, electrical, energy codes, etc.

H. ABBREVIATIONS:

1. TCC – Temperature Control Contractor
2. I/O: Input/output.
3. LonWorks: A control network technology platform for designing and implementing interoperable control devices and networks.
4. MS/TP: Master slave/token passing.
5. PC: Personal computer.
6. PID: Proportional plus integral plus derivative.

## PART 2 - PRODUCTS

### 2.1 NETWORK CONTROLLER

- A. Install the Network Controller in a surface mounted panel, NEMA type 12 enclosures, with a removable hinged door. Provide a flush mounted key lock. All control panels must be painted the same color and identified. The boxes are to be made from 16-gauge material. Panels should not be provided with knockouts.
- B. Control panels shall be constructed by a UL approved panel manufacturer. The standard used shall be UL508A. All proper labels are to be attached, a parts list and laminated copy of as-built control drawing will be in a door pocket. Panel shall meet arc flash requirements.
- C. The Network Controller shall be web-based and communicate BACnet IP. It shall issue all time schedules, summer/winter commands, customized trending, holiday scheduling, alarm handling, clock, or other shared commands to all unitary controllers within the building network. If for any reason communications between the unitary(s) and the Network Controller is lost, the unitary(s) shall operate in a stand-alone manner (in day operation) until communications is restored. It shall also operate in the "summer" or "winter" mode as last commanded.
- D. The Network Controller shall be integrated and interoperable with the facility infrastructure and include user access to all system data locally over the Local Area Network (LAN) / Wide Area Network (WAN) within the building and remotely by a standard Web Browser over the Internet. Any computer connected to the network, utilizing a web browser and having the proper password.
- E. The Network Controller shall be a fully user-programmable, supervisory controller. It shall monitor the network of distributed unitary controllers, provide global strategy and direction, and communicate on a peer-to-peer basis with other Network Controllers.



- F. The Network Controller shall have battery back-up to allow a minimum of seven days of operation. The Network Controller shall be composed of one or more independent, stand-alone, microprocessors to manage the network strategies described in the Application software section. The network controller shall have ample memory to support its operating system, database, and programming requirements. The operating system of the Network Controller shall manage the input and output communications signals to allow distributed unitary controllers to share real and virtual point information and allow central monitoring and alarms. The database and custom programming routines of the Network Controller shall be editable from a single operator station.
- G. The Network Controller shall be remotely monitored via the internet. Additionally, it shall include automatic emailing and texting out alarms, gathering alarms, reports and logs, programming and downloading database.
- H. The Network Controller shall continually check the status of all processor and memory circuits. If a failure is detected, the controller shall:
  - 1. Assume a predetermined failure mode.
  - 2. Emit an alarm.
  - 3. Display card failure identification.
- I. Under no circumstance shall more than 75% of the total number of sensor and control points be connected through a single Network Controller. Each DDC system component shall provide for the future addition of at least 20% of each type of the number of sensor and control points connected to that component including a minimum of one universal input and one universal output.
- J. The Network “Building Level” Controller power shall be a dedicated circuit taken from emergency power electrical panel.
- K. Minimum of 3’ working clearance shall be provided in front of all enclosures and panels; clearances shall be ensured to permit the enclosure door to open at least 90 degrees from its closed position of all panels containing control components for servicing.

## 2.2 UNITARY CONTROLLER

- A. Unless otherwise specified, each piece of equipment shall have its own Unitary Controller (i.e. terminal units, etc.). The Unitary Controller for each piece of equipment shall be mounted on the side of the unit. The Unitary Controller for all other equipment shall be mounted in a panel and properly labeled.
- B. Each Central Station Air Handler and/or Outside Air Unit shall have its own Unitary Controller mounted where shown in the drawings. If an installation location is not clear, the Contractor shall notify the Engineer for clarification prior to installation.
- C. Unitary Controllers used in conditioned ambient shall be mounted in dust-proof enclosures, and shall be rated for operation at 32 degrees F to 120 degrees F. All Unitary Controllers shall have an RJ-11 or similar type connection for monitoring or programming access by room or local equipment level with access to any unitary within the network without modification.

- D. Control panels shall be constructed by a UL approved panel manufacturer. The standard used shall be UL508A. All proper labels are to be attached, a parts list and laminated copy of as-built control drawing will be in a door pocket. Panel shall meet arc flash requirements.
- E. Unitary Controllers utilized in the network shall have full stand-alone capability including time of day and holiday scheduling as well as all energy management functions such as optimal start/stop, duty cycling, etc. The terminal unit Unitary Controllers may be pre-programmed with the project specific sequence of operation as specified for the application. Any re-programming of the electronics shall be performed on location using a portable personal computer with appropriate software or through the Network Controller. The entire unitary database shall have the capability of being backed up and or downloaded locally.
- F. All points to have a unique digital input to the BAS system. The use of digital point count expanders is not an acceptable replacement to digital inputs to the unitary controller. The conversion of a single universal input channel to accept up to multiple voltage free contacts such as relay contacts, auxiliary starter contacts, differential pressure switches, etc. IS NOT ACCEPTABLE.
- G. Unitary Controllers shall communicate via BACnet MSTP. A BACnet Protocol Implementation Conformance Statement (PICS) shall be provided for each Unitary Controller that will communicate on the BACnet MS/TP Bus.
- H. All Unitary Controllers shall be fully application programmable. All control sequences within or programmed into the unitary controller shall be stored in non-volatile memory, which is not dependent upon the presence of a battery shall be retained.
- I. Local controllers shall be mounted at eye level for accessibility and service, and located within 50' of the system served, unless otherwise shown on plans.
- J. All unitary controllers shall be fully application programmable. Controllers require a 10% spare point capacity to be provided for all applications. All control sequences within or programmed into the unitary controller shall be stored in non-volatile memory, which is not dependent upon the presence of a battery, to be retained.
- K. The Unitary Controller for each VAV box shall be mounted on the side of the unit. The unitary controller for all other equipment shall be mounted in a panel and properly labeled. Prior to installation, insure through coordination with all trades, that appropriate clearances (36" minimum) as required by the N.E.C. are maintained at all control panels, including unitary controllers for VAV terminals, etc.
- L. After a power failure, the Unitary Controller shall operate the control application using the current setpoints and configuration. Reverting to default or factory setpoints are not acceptable.
- M. Digital expanders, multiplexers or other devices which gang multiple signals into or out of a signal point are not allowed. Each input or output called for shall have its own discrete point on the controller. All points to have a unique digital input to the BAS system. The use of digital point count expanders is not an acceptable replacement to digital inputs to the unitary controller. The conversion of a single universal input channel to accept up to multiple

voltage free contacts such as relay contacts, auxiliary starter contacts, differential pressure switches, etc. IS NOT ACCEPTABLE.

- N. The unitary controller for each VAV box shall be mounted on the side of the unit. The unitary controller for all other equipment shall be mounted in a panel and properly labeled.
- O. Enclosures must be appropriately rated and properly installed and for their intended use. Enclosures installed in areas are subject to falling dirt and circulating dust, lint, fibers, and flyings as well as dripping or light splashing should be NEMA12. Mechanical rooms would typically fall under this category.
- P. Minimum of 3' working clearance shall be provided in front of all enclosures and panels; clearances shall be ensured to permit the enclosure door to open at least 90 degrees from its closed position of all panels containing control components for servicing.
- Q. Connect manual-reset limit controls independent of manual-control switch positions.
- R. Locations mounted above ceiling shall be marked on ceiling grid.
- S. Temperature control panel power shall be on a dedicated circuit taken from nearest appropriate emergency power electrical panel unless otherwise indicated.

### PART 3 – EXECUTION:

- 3.1 A mandatory pre-installation meeting shall occur prior to the TCC beginning any work on site. This meeting shall be attended minimally the prime contractor, mechanical contractor superintendent, TCC superintendent, Engineer, Owner, and Architect. The purpose of the meeting is to have the controls installer communicate their understanding of the system design and how the system is intended operate to the Engineer and get the Engineer's input and agreement. The agreement between the TCC and the mechanical engineer is to be thoroughly documented by the TCC for later reference.
- 3.2 The installation shall comply with the Local Authorities and State Fire Marshal code requirements, including normal operating and smoke mode functions (where applicable). The installation shall comply with the requirements of the NEC, NFPA, UL and the Building Codes, including referenced mechanical, electrical, energy codes, etc.
- 3.3 The Ethernet LAN: This is a shared, routed system extended to each building by the Information Technologies. The new BAS/ATC will be connected to the LAN.
- 3.4 All labeling for this system shall utilize actual final room names and numbers. The room names and numbers on the Contract Documents may not be the Owner's exact requirements. Coordinate with the Owner to ensure compliance.
- 3.5 Include in the bid for the Controls Contractor to perform additional 40 on-site hours of on-site programming, adjustments, modifications, etc. as requested by the Engineer during the warranty period after the date of substantial completion for the project.
- 3.6 WIRE MANAGEMENT, ELECTRICAL POWER, ETC.
  - A. Refer to CABLING section of this specification for additional requirements.

- B. Electrical work required for system interlock and installation of the temperature control system shall be included in the bid and installed per all applicable codes. Coordinate with other trades as required for installation of a complete system.
- C. All wiring and cabling in mechanical and electrical rooms shall be in conduit. No wiring or conduit can be exposed to view in any other area. Conceal all wiring and cabling in conduit in wall from thermostats or other controls devices to above ceiling. Install conduit in wall from wall thermostats to above ceiling for cabling. Route wiring directly to cable tray from control points above the ceiling. Rough-in for control devices shall be in compliance with the requirements of the ELECTRICAL SPECIFICATIONS.
- D. Any power for controls shall be fed from dedicated circuits in emergency electrical panels, when provided for a project, and shall not be obtained from receptacles, lighting, or equipment circuits. Unitary control power may be obtained from the equipment served. If power is obtained from the equipment served, the power may not be interrupted to the electronics if the equipment is off for any reason.
- E. The TCC shall be responsible for the power source to any control panels, unitary controllers, etc. on any controlled equipment and all other control power requirements. This includes circuit breakers, wiring, conduit, etc. installed in strict accordance with NEC. The TCC may contract with the electrical contractor for the power wiring installation.
- F. Prior to installation, insure through coordination with all trades, that appropriate clearances (36" minimum) as required by the N.E.C. are maintained at all control panels, including unitary controllers for VAV terminals, heat pumps, etc.
- G. The TCC shall provide all CAT6 cabling network cabling for a complete system. This shall include cabling to the Owner's data drop. The main system data drop will be provided by others.
- H. All control circuits within the electrical panels shall be marked to indicate equipment served.
- I. The TCC shall perform all temperature control interlock wiring. This shall include control valves, dampers, thermostats, indoor/outdoor HVAC systems, etc. Electrical work required for system interlock and installation of the temperature control system shall be included in the bid and installed per all applicable codes. Coordinate with other trades as required for installation of a complete system.
- J. The TCC shall be responsible for any power required for the unitary controls or control panels. This includes circuit breakers, wiring, conduit, etc. installed in strict accordance with NEC. The TCC may contract with the electrical contractor for the power wiring installation.
- K. Provide one duplex outlet mounted inside the control panel and separately fused with a non-time delay fuse at 15 A at any panel location containing electronic control components. This receptacle may be served from the control panel 120 VAC power source.
- L. All wiring shall be continuous runs. Any junctions must be made in metal enclosure.
- M. Grounding terminals shall be color coded green and yellow and shall be compatible with the other specialty terminals specified above and shall mount on the same DIN rail system.

Units shall be arranged so that the wiring connected to them is grounded to the enclosure via the mounting rail. These terminals shall be provided for grounding cable shields at the points where the cables enter a control panel and terminate on the control panel terminal strip. Terminals shall be Entelec M 4/5.3A.PI or equivalent by Weidmuller, Phoenix, or Allen Bradley.

- N. The Department of Housing, Building and Construction's Electrical Division requires that all new lighting control panels, new Building Automation Systems control panels, and new conventional HVAC control panels be certified as being constructed and wired in accordance with NFPA 70 110.3 (a) (1) and article 409.

### 3.7 CABLING

- A. Refer to WIRE MANAGEMENT section of this specification for additional requirements.
- B. ALL CONTROL WIRING SHALL BE INSTALLED IN A WIRE MANAGEMENT SYSTEM TO INCLUDE CABLE TRAYS, BRIDLE RINGS, & CONDUITS. NO EXCEPTIONS! COORDINATE WITH AN ELECTRICAL CONTRACTOR TO INSURE A COMPLETE WIRE MANGEMENT SYSTEM.
- C. Acceptable cable manufacturers are Belden, West Penn, or Alpha.
- D. A complete cabling system shall be furnished and installed, which shall adhere to the highest workmanlike standard of quality and appearance. Cabling shall be installed square with building lines and contained within a wire management system.
- E. All sizing of cabling shall be according to manufacturer's recommendations but shall be a minimum of 18 AWG.
- F. Furnish a floor plan of the building indicating communication cable labeling and routing as well as addresses and branch wiring from the unitary devices. All cabling shall be labeled on both ends. The type, size and label of all cabling shall be indicated on submittal floor plan drawings.
- G. Wall space temperature sensor cabling (from the sensor to the unitary controller) shall have a minimum of four (4) conductors.
- H. All cabling shall be stranded. "NO" solid conductors will be accepted. All cabling shall be 100% shielded with appropriate drain wire and insulation.
- I. All cable connections shall be continuous run (including shield). Any junctions must be made in a metal enclosure, connections must be soldered, taped and the metal enclosure must be mechanically attached to the nearest ground. No wire nuts or crimped connections will be accepted. Note location of junction boxes on the as built floor plans. All cabling networking unitary controllers, and other networked equipment, shall be in soldered.
- J. All shields must be terminated as per manufacturer's recommendation. Shield termination requirements by the manufacturer must be provided with submittals.
- K. Wireless controllers are not approved unless specifically mentioned in the sequence of operations or noted on plans.

### 3.8 SYSTEM SOFTWARE

- A. System software will be the latest version available with upgrades provided for full warranty period and shall be fully licensed to the owner for all network controllers and servers. Refer to the WARRANTY section of this specification for additional requirements.
- B. The BAS shall include trend logging screens accessible from tabs on the home page for building utilities usage.
- C. System software shall, at a minimum, provide:
  - 1. Monitor and supervise all control points.
  - 2. Add new points and edit system database.
  - 3. Change control setpoints, timing parameters and loop tuning of PID coefficients in all control loops in all control units.
  - 4. Enter programmed start/stop schedules.
  - 5. View alarm and messages.
  - 6. Modify existing control logic (or sequence of operation) in all control units.
  - 7. Upload/Download programs, databases, control parameters, etc.
  - 8. Modify graphic screens.
- D. Sequence of operation programming methodology - The application software shall be user programmable. Application programming shall be (1) Line type programming that uses text programming in a language similar to BASIC or FORTRAN, or (2) graphical block programming - The method of programming shall be by manipulation of graphic icon "blocks." Each block represents a subroutine containing the programming necessary to execute the function of the device that the block represents.
- E. Unitary Control Unit Database Archiving - The host software shall provide capability to upload sequence of operation, database, and other control parameters from each controller. Uploaded programs shall be retained on hard disk for system backup. Programs may be modified using Editor functions and downloaded to individual controllers as desired. Downloading of databases shall not interrupt other multi-tasked functions that are ongoing.
- F. THIRD PARTY SOFTWARE PACKAGES: The host software shall provide the capacity to run third party software packages for word processing, spreadsheets, or database management programs. Use of third-party software shall not suspend operation of background tasks of multi-tasking operating system, such as alarm logging, and report generation.

### 3.9 GRAPHICS SCREENS AND TRENDS

- A. All graphics screens shall be submitted for review by Engineer. Provide the following animated, color graphics screens minimally:
- B. Entire floor plan home screen with OAT, Time, and Date displays.
  - 1. Floor plan showing major zones,
  - 2. Click major zone displays enlarged floor plan of the zone showing individual heat pump zones & numbers. Include link to respective mechanical room.

3. Click individual zone shows heat pump graphic. Display all data points from points list, occ/unocc schedule and setpoints, VAV cfm and setpoint, OAT, Time and Date.
- C. Color Graphic Screens shall be designed for all mechanical systems and shall include the following:
1. A graphic shall be the starting page with the building graphically indicated. Break up the floor plan into zones to match Contract Documents. The building shall be the point of reference to enter into the respective building control system.
  2. All terminal equipment including but not limited to VAV boxes, reheat coils, zone dampers, etc.
  3. All AHUs and OA units.
  4. Domestic hot water heaters and pumps.
  5. The summation of all supply OA for each unit shall be displayed on the AHU graphic pages.
  6. All floor plans indicate all actual room numbers, thermostats, and mechanical equipment. Operator shall be capable of clicking on any equipment and pull up the respective graphic screen.
- D. Graphics to include floor plans with room numbers (as-built room numbers) and thermostat locations, links to flow diagrams for heat pumps, zone dampers, hydronic loop systems, outside air systems, domestic hot water, and lighting controls.
- E. All new graphics shall match the existing system graphics, unless noted otherwise.
- F. The graphical programming software shall allow for interactive mouse-driven placement of block icons on the graphic screen and connection of block inputs to block outputs by means of drawing lines to form a graphic logic diagram. The user shall not have to manually input text to assign block input/output interconnections. Blocks shall allow entry of adjustable settings and parameters via pop-up windows.
- G. The clarity of sequence shall be such that the user has the ability to verify that the system programming meets the specs without having to learn or interpret a manufacturer's unique programming language. Provide a means for testing and/or debugging the control programs off-line (not communicating with control units) using operator entered values for physical inputs and time. Provide a means for testing and/or debugging the control programs on-line (communicating with control units), showing actual physical inputs and all block outputs in real time.
- H. Provide a utility that shall allow the graphic logic diagrams to be directly compiled into application programs. Logic diagrams shall be viewable either off-line, or on-line with real-time output values.
- I. All graphic software shall be in the html web browser format and support multiple simultaneous screens to be opened and resizable in a "Windows" type environment. All functions, except text entry, shall be executable with a mouse. Graphic software shall provide for multitasking such that third party programs can be used while the Operator Workstation Software is on-line. Provide the ability to alarm graphically even when operator is in another software package. The software shall allow for Owner to create user defined, color graphic displays of geographic maps, building plans, floor plans, and mechanical and electrical system schematics.

- J. The contractor shall provide libraries of pre-engineered screens and symbols depicting standard air handling unit components (e.g. fans, coils, filters, dampers, etc.), mechanical system components (e.g., pumps, heat pumps, etc.), complete mechanical systems (e.g. VAV, etc.) and electrical symbols.
- K. The graphic development package shall use a mouse or similar pointing device to allow the user to perform the following:
  - 1. Define symbols
  - 2. Position items on graphic screens
  - 3. Attach physical or virtual points to a graphic
  - 4. Define background screens
  - 5. Define connecting lines and curves
  - 6. Locate, orient and size descriptive text
  - 7. Define and display colors for all elements
  - 8. Establish correlation between symbols or text and associated system points or other displays.
  - 9. Create hot spots or link triggers to other graphic displays or other functions in the software
- L. The TCC shall including programming of 25-point trends as directed by the Engineer. These can be requested at any time during the project including the warranty period. Trend “change of state” for digital inputs. Trend analog points in 30-minute increments. Maintain trend history for 30 days. Include the following:
  - 1. Outside air temperature
  - 2. OA unit leaving air temperatures for each unit
  - 3. Summation of all VAV boxes connected to a unit
  - 4. VFD speeds (OA & EA)
  - 5. Water to water unit main supply and return temperatures (load side)
  - 6. Critical room space temperatures
  - 7. Domestic hot water supply temperatures
  - 8. Freezer/Cooler temperatures
  - 9. Makeup water flow rate
  - 10. Electrical power kW and kWh
  - 11. Others as directed in the field

### 3.10 TRAINING

- A. A formal on-site "Hands On" training session shall be conducted for the owner's maintenance personnel. This session shall be a minimum of three (3) (8) hour days to train the staff on setup, operation, and maintenance of all system(s) and/or devices. This will be at a time and location selected by the owner. One (1) additional eight (8) hour session shall be provided as “opposite season” training – generally 6 months into the warranty period. One (1) additional eight (8) hour session shall be provided at a later date. (This may be requested any time during the warranty period.) All training materials and books shall be provided. Both sessions shall be given by the manufacturers "factory" technical representative. (This is defined as someone other than the installing contractor's representative.) All expenses are to be provided by the TCC. All training sessions shall be scheduled at owner's request.



- B. TCC shall conduct training courses for designated personnel in operation and maintenance of system. Training shall be oriented to specific system being installed under his contract and shall be digitally recorded and submitted on DVD by the TCC.
- C. Training shall be a mix of, test exercises, and actual keyboard entry and screen viewing at the operator's terminal. A curriculum shall be discussed and implemented based on the level of expertise of the employees. Hands-on experience and problem solving shall be emphasized.
- D. If during any training session, the trainer/owner finds more than three (3) items that need repair, the training session will be immediately terminated. The session will be rescheduled for another date. The re-scheduled training session will be carried out at no additional cost to the Owner.
- E. The training shall be oriented to making the owner self sufficient in the day-to-day use and operation of the DDC system.
- F. Additionally, the training shall include:
  - 1. System start-up, shutdowns, power outage and restart routines, alarms, security levels, changing setpoints, changing schedules and other parameters, overrides, freeze protection, manual operation, return to automatic operation, and resetting equipment.
  - 2. All screens shall be discussed, allowing time for questions.
  - 3. Information specifically focused on showing the owner methods of troubleshooting the mechanical systems using the DDC.
  - 4. Use of laptop and hand-held operator interface device, if applicable.
  - 5. Creating, modifying, viewing, downloading, and reloading, trend logs.
  - 6. Remote access to the system.
  - 7. The other training sessions shall be oriented toward answering specific questions from Owner's staff.
  - 8. The trainer must be well grounded in both DDC system operation and in mechanical systems service and shall be the programmer.
- G. This documentation and process shall be complete, approved and accepted by Engineer and Owner prior to acceptance. This information shall be documented as completed. A copy shall be delivered to the Engineer and Owner and included in the O&M manuals.

### 3.11 COMMISSIONING & VERIFICATION, FUNCTION PERFORMANCE TESTING & CHECKLISTS:

- A. 100% compliance with the requirements of this section is a condition of the Owner's acceptance and start of the warranty period.
- B. The TCC shall be responsible for completion of (1) their hardware checkout sheets and test reports, (2) Point-by-point confirmations of ALL points – this includes visual inspection of installed components, and (3) sequence of operation confirmation.
- C. This documentation and process shall be complete, approved and accepted by Engineer and Owner prior to acceptance. This information shall be documented as completed. A copy shall be delivered to the Engineer and Owner and included in the O&M manuals. Each subcontractor shall be responsible for completion of their own System Verification

Checklists/Manufacturer's Checklists. Sample checklists shall be submitted to the Engineer and Testing Agent for approval.

- D. Air and water balancing shall be completed (and discrepancies resolved) before the TCC's final system check and before the acceptance test to be conducted in the presence of the Engineer.
- E. This project will be commissioned and the TCC shall be responsible for completing the functional performance testing of the control system sequences and graphics with the Commissioning Agent.

### 3.12 WARRANTY & SOFTWARE LICENSES

- A. Labor and materials for the control system specified shall be warranted free from defects for a period of 12 months after substantial completion and acceptance. Control system failures during the warranty period shall be adjusted, repaired, or replaced at no additional cost or reduction in service to the Owner.
- B. The TCC shall respond to the Owner's request for warranty service within 24 hours during normal business hours. The TCC shall respond to the Owner's request for Emergency service (defined as life-threatening or creating the potential to cause property damage) during the warranty period within 4 hours.
- C. The TCC shall provide technical phone support to the owner during the warranty period for warranty related issues and for two years after the warranty period. If the technical support location of the TCC is outside of the toll free calling area for the customer, the TCC shall have a toll free number or accept collect calls for the purpose of providing technical support.
- D. During the warranty period, standard parts for the DDC system shall arrive at the facility within 48 hours of placing an order. Non-standard parts (requiring re-manufacturing or ordering from another supplier) shall be shipped within 96 hours.
- E. Operator workstation software, project-specific software, graphic software, database software, and firmware updates which resolve known software deficiencies as identified by the TCC shall be provided and correctly installed at no charge during the warranty period.
- F. Provide licensed electronic copies of all software for each workstation, laptop, server. This includes but is not limited to: project graphic images (editing/modifying/creating), project database, trouble-shooting and debugging programs, project-specific programming code and all other software required to operate and modify the programming code (including software at system level, primary control units, secondary control units, and all communication software). Any hardware devices (cables, protection devices) required to operate the software/hardware shall also be provided.
- G. All additional licensing needed for this project shall be supplied by TCC. Software license shall not expire or utilize any sort of protection hardware device for its use. In any case owner shall be free to direct the modification of any software license, regardless of supplier to allow open access to all controllers. Owner shall hold the software and firmware licensing. Software license shall not expire or utilize any sort of protection hardware device for its use.

- H. System software shall be the latest version available with upgrades provided at the end of the warranty period and shall be fully licensed to the Owner for the entire system. Supply all software necessary for configuration of, modification, editing or communicating to any of the unitary devices. Software shall be capable of uploading and downloading the entire unitary data base or any part of the automated system for backup or archiving. Software shall be "IBM compatible".

END OF SECTION.

## SECTION 23 2113 - HYDRONIC PIPING

### PART 1 – GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The Contractor's attention is directed to the General and Special Conditions, COMMON WORK RESULTS FOR HVAC and to all other Contract Documents as they apply to this branch of the work. Attention is also directed to all other sections of the Contract Documents which affect the work of this section, and which are hereby made a part of the work specified in this section.
- B. Each Contractor's attention is also directed to Specification Section HANGERS, CLAMPS, ATTACHMENTS, ETC.
- C. The Contractor's attention is also directed to Specification Section SHOP DRAWINGS, MAINTENANCE, MANUALS AND PARTS LISTS FOR HVAC.
- D. The Contractor's attention is directed to Specification Section INSULATION - MECHANICAL.
- E. The Contractor's attention is directed to Specification Section PIPE FILLING, CLEANING, FLUSHING, PURGING AND CHEMICAL TREATMENT.

#### 1.2 SCOPE

- A. Unless otherwise indicated, all materials shall be new and of the best grade and quality for the type specified. Materials shall comply with the "Buy American Act".
- B. Where piping is not indicated on the plans, but is obviously or apparently required, contact the Engineer prior to submission of the bid.
- C. The piping indicated shall be installed complete and shall be of the size indicated. When a pipe size is not indicated, the Contractor shall request the pipe size from the manufacturer. Where a section of piping is not indicated but is obviously required for completion of the system, the Contractor shall provide same at no additional cost to the project.
- D. Pay particular attention to conflict of piping with other work. Do not install until conflict is resolved. If in doubt, consult Engineer.
- E. Piping materials in each system shall, to the extent practicable, be of the same material. Frequent changes of material (for example, from copper to steel) shall be avoided and in no case shall be accomplished without use of insulating unions and permission of the Engineers.
- F. Dielectric couplings or through ways shall be provided at all connections of dissimilar materials.

- G. Nipples shall be of the same material, composition, and weight classification as pipe with which installed.
- H. Plastic piping or any material with a flame and smoke spread rating not approved for plenum use shall not be permitted in supply, return, relief, or exhaust plenums.

## PART 2 – PRODUCTS

### 2.1 UNIONS, FLANGES AND WELDED TEES

- A. Screwed unions, soldered unions or bolted flanges shall be provided as required to permit removal of equipment, valves, and piping accessories from the piping system. Keep adequate clearances for coil removal, rodding, tube replacement, motor lubrication, filter replacement, etc. Flanged joints shall be assembled with appropriate flanges, gaskets, and bolting. The clearance between flange faces shall be such that the connections can be gasketed and bolted tight without imposing undue strain on the piping system.
- B. Dielectric insulating couplings or though ways shall be used wherever the adjoining materials being connected are of dissimilar metals such as connections between copper and steel pipe.
- C. Tee connections for welded pipe shall be assembled with welding fittings. Where the size of the side outlet is such that a different connection technique than on the run is required, a weldolet, sockolet, or threadolet type fitting may be used for the branch in place of reducing tees only where the branch is 2/3 the run size or smaller. Weld-o-let and thread-o-let branch connections are acceptable.

### 2.2 STANDARDS

- A. All piping and material shall be new, comply with the “Buy American Act” and shall conform to the following minimum applicable standards:
  - Steel pipe; Schedule 40; ASTM A-53.
  - Copper tube; Type K, L, M; ASTM B88-62; Type DWV ASTM B306-62.
  - Cast iron soil pipe; ASA A-40. I and CS 188-59.
  - Cast iron drainage fittings; ASA B16.12.
  - Cast iron screwed fittings; ASA B16.4.
  - Welding fittings; ASA B16.9.
  - Cast brass and wrought copper fittings; ASA B16.18.
  - Cast brass drainage fittings; ASA B16.23.
  - PVC pipe; Schedule 40; ASTM D-1785.
  - PVC pipe; Schedule 40; ASTM D2665 and D1784. Piping must be installed in compliance to the manufacturer’s recommendations which shall be made available to the plumbing inspector.

### 2.3 HVAC PIPING APPLICATIONS

- A. Condensate Drain Lines shall be polypropylene tubing with 1 -1/4 inch outside diameter PVC conduit.

- B. Refrigerant Piping: Type "L" copper tubing with forged or wrought copper fittings and silver soldered joints. Solder must have a minimum of 15% silver content.

### PART 3 – EXECUTION

- 3.1 All piping shall be capped or plugged during erection as required to keep clean and debris and moisture free.
- 3.2 All piping shall be installed straight and true, parallel, or perpendicular to the building construction. Piping shall be installed to allow for expansion without damage to the building finishes, structure, pipe, equipment, etc., use offsets, U-bends or expansion joints as required. No mitered joints or field fabricated pipe bends shall be accepted. Pipe shall clear all windows, doors, louvers, and other building openings.
- 3.3 All pipes shall be supported in a neat and workmanlike manner and wherever possible, parallel runs of horizontal piping shall be grouped together on hangers. Vertical risers shall be supported at each floor line with approved steel pipe riser clamps. Spacing of pipe supports shall not exceed eight (8) foot intervals for pipes 3" and smaller and ten (10) foot intervals on all other piping. Small vertical pipes (1" and less) shall be bracketed to walls, structural members, etc. at four (4) foot intervals so as to prevent vibration or damage by occupants.
- 3.4 The use of wire or perforated metal to support pipes will not be permitted. Hanging pipes from other pipes shall not be permitted.
- 3.5 Insulated piping shall be supported on a rigid insulation block at each hanger to prevent crushing of insulation by hangers. Hangers shall pass completely around the insulation jacket and a steel protective saddle shall be applied to prevent compression of the insulation.
- 3.6 In metal buildings or buildings with light gauge trusses, support piping with standard pipe hangers with C-clamp connection to main structural members (not perkins), use angle steel cross pieces between main structural members where required to provide rigid support.
- 3.7 Where piping rests directly on a hanger, clip, bracket or other means of support, the support element shall be of the same material as the pipe, (e.g., copper to copper, ferrous to ferrous, etc.) or shall be electrically isolated one from the other to prevent pipe damage by electrolysis. Pay particular attention and do not allow copper pipe to rest on ferrous structural members, equipment, etc. without electrolytic isolation. This includes temporary support required during Construction.
- 3.8 In general, piping shall be installed concealed except in mechanical rooms, etc. unless otherwise indicated, and shall be installed underground or beneath concrete slabs only where indicated. All lines at ceilings shall be held as high as possible and shall run to avoid conflicts with other trades, and to facilitate the Owner's use and maintenance. Location of pipe in interior partitions shall be carefully coordinated with whoever will construct the partitions after the piping is in place. Where exposed risers occur, they shall be kept as close to walls as possible.

- 3.9 Pipe shall be cut accurately to measurements established at the building by the Contractor and worked into place without springing or forcing. All pipes shall be reamed to full pipe diameter before joining and before assembling. All lengths of pipe shall be set vertically and tapped with a hammer to remove scale and dust and inspected to ensure that no foreign matter is lodged therein.
- 3.10 Piping carrying water or other fluids subject to freezing shall not be installed in locations subject to freezing. If in doubt, consult Engineer.
- 3.11 Apply approved pipe dope for service intended to all male threaded joints. The dope shall be listed for intended use.
- 3.12 Eccentric reducers shall be used where required to permit proper drainage and venting of pipe lines; bushings shall not be permitted.
- 3.13 Installation of pipe shall be in such a manner as to provide complete drainage of the system, whether detailed or not on plans. Drain valves shall be provided at all drainage points on pipes. Drain valves shall be 1/2" size ball valves with 3/4" hose thread end and vacuum breaker. Label each drain valve.
- 3.14 When running any type of pipe below a footing, perpendicular to the footing, the area underneath the footing and in the zone of influence shall be backfilled with concrete. The zone of influence is the area within a 45 degree angle projecting down from the top edge of footing on all sides of the footing.
- 3.15 When running any type of pipe below a footing, parallel to the footing, the area underneath the zone of influence shall be backfilled with 4" of crushed stone or sand bedding under the pipe. Each pipe section shall be anchored into unexcavated earth on both ends with deadman anchor system. The remainder of the trench in the zone of influence shall be backfilled with cementitious flowable fill. The zone of influence is the area within a 45 degree angle projecting down from the top edge of the footing on all sides of the footing.
- 3.16 PIPE TESTING:
- A. Piping shall be tested before being insulated or concealed in any manner. Where leaks or defects develop, required corrections shall be made and tests repeated until systems are proven satisfactory.
  - B. The Contractor shall perform all additional tests that may be required by all governing agencies.
  - C. Any leaks or imperfections found shall be corrected and a new test run until satisfactory results are obtained. The cost of repair or restoration of surfaces damaged by leaks in any system shall be borne by the Contractor.
- 3.17 PITCH OF PIPING

- A. All piping systems shall be installed to drain to a low point. Certain minimum pitches shall be required for this drainage. For proper flow and/or for proper operation, the following pitches shall be required:
- B. CONDENSATE DRAIN LINES FROM COOLING EQUIPMENT: Not less than  $\frac{1}{4}$ " per foot in direction of flow.
- C. ALL OTHER LINES: Provide ample pitch to a low point to allow 100 percent drainage of the system.

END OF SECTION



## SECTION 23 2300 – REFRIGERANT PIPING

### PART 1 – GENERAL:

#### 1.1 RELATED DOCUMENTS

- A. The Contractor's attention is directed to the General and Special Conditions, COMMON WORK RESULTS FOR HVAC and to all other Contract Documents as they apply to this branch of the work. Attention is also directed to all other sections of the Contract Documents which affect the work of this section, and which are hereby made a part of the work specified in this section.
- B. Each Contractor's attention is also directed to Specification Section HANGERS, CLAMPS, ATTACHMENTS, ETC.
- C. The Contractor's attention is also directed to Specification Section SHOP DRAWINGS, MAINTENANCE, MANUALS AND PARTS LISTS FOR HVAC.
- D. The Contractor's attention is directed to Specification Section INSULATION - MECHANICAL.

#### 1.2 SCOPE

- A. Unless otherwise indicated, all materials shall be new and of the best grade and quality for the type specified.
- B. Where piping is not indicated on the plans, but is obviously or apparently required, contact the Engineer prior to submission of the bid.
- C. The piping indicated shall be installed complete and shall be of the size as recommended by the equipment vendor. Where a section of piping is not indicated but is obviously required for completion of the system, the Contractor shall provide same at no additional cost to the project.
- D. Pay particular attention to conflict of piping with other work. Do not install until conflict is resolved. If in doubt, consult Engineer.
- E. Refrigerant piping must be installed to meet the HVAC equipment manufacturer's requirements. A refrigerant piping schematic shall be obtained from the equipment manufacturer which indicates pipe sizes, valves, traps, sight glasses and other required refrigerant specialties. While installing or soldering refrigerant lines, the piping system must be continuously purged with nitrogen. After the piping system is installed, the refrigerant system must be evacuated to 25 microns for eight hours. Contact Engineer 36 hours prior to installation of refrigerant lines or evacuation of refrigerant system.

### PART 2 – PRODUCTS:

#### 2.1 SPECIFICATIONS STANDARDS

- A. All piping and material shall be new and shall conform to the following minimum applicable standards:
  - Copper tube; Type L, ASTM B88-62.

#### 2.2 HVAC PIPING APPLICATIONS

- A. Refrigerant Piping Type "L" copper tubing with forged or wrought copper fittings and silver soldered joints. Solder must have a minimum of 15% silver content.

- Mechanically joined refrigerant joints such as Vulcan Lokring (or equivalent) shall be acceptable. The joining system must be approved for use by the VRF manufacturer and must be installed by an approved contractor with training in the mechanical joining system.

B. QUALITY ASSURANCE

- Refer to specification Section 23 05 00, COMMON WORK RESULTS FOR HVAC.
- Comply with ASHRAE Standard 15-2007, Safety Standard for Refrigeration Systems (ANSI Approved) and Standard 34-2007, Designation and Classification of Refrigerants. The application of this Code is intended to assure the safe design, construction, installation, operation, and inspection of every refrigeration system employing a fluid which normally is vaporized and liquefied in its refrigeration cycle.
- Installer: Company specializing in performing the work of this Section with minimum three years documented experience.
- D. Equipment Manufacturer, Delegated Refrigerant piping design: Design piping system under direct supervision of a Licensed Professional Engineer experienced in design of this work and employed or approved by the manufacturer of the equipment.

PART 3 – EXECUTION:

- 3.1 All piping shall be capped or plugged during erection as required to keep clean and debris and moisture free.
- 3.2 All piping shall be installed straight and true, parallel, or perpendicular to the building construction. Piping shall be installed so as to allow for expansion without damage to the building finishes, structure, pipe, equipment, etc., use offsets, U-bends or expansion joints as required. No mitered joints or field fabricated pipe bends shall be accepted. Pipe shall clear all windows, doors, louvers, and other building openings.
- 3.3 All pipes shall be supported in a neat and workmanlike manner and wherever possible, parallel runs of horizontal piping shall be grouped together on hangers. Vertical risers shall be supported at each floor line with approved steel pipe riser clamps. Spacing of pipe supports shall not exceed eight (8) foot intervals for pipes 3" and smaller. Small vertical pipes (1" and less) shall be bracketed to walls, structural members, etc. at four (4) foot intervals so as to prevent vibration or damage by occupants.
- 3.4 The use of wire or perforated metal to support pipes will not be permitted. Hanging pipes from other pipes shall not be permitted.
- 3.5 Hangers shall pass completely around the insulation jacket and a steel protective saddle shall be applied to prevent compression of the insulation.
- 3.6 In metal buildings or buildings with light gauge trusses, support piping with standard pipe hangers with C-clamp connection to main structural members (not perlins), use angle steel cross pieces between main structural members where required to provide rigid support.
- 3.7 Where piping rests directly on a hanger, clip, bracket or other means of support, the support element shall be of the same material as the pipe, (e.g., copper to copper, ferrous to ferrous, etc.) or shall be electrically isolated one from the other so as to prevent pipe damage by electrolysis. Pay particular attention and do not allow copper pipe to rest on ferrous structural members, equipment, etc. without electrolytic isolation. This includes temporary support required during construction.

- 3.8 In general, piping shall be installed concealed except in mechanical rooms, etc. unless otherwise indicated, and shall be installed underground or beneath concrete slabs only where indicated. All lines at ceilings shall be held as high as possible and shall run so as to avoid conflicts with other trades, and to facilitate the Owner's use and maintenance. Location of pipe in interior partitions shall be carefully coordinated with whoever will construct the partitions after the piping is in place. Where exposed risers occur, they shall be kept as close to walls as possible.
- 3.9 Pipe shall be cut accurately to measurements established at the building by the Contractor and worked into place without springing or forcing. All pipes shall be reamed to full pipe diameter before joining and before assembling. All lengths of pipe shall be set vertically and tapped with a hammer to remove scale and dust and inspected to ensure that no foreign matter is lodged therein.
- 3.10 PIPE TESTING:
- A. Piping shall be tested before being insulated or concealed in any manner. Where leaks or defects develop, required corrections shall be made and tests repeated until systems are proven satisfactory.
  - B. Any leaks or imperfections found shall be corrected and a new test run until satisfactory results are obtained. The cost of repair or restoration of surfaces damaged by leaks in any system shall be borne by the Contractor.
- 3.11 Refrigerant piping must be installed to meet the HVAC equipment manufacturer's requirements. A refrigerant piping schematic shall be obtained from the equipment manufacturer which indicates pipe sizes, valves, traps, sight glasses and other required refrigerant specialties. While installing or soldering refrigerant lines, the piping system must be continuously purged with nitrogen. After the piping system is installed, the refrigerant system must be evacuated to 25 microns for eight hours. Contact Engineer 36 hours prior to installation of refrigerant lines or evacuation of refrigerant system.
- 3.12 MANUFACTURER'S INSTRUCTION
- A. Compliance: comply with manufacturer's written recommendations or specifications, including design, product technical bulletins, handling, storage and installation instructions, and datasheet.
- 3.13 Contract Drawings
- A. Due to diagrammatic drawings, it is not possible to indicate all offsets, fittings, and accessories that may be required. Carefully investigate the plumbing, fire protection, electrical, structural and finish conditions that would affect the work to be performed and arrange such work, accordingly, furnishing required offsets, fittings, and accessories to meet such conditions.

END OF SECTION.

This page intentionally left blank.

## SECTION 233113 - METAL DUCTS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The Contractor's attention is directed to the General and Special Conditions, COMMON WORK RESULTS FOR HVAC and to all other Contract Documents as they apply to this branch of the work. Attention is also directed to all other sections of the Contract Documents which affect the work of this section, and which are hereby made a part of the work specified in this section.
- B. The Contractor's attention is directed to Specification Section SHOP DRAWINGS, MAINTENANCE, MANUALS AND PARTS LISTS FOR HVAC.

#### 1.2 SCOPE

- A. This branch of the work includes all materials, labor and accessories for the fabrication and installation of all sheet metal work as shown on the drawings and/or as specified herein. Where construction methods for various items are not indicated on the drawings or specified herein, all such work shall be fabricated and installed in accordance with the recommended methods outlined in the latest edition of SMACNA's Duct Manual and Sheet Metal Construction for Low Velocity Ventilating and Air Conditioning Systems. All equipment furnished by manufacturers shall be installed in strict accord with their recommended methods.
- B. Ductwork shall be constructed and installed per the latest edition of the International Mechanical Code.
- C. Ductwork shall be kept clean at all times. Ductwork stored on the job site shall be placed a minimum of 4" above the floor and shall be completely covered in plastic. Installed ductwork shall be protected with plastic. Do not install the ductwork if the building is not "dried-in". If this is required, the entire lengths of duct shall be covered in plastic to protect. The Owner/Engineer shall periodically ensure that these procedures are followed. If deemed unacceptable, the Contractor shall be required to clean the duct system utilizing a NADCA certified Contractor.
- D. Prior to purchase and fabrication of ductwork (shop fabricated or manufactured), the Contractor shall coordinate installations with new and existing conditions. Notify the Engineer if there are any discrepancies for resolution.

PART 2 - PRODUCTS

2.1 LOW VELOCITY DUCTWORK (Return, General Exhaust, Transfer, Supply air from VAV to dif-fuser, Supply air from heat pump)

- A. Ductwork, plenums, and other appurtenances shall be constructed of one of the following: Steel sheets, zinc coated, Federal Specification 00-S-775, Type I, Class E & ASTM A93-59T with G-90 zinc coating. Aluminum alloy sheets 3003, Federal Specification AA-A-359, Temper H-14.
- B. Ductwork, plenums, and other appurtenances shall be constructed of the materials of the mini-mum weights or gauges as required by the latest SMACNA 2" W.G. Standard or below table. When gauge thickness differs, the heavier gauge shall be selected. The below table shall serve as a minimum.

<u>Round Diameter</u>	<u>Duct Gauge</u>	<u>Rectangular Width</u>	<u>Duct Gauge</u>
3-12 Inches	26 Ga.	3-12 inches	26 Ga,
12-18 Inches	24 Ga.	13-30 inches	24 Ga.
19-28 Inches	22 Ga.	31-54 inches	22 Ga.
29-36 Inches	20 Ga.	55-84 inches	20 Ga.
37-52 Inches	18 Ga.	85 inches and up	18 Ga.

- C. All ductwork connections, fittings, joints, etc., including longitudinal and transverse joints, seams and connections shall be sealed. Seal with medium velocity, smooth-textured, water based duct sealant. Sealant shall be UL 181B-M listed, UL 723 classified, NFPA 90A & 90B compliant, per-manently flexible, non-flammable, and rated to 15"wg. Apply per manufacturer's recommenda-tions. Contractors shall insure no exposed sharp edges or burrs on ductwork.
- D. Duct dimensions indicated are required inside clear dimensions. Plan duct layouts for adequate insulation and fitting clearance. Internal duct liner, where applicable, must be accounted for. Refer to drawings and Section 2.7 for additional information.
- E. All angular turns shall be made with the radius of the center line of the duct equivalent to 1.5 times the width of the duct.
- F. Cross-break all ducts where either cross-sectional dimension is 18" or larger.
- G. Ducts shall be hung by angles, rods, 18 ga. minimum straps, trapezes, etc., in accordance with SMACNA's recommended practices. Duct supports shall not exceed 12 ft intervals. There shall be no less than one set of hangers for each section of ductwork. Where ductwork contains filter sections, coils, fans or other equipment or items, such equipment or items shall be hung inde-pendently of ductwork with rods or angles. Do not suspend ducts from purlins or other weak structural members where no additional weight may be applied. If in doubt, consult the Structural Engineer.
- H. Double turning vanes shall be installed in square turns and/or where indicated.
- I. Snaplock ductwork is acceptable for low velocity round runouts only. Snaplock must be sealed with duct sealant.

PART 3 - EXECUTION

- 3.1 Unless otherwise dimensioned on the drawings, all diffusers, registers, and grilles shall be locat-ed aesthetically and symmetrically with respect to lighting, ceiling patterns, doors, masonry bond, etc. Locate all supply, return, and exhaust diffusers and grilles in the locations shown on the arch-itectural reflected ceiling plan.

- 3.2 All ductwork connections, fittings, joints, etc., shall be sealed. Seal with high velocity, smooth-textured, water based duct sealant. Sealant shall be UL 181B-M listed, UL 723 classified, NFPA 90A & 90B compliant, permanently flexible, non-flammable, and rated to 15"wg. Apply per manufacturer's recommendations.
- 3.3 The interior surface of the ductwork connecting to return/exhaust air grilles shall be painted flat black. The ductwork shall be painted a minimum of 24" starting from the grille.
- 3.4 Exterior surfaces of all ductwork shall be painted based on architect choosing.
- 3.5 Provide approved flexible connectors at inlet and outlet of each item of heating and cooling equipment whether indicated or not. Install so as to facilitate removal of equipment as well as for vibration and noise control.
- 3.6 All fans and other vibrating equipment shall be suspended by independent vibration isolators.
- 3.7 Miscellaneous accessories such as test openings with covers, latches, hardware, locking devices, etc., shall be installed as recommended by SMACNA and/or as indicated. Test openings shall be placed at the inlet and discharge of all centrifugal fans, VAV boxes, fan sections of air handling units, at the end and middle of all main trunk ducts and where indicated. All such openings shall be readily accessible without damage to finishes.
- 3.8 The Contractor who installs the sheet metal shall furnish to the Air Balancing Contractor, a qualified person to assist in testing and balancing the system.
- 3.9 All grille and register taps shall be factory manifolded. Field installed taps will not be allowed. Manifolded taps may be tack welded and caulked for appearance. Only taps for grilles and registers may be provided this way. All other fittings shall be full body welded.
- 3.10 AIR LEAKAGE TESTING OF THE DUCTWORK SYSTEMS
- A. It is the intent of this section to ensure the ductwork installed has minimal air leakage. Air leakage testing shall be accomplished by an AABC certified company. Refer to the Test & Balance specifications. Whenever the systems are being leak tested by the Test & Balance Contractor, a representative from the Mechanical Contractor shall be present to assist.
- B. Carefully select the ductwork construction requirements and the type of duct sealant to be used as required to meet the leakage allowances. The sheet metal duct pressure classification is a minimum only. The Contractor shall select the appropriate sheet metal pressure classification, duct sealant class and duct sealant materials to meet the project air leakage allowances.
- C. All return and exhaust air sheet metal ductwork associated with the system shall be tested. Flexible ductwork shall not be tested. Cap the main duct prior to the central equipment fan connection. Also cap the branch ducts which serve the diffusers, after the round branch air volume with sheet metal caps. Seal caps well to damper to avoid air loss at this location. This air loss, from the caps, is included in the noted leakage rate.
- D. A duct pre-installation conference shall be held prior to the installation of the ductwork. Present should be the Owner, Engineer, Test & Balance Contractor, General Contractor, Mechanical Contractor, Sheet Metal Contractor, and Insulation Contractor. At this meeting, the Contractor shall advise all of the duct materials and sealant materials to be used to meet the air leakage allowances.
- E. It is the intent to test all ductwork. The duct systems which will require testing are as follows:
1. All FCU air duct systems

- F. Do not insulate the supply air systems prior to testing.
- G. The maximum allowable supply air leakage rate is 2.5% of the systems design CFM when the ductwork is pressurized to 2.5" WG. Therefore, if a supply air system is tested, and the supply air fan rated capacity is 10,000 CFM, the allowable leakage is 250 CFM. The maximum allowable return air and exhaust air leakage rate is 2.5% of the system design when the ductwork is pressurized to 1.50" WG.
- H. The noted allowable leakage rate is the total allowable. It shall include leakage associated with the following:
  - 1. All ductwork as described in above paragraphs.
  - 2. Access doors
  - 3. Volume dampers
  - 4. Relief air doors
  - 5. End caps used to seal ducts
- I. If any duct system fails a test, the Contractor shall reseal the system. It shall than be retested until the duct system meets the leakage allotment at no additional cost to the Owner.

A light test shall be performed by passing a lamp having a power rating of not less than 100 watts through the entire section of ductwork to be tested. The lamp shall be open so as to emit light equally in all directions perpendicular to the duct walls. A test shall be performed for the entire duct system, including the hood-to-duct connection. The duct work shall be permitted to be tested in sections, provided that every joint is tested. For *listed* factory-built grease ducts, this test shall be limited to duct joints assembled in the field and shall exclude factory welds.

END OF SECTION



## SECTION 233300 – AIRDUCT ACCESSORIES

### PART 1 – GENERAL:

#### 1.1 RELATED DOCUMENTS

- A. The Contractor's attention is directed to the General and Special Conditions, COMMON WORK RESULTS FOR HVAC and to all other Contract Documents as they apply to this branch of the work. Attention is also directed to all other sections of the Contract Documents which affect the work of this section, and which are hereby made a part of the work specified in this section.
- B. The Contractor's attention is directed to Specification Section SHOP DRAWINGS, MAINTENANCE, MANUALS AND PARTS LISTS FOR HVAC.

#### 1.2 SCOPE

- A. This branch of the work includes all materials, labor and accessories for the fabrication and installation of all sheet metal work as shown on the drawings and/or as specified herein. Where construction methods for various items are not indicated on the drawings or specified herein, all such work shall be fabricated and installed in accordance with the recommended methods outlined in the latest edition of SMACNA's Duct Manual and Sheet Metal Construction for Low Velocity Ventilating and Air Conditioning Systems. All equipment furnished by manufacturers shall be installed in strict accord with their recommended methods.
- B. Ductwork accessories shall be constructed and installed per the latest edition of the International Mechanical Code.
- C. Ductwork accessories shall be kept clean at all times. Ductwork stored on the job site shall be placed a minimum of 4" above the floor and shall be completely covered in plastic. Installed ductwork shall be protected with plastic. Do not install the ductwork if the building is not "dried-in". If this is required, the entire length of duct shall be covered in plastic to protect. The Owner/Engineer shall periodically ensure that these procedures are followed. If deemed unacceptable, the Contractor shall be required to clean the duct system utilizing a NADCA certified Contractor.
- D. Prior to purchase and fabrication of ductwork (shop fabricated or manufactured), the Contractor shall coordinate installations with new and existing conditions. Notify the Engineer if there are any discrepancies for resolution.

### PART 2 – PRODUCTS:

#### 2.1 LOW VELOCITY DUCTWORK ACCESSORIES

- A. Provide a "high efficiency" type take-off with round damper (Flexmaster STOD-B03 or approved equal) for all round duct branches from a rectangular main to a GRD. Refer to the detail on the drawings for all installation requirements.

- B. Miscellaneous accessories such as test openings with covers, latches, hardware, locking devices, etc., shall be installed as recommended by SMACNA and/or as indicated. Test openings shall be placed at the inlet and discharge of all centrifugal fans, VAV boxes, fan sections of air handling units, at the end and middle of all main trunk ducts and where indicated. All such openings shall be readily accessible without damage to finishes.
- C. FLEXIBLE CONNECTORS: Duro-Dyne, Ventfabrics, Inc., U.S. Rubber or equivalent; conforming to NFPA No. 90A; neoprene coated glass fabric; 20 oz. for low velocity ducts secured with snap lock.
- D. ACCESS DOORS IN DUCTWORK: Flexmaster TBSM, Air Balance, Vent Products or equal. Access doors for rectangular ducts shall be 16"x16" where possible. Otherwise install as large an access door as height permits by 16" in length. Door shall be 2" thick double-wall insulated with continuous hinge and cam lock. Provide in ducts where indicated or where required for servicing equipment whether indicated or not. Provide a hinged access door in duct adjacent to all fire, smoke, and control dampers for the purpose of determining position. Access doors shall also be provided on each side of duct coils and downstream side of VAV boxes and CAV boxes.
- E. ARCHITECTURAL ACCESS DOORS IN CEILINGS OR WALLS: Provide Kees D Panel, Cesco, Milcor or equal. Panels shall be 24"x24" in size and constructed with 16 gauge galvanized steel for door and frame. Provide with primer finish to accept specified finish. Door shall include three (3) screwdriver operated cam latches and concealed continuous pivoting rod hinge. Door shall open 175 degrees. For masonry construction, furnish frames with adjustable metal masonry anchors. For fire rated units, provide manufacturer's standard insulated flush panel/doors with continuous piano hinge and self-closing mechanism. The Contractor shall include all required access doors in the bid and shall coordinate with the General Contractor prior to the bid to insure a complete project.
- F. VOLUME DAMPERS (RECTANGULAR): Ruskin MD35 or Air Balance, Pottorff, rectangular volume dampers. Frames shall be 16-gauge galvanized steel. Blades shall be opposed blade 16-gauge galvanized steel with triple crimped blades on 6" centers. Linkage shall be concealed in jamb. Bearings shall be 1/2" nylon. Maximum single section size shall be 48" wide and 72" high. Provide with Ventfabrics 2" high elevated dial regulator to avoid damper handle from conflicting with duct insulation. Provide permanent mark on dial regulator to mark air balance point.
- G. VOLUME DAMPERS (ROUND): Ruskin MDRS25 or Air Balance, Pottorff round volume dampers. Dampers shall be butterfly type consisting of circular blade mounted to axle. Frames shall be 20-gauge steel and 6" long. Damper blades shall be 20 gauge crimped galvanized steel. Axle shall be 3/8"x6" square plated steel. Bearing shall be 3/8" nylon. Provide with Ventfabrics 2" high elevated dial regulator to avoid damper handle from conflicting with duct insulation. Provide permanent mark on dial regulator to mark air balance point.

PART 3 – EXECUTION:

- 3.1 Unless otherwise dimensioned on the drawings, all diffusers, registers, and grilles shall be located aesthetically and symmetrically with respect to lighting, ceiling patterns, doors, masonry bond, etc. Locate all supply, return, and exhaust diffusers and grilles in the locations shown on the architectural reflected ceiling plan.
- 3.2 All ductwork connections, fittings, joints, etc., shall be sealed. Seal with high velocity, smooth-textured, water-based duct sealant. Sealant shall be UL 181B-M listed, UL 723 classified, NFPA 90A & 90B compliant, permanently flexible, non-flammable, and rated to 15" wg. Apply per manufacturer's recommendations.
- 3.4 Miscellaneous accessories such as test openings with covers, latches, hardware, locking devices, etc., shall be installed as recommended by SMACNA or the duct manufacturer, and/or as indicated. Test openings shall be placed at the discharge of all air handling units and at the end and middle of all main trunk ducts and where indicated. All such openings shall be readily accessible without damage to finishes.
- 3.5 The interior surface of the ductwork connecting to return/exhaust air grilles shall be painted flat black. The ductwork shall be painted a minimum of 24" starting from the grille.
- 3.6 Provide approved flexible connectors at inlet and outlet of each item of heating and cooling equipment whether indicated or not. Install to facilitate removal of equipment as well as for vibration and noise control.
- 3.7 Double turning vanes shall be installed in square turns and/or where indicated.
- 3.8 Air volume dampers shall be installed in each duct branch takeoffs and/or where indicated, whichever is more stringent. All such dampers shall be accessible without damage to finishes or insulation and shall be provided where required for proper system balance.
- 3.9 All fans and other vibrating equipment shall be suspended by independent vibration isolators.
- 3.10 Miscellaneous accessories such as test openings with covers, latches, hardware, locking devices, etc., shall be installed as recommended by SMACNA and/or as indicated. Test openings shall be placed at the inlet and discharge of all centrifugal fans, VAV boxes, fan sections of air handling units, at the end and middle of all main trunk ducts and where indicated. All such openings shall be readily accessible without damage to finishes.
- 3.11 The Contractor who installs the sheet metal shall furnish to the Air Balancing Contractor, a qualified person to assist in testing and balancing the system.
- 3.12 All grille and register taps shall be factory manifolded. Field-installed taps will not be allowed. Manifolded taps may be tack welded and caulked for appearance. Only taps for grilles and registers may be provided this way. All other fittings shall be full body welded.

END OF SECTION.

## SECTION 233713 – DIFFUSERS, REGISTERS & GRILLES

### PART 1 – GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The Contractor's attention is directed to the General and Special Conditions, COMMON WORK RESULTS FOR HVAC and to all other Contract Documents as they apply to this branch of the work. Attention is also directed to all other sections of the Contract Documents which affect the work of this section, and which are hereby made a part of the work specified in this section.
- B. The Contractor's attention is directed to Specification Section HVAC.

### PART 2 – PRODUCTS

#### 2.1 REGISTERS, GRILLES, AND DIFFUSERS

- A. Acceptable R, G & D manufacturers are Krueger, Anemostat, Nailor Industries, Titus, and Tuttle & Bailey. Shop drawings shall identify and list all characteristics of each device exactly as scheduled herein. Finishes for specified devices shall be selected by the Architect. Factory color samples shall be submitted with shop drawings. Devices shall be white unless noted otherwise. Aluminized steel devices are not acceptable. Steel devices are not acceptable unless specifically noted otherwise.

- 2.2 Refer to drawings for schedule.

### PART 3 – EXECUTION

#### 3.1 EXAMINATION

- A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 INSTALLATION

- A. Install diffusers, registers, and grilles level and plumb.
- B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
- C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

### 3.3 ADJUSTING

- A. After installation, adjust diffusers, registers, and grilles to air patterns indicated on drawings, or as directed, before starting air balancing.

END OF SECTION.

## VARIABLE REFRIGERANT VOLUME SYSTEMS

### PART 1 - GENERAL:

#### 1.1 WORK INCLUDED

- A. Furnish and install a multiple evaporator (fan coil), direct expansion (DX), variable capacity HVAC system including scheduled fan coil units, wall mounted units, refrigerant piping, insulation, control wiring, and condensing units required to meet the performance as shown in the equipment schedules.

#### 1.2 QUALITY ASSURANCE

- A. The units shall be listed by Electrical Laboratories (ETL) and bear the cETL label.
- B. All wiring shall be in accordance with the National Electric Code (NEC).
- C. The system will be produced in an ISO 9001 and ISO 14001 facility, which are standards set by the International Standard Organization (ISO). The system shall be factory tested for safety and function.
- D. The outdoor unit will be factory charged with R-410A.

#### 1.3 PERFORMANCE

- A. The variable capacity heat pump air conditioning system shall be a Variable Refrigerant Volume (heat and cool model) split system as specified. The system shall consist of multiple evaporators, manufacturer supplied or approved refrigerant joints and headers, a two (or three) pipe refrigeration distribution system using PID control and matched variable speed outdoor condensing units. The outdoor unit is a direct expansion (DX), air-cooled heat pump, single-zone air-conditioning system with variable speed driven compressors using R-410A refrigerant. All zones are capable of operating separately with individual temperature control.
- B. Operation of the system shall permit either individual cooling or heating of each fan coil and wall mounted unit. Each fan coil or wall mounted unit shall be able to provide set temperature independently via an on-site central touch screen interface panel. The system shall also provide a BACnet interface to the campus central automation system.
- C. Each indoor unit or group of indoor units shall be independently controlled.
- D. Equipment capacities to meet LATs and Total and Sensible capacities as scheduled.

#### 1.4 STRUCTURAL REQUIREMENTS

- A. Provide factory assembled units complete with factory installed expansion valves, control boards, and all control devices. No field installation of control devices shall be required.

- B. Units shall be provided with access to control board, fans, motors, expansion valves etc. Access shall not be required through the ceiling tile system.
- C. Provide access for motor and filter compartments with door swing away from piping connections.

## 1.5 WARRANTY

- A. The units shall have the manufacturer's parts and labor warranty for a period of one (1) year from date of substantial completion. The compressors shall have a parts and labor warranty of ten (10) years from date of substantial completion. All warranty service work shall be performed by a factory trained service professional. Warranty shall be administered by the manufacturer or local manufacturer's distribution representative. All service persons shall be factory trained and certified. If the manufacturer or local distribution representative does not have a local service department, then the contractor shall assume all warranty obligations during this period. If warranty is a "contractor warranty" then it shall be clearly indicated in the equipment submittal. The contractor's factory certification shall be provided in the equipment submittal.

## PART 2 - PRODUCTS:

### 2.1 ACCEPTABLE MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide the LG system as indicated on drawings or approved equal comparable product by one of the following:
  - 1. Mitsubishi
  - 2. Daikin
  - 3. Samsung
- B. All bidders shall furnish the minimum system standards as defined by the base bid model numbers, model families or as otherwise specified herein. In any event, the contractor shall be responsible for all specified items and intents of this document without further compensation.
- C. Non-basis of design manufacturers shall provide the contractor a complete drawing package prior to bid allowing the bidding contractor proper time to accurately estimate the cost differences between the basis and non-basis of design. This information shall include but is not limited to:
  - 1. Refrigerant piping schematics including total system refrigerant charge.
  - 2. Refrigerant piping drawings drafted over scaled building plans showing no less information than is included on HVAC contract documents and must include:
    - a. Pipe sizes and length required, (indicate differences between contract document).
    - b. Location of any additional equipment required.
    - c. Location of any special manufacturer fittings required.
  - 3. Total system refrigerant quantities.
  - 4. Additional insulation requirements.
  - 5. Component electrical characteristics for all equipment including:
    - a. Minimum Circuit Amps (MCA).
    - b. Maximum Fuse Amps (MFA).
    - c. Maximum Starting Current (MSA).
    - d. Total Over Current Amps.
  - 6. Electrical wiring schematics.

7. Control wiring schematics.
  8. Changes in structural support requirements.
  9. Differences in quantity of any other system components necessary for non-basis.
- D. It is the responsibility of the installing contractor to include all additional installing cost, (mechanical and electrical), between basis of design and non-basis of design manufacturers.

## 2.2 PARTS AVAILABILITY

- A. The installed system shall have a minimum of one local parts distributor with local stock of all critical components. Local shall be defined as 60 mile radius from project site. Local availability shall include all fan blades, fan motors, compressors, circuit boards, valves, sensors, etc. If local stock of parts is not available, the manufacturer shall provide all warranty parts with next day freight availability at no additional cost to the district for 5 years. Unless parts are stocked locally, the district shall be provided with the following spare parts at no additional cost (to be delivered at startup):
1. Compressor of each size used on the project
  2. Fan blade for each style used on the project (condenser and all FCU)
  3. Circuit board for each model FCU and ACCU used

## 2.3 OPERATING RANGE

- A. The operating range in cooling will be 23°F DB ~ 122°F DB.
- B. The operating range in heating will be -13°F DB – 61°F DB

## 2.4 REFRIGERANT PIPING

- A. All Y-fittings, headers, T-fittings, and portions of the refrigerant piping that split refrigerant flow shall be sized and provided by the equipment manufacturer. Field fabrication of these components by the contractor shall not be acceptable.
- B. A refrigerant piping diagram showing each condensing unit system, line lengths, model numbers for manufacturer supplied fittings shall be computer generated by the manufacturer or manufacturer's representative using the manufacturer's selection and sizing software program. These diagrams shall be included in the equipment submittal for review by the engineer.

## 2.5 OUTDOOR UNIT

- A. The outdoor unit is designed specifically for use with the manufacturer's indoor fan coil unit series components.
1. The outdoor unit shall be factory assembled and pre-wired with all necessary electronic and refrigerant controls. The refrigeration circuit of the condensing unit shall consist of scroll compressors, motors, fans, condenser coil, electronic expansion valves, solenoid valves, 4-way valve, distribution headers, capillaries, filters, shut off valves, oil separators, service ports and refrigerant regulator.
  2. High/low pressure gas line, liquid and suction lines must be individually insulated between the outdoor and indoor units.



3. The outdoor unit can be wired and piped with outdoor unit access from the left, right, rear or bottom.
4. The connection ratio of indoor units to outdoor unit shall be permitted up to that scheduled.
5. Each outdoor system shall be able to support the connection of up to 12 indoor units dependent on the model of the outdoor unit.
6. The sound pressure level standard shall be that value as listed in the equipment schedule. The outdoor unit shall be capable of operating automatically at further reduced noise during night time.
7. The system will automatically restart operation after a power failure and will not cause any settings to be lost, thus eliminating the need for reprogramming.
8. The unit shall incorporate an auto-charging feature and a refrigerant charge check function. If units without an auto-charge function are used, a factory service representative must be present at startup to weigh in the refrigerant charge (no exceptions). The service person must be a paid employee of the manufacturer, a factory trained 3rd party is not acceptable.
9. The outdoor unit shall be modular in design and should allow for side-by-side installation with minimum spacing.
10. The following safety devices shall be included on the condensing unit; high pressure switch, control circuit fuses, crankcase heaters, fusible plug, high pressure switch, overload relay, inverter overload protector, thermal protectors for compressor and fan motors, over current protection for the inverter and anti-recycling timers.
11. To ensure the liquid refrigerant does not flash when supplying to the various indoor units, the circuit shall be provided with a sub-cooling feature.
12. Oil recovery cycle shall be automatic occurring 2 hours after start of operation and then every 8 hours of operation.
13. The outdoor unit shall be capable of heating operation at 0°F dry bulb ambient temperature without additional low ambient controls.
14. The system shall continue to provide heat to the indoor units in heating operation while in the defrost mode.

B. Unit Cabinet:

1. The outdoor unit shall be completely weatherproof and corrosion resistant. The unit shall be constructed from rust-proofed mild steel panels coated with a baked enamel finish.

C. Fan:

1. The condensing unit shall consist of one or more propeller type, direct-drive fan motors that have multiple speed operation via a DC (digitally commutating) inverter.
2. The condensing unit fan motor shall have multiple speed operation of the DC (digitally commutating) inverter type, and be of high external static pressure and shall be factory set as standard at 0.16 in. WG. A field setting switch to a maximum 0.32 in. WG pressure is available to accommodate field applied duct for indoor mounting of condensing units.
3. The fan shall be a vertical discharge configuration.
4. Nominal sound pressure levels shall be as shown below.
5. The fan motor shall have inherent protection and permanently lubricated bearings and be mounted.
6. The fan motor shall be provided with a fan guard to prevent contact with moving parts.
7. Night setback control of the fan motor for low noise operation by way of automatically limiting the maximum speed shall be a standard feature. Operation sound level shall be selectable from 3 steps as shown below.

Operation Sound (dB)	Night Mode Sound Pressure Level (dB)
----------------------	---

Step 1 max.	57
-------------	----

D. Condenser Coil:

1. The condenser coil shall be manufactured from copper tubes expanded into aluminum fins to form a mechanical bond.
2. The heat exchanger coil shall be of a waffle louver fin and rifled bore tube design to ensure high efficiency performance.
3. The heat exchanger on the condensing units shall be manufactured from Hi-X seamless copper tube with N-shape internal grooves mechanically bonded on to aluminum fins to an e-Pass Design.
4. The fins are to be covered with an anti-corrosion acrylic resin and hydrophilic film type E1.
5. The pipe plates shall be treated with powdered polyester resin for corrosion prevention. The thickness of the coating must be between 2.0 to 3.0 microns.

E. Compressor:

1. The scroll compressors shall be variable speed, inverter controlled, which is capable of changing the speed to follow the variations in total cooling and heating load as determined by the suction gas pressure as measured in the condensing unit. In addition, samplings of evaporator and condenser temperatures shall be made so that the high/low pressures detected are read every 20 seconds and calculated. With each reading, the compressor capacity (INV frequency or STD ON/OFF) shall be controlled to eliminate deviation from target value.
2. The inverter driven compressor in each condensing unit shall be of highly efficient reluctance DC (digitally commutating), hermetically sealed scroll “G-type.”
3. Neodymium magnets shall be adopted in the rotor construction to yield a higher torque and efficiency in the compressor instead of the normal ferrite magnet type. At complete stop of the compressor, the neodymium magnets will position the rotor into the optimum position for a low torque start.
4. The capacity control range shall be as low as 6% to 100%.
5. Each non-inverter compressor shall also be of the hermetically sealed scroll type.
6. Each compressor shall be equipped with a crankcase heater, high pressure safety switch, and internal thermal overload protector.
7. Oil separators shall be standard with the equipment together with an intelligent oil management system.
8. The compressor shall be spring mounted to avoid the transmission of vibration.
9. In the event of compressor failure, the remaining compressors shall continue to operate and provide heating or cooling as required at a proportionally reduced capacity. The microprocessor and associated controls shall be designed to specifically address this condition and generate an alarm to the fan coil unit controllers, centralized touch screen and central automation system.
10. In the case of multiple condenser modules, conjoined operation hours of the compressors shall be balanced by means of the Duty Cycling Function, ensuring sequential starting of each module at each start/stop cycle, completion of oil return, completion of defrost or every 8 hours.
11. Control wiring to be installed per manufacturer requirements. Wire type to be 18 AWG, 2-conductor, twisted, stranded, and shielded.

F. Electrical:

1. The power supply to the outdoor unit shall be 240 volts, 1 phase, 60 hertz +/- 10%.
2. The control wiring shall be a two-wire multiplex transmission system, making it possible to connect multiple indoor units to one outdoor unit with one 2-cable wire, thus simplifying

the wiring operation. Manufacturer shall provide control wiring diagram with equipment submittals.

3. The control wiring lengths shall be as shown below.

2.6 FAN COIL UNIT (DUCTED)

A. General:

1. Unit shall be a concealed fan coil unit, operable with R-410A refrigerant, equipped with an electronic expansion valve (factory installed). The unit shall be constructed of a galvanized steel casing. It shall be a horizontal discharge air with horizontal return air configuration. Computerized PID control shall be used to control superheat to deliver a comfortable room temperature condition. The unit shall be equipped with a programmed drying mechanism that dehumidifies while inhibiting changes in room temperature when used with manufacturer supplied remote control. Included as standard equipment, a long-life filter that is mold resistant and a condensate drain pan. The indoor units sound pressure shall range from 48 dB(A) to 50 dB(A) at low, medium or high speeds tested in accordance to ISO Standard 3745.

B. Indoor Unit:

1. The indoor unit shall be completely factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, condensate drain pan, condensate drain pump, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch. The unit shall have an adjustable external static pressure switch.
2. Indoor unit and refrigerant pipes will be charged with dehydrated air prior to shipment from the factory.
3. Both refrigerant lines shall be insulated from the outdoor unit.
4. Return air shall be through a net mold resistant filter.
5. The indoor units shall be equipped with a condensate pan.
6. The indoor units shall be wrapped with an acoustic blanket.
7. The indoor units shall be equipped with a return air thermistor.
8. The indoor unit will be separately powered with 240V/1-phase/60Hz.
9. The voltage range will be 253 volts maximum and 187 volts minimum.
10. Switch box shall be reached from the side or bottom for ease of service and maintenance.

C. Unit Cabinet:

1. The cabinet shall be located within open framework and ducted to the supply and return openings.
2. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.
3. Optional high efficiency air filters are available for each model unit.

D. Fan:

1. The fan shall be direct-drive, statically and dynamically balanced impeller with high medium and low fan speeds available.
2. The fan motor shall operate on 240 volts, 1 phase, 60 hertz with a motor output range from 1 to 1.1 HP.
3. The airflow rate shall be available in high, medium, and low settings.
4. The fan motor shall be thermally protected.
5. Fan motor external static pressure:

Model Number	Fan ESP Min/Max (in. WG)
--------------	--------------------------

ARNU763b8a4	0.47~0.98
-------------	-----------

- E. Filter:
  - 1. The return air shall be filtered by means of a washable long-life filter with mildew proof resin.
  
- F. Coil:
  - 1. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.
  - 2. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.
  - 3. The refrigerant connections shall be flare connections.
  - 4. Condensate shall be polypropylene tubing with 1 -1/4 inch outside diameter PVC conduit.
  - 5. A condensate pan shall be located under the coil.
  - 6. A thermistor will be located on the liquid and gas line.
  
- G. Electrical:
  - 1. A separate power supply will be required of 240 volts, 1 phase, 60 hertz. The acceptable voltage range shall be 187 to 253 volts.
  - 2. Transmission (control) wiring between the indoor and outdoor unit shall be a maximum of 3,280 feet (total 6,560 feet).
  - 3. Transmission (control) wiring between the indoor unit and remote controller shall be a maximum distance of 1,640 feet.
  
- H. Control:
  - 1. The unit shall have controls provided by manufacturer to perform input functions necessary to operate the system.
  - 2. The unit shall be compatible with interfacing with connection to BACnet via interfacing with connection to BMS system. Consult with manufacturer prior to applying controls.

## 2.7 WALL MOUNTED UNITS

- A. General: Indoor unit shall be a wall mounted fan coil unit, operable with refrigerant R-410A, equipped with an electronic expansion valve, for installation onto a wall within a conditioned space. Compact design with finished white casing computerized PID control shall be used to control superheat to deliver a comfortable room temperature condition. The unit shall be equipped with a programmed drying mechanism that dehumidifies while limiting changes in room temperature. A mildew-proof, polystyrene condensate drain pan and resin net mold resistant filter shall be included as standard equipment. The indoor units sound pressure shall range from 34 dB(A) to 46 dB(A) at low, medium or high speeds tested in accordance to ISO Standard 3745.
  
- B. Indoor Unit:
  - 1. Indoor unit shall be completely factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, condensate drain pan, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch. The unit shall have an auto-swing louver which ensures efficient air distribution, which closes automatically when the unit stops. The remote controller shall be able to set five (5) steps of discharge angle. The front grille shall be easily removed for washing. The discharge angle shall automatically set at the same angle as the previous operation upon restart. The drain pipe can be fitted to from either left or right sides.

2. Indoor unit and refrigerant pipes will be charged with dehydrated air prior to shipment from the factory.
  3. Both refrigerant lines shall be insulated from the outdoor unit.
  4. Return air shall be through a resin net mold resistant filter.
  5. The indoor units shall be equipped with a condensate pan and external condensate pump.
  6. The indoor units shall be equipped with a return air thermistor.
  7. The indoor unit will be separately powered with 204V/1-phase/60Hz.
  8. The voltage range will be 253 volts maximum and 187 volts minimum.
- C. Unit Cabinet
1. The cabinet shall be affixed to a factory supplied wall mounting template and located in the conditioned space.
  2. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.
- D. Fan:
1. The fan shall be a direct-drive cross-flow fan, statically and dynamically balanced impeller with high, medium and low fan speeds available.
  2. The fan motor shall operate on 240 volts, 1 phase, 60 hertz with a motor output range 0.054 to 0.058 HP.
  3. The airflow rate shall be available in high, medium and low settings.
  4. The fan motor shall be thermally protected.
- E. Coil:
1. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.
  2. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.
  3. The coil shall be a 2-row cross fin copper evaporator coil with 14 fpi design completely factory tested.
  4. The refrigerant connections shall be flare connections and condensate shall be polypropylene tubing with 1 -1/4 inch outside diameter PVC conduit.
  5. A thermistor will be located on the liquid and gas line.
  6. A condensate pan shall be located in the unit.
- F. Control:
1. The unit shall have controls to perform input functions necessary to operate the system.
  2. The unit shall be compatible with interfacing with connection to BMS system.
  3. The unit shall be compatible with an intelligent Touch advanced multi-zone controller or an intelligent Manager III customizable BMS. Consult with LG prior to applying controls.

## CONTROLS

- A. Each zone shall be supplied with a wall mounted thermostat controller. The controller shall have a backlit LCD display and be able to support the following display items and user input operations:
1. On/Off control
  2. Manual change of mode of operation
  3. Fan speed
  4. Setpoint adjustment

5. Reading of both setpoint temp, actual room temp, fan speed setting, and mode of operation on the unit display.
- B. Each classroom and recreation hall will have a primary indoor unit and a secondary indoor unit for a single thermostat serving the zone. The primary indoor unit will be hardwired to the thermostat and then also wired to the secondary indoor unit. The secondary indoor unit will be set up as 'Secondary' via a dip switch by the TCC. The secondary indoor unit will activate based on the signal from the primary indoor unit and will not receive a signal from the BACnet controller. Consult with LG prior to applying controls.
- C. The controllers shall be capable of diagnostic use and provide malfunction codes to indicate the type of failure that has occurred.
- D. The controllers shall be capable of accepting independent setpoints for cooling and heating operation. The use of a common setpoint is not allowable due to wide swings in space temperature resulting from "dead band" resulting from a common setpoint.
- E. The system shall provide automatic change-over from heating to cooling mode of operation. If, in heating mode, the space temperature rises 1 degree above the cooling setpoint, the system shall change from heating to cooling mode. If, in cooling mode, the space falls 1 degree below the heating setpoint, the system shall change from cooling to heating mode. Auto-change-over is required for all systems (heat pump and heat recovery). If not available in heat pump system, then the manufacturer must provide heat recovery to meet this requirement.
- F. Adjustable setback temperature – The controllers shall allow for independent and adjustable setback temperature at each unit. The setback temperature (adjustable) shall determine the "override" temperature to start the system when in setback mode if the temperature rises or falls outside of the specified range.

2.8 CONTROLS INTERFACE, (BACnet).

- A. Provide BACnet interface. Interface shall communicate with BACnet clients via BACnet over ethernet with the following information being available.

ON/OFF Status	Monitors ON/OFF status of the respective air conditioners.
Alarm Sign	Monitors whether air conditioners are operating normally and, if not, sends out an alarm sign.
Error Code	Displays error code specified by the respective manufacturer if an abnormality occurs in the system.
Operation Mode	Monitors status of cooling, heating, and ventilation operation.
Room Temperature	Monitors room temperature and displays the actual room temperature.
Filter Limit	Checks the limit of filters in use and monitors if there is a necessity to replace the filters.
Thermostat Status	Monitors whether the thermostat in the air conditioner is operating properly.
Compressor Status	Monitors whether compressors in outdoor units that are connected to the indoor units are operating properly.
Indoor Fan Status	Monitors whether fans in the air conditioners are operating properly.
Heater Operation	Monitors whether heaters in the air conditioners are

Status	operating properly.
ON/OFF Operation	Starts and stops the respective air conditioners and monitors control results.
Operation Mode Setting	Sets the operation mode (cooling, heating, ventilation or auto mode) and monitors the setting results.
Room Temperature Setting	Sets room temperatures of the respective air conditioners and monitors the setting results.
Filter Limit and Reset	Checks whether there is a use limit for the respective filters and then resets the sign as necessary.
Remote Control Operation Rejection	Sets the permission/rejection function of remote controllers in order not to allow operation control, such as ON/OFF, operation mode and room temperature, from the remote controllers.
Sub Group Address Control Operation Rejection	Sets the control permission/rejection function of centralized devices (i.e., air conditioners in a sub group address) connected on the DIII-NET.
Airflow Rate Setting Operation	Sets the airflow rate and monitors the setting results.
Air Direction Setting Operation	Sets the air direction and monitors the setting results.
System Forced OFF Setting Rejection	Upon receiving a Forced OFF Command, checks whether it is a normal reset or forced OFF and then operates as necessary.
Forced Thermostat OFF Setting	Upon receiving a Thermostat OFF command, checks whether it is a rest or set and then monitors setting results.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION REQUIREMENTS

- A. The system must be installed by a factory trained contractor/installer. The bidders shall be required to submit training certification proof prior to award of contract. The mechanical contractor's installation price shall be based on the systems installation requirements. The mechanical contractor bids with complete knowledge of the HVAC system requirements.
- B. Install units level and plumb.
- C. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.
- D. Install ground-mounted, compressor-condenser components on 4-inch- (100-mm-) thick, reinforced concrete base that is 4 inches (100 mm) larger, on each side, than unit. Concrete, reinforcement, and formwork to be provide as per manufacturer requirements and submitted for review in shop drawings.

- E. Install ground-mounted, compressor-condenser components on polyethylene mounting base.

### 3.2 CONNECTIONS

- A. Where piping is installed adjacent to unit, allow space for service and maintenance of unit.
- B. Duct Connections: Duct installation requirements are specified in Division 23 Section "Metal Ducts" Drawings indicate the general arrangement of ducts. Connect supply and return ducts to split-system air-conditioning units with flexible duct connectors. Flexible duct connectors are specified in Division 23 Section "Air Duct Accessories."

### 3.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- B. Perform tests and inspections.
  - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- C. Tests and Inspections:
  - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
  - 2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
  - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Remove and replace malfunctioning units and retest as specified above.
- E. Prepare test and inspection reports.

### 3.4 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
  - 1. Complete installation and startup checks according to manufacturer's written instructions.

### 3.5 SEASONAL SYSTEM TESTING

- A. Depending upon substantial completion of the system, contractors to perform system tests within seasonal changes to ensure proper working conditions of installed system.

### 3.6 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units.



END OF SECTION 23 81 50

## SECTION 260010 - GENERAL REQUIREMENTS FOR ELECTRICAL SYSTEMS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. The Instructions to Bidders, General and Special Conditions, and all other contract documents shall apply to the Contractor's work as well as to each Sub Contractor's work. Each Contractor is directed to familiarize themselves in detail with all documents pertinent to this Contract. In case of conflict between these General Provisions and the General and/or Special Conditions, the affected Contractor shall contact the Engineer for clarification and final determination.
- C. Each Contractor shall be governed by any alternates, unit prices and Addenda or other contract documents insofar as they may affect their part of the work.

#### 1.2 SUMMARY

- A. Section Includes general requirements applicable to work specified in Divisions 26.
- B. The work included in this division consists of the furnishing of all labor, equipment, transportation, supplies, material, and appurtenances and performing all operations necessary for the satisfactory installation of complete and operating Electrical Systems indicated on the drawings and/or specified herein.
- C. Any materials, labor, equipment, or services not mentioned specifically herein which may be necessary to complete or perfect any part of the Electrical Systems in a substantial manner, in compliance with the requirements stated, implied, or intended in the drawings and specifications, shall be included as part of this Contract. The Contractor shall give written notice of any materials or apparatus believed inadequate or unsuitable; in violation of laws, ordinances, rules, or regulations of authorities having jurisdiction; and any necessary items of work omitted a minimum of ten days prior to bid. In the absence of such written notice and by the act of submitting a bid, it shall be understood that the Contractor has included the cost of all required items in their bid, and that they will be responsible for the approved satisfactory functioning of the entire system without extra compensations.
- D. It is not the intent of this section of the specifications (or the remainder of the contract documents) to make any specific Contractor, other than the Contractor holding the prime contract, responsible to the Owner, Architect and Engineer. All transactions such as submittal of shop drawings, claims for extra costs, requests for equipment or materials substitution, shall be done through the Contractor to the Architect (if applicable), then to the Engineer.

- E. This section of the Specifications or the arrangement of the contract documents shall not be construed as an attempt to arbitrarily assign responsibility for work, material, equipment or services to a particular trade Contractor or Sub-Contractor. Unless stated otherwise, the subdivision and assignment of work under the various sections shall be the responsibility of the Contractor holding the prime contract.
- F. Any reference within these specifications to a specific entity, i.e., "Electrical Contractor" is not to be construed as an provide to limit or define the scope of work for that entity or assign work to a specific trade or contracting entity. Such assignments of responsibility are the responsibility of the Contractor holding the prime contract, unless otherwise provided herein.
- G. In each of the specifications and drawings referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" had been substituted for "should" wherever it appears.
- H. Intent and Interpretation
  - 1. It is the intent of these specifications and all associated drawings that the Contractor provide finished work, tested, and ready for operation. Wherever the word "provide" is used, it shall mean "furnish and install complete, tested and ready for operation."
  - 2. Minor details not usually shown or specified, but necessary for the proper installation and operation, shall be included in the work, the same as if herein specified or shown.
  - 3. It is the intention of the Contract Documents to call for a complete and operational system, including all components, accessories, finish work, etc. as necessary for trouble free operation, tested and ready for operation. Anything that may be required, implied, or inferred by the Contract Documents shall be provided and included as part of the Bid.
  - 4. All Contractors and Vendors providing a bid for this project shall review the Plans and Specifications and determine any modifications and/or adjustments necessary relative to the proposed equipment and materials with specific manufacturer's installation requirements. Include in the bid any necessary installation methods, features, options, accessories, etc. necessary to install the proposed equipment and materials, regardless of whether used as basis of design or being offered as a substitution in accordance with the specific manufacturer's installation requirements whether specifically detailed or not within the Plans and Specifications.
  - 5. The Bidder/Proposer shall completely review the Contract Documents. Any interpretation as to design intent or scope shall be provided by the Engineer/Architect. Should an interpretation be required, the Bidder/Proposer shall request a clarification not less than ten days prior to the submission of the proposal so that the condition may be clarified by Addendum. In the event of any conflict, discrepancy, or inconsistency develops; the interpretation of the Engineer shall be final.
  - 6. The Contractor shall give written notice of any materials or apparatus believed inadequate or unsuitable; in violation of laws, ordinances, rules, or regulations of authorities having jurisdiction; and any necessary items of work omitted a minimum of ten days prior to bid. In the absence of such written notice and by the act of submitting a bid, it shall be understood that the Contractor has included the cost

of all required items in the bid, and that will be responsible for the approved satisfactory functioning of the entire system without extra compensations.

I. Drawings and Specifications

1. The drawings are diagrammatic only and indicate the general arrangement of the systems and are to be followed insofar as possible. If deviations from the layouts are necessitated by field conditions, detailed layouts of the proposed departures shall be submitted in writing to the Engineer for approval before proceeding with the work. The Contract Drawings are not intended to show every vertical or horizontal offset which may be necessary to complete the systems. Contractors shall, however, anticipate that additional offsets may be required and submit their bid accordingly.
2. The drawings and specifications are intended to supplement each other. No Contractor, bidder, proposer, or supplier shall take advantage of conflict between them, or between parts of either, but should this condition exist, the Contractor or supplier shall request a clarification of the condition at least ten days prior to the submission of bids so that the condition may be clarified by Addendum. In the event that such a condition arises after work is started, the interpretation of the Engineer shall be the determining factor. In all instances, unless modified in writing and agreed upon by all parties thereto, the Contract to accomplish the work shall be binding on the affected Contractor.
3. The drawings and specifications shall be considered to be cooperative and complimentary and anything appearing in the specifications which may not be indicated on the drawings or conversely, shall be considered as part of the Contract and must be executed the same as though indicated by both.
4. This Contractor shall make all their own measurements in the field and shall be responsible for correct fitting. They shall coordinate this work with all other branches of work in such a manner as to cause a minimum of conflict or delay.
5. The Engineer shall reserve the right to make minor adjustments in location of conduit, fixtures, outlets, switches, etc., where they consider such adjustments desirable in the interest of concealing work or presenting a better appearance.
6. Each Contractor shall evaluate ceiling heights called for on Architectural Plans and ensure that these heights may be maintained after all mechanical and electrical equipment is installed. Where the location of Electrical equipment may interfere with ceiling heights, the Contractor shall call this to the attention of the Engineer in writing prior to making the installation. Any such changes shall be anticipated and requested sufficiently in advance so as to not cause extra work on the part of the Contractor or unduly delay the work.
7. Should overlap of work between the various trades become evident, this shall be called to the attention of the Engineer. In such an event, neither trade shall assume that he is to be relieved of the work which is specified under his branch until instructions in writing are received from the Engineer.
8. The Electrical drawings are intended to show the approximate location of equipment, materials, etc. Dimensions given in figures on the drawings shall take precedence over scaled dimensions and all dimensions whether given in figures or scaled shall be verified in the field. In case of conflict between small- and large-scale drawings, the larger scale drawings shall take precedence.
9. The Electrical Contractor and their Sub-Contractors shall review all drawings in detail as they may relate to his work (structural, architectural, site survey, mechanical, etc.). Review all drawings for general coordination of work,

responsibilities, ceiling clearances, wall penetration points, chase access, fixture elevations, etc. Make any pertinent coordination or apparent conflict comments to the Engineers at least ten days prior to bids, for issuance of clarification by written addendum.

10. Where on any of the drawings a portion of the work is drawn out and the remainder is indicated in outline, or not indicated at all, the parts drawn out shall apply to all other like portions of the work. Where ornament or other detail is indicated by starting only, such detail shall be continued throughout the courses or parts in which it occurs and shall also apply to all other similar parts of the work, unless otherwise indicated.

### 1.3 COST BREAKDOWN AND PAY APPLICATIONS

- A. Within thirty days after acceptance of the Contract, each Contractor is required to furnish to the Engineer one copy of a detailed cost breakdown on each respective area of work. These cost breakdowns shall be made on forms provided or approved by the Engineer or Architect. Payments will not be made until satisfactory cost breakdowns are submitted. Refer to Division 00 and 01 specification sections for additional requirements.
- B. In addition to cost breakdowns by specification section, the following shall also be provided: Material and labor shall be listed separately. These items are in addition to items listed in Division 01 specifications. Pay special attention to required withholding percentages for startup, testing, documentation, acceptance, owner training, etc. The breakdown shall be minimally as follows:
  1. Permitting
  2. Mobilization
  3. Electrical Submittals
  4. Electrical Coordination Drawings
  5. Temporary Power
  6. Interior Lighting Materials & Labor
  7. Exterior Lighting Materials & Labor
  8. Lighting Controls Materials & Labor
  9. Lighting and Lighting Controls Startup, Testing, & Verification (equal to 2.5% of Equipment Value)
  10. Electrical Distribution Equipment Materials & Labor
  11. Electrical Distribution Equipment Power System Study & Field Adjusting
  12. Feeders Materials & Labor
  13. Branch Circuiting Materials & Labor
  14. Service Grounding Materials & Labor
  15. Surge Suppression Materials & Labor
  16. Electrical Devices Materials & Labor
  17. Underground Duct Banks Materials & Labor
  18. Owner Training
  19. Punchlist
  20. As-Built/Record Drawings
  21. O&M Manuals
  22. Warranty
  23. Demobilization

## 1.4 REFERENCES

### A. Abbreviations and Acronyms

1. A, AMP: Ampere
2. ADA: Americans with Disabilities Act.
3. AFF: Above Finished Floor
4. AFG: Above Finished Grade
5. AHJ: Authority Having Jurisdiction
6. AHU: Air Handling Unit
7. AIC: Amps Interrupting Capacity
8. ANSI: American National Standards Institute.
9. ASA: American Standards Association.
10. ASTM: American Society for Testing Materials.
11. ASHRAE: American Society of Heating, Refrigeration and Air Conditioning Engineers.
12. ATS: Automatic Transfer Switch
13. A/V: Audio/Visual
14. AWG: American Wire Gauge
15. BAS: Building Automation System
16. BFG: Below Finished Grade
17. BICSI: Building Industry Consulting Services International
18. C: Conduit
19. CB: Circuit Breaker
20. CFCI: Contractor Furnished, Contractor Installed
21. CFOI: Contractor Furnished, Owner Installed
22. CKT: Circuit
23. CLG: Ceiling
24. CT: Current Transformer
25. DDC: Direct Digital Building Controls
26. DOAS: Dedicated Outdoor Air System
27. DWG: Drawing
28. EC: Electrical Contractor
29. ELEV: Elevator
30. EM: Emergency
31. EPO: Emergency Power Off
32. FA: Fire Alarm
33. FAA: Fire Alarm Annunciator
34. FACP: Fire Alarm Control Panel
35. FCC: United States Federal Communications Commission
36. FFE: Finished Floor Elevation
37. FLA: Full Load Amps
38. G, GND: Ground
39. GFCI: Ground Fault Circuit Interrupter
40. GC: General Contractor
41. HOA: Hands Off Auto
42. HP: Horsepower
43. IDF: Intermediate Distribution Frame
44. IECC: International Energy Conservation Code
45. ISO: International Standards Organization.
46. IT: Information Technology

47. KVA: Kilovolt-Amperes
48. KW: Kilowatt
49. KWH: Kilowatts Hours
50. LRA: Locked Rotor Amps
51. LTG: Lighting
52. MC: Mechanical Contractor
53. MCA: Minimum Circuit Ampacity
54. MCB: Main Circuit Breaker
55. MDF: Main Distribution Frame
56. MDP: Main Distribution Panel
57. MLO: Main Lugs Only
58. MOCP: Maximum Overcurrent Protection
59. MSB: Main Switchboard
60. N/A: Not Applicable
61. NEC: National Electrical Code
62. NECA: Standards for Installation.
63. NEMA: National Electrical Manufacturers Association.
64. NESC: National Electrical Safety Code.
65. NFPA: National Fire Protection Association.
66. NIC: Not in Contract
67. NRTL: Nationally Recognized Testing Laboratory
68. NTS: Not to Scale
69. N/A: Not Applicable
70. OFCI: Owner Furnished, Contractor Installed
71. OFOI: Owner Furnished, Owner Installed
72. OSHA: Office of Safety and Health Administration.
73. P: Pole, Poles
74. PC: Plumbing Contractor
75. PIR: Passive Infrared
76. RFI: Request for Information
77. RIO: Rough-in Only
78. RM: Room
79. SPD: Surge Protection Device
80. SS: Stainless Steel
81. SWBD: Switchboard
82. TIA: Telecommunications Industry Association
83. TYP: Typical
84. UL: Underwriters Laboratories, Inc.
85. UON or UNO: Unless otherwise noted.
86. UG: Underground
87. V: Volt, Volts
88. VFD: Variable Frequency Drive
89. W: Watts
90. WG: Wire Guard
91. WP: Weather Proof
92. XFMR: Transformer

B. Definitions

1. Architect: The Architect of Record for the project, if applicable.

2. Basis of Design (BOD): Documentation of primary thought processes and assumptions behind design decisions made to meet design intent. Describes systems, components, conditions, and methods chosen to meet intent.
  3. Bidder/Proposer: Any person, agency or entity submitting a proposal to any person, agency, or entity for any part of the work required under this contract.
  4. Contract Documents: All documents pertinent to the quality and quantity of work to be performed on this project. Includes, but not limited to: Plans, Specifications, Instructions to Bidders, General and Special Conditions, Addenda, Alternates, Lists of Materials, Lists of Sub-Contractors, Unit Prices, Shop Drawings, Field Orders, Change Orders, Cost Breakdowns, Schedules of Value, Periodical Payment Requests, Architect's Supplemental Instructions, Construction Contract with Owner, etc.
  5. Contractor: Any Contractor whether bidding, proposing, or working independently or under the supervision of a General Contractor or Prime Contractor and who installs any type of Electrical Work as specified in the Contract Documents.
  6. Electrical Contractor: Any Contractor whether bidding or working independently or under the supervision of the entity holding the Prime Contract and who installs any type of Electrical work, such as: power, lighting, television, telecommunications, data, fiber optic, intercom, fire detection and alarm, security, video, underground or overhead electrical, etc.
  7. Electrical Sub-Contractor: Each or any Contractor contracted to, or employed by, the Electrical Contractor for any work required by the Electrical Contractor.
  8. Engineer: The Consulting Mechanical-Electrical Engineer consulting to the Owner, Architect, or Other, etc.
  9. Indicated: Listed in the Specifications, shown on the Plans or Addenda thereto.
  10. Install: Install equipment furnished by others in complete working order.
  11. Installer: Contractor or another entity engaged by Contractor as an employee, subcontractor, or sub-subcontractor, to perform a particular construction operation, including installation, erection, application, assembly, and similar operations.
  12. Furnish: Deliver to the site in good condition and turn over to the Contractor who is to install.
  13. Prime Contractor: The Contractor who has been engaged by the Owner in a contractual relationship to accomplish the work.
  14. Project: All of the work required under this Contract.
  15. Provide: Furnish and install complete, tested, and ready for operation.
  16. Start-Up: The activities where systems or equipment are initially tested and operated. Start-up is completed prior to functional testing.
  17. Typical: Where indicated repeat this work, method or means each time the same or similar condition occurs whether indicated or not.
  18. Vendor: Supplier of equipment.
- C. Reference Standards: Contractor is responsible for knowledge and application of current versions of all applicable standards and codes. Contractor shall adhere to the most recent revisions or version adopted by the Authorities Having Jurisdiction, including all relevant changes or addenda at the time of installation.
1. IEEE – Institute of Electrical and Electronics Engineers.
    - a. IEEE C2, National Electrical Safety Code
  2. NECA – National Electrical Contractors Association.
    - a. NECA 1, Standard for Good Workmanship in Electrical Construction



3. NFPA - National Fire Protection Association.
  - a. NFPA 70, National Electrical Code (NEC)
4. OSHA - The Occupational Safety and Health Act

## 1.5 COORDINATION

### A. Utility Company Requirements

1. Contact the utility company for specifics on construction of pads, conduit, etc., prior to bidding the work and determine all their requirements. All work shall be in accordance with their standards.
2. Each contractor, prior to bidding the work, is to contact the utility companies (electric and telecommunications) and determine the exact points of extension of all underground services in the field with a representative of each utility company. Also, obtain construction details on manholes, transformer pads, pedestal stub-ups, etc., from each utility company as applicable. Extension points indicated on the plans are approximate and are given for the bidder's information only.
3. The Contractor shall provide the local utility company with a drawing produced by a licensed Land Surveyor or a licensed Engineer and acceptable to the utility that locates the centerline of the service and connection point. Coordinate further requirements with utility company.
4. The Contractor is responsible for all fees, permit costs, etc., from the electrical utility, data, telephone, and cable TV companies. This includes any cost associated with the underground electrical service extension.

### B. Coordination with Existing Utilities and Structures

1. The locations of all piping, conduits, cables, utilities, and manholes existing, or otherwise, that are present within the contract construction site, shall be subject to continuous uninterrupted maintenance with no exception unless the Owner of the utility grants permission for temporary interruption.
2. Known utilities and structures as available to the Engineer are shown on the drawings. However, it is additionally required that, prior to any excavation being performed, each Contractor ascertain and mark all utilities or lines that would be endangered by the excavation. Contractor shall bear costs of repairing damaged utilities.
3. If utilities or structures are installed within the construction project boundary, the Contractor shall first probe and make every effort to locate the lines prior to excavating in the respective area.
4. Cutting into existing utilities and services shall be done in coordination with and as designated by the Owner of the utility. The Contractor shall work continuously to restore service(s) upon deliberate or accidental interruption, providing premium time and materials as needed without extra claim to the Owner.
5. The Contractor shall repair to the satisfaction of the Engineer any surface or subsurface improvements damaged during the course of the work, unless such improvement is shown to be abandoned or removed.
6. Machine excavation shall not be permitted within ten feet of existing gas or fuel lines. Hand excavate only in these areas, in accord with utility company, agency or other applicable laws, standards or regulations.
7. Protect all new or existing lines from damage by traffic, etc. during construction.

8. Protect existing trees, indicated to remain with fencing or other approved method. Hold all new subsurface lines outside the drip line of trees, offsetting as necessary to protect root structures. Refer to planting or landscaping plans, or in their absence, consult with the Architect.
- C. Interruption of Existing Services: In general, and to the extent possible, perform all work without interruption of the existing facilities' operations. Do not interrupt services to facilities occupied by Owner or others unless permitted under the following conditions:
1. Notify the Owner, Architect, and Engineer no fewer than seven days in advance of proposed interruption of service.
  2. Provide the exact time the interruption will occur and the length of the interruption.
  3. Do not proceed with interruption of service without written permission from Owner, Architect, and Engineer.
  4. Failure to comply with this requirement may result in complete work stoppage by the Contractors involved until a complete schedule of interruptions can be developed.
  5. Contractor will not be entitled to additional compensation due to work stoppage mandated by unscheduled interruption.
  6. Coordinate interruptions with systems impacted by outages including but not limited to the following:
    - a. Emergency Lighting
    - b. Elevators
    - c. Fire Alarm Systems
  7. Whenever utilities are interrupted, either deliberately or accidentally, the Contractor shall work continuously to restore the service. The Contractor shall provide tools, materials, skilled journeymen of their own and other trades as necessary, premium time as needed and coordination with all applicable utilities, including payment of utility company charges (if any), all without requests for extra compensation to the Owner, except where otherwise provided for in the contract for the work.
- D. Coordination Between Trades
1. The Contractor is expressly directed to read the General Conditions and all detailed sections of these specifications for all other trades and to study all drawings applicable to their work, including Architectural, Mechanical, Structural, and other pertinent Drawings, to the end that complete coordination between trades will be affected.
  2. The Contractor is responsible for the correct location of all rough-in and connections at every piece of equipment. Work not correctly located shall be relocated at the Contractor's expense.
  3. It shall be the responsibility of each Contractor to leave the necessary room for other trades. No extra compensation or time will be allowed to cover the cost of removing fixtures, devices, conduit, ducts, etc. or equipment found encroaching on space required by others.
  4. Where any work is to be installed in close proximity to, or will interfere with work of other trades, each shall cooperate in working out space conditions to make a satisfactory adjustment. If directed by the Engineer, the Contractor shall prepare composite working drawings and sections at a suitable scale not less than  $\frac{1}{4}$  inch = 1 Foot, clearly indicating how his work is to be installed in relation to the work of other trades, or so as not to cause any interference with work of other trades. The

Contractor shall make the necessary changes in his work to correct the condition without extra charge.

5. The Contractor shall furnish to other trades, as required, all necessary templates, patterns, setting plans, and shop details for the proper installation of work and for the purpose of coordinating adjacent work.

E. Temporary Services

1. The Contractor shall arrange for temporary electrical and other services required to accomplish the work. In the absence of other provisions in the contract, the Contractor shall provide for temporary services of all types, including the cost of connections, utility company fees, construction, removal, etc., in their bid.
2. All temporary services shall be removed by Contractor prior to acceptance of work.

F. Temporary Use of Equipment

1. The permanent electrical equipment, when installed, may be used for temporary services, subject to an agreement among the Contractors involved, the Owner, and with the consent of the Engineer. Should the permanent systems be used for this purpose, each Contractor shall pay for all temporary connections required and any replacements required due to damage without additional cost to the Owner, leaving the equipment and installation in "as new" condition. The Contractor may be required to bear utility costs, user fees, etc.
2. Permission to use the permanent equipment does not relieve the Contractors who utilize this equipment from the responsibility for any damages to the building construction and/or equipment which might result from its use.

G. Preinstallation Conference

1. Conduct a preinstallation conference at project site before each construction activity when required by other Sections and when required for coordination with other construction.
2. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect and Engineer of scheduled meeting dates.
3. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including any possible conflicts, requirements, limitations, and coordination with other work.
4. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
5. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
6. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date

1.6 SUBMITTALS

- A. Review of submittals by the Engineer applies only to conformance with the design intent of the project and general compliance with the information given in the contract documents. In all cases, the installing Contractor alone shall be responsible for

furnishing the proper quantity of equipment and/or materials required, for seeing that all equipment fits the available space in a satisfactory manner and that piping, electrical and all other connections are suitably located.

- B. The Engineer's review of submittals, schedules or other required submittal data shall not relieve the Contractor from responsibility for the adaptability of the equipment or materials to the project, compliance with applicable codes, rules, regulations, information that pertains to fabrication and installation, dimensions and quantities, electrical characteristics, and coordination of the work with all other trades involved in this project.
- C. If a submittal deviates from the drawings or specifications because of Contractor's standard practice, approved substitution request, or any other reason, the submittal shall notify the designer of the deviation.
- D. Prior to the start of work the contractor shall submit the following. Work shall not proceed without the Engineer's and Owner's completed review of the submitted items.
- E. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
  - 1. If information must be specially prepared for submittal because standard published data are unsuitable for use, submit as Shop Drawings, not as Product Data.
  - 2. Clearly and precisely mark red notations and yellow highlights on the submittal to show which products and options are applicable.
  - 3. Include the following information, as applicable:
    - a. Manufacturer's catalog cuts.
    - b. Manufacturer's product specifications.
    - c. Standard color charts.
    - d. Statement of compliance with specified referenced standards.
    - e. Testing by recognized testing agency.
    - f. Application of testing agency labels and seals.
    - g. Notation of coordination requirements.
    - h. Rated capacities, operating characteristics, and electrical characteristics,
    - i. Wiring diagrams that show factory-installed wiring and interface points.
    - j. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
  - 4. Format and Organization: submit bookmarked electronic PDF files complying with the following:
    - a. Cover: Clearly display the following information: Owner name, Project name, Submittal name, project submittal number, Contractor name and contact information, and applicable specification section numbers.
    - b. Table of Contents: Include a TOC that lists materials by section number, with a brief product description, manufacturer, and part number, and list the submittal page number per product
    - c. Product Information
- F. Product Schedules: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
  2. Manufacturer and product name, and model number if applicable.
  3. Number and name of room or space.
  4. Location within room or space.
- G. Shop Drawings: Prepare Project-specific information, drawn accurately to scale.
1. Shop Drawings that are reproductions of the Contract Documents are not permitted and will be rejected.
  2. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
    - a. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
    - b. Mounting Details
    - c. Wiring diagrams and installation details
    - d. Identification of products.
    - e. Schedules.
    - f. Compliance with specified standards.
    - g. Notation of coordination requirements.
    - h. Notation of dimensions established by field measurement.
    - i. Seal and signature of professional engineer if specified.
- H. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- I. Closeout Submittals
1. Upon substantial completion of the project, provide a minimum of three bound copies with complex index and tabs to locate each item described below along with digital copy in PDF format on USB storage media.
  2. As-Built Record Documentation
    - a. The Contractor shall insure that any deviations from the design are being recorded daily, as necessary, on record drawings being maintained by the Contractor. Dimensions from fixed, visible permanent lines or landmarks shown in vertical and horizontal ways shall be utilized. Compliance shall be a requirement for final payment. Pay particular attention to the location of underfloor or underground exterior in-contract or utility-owned or leased service lines, main switches, and other appurtenances important to the maintenance and safety of the Electrical System. Deliver these record drawings to the Engineer as a system is completed, within ten days of the mark-up and/or while the accuracy of the mark-ups can be verified visually. Monthly payment may be withheld if the requirement is not complied with.
    - b. All underground utilities/piping installed as part of this project shall be surveyed by a land surveyor licensed in the State where the Work is being performed. This shall include underground electrical primary, communications, and structures. The survey shall include actual duct bank depths to top of conduit every 100 feet in length. The survey shall also include benchmarks dimensions relative to above grade, fixed structures.

- The survey shall be furnished on electronic storage media in AutoCad “.dwg” format and “.pdf” format. The survey information shall be included in the closeout documentation.
- c. Refer to additional record drawing requirements within the general conditions and other sections of these specifications.
3. Start-Up and System Testing Certificates
    - a. Provide reports from all required testing to indicate procedures followed and complete results of all tests. Provide reports on manufacturer’s standard forms for all equipment and system tests. Testing reports shall indicate applicable NEC, NFPA, UL, NETA, and/or ANSI standards.
  4. Operation and Maintenance Manuals
    - a. Provide operation and maintenance instructions and parts lists for all equipment provided in this contract. Formatting and content shall follow the guidelines outlined in the latest version of ASHRAE Application Handbook, Guideline.
    - b. All instructions shall be submitted in draft, for approval, prior to final issue. Manufacturer's advertising literature or catalogs will not be acceptable for operating and maintenance instructions.
    - c. The operation and maintenance document directory should provide easy access and be well organized and clearly identified.
    - d. The operation and maintenance manuals shall contain the following information:
      - 1) Emergency information should be immediately available during emergencies and should include emergency and staff and/or agency notification procedures.
      - 2) Provide contacts (company name, address, phone number, email) where parts may be purchased for each principal item of equipment.
      - 3) Provide detailed maintenance instructions, including recommended preventative maintenance schedules for all equipment requiring maintenance. For lighting and lighting controls, provide recommended driver replacement schedule, provide a schedule for inspecting and recalibrating lighting controls, and provide a recommended settings list for all components with adjustable settings.
      - 4) General Information. Provide the following:
        - a) Building function
        - b) Building description
        - c) Operating standards and logs
      - 5) Technical Information. Provide the following:
        - a) System description
        - b) Operating routines and procedures
        - c) Seasonal start-up and shutdown
        - d) Special procedures
        - e) Basic troubleshooting
      - 6) Equipment data sheets. Provide the following:
        - a) Vendor and local representative’s contact information
        - b) Operating and nameplate data
        - c) Warranty
        - d) Detailed operating instructions.
        - e) Tools required
        - f) Types of cleaners to use
      - 7) Maintenance program information. Provide the following:

- a) Manufacturer's installation, operation, and maintenance instructions
- b) Spare parts information
- c) Preventive maintenance actions
- d) Schedule of actions
- e) Action description
- f) History
- 8) Test reports document observed performance during start-up and commissioning.
- 9) Reference Division 01 specifications for additional requirements.
- e. Shop drawings will not be accepted as satisfying the requirement for Operation and Maintenance Manuals.
- f. Submittals: Provide complete copies of all reviewed submittals. Where submittals were returned "Furnish as Corrected", the contractor shall make the corrections noted by the engineer and submit final corrected shop drawings with close-out documentation.
- g. Parts List: Provide an inventory of all spare parts, special tools, attic stock, etc. that have been provided to the owner.
5. Warranty Documentation: Provide all documentation and certificates related to Contractor's warranty and all other specific manufacturer's warranties indicated in the construction documents.
6. Training Verification: Provide certification that all specified training has been completed. List training session dates, times, and types. Include any session materials and recordings.
7. Inspection Certificates: Provide certificates of inspection from electrical inspector, fire marshal, and any other required special inspections.
8. Reports and System Certifications: Provide final reports and any system certifications required in other specification sections.
9. Power Riser Diagram: Provide a framed and mounted full-size copy of the overall power riser diagram (under glass) to the Owner. Also, provide three vinyl-coated copies of same. Where an existing power riser diagram is present, the Contractor shall obtain the document from the Owner, and update in digital format with the scope of this project. Edits shall be in digital format and this work shall be closely coordinated with the Owner.
10. Software and Firmware Operational Documentation: Provide documentation, including the following:
  - a. Software operating and upgrade manuals.
  - b. Names, versions, and website addresses for locations of installed software.
  - c. Device address list.
  - d. Printouts of software application and graphic screens.
11. Software Back-ups: Provide software back-ups on USB media that is clearly and permanently labeled and provided with lanyard to prevent misplacement.

## 1.7 MAINTENANCE MATERIAL

### A. Spare Parts and Extra Stock Material

1. Parts and Materials shall be properly marked and packaged for long term storage.

### B. Special Tools and Keys:

1. Provide, along with the equipment provided, any special wrenches or tools necessary to dismantle or service equipment or appliances.
2. Wrenches shall include necessary keys, handles and operators for valves, switches, breakers, etc. and keys to electrical panels, etc.
3. Provide at least two of any such special wrench, keys, etc. to the Owner prior to completion of the project. Obtain a receipt that this has been accomplished and forward a copy to the Architect and Engineer.

## 1.8 QUALITY ASSURANCE

- A. **Manufacturer Qualifications:** Manufacturer shall be a firm engaged in the manufacture of specified products of types and sizes required, and whose products have been in satisfactory use in similar service for a minimum of five years unless otherwise approved.
1. The manufacturer shall have a valid ISO 9001 certification and an applicable quality assurance system that is regularly reviewed and audited by a third-party registrar. Manufacturing, inspection, and testing procedures shall be developed and controlled under the guidelines of the quality assurance system.
  2. Equipment shall be supported by service organizations which are reasonably convenient to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.
- B. **Installer Qualifications**
1. All Electrical Contractors bidding this project must have been a licensed company for a minimum of three years to qualify to bid this project. Individual employee experience does not supersede this requirement.
  2. All subcontractors bidding the electrical work must have completed one project of 70 percent this subcontract cost size and two projects of 50 percent this subcontract cost size.
  3. All electrical work shall be accomplished by qualified workers competent in the area of work for which they are responsible. Untrained and incompetent workers as evidenced by their workmanship shall be relieved of their responsibilities in those areas. The Engineer shall reserve the right to determine the quality of workmanship of any worker and unqualified or incompetent workers shall refrain from work in areas not satisfactory to them. Requests for relief of a worker shall be made through the normal channels of responsibility established by the Architect or the contract document provisions.
  4. All electrical work shall be accomplished by Journeymen electricians under the direct supervision of a licensed Electrician.
  5. Special electrical systems, such as Fire Alarm Systems, Telecommunications or Data Systems, Video Systems, Special Electronic Systems, Control Systems, etc., shall be installed by workers normally engaged or employed in these respective trades.
- C. **Licensed Professional Engineer Qualifications:** Professional Engineer possessing active qualifications in accordance with Division 01 and licensed by the State in which the Work is being performed.



1.9 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver or install indoor equipment until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above equipment is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.10 FIELD CONDITIONS

- A. Ambient Conditions:
  - 1. Rate equipment for continuous operation under the following conditions unless otherwise indicated:
    - a. Ambient Temperature: Not exceeding 104 deg F.
    - b. Altitude: Not exceeding 6600 feet.

1.11 WARRANTIES

- A. Contractor Warranty: Contractor shall unconditionally guarantee all equipment, apparatus, materials, and workmanship entering into this Contract to be the best of its respective kind and shall replace all parts at their own expense, which fail or are proven defective within one year from Substantial Completion of the work by the Engineer. The effective date of completion of the work shall be the date each or any portion of the work is accepted by the Architect, Engineer, and Owner's Statement of Substantial Completion.
- B. Manufacturer Warranty: Items of equipment which have longer guarantees, as called for in these specifications or as otherwise offered by the manufacturer shall have warranties and guarantees completed in order and shall be in effect at the time of final acceptance of the work by the Engineer. The Contractor shall present the Engineer with such warranties and guarantees at the time of final acceptance of the work. The Owner reserves the right to use equipment installed by the Contractor prior to date of final acceptance. Such use of equipment shall in no way invalidate the guarantee except that the Owner shall be liable for any damage to equipment during this period due to negligence of his operator or other employee.
- C. The Warranties specified herein, and other Sections shall not deprive the Owner of other rights the Owner may have under provisions of the Contract Documents and shall be in addition to and run concurrently with other warranties made by the Contractor under requirements of the Contract Documents.

1.12 INDEMNIFICATION

- A. The Contractor shall hold harmless and indemnify the Engineer, employees, officers, agents and consultants from all claims, loss, damage, actions, causes of actions, expense and/or liability resulting from, brought for, or on account of any personal injury or property damage received or sustained by any person, persons, (including third parties), or any property growing out of, occurring, or attributable to any work performed

under or related to this contract, resulting in whole or in part from the negligence of the Contractor, any subcontractor, any employee, agent or representative.

### 1.13 HAZARDOUS MATERIALS

- A. The Contractor is hereby advised that it is possible that asbestos and/or other hazardous materials are or were present in this building(s). Any worker, occupant, visitor, inspector, etc., who encounters any material of whose content they are not certain shall promptly report the existence and location of that material to the Contractor and/or Owner. The Contractor shall, as a part of their work, ensure their workers are aware of this potential and what they are to do in the event of suspicion. The Contractor shall also keep uninformed persons from the premises during construction. Furthermore, the Contractor shall insure that no one comes near to or in contact with any such material or fumes therefrom until its content can be ascertained to be non-hazardous.
- B. CMTA, Inc., Consulting Engineers, have no expertise in the determination of the presence of hazardous materials. Therefore, no attempt has been made by them to identify the existence or location of any such material. Furthermore, CMTA nor any affiliate thereof will neither offer nor make any recommendations relative to the removal, handling, or disposal of such material.
- C. If the work interfaces, connects or relates in any way with or to existing components which contain or bear any hazardous material, asbestos being one, then, it shall be the Contractor's sole responsibility to contact the Owner immediately.
- D. The Contractor by execution of the contract for any work and/or by the accomplishment of any work thereby agrees to bring no claim relative to hazardous materials for negligence, breach of contract, indemnity, or any other such item against CMTA, its principals, employees, agents, or consultants. Also, the Contractor further agrees to defend, indemnify, and hold CMTA, its principals, employees, agents, and consultants, harmless from any such related claims which may be brought by any subcontractors, suppliers or any other third parties.

## PART 2 - PRODUCTS

### 2.1 GENERAL REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency suitable to the AHJ, and marked for intended location and application.
- B. Materials used shall present no environmental or toxicological hazards as defined by current industry standards and shall comply with OSHA and EPA standards, other applicable federal, state, and local laws.
- C. Standard Products

1. Except where specifically noted otherwise, all equipment supplied by the Contractor shall be the standard products of a single manufacturer of known reputation and experience in the industry.
  2. Only equipment, components, and accessories in current production for at least five years beyond the completion date of this system shall be used and installed. Any equipment found to be obsolete or not in future production will be removed and replaced at Contractor's expense. This includes all equipment, materials, and labor.
  3. Products manufactured more than 2 years prior to date of delivery to site shall not be used, unless specified otherwise.
- D. Product numbers are subject to change by the manufacturer without notification. In the event a product number is invalid or conflicts with the written description, notify the Engineer in writing prior to ordering the material and performing installation work.

## 2.2 PRODUCT SUBSTITUTIONS

- A. Conform to the substitutions requirements and procedures outlined in Division 01.
- B. One substitution for each product specified will be considered and substitutions must be submitted to Engineer a minimum of 10 days prior to bid using the standard CSI substitution request form.
- C. If prevailing laws of cities, towns, states, or countries are more stringent than these specifications regarding such substitutions, then those laws shall prevail over these requirements.
- D. Where products are noted as "or equal", a product of equivalent design, manufacture, and performance will be considered. Submit product data (product information, catalog cut sheets, test data, etc.) to substantiate that the product is in fact equivalent to that specified. The burden of proof that the substituted product is equivalent to the specified product rests with the Contractor. Whenever material, process or equipment is specified in accordance with an industry specification (ANSI, TIA, etc.), UL rating, or other association standard, present an affidavit from the manufacturer certifying that the product complies with the particular standard specification. When requested by the Engineer, submit supporting test data to substantiate compliance.
- E. Manufacturers' names and model numbers used in conjunction with materials, processes or equipment included in the contract documents are used to establish standards of quality, utility and appearance and shall not be construed as limiting competition. Materials, processes, or equipment that, in the opinion of the Engineer, are equivalent in quality, utility and appearance will be approved as substitutions to that specified when "or equal" follows the manufacturers' names or model number(s).
- F. When the Engineer accepts a substitution in writing, it is with the understanding that the Contractor guarantees the substituted product, component, article, or material to be equivalent to the one specified and dimensioned to fit within the construction according to contract documents. Do not provide substituted material, processes, or equipment without written authorization from the Engineer. Assumptions on the acceptability of a

proposed substitution, prior to acceptance by the Engineer, are at the sole risk of the Contractor.

- G. Approved substitutions shall not relieve the Contractor of responsibilities for the proper execution of the work, or from provisions of the specifications.
- H. Contractor shall pay expenses, without additional charge to the Owner, in connection with substitution materials, processes and equipment, including the effect of substitution on their work or other Contractor's work.
- I. In all cases where substitutions affect other trades, the Contractor offering such substitutions shall advise all such Contractors of the change and shall reimburse them for all necessary changes in their work. Any Drawings, Specifications, Diagrams, etc., required to describe and coordinate such substitutions or deviations shall be professionally prepared at the responsible Contractor's expense. Review of Shop Drawings by the Engineer does not absolve the Contractor of this responsibility.
- J. Contractor shall be responsible and assume all costs for removal and replacement of any substituted product installed without prior written approval. Such costs shall include, but not be limited to labor, materials as well as any penalties, fees or costs incurred for late completion.

## PART 3 - EXECUTION

### 3.1 INSTALLERS

- A. Supervision of Work: Each Contractor and Sub-Contractors shall personally supervise the work or have a competent superintendent on the project site at all times during progress of the work, with full authority to act in matters related to the project.
- B. Conduct of Workmen: The Contractor shall be responsible for the conduct of all workmen under their supervision. Misconduct on the part of any workmen to the extent of creating a safety hazard, or endangering the lives and property of others, shall result in the prompt relief of that workman. The consumption or influence of alcoholic beverages, narcotics or illegally used controlled substances on the jobsite is strictly forbidden. Possession of a firearm is prohibited and may result in prosecution. Foul or bad language, graffiti is strictly prohibited. Display of nude tattoos is prohibited.
- C. No tobacco use, including smokeless tobacco, is allowed on property.

### 3.2 EXAMINATION

- A. Each Contractor shall inform themselves of all of the conditions under which the work is to be performed, the site of the work, the structure of the ground, the obstacles that may be encountered, the availability and location of necessary facilities and all relevant matters concerning the work. All Contractors shall carefully examine all Drawings and Specifications and inform themselves of the kind and type of materials to be used throughout the project and which may, in any way, affect the execution of their work.

- B. Each Contractor shall fully acquaint themselves with all existing conditions as to ingress and egress, distance of haul from supply points, routes for transportation of materials, facilities and services, availability of temporary or permanent utilities, etc. The Contractor shall include in their work all expenses or disbursements in connection with such matters and conditions. Each Contractor shall verify all work shown on the drawings and conditions at the site and shall report in writing to the Engineer ten days prior to bid, any apparent omissions, or discrepancies in order that clarifications may be issued by written addendum. No allowance is to be made for lack of knowledge concerning such conditions after bids are accepted.

### 3.3 PREPARATION

- A. Surveys, Measurements, and Grades
  - 1. The Contractor shall lay out their work and be responsible for all necessary lines, levels, elevations, and measurements. They must verify the figures shown on the drawings before laying out the work and will be held responsible for any error resulting from their failure to do so.
  - 2. Base all measurements, both horizontal and vertical from established benchmarks. All work shall agree with these established lines and levels. Verify all measurements at site and check the correctness of same as related to the work.
  - 3. Should the Contractor discover any discrepancy between actual measurements and those indicated, which prevents following good practice or the intent of the drawings and specifications, they shall notify the Engineer through normal channels of job communication and shall not proceed with his work until they have received instructions from the Engineer.

### 3.4 INSTALLATION

- A. At no time shall the contractor work on energized electrical equipment. Contractor shall comply with NFPA 70E requirements at all times throughout construction.
- B. Permits and Fees
  - 1. The Contractor shall give all necessary notices, obtain, and pay for all permits, government sales taxes, fees, and other costs in connection with their work. As necessary, the Contractor shall file all required plans, utility easement requests and drawings, survey information on site locations, load calculations, etc., prepare all documents and obtain all necessary approvals of all utility and governmental departments having jurisdiction; obtain all required certificates of inspection for their work and deliver same to the Engineer before request for final acceptance and final payment for the work.
  - 2. Ignorance of Codes, Rules, regulations, utility company requirements, laws, etc., shall not diminish or absolve Contractor's responsibilities to provide and complete all work in compliance with such.
- C. Codes and Regulations
  - 1. The Contractor shall include in the work, without extra cost, any labor, materials, services, apparatus, or drawings required in order to comply with all applicable

laws, ordinances, rules, and regulations, whether or not shown on drawings and/or specified.

2. All materials furnished and all work installed shall comply with the adopted edition of the National Electrical Codes, National Fire Codes of the National Fire Protection Association, the requirements of local utility companies, and with the requirements of all governmental agencies or departments having jurisdiction.
3. All electrical work is to be constructed and installed in accordance with plans and specifications which have been approved in their entirety and/or reflect any changes requested by the AHJ, as applicable or required. Electrical work shall not commence until such plans are in the hands of the Electrical Contractor.
4. The Contractor shall insure their work is accomplished in accord with OSHA Standards and any other applicable government requirements.
5. Where conflict arises between any code and the contract documents, the code shall apply except in the instance where the plans and specifications exceed the requirements of the code. Any changes required as a result of these conflicts shall be brought to the attention of the Engineer at least ten working days prior to bid date, otherwise the Contractor shall make the required changes at their own expense. The provisions of the codes constitute minimum standards for wiring methods, materials, equipment and construction and compliance therewith will be required for all electrical work, except where the drawings and specifications require better materials, equipment, and construction than these minimum standards, in which case the drawings and specifications shall be the minimum standards.

D. Materials and Workmanship

1. All electrical equipment, materials and articles incorporated in the work shall be new and of equal quality to the specified basis of design. All workmanship shall be first-class and shall be performed by electricians skilled and regularly employed in their respective trades.
2. The Contractor shall determine that the equipment he proposes to furnish can be brought into the building(s) and installed within the space available. All equipment shall be installed so that all parts are readily accessible for inspection, maintenance, replacement, etc. Extra compensation will not be allowed for relocation of equipment for accessibility or for dismantling equipment to obtain entrance into the building(s).
3. All fixtures, devices and wiring required shall be installed to make up complete systems as indicated on the drawings and specified herein.
4. All electrical materials, equipment and appliances shall conform to the latest standards of the National Electric Manufacturers Association (NEMA) and the National Board of Fire Underwriters (NBFU) and shall be approved by the Owner's insuring agency if so required.
5. Comply with National Electrical Contractors Association (NECA) performance standards that are published as National Electrical Installation Standards (NEIS).
6. All applicable equipment and devices provided shall meet all FCC requirements and restrictions.

E. Weatherproofing

1. Where any work penetrates waterproofing, including waterproof concrete, the method of installation shall be as approved by the Architect and/or Engineer before

work is done. The Contractor shall furnish all necessary sleeves, caulking and flashing required to make openings absolutely watertight.

2. Wherever work penetrates roofing, it shall be done in a manner that will not diminish or void the roofing guarantee or warranty in any way. Coordinate all such work with the roofing installer.

#### F. Equipment Access

1. The Contractor shall be responsible for the sufficiency of the size of shafts and chases, the adequate clearance in partitions and above suspended ceilings for the proper installation of their work. Cooperate with the Prime Contractor and all other Contractors whose work is in the same space and advise each Contractor of equipment requirements. Such spaces and clearances shall be kept to the minimum size required to ensure adequate clearance and access.
2. The Contractor shall locate all equipment which must be serviced, operated, or maintained in fully accessible positions. Equipment shall include but not be limited to junction boxes, pull boxes, contactors, panels, disconnects, controllers, switchgear, etc. Minor deviations from drawings may be made to allow for better accessibility, and any change shall be approved where the equipment is concealed.
3. Each Contractor shall provide (or arrange for the provision by other trades) the access panels for each concealed junction box, pull box, fixtures or electrical device requiring access or service as shown on Engineer's plans or as required. Locations of these panels shall be identified in sufficient time to be installed in the normal course of work. All access panels shall be installed in accord with the Architect's standards for such work. In the absence of such specifications, at a minimum such work shall comply with the specifications below. All locations for access panels which are not specifically indicated on the drawings shall be submitted to and approved by the architect prior to ordering.
4. Access Doors; in Ceilings or Walls:
  - a. In mechanical, electrical, and service spaces: 14-gauge aluminum brushed satin finish, 1" border.
  - b. In finished areas: 14-gauge primed steel with 1" border to accept the architectural finishes specified for the space. Confirm these provisions with the Architect prior to obtaining materials or installing any such work.
  - c. In fire or smoke rated partitions, access doors shall be provided that equal or exceed the required rating of the construction they are mounted in.

#### G. Connections

1. Provide rough-in and final connections to all electrically operated equipment furnished under the Work of the contract documents. Carefully coordinate with equipment suppliers, manufacturer's representatives, vendors, and other trades to provide complete electrical and dimensional interface to all equipment.
2. Provide all power wiring complete from power source to motor or equipment junction box, including power wiring through starters or contactors. Install all starters not factory mounted on equipment.
3. Provide all control, interlock, sensor, thermocouple, and other connections required for equipment operation. Coordinate ampacity and voltage characteristics for all motors and equipment.
4. Prior to bidding the work, coordinate power, control, sensor, interlock and all other wiring requirements for equipment or motors with all other trades, to ensure all

needed wiring is provided. Failure to provide such coordination shall not be justification for claims of extra compensation of a time extension to the Contract.

5. At no times shall the contractor work on energized electrical equipment. Comply with NFPA 70E requirements at all times during construction.

- H. Scaffolding, Rigging, and Hoisting: The Contractor shall furnish all scaffolding, rigging, hoisting, and services necessary for erection and delivery into the premises of any equipment and apparatus furnished. All such temporary appurtenances shall be set up in strict accord with OSHA Standards and Requirements. Remove same from premises when no longer required.

### 3.5 RESTORATION

- A. The Contractor shall replace to their original condition all paving, curbing surfaces, drainage ditches, structures, fences, shrubs, existing or new building surfaces and appurtenances, and any other items damaged or removed by his operations. Replacement and repairs shall be in accordance with good construction practice and shall match materials employed in the original construction of the item to be replaced. All repairs shall be to the satisfaction of the Engineer, and in accord with the Architect's standards for such work, as applicable. Patchwork on new construction will not be accepted.

### 3.6 IDENTIFICATION AND OPERATING INSTRUCTIONS

- A. Provide all equipment with a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.
- B. Provide operating instructions for each system and principal item of equipment as specified in the technical sections for use by operation and maintenance personnel. The operating instructions shall include the following:
  1. Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
  2. Start up, proper adjustment, operating, lubrication, and shutdown procedures.
  3. Safety precautions.
  4. The procedure in the event of equipment failure.
  5. Other items of instruction as recommended by the manufacturer of each system or item of equipment.
- C. Print or engrave operating instructions and frame under glass or in approved laminated plastic. Post instructions where directed. For operating instructions exposed to the weather, provide weather-resistant materials or weatherproof enclosures. Operating instructions shall not fade when exposed to sunlight and shall be secured to prevent easy removal or peeling.



### 3.7 SYSTEM TESTING, VERIFICATION, AND START-UP

- A. The Contractor (and Sub-Contractors) shall be responsible for starting-up, testing, checking, examining, inspecting, and verifying their systems.
- B. The Electrical Contractor shall designate an individual under their employment to lead the start-up, testing, and verification process. This person should not be the project manager or job site superintendent, but a person dedicated to making this critical task successful and completed in a timely manner.
- C. A pre-start-up conference shall be held with the Architect, Owner, Contractors, and the Manufacturer providing startup services. The purpose of this meeting will be to discuss the goals, procedures, etc. for start-up.
- D. The Contractor shall include in the bid to provide systems startup and verification for all electrical systems specified for this project. Specific startup, testing, and verification requirements are included throughout the Electrical specifications. In general, as part of the verification process, equipment suppliers shall perform start-up by their factory authorized technicians (unless noted otherwise) and shall complete and submit start-up reports/checklists. Submit start-up reports to the Engineer. The Contractor shall have appropriate trades on site to correct all deficiencies noted by the factory representative. For each deficiency noted, documentation of corrective action (including date and time) shall be submitted to the Engineer and Owner.
- E. Where manufacturer start-up is not specified for a particular piece of equipment or system, the Contractor shall be responsible to perform start-up in strict accordance with manufacturer's instructions.
- F. The Contractor shall be responsible for completion of a System Verification Checklist (SVC) / Manufacturer's Checklists. Furnish to the Testing Agent and Engineer. Sample checklists shall be submitted to the Engineer, Owner, and Testing Agent for approval.
- G. The completed reports shall be organized and bound together in a tabbed binder and submitted for review and approval.

### 3.8 FIELD QUALITY CONTROL

- A. Inspections
  - 1. Before requesting a final review of the installation from the Architect and/or Engineer, the Contractor shall thoroughly inspect the installation to assure that the work is complete in every detail and that all requirements of the Contract Documents have been fulfilled. Failure to accomplish this may result in charges from the Architect and/or Engineers for unnecessary and undue work on their part.
  - 2. Owner's and Engineer's inspections: Two inspections will be held to generate and then review punchlist items. All site inspections and visits thereafter shall be billed to the Contractor at the Engineer's standard hourly rates.
  - 3. The Contractor shall provide as a part of this contract electrical inspection by a competent Electrical Inspection Agency, licensed to provide such services. The name of this agency shall be included in the list of materials of the Form of Proposal

- by the Contractor. All costs incidental to the provision of electrical inspections shall be borne by the Electrical Contractor.
4. The Contractor shall advise each Inspection Agency in writing (with an information copy of the correspondence to the Architect and/or Engineer) when they anticipate commencing work. Failure of the Inspection Agency to inspect the work in the stage following and submit the related reports may result in the Contractor's having to expose concealed work not so inspected. Costs associated with any rework, cutting, and patching will be at the expense of the responsible Contractor.
  5. Inspections shall be scheduled for rough-in as well as finished work. The rough inspections shall be divided into as many inspections as may be necessary to correct deficiencies. Report of each such inspection visit shall be submitted to the Architect, Engineer, and the Contractor within three days of the inspection.
  6. Approval by an Inspector does not relieve the Contractor from the responsibilities of furnishing equipment having a quality of performance equivalent to the requirements set forth in these plans and specifications. All work under this contract is subject to the review of the Architect and/or Engineer, whose decision is binding.
  7. Before final acceptance, the Contractor shall furnish three copies of the certificates of final approval by the Electrical Inspector (as well as all other inspection certificates) to the Engineer with one copy of each to the appropriate government agencies, as applicable. Final payment for the work shall be contingent upon completion of this requirement.

B. Punch Lists

1. The Contractor shall review each area and prepare a punch list for each of the subcontractors, as applicable, for at least three stages of the project.
  - a. For review of in-wall work that will be concealed by drywall or other materials well before substantial completion.
  - b. For review of the above-ceiling work that will be concealed by tile or other materials well before substantial completion.
  - c. For review of all other work as the project nears substantial completion.
2. When all work from the Contractor's punch list is complete at each of these stages and prior to completing ceiling installations (or at the final punch list stage), the Contractor shall request that the Engineer develop a punch list. This request is to be made in writing two weeks prior to the proposed date.
3. After all corrections have been made from the Engineer's punch list, the Contractor shall review and initial off on each item. This signed-off punch list shall be submitted to the Engineer. The Engineer shall return to the site once to review each punch list and all work prior to the ceilings being installed and at the final punch list review.
4. At the engineer's option, the contractor shall supply digital photographs via email or file-share of any installed work.
5. If additional visits are required by the Engineer to review work not completed by this review, the Engineer shall be reimbursed directly by the Contractor by check or money order (due 10 days from date of each additional visit) at a rate of \$125.00 per hour for extra trips required to complete either of the above-ceiling or final punch lists.
6. All panelboard fronts shall be removed prior to final punch list inspection and re-installed after completion. Directories for each panelboard shall be completed and available for review by the Engineer at that time.

### 3.9 CLEANING

- A. The Contractor shall, at all times, keep the area of work presentable to the public and clean of rubbish caused by their operations; and at the completion of the work, shall remove all rubbish, all tools, equipment, temporary work, and surplus materials, from and about the premises, and shall leave the work clean and ready for use. If the Contractor does not attend to such cleaning immediately upon request, the Engineer may cause cleaning to be done by others and charge the cost of same to the responsible Contractor. Each Contractor shall be responsible for all damage from fire which originates in, or is propagated by, accumulations of rubbish or debris.
- B. After completion of all work and before final acceptance of the work, each Contractor shall thoroughly clean all equipment and materials and shall remove all foreign matter such as grease, dirt, plaster, labels, stickers, etc., from the exterior of materials, equipment, and all associated fabrication. Pay particular attention to finished area surfaces such as lighting fixture lenses, lamps, reflectors, panels, etc.

### 3.10 TRAINING

- A. Upon completion of all work and all tests, each Contractor shall furnish the necessary skilled labor and helpers for operating all systems and equipment for a period of three days of eight hours each, or as otherwise specified. During this period, instruct the Owner or their representative fully in the operations, adjustment, and maintenance of all equipment furnished. Give at least one week's written notice to the Owner, Architect and Engineer in advance of this period. The Engineer may attend any such training sessions or operational demonstrations. The Contractor shall certify in writing to the Engineer that such demonstrations have taken place, noting the date, time and names of the Owner's representative that were present.
- B. Training shall be accompanied by complete as-built documentation and the technical systems operation manual.
- C. The training shall be accomplished by a factory trained representative. Include a minimum of Four hours for each system described here-in unless noted otherwise. Each equipment representative shall be represented wherever their equipment is used.
- D. Demonstration and Training DVDs: These training sessions shall be videotaped by the Installer. Submit two copies within seven days of end of each training module. On each copy, provide an applied label with the following information:
  - 1. Name of Project.
  - 2. Name and address of photographer.
  - 3. Name of Architect and General Contractor
  - 4. Name of Contractor.
  - 5. Date video was recorded.
- E. Brochures: Furnish Owner a complete set of operating instructions and diagrams.
- F. Instruction Program: Submit outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and

instructors' names for each training module. Include learning objective and outline for each training module.

- G. At completion of training, submit two complete training manual(s) for Owner's use.
- H. Qualification Data: For facilitator, instructor, and photographer.
- I. Attendance Record: For each training module, submit list of participants and length of instruction time.

### 3.11 PROTECTION

- A. The Contractor shall be entirely responsible for all material and equipment furnished for their work and special care shall be taken to properly protect all parts thereof from damage during the construction period. Such protection shall be by a means acceptable to the Engineer. Equipment damaged while stored on site either before or after installation shall be repaired or replaced (as determined by the Engineer) by the responsible Contractor. Electrical equipment exposed to the weather shall be replaced by the Contractor at their own expense.

END OF SECTION 260010

## SECTION 260500 - COMMON WORK RESULTS FOR ELECTRICAL SYSTEMS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 01 Specification Sections, and Section 260010 "General Requirements for Electrical Systems" apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Slotted Support Systems.
  - 2. Conduit and Cable Supports.
  - 3. Mounting, Anchoring, and Attachment Components.
  - 4. Fabricated Metal Supports.
  - 5. Concrete Bases.
  - 6. Vibration Isolation pads.
  - 7. Sleeves for penetration of non-fire-rated construction walls and floors.
  - 8. Sleeve-seal systems.
  - 9. Firestopping.
  - 10. Cutting and Patching
  - 11. Painting

#### 1.3 REFERENCES

- A. Abbreviations and Acronyms
  - 1. EMT: Electrical Metallic Tubing.
  - 2. FMC: Flexible Metal Conduit.
  - 3. GRC/GRS: Galvanized Rigid Steel Conduit.
  - 4. LFMC: Liquid-tight flexible metal conduit.
  - 5. RMC: Rigid Metal Conduit
- B. Definitions
  - 1. Channel: A continuous slotted channel (strut) with inturned lips suitable for assembly into multiple configurations
- C. Reference Standards: The following publications are referred to in the text by the basic designation only. The edition/revision of the referenced publications shall be the latest version as of the date of the Contract Documents, unless otherwise specified.
  - 1. Metal Framing Manufacturers Association (MFMA)
    - a. MFMA-4: Metal Framing Standards Publication
    - b. MFMA-103: Guidelines for the use of Metal Framing

#### 1.4 COORDINATION

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.
- B. Coordinate installation of roof curbs, equipment supports, and roof penetrations with Division 07 Section "Roof Accessories."

#### 1.5 SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of components, profiles, and finishes.
  - 2. Include rated capacities.
- B. Shop Drawings: For fabrication and installation details and include calculations for the following:
  - 1. Slotted channel systems.
  - 2. Equipment supports.
  - 3. Concrete Bases for Equipment.
  - 4. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
- C. Delegated-Design Submittal: Signed and sealed by a qualified professional engineer. For field assembled or fabricated hangers and supports for electrical systems.
  - 1. Include design calculations and details of trapeze hangers.
- D. Qualification Data: For professional engineer.

#### 1.6 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

### PART 2 - PRODUCTS

#### 2.1 GENERAL REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency acceptable to the authority having jurisdiction and marked for intended location and application.
- B. Delegated Design: Design support systems, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

## 2.2 SLOTTED SUPPORT SYSTEMS

- A. Description: Preformed, continuous slot, bolted channels with associated fittings and hardware.
1. Available Manufacturers: Subject to compliance with requirements, provide products from one of the following or an approved equal:
    - a. Eaton B-Line.
    - b. Kindorf.
    - c. nVent Caddy.
    - d. Power-Strut.
    - e. SuperStrut.
    - f. Unistrut.
  2. Comply with MFMA-4 for factory fabricated components suitable for field assembly.
  3. Material and Finish for channel, fittings, and accessories:
    - a. Steel: Minimum 16 gauge, Hot-dip galvanized after fabrication and applied according to ASTM A123 or A153 suitable for indoor or outdoor wet locations.
  4. Channel Dimensions: Minimum 1-5/8 inches wide with varying heights and welded combinations selected to meet applicable load criteria.

## 2.3 CONDUIT AND CABLE SUPPORTS

- A. Available Manufacturers: Subject to compliance with requirements, provide products from one of the following or an approved equal:
1. Eaton B-Line
  2. nVent Caddy
  3. Thomas & Betts
- B. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- C. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Provide plugs with number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported.
- D. Device Box Mounting Brackets: Factory-fabricated sheet steel brackets for support of device boxes adjacent to or between studs.
- E. Through-Stud Cable and Raceway Support Clips: Factory-fabricated spring steel clip for cables or raceways where run horizontally through metal studs.
- F. Roof-mounted Raceway Support Blocking: Non-penetrating, factory-fabricated support blocking for use under roof-mounted raceways. Wedge-shaped blocking constructed of 100% recycled UV-resistant Rubber with integral galvanized steel strut to accept raceway support clips.

- G. Tee Bar Grid Box Hanger: Factory-fabricated metal electrical box hanger for supporting boxes at locations between ceiling system t-grid components. Height adjustable for various electrical box depths. Attached to ceiling tee bar with screws or integral clamp for stability. Includes tab for independent support wire attachment.

## 2.4 MOUNTING, ANCHORING, AND ATTACHMENT COMPONENTS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Eaton B-Line
  - 2. Empire Industries.
  - 3. Hilti.
  - 4. ITW.
  - 5. MKT Fastening.
- B. Description: Items for fastening electrical items or their supports to building surfaces
  - 1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened Portland cement concrete, or steel with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
  - 2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated or stainless steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
  - 3. Concrete Inserts: Steel, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
  - 4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
  - 5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
  - 6. Toggle Bolts: All-steel springhead type.
  - 7. Hanger Rods: Solid, threaded steel.

## 2.5 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.
- B. Materials: Comply with requirements in Division 05 Section "Metal Fabrications" for steel shapes and plates.

## 2.6 VIBRATION ISOLATION PADS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Korfund Maxi-Flex Pads or a comparable product by one of the following:
  - 1. Ace Mountings Co.
  - 2. California Dynamics Corporation.
  - 3. Eaton B-Line.



4. Kinetics Noise Control.
5. Mason Industries.
6. Vibration Eliminator Co.
7. VMC Group

- B. Description: Molded, oil resistant, non-skid elastomeric pads arranged in 2-inch square segments.
- C. Size: Factory or field cut to match requirements of supported equipment.
- D. Load Rating from 120 lbs. up to 360 lbs. per 2-inch segment.

## 2.7 SLEEVES

A. Wall and Floor Sleeves:

1. Galvanized Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.

## 2.8 SLEEVE-SEAL SYSTEMS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable. Link Seal system or approved equal.
1. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
  2. Pressure Plates: Glass reinforced nylon polymer.
  3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

## 2.9 FIRESTOPPING FOR ELECTRICAL SYSTEMS

- A. Manufacturers: Subject to compliance with requirements, provide products from one of the following or approved equal:
1. Hilti
  2. Specified Technologies Inc (STI)
  3. Wiremold
- B. Source Limitations: Obtain firestopping systems through one source from a single manufacturer.
- C. General Requirements:
1. Firestopping systems shall bear UL classification marking corresponding to its Fire Resistance Directory.
  2. Comply with testing requirements set forth in ASTM E814 or UL 1479.
  3. Provide through-penetration firestop systems that are compatible with one another, with the substrates forming openings, and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and

- application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.
4. Provide components for each through-penetration firestop system that are needed to install fill materials. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire-resistance-rated systems.
- D. Fire rated cable pathways: Re-penetrable, maintenance-free cable management devices for use with cable bundles penetrating through fire rated walls or floors.
1. Shall contain a built-in fire sealing system sufficient to maintain the hourly rating of the fire rated wall or floor being penetrated.
  2. The system shall adjust to the installed cable loading and shall permit cables to be installed, removed, or retrofitted without the need to remove or reinstall firestop materials.
  3. Shall be engineered to allow two or more devices to be ganged together with wall plates for larger cable capacities.
- E. Fire-rated cable grommets: Molded, two-piece grommet with sealing membrane for use with single cables or small bundles at through or membrane wall penetrations.
1. System shall be installed around cables and shall lock tightly into the wall assembly.
- F. Outlet Box Putty Pads: Non-hardening, moldable, intumescent material shaped into preformed pads for use with metallic outlet boxes.
- G. Refer to Division 07 for requirements related to other firestopping systems and materials.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas and equipment to receive vibration isolation devices for compliance with manufacturer's installation requirements for installation tolerances and other conditions affecting performance.
- B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.
- C. Examine substrates and conditions for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 CUTTING AND PATCHING

- A. Unless otherwise indicated, provide cutting and patching necessary to install the work specified. Patching shall match adjacent surfaces to the satisfaction of the Engineer and shall be in accordance with the Architect's standards for such work.
- B. Do not cut structural elements without reinforcing the structure to maintain the designed weight bearing and stiffness. Coordinate approved reinforcement method with Architect and Structural Engineer.

### 3.3 SUPPORT SYSTEM APPLICATION

- A. Comply with NFPA 70, NECA 1, NECA 101, and MFMA-103 for application of hangers and supports for electrical equipment and systems except where requirements of this Section are more stringent.
- B. Maximum Horizontal and Vertical Support Spacing for Raceway(s): Space supports for raceways as required by NFPA 70.
- C. Minimum Hanger Rod Size for Raceway Supports: 3/8-inch diameter unless noted otherwise.
- D. Single Raceways:
  - 1. For Raceways 1-1/4-inch and smaller: Install adjustable steel band hanger suspended on threaded rod.
  - 2. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/4-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.
- E. Multiple Raceways and single raceways larger than 1-1/4-inch:
  - 1. Install trapeze-type supports fabricated with slotted support system suspended on threaded rods for horizontal applications and fastened to building structure for vertical applications.
  - 2. Size so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
  - 3. Secure raceways and cables to these supports with two-bolt steel conduit clamps or single-bolt steel conduit clamps using spring friction action for retention in support channel.

### 3.4 SUPPORT SYSTEM INSTALLATION

- A. Comply with NFPA 70, NECA 1, NECA 101, and MFMA-103 for installation requirements except where requirements of this Article are more stringent.
- B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading

limits. Minimum static design load used for strength determination shall be weight of supported components multiplied by a safety factor of four with a minimum of 200 lbs.

- C. Mounting and Anchorage of Surface-Mounted or Recessed-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
1. To Wood: Fasten with lag screws or through bolts.
  2. To New Concrete: Bolt to concrete inserts.
    - a. Where support anchors are required, establish their type, and locate in concrete construction before concrete is poured. Fit each hanger rod with a nut at its upper end and set nut in a universal concrete insert in the form. Where supported weight exceeds holding strength of a single insert, pass rods through top slot of inserts and interlock with reinforcing steel. Also, where particularly heavy loads are to be supported, suspend hanger rod or rods from a structural angle spanning two or more inserts and securely bolted thereto to distribute the weight.
  3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
  4. To Existing Concrete: Self-drilling concrete anchors or expansion anchor fasteners.
  5. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69 or Spring-tension clamps.
  6. To Light Steel: Sheet metal screws.
  7. For Surface-Mounted Items on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to structure. Attachment to gypsum wall board is not acceptable as sole support means; slotted-channel rack solidly attached to structure or light-gauge metal framing at both ends is required.
  8. For Recessed-Mounted Items in Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices to intermediate light-gauge metal framing members on each side of device or provide slotted-channel racks within hollow wall attached to structure by means that meet anchorage requirements. Attachment to gypsum wall board is not acceptable as sole support means.
- D. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars or existing raceways embedded in slab. Verify reinforcing locations with Structural Engineer and X-Ray existing concrete structures as required.
- E. Do not support any items (equipment, piping, conduit, etc.) exceeding 2 inches in diameter from the bottom of slabs. Where intermediate supports are required between structural members, use slotted steel channels support systems attached to beams or joists in order to avoid attachment to slabs.
- F. Slotted Support Systems
1. Install slotted channel systems level and plumb.
  2. Remove burrs from all exposed cut edges prior to installation.

- G. Wall Stud and Ceiling Supports
  - 1. Fasten junction, pull and devices boxes securely to the building construction, independent of raceway system.
  - 2. Install Device Box Mounting Brackets supported between two studs. Attach all device boxes to two studs, device box stabilizers are prohibited.
  - 3. Install Tee Bar Grid Box Hanger supported between two ceiling grid tee bars where devices boxes are located flush in recessed suspended ceilings. Install at least one independent support rod from box hanger to structure.
  - 4. Install Through-Stud Cable and Raceway Support Clips where cables or raceways run horizontally through metal studs.
- H. Install Roof-mounted Raceway Support Blocking where raceways run on across roofing.
  - 1. Coordinate installation of roof supports with items specified in Division 07 Section "Roof Accessories." Provide products compatible with rooftop materials included in the Work to maintain warranty of roof system.
- I. Threaded Rod Hardware
  - 1. Provide minimum of two lock nuts per threaded support rod except where lock nut tightens against a threaded socket, one locknut may be used.
  - 2. Trim rod excess to within 1-inch of locknut, de-burr, and provide protective endcap.
- J. Support raceways at a distance above suspended ceilings to permit removal of ceiling panels and luminaires.
- K. Locate raceways and supports so as not to hinder function or code required clearance to any system or equipment.
- L. Provide independent supports and hang all electrical raceways and devices from the building structure with UL listed and approved materials. Utilizing the support systems of other trade's work is prohibited, except with written approval from the Engineer.
- M. Provide riser support clamps for vertical conduit runs and install at each floor level penetration and at additional locations required to support weight of system.
- N. Tighten all bolted connections to proper torque values in accordance with manufacturer's written instructions.
- O. Provide supports to maintain 1/4-inch air space between raceway and mounting surface where raceways are mounted exposed in wet or corrosive locations and where directly attached to concrete or masonry.
- P. The use of tie wire or perforated metal tape for support or fastening of any raceway system is prohibited.
- Q. Where galvanized wire is used for cable supports above suspended ceilings, provide minimum #12 support wire independent of ceiling system secured at both ends. Paint or provide tag to distinguish supports from ceiling system.
- R. Welding directly on raceways, fittings, or outlet boxes is prohibited.

### 3.5 INSTALLATION OF VIBRATION ISOLATION PADS

- A. Select vibration device load ratings to match equipment loading and deflection criteria.
- B. Arrange pads in single or multiple layers of sufficient stiffness for uniform loading.
- C. Install pre-cut segments in accordance with manufacturer recommendations to match shape of equipment base.

### 3.6 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Comply with installation requirements in Division 05 Section "Metal Fabrications" for site-fabricated metal supports.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- C. Field Welding: Comply with AWS D1.1/D1.1M.

### 3.7 CONCRETE EQUIPMENT BASES

- A. Housekeeping Pads: Construct concrete housekeeping pads a minimum of 4-inches thick and 6-inches larger in both directions than supported unit.
- B. Exterior Equipment Pads: Construct exterior equipment pads a minimum of 8-inches thick and 6-inches larger in both directions than supported unit unless noted otherwise.
- C. Use 3000-psi, 28-day compressive-strength concrete unless otherwise noted. Comply with Division 03 Section "Cast-in-Place Concrete" and ACI standards for subbase requirements, concrete materials, reinforcement, placement, and cover requirements.
  - 1. Reinforce pads with a minimum #4 rebar on 12-inch centers each way or equivalent welded wire fabric. Support reinforcement and tie together to prevent displacement during construction.
  - 2. For interior pads, provide #4 dowels at 24-inch centers each way (minimum of 4) to anchor to structural slab below. Embed dowels into slab a minimum of 3-inches.
  - 3. Provide rubbed finish for all surfaces.
  - 4. Provide 3/4-inch chamfer at all exposed edges.
  - 5. Provide Engineer approved repairs if pad surface is rough or shows signs of honeycomb.
  - 6. Provide crown for exterior pads with a slope of 1/8-inch per foot.
  - 7. Do not set heavy equipment on pad for at least 7 days after pour unless approved by Engineer.
- D. Anchor equipment to concrete base.
  - 1. Locate anchors to be a minimum of 10 bolt diameters from edge of the base.
  - 2. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3. Install anchor bolts to elevations required for proper attachment to supported equipment.
4. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

### 3.8 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

- A. Comply with NECA 1.
- B. Coordinate all required openings and provide sleeves and inserts prior to construction of wall and floor systems. Where openings are missed or incorrectly located, provide core-drilling and patching at no additional expense to owner.
- C. Install sleeves without compromising structural integrity of wall or floor.
- D. Sleeves for Conduits or Cable Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:
  1. Interior Penetrations of Non-Fire-Rated Walls and Floors:
    - a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint.
    - b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall, so no voids remain. Tool exposed surfaces smooth; protect material while curing.
  2. Unless sleeve seal systems are used, size pipe sleeves to provide a minimum 1/4-inch annular clear space between sleeve and raceway. Where conduit motion due to expansion and contraction will occur, provide sleeves a minimum of two conduit sizes larger than the nominal conduit diameter.
  3. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls.
    - a. For conduit penetrations, cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
    - b. For cable penetrations, extend sleeve a minimum of 2-inches beyond surface of wall and provide plastic insulated bushing.
  4. Install sleeves for floor penetrations. Extend sleeves installed in floors a minimum of 6-inches above finished floor level unless noted otherwise. Install sleeves during erection of floors.
  5. Fasten sleeves securely in floors, walls, so that they will not become displaced when concrete is poured or when other construction occurs around them. Take precautions to prevent concrete, plaster or other materials being forced into the space between pipe and sleeve during construction.
- E. Sleeves for Cables Penetrating Non-Fire-Rated Gypsum Board Assemblies:
  1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
  2. Seal space outside of sleeves with approved joint compound or acoustical sealant for gypsum board assemblies.

- F. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units and counter flashing applied in coordination with roofing work. Coordinate all work with roofing system to maintain roof warranty.
- G. Exterior-Wall and Floor Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seal system. Size sleeves to allow for manufacturer recommended annular clear space between raceway or cable and sleeve for installing sleeve-seal system. Where sleeves are installed in core drilled openings, grout sleeve into the opening.
- H. Where sleeves are installed exposed in finished spaces, provide metal escutcheon plates of size to match the sleeve.
- I. Sleeve-Seal-System:
  - 1. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.
  - 2. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

### 3.9 ELECTRICAL SYSTEM FIRESTOPPING INSTALLATION

- A. Install firestopping at all penetrations of fire-rated assemblies. Comply with requirements in Division 07 and as outlined below.
- B. Coordinate location and proper selection of firestop devices with fire rated assembly. Ensure cast-in place devices are installed before placement of concrete.
- C. Install firestop materials in accordance with UL Fire Resistance Directory and manufacturer's instructions.
- D. Affix permanent label to each side of penetration immediately adjacent to firestopping to communicate to futures installers and code authorities the following:
  - 1. Fire-stop product/system used
  - 2. Installation Company
  - 3. Penetration Hour Rating
  - 4. Installation Date
- E. Examine sealed penetration areas to ensure proper installation before concealing or enclosing areas. Keep areas of work accessible until inspection by applicable code authorities.

### 3.10 PAINTING

- A. Touchup: Comply with requirements in Division 09 painting Sections for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.



- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 260500

## SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions, Division 01 Specification Sections, and Section 260010 “General Requirements for Electrical Systems” apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Building wire and cable rated 600 V and less.
  - 2. Connectors, splices, and terminations rated 600 V and less.
  - 3. Control Voltage Conductors and Cables

#### 1.3 REFERENCES

- A. Abbreviations
  - 1. RoHS: Restriction of Hazardous Substances.
- B. Definitions
  - 1. Low Voltage: Circuits and equipment operating at more than 50VAC but less than 1000VAC for building electrical distribution systems.
  - 2. Control Voltage: Circuits and equipment operating at less than 50VAC for remote-control and signaling power-limited circuits.
  - 3. Plenum: A space forming part of the air distribution system to which one or more air ducts are connected. An air duct is a passageway, other than a plenum, for transporting air to or from heating, ventilating, or air-conditioning equipment.
  - 4. Homerun: The run of raceway(s) and cable(s) between the panelboard or switchboard and the junction box in the area served where branch circuit cables originate.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.

## PART 2 - PRODUCTS

### 2.1 GENERAL REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

### 2.2 BUILDING WIRE AND CABLE

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Alpha Wire Company.
  - 2. Cerro Wire LLC.
  - 3. Encore Wire Corporation.
  - 4. General Cable Technologies Corporation.
  - 5. Okonite Company.
  - 6. Southwire Company.
- B. Building Wire Description: Flexible, insulated, and uninsulated, drawn current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.
- C. Cable Description: A factory assembly of one or more current-carrying insulated conductors in an overall protective sheath.
- D. General Requirements:
  - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
  - 2. RoHS compliant.
  - 3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."
- E. Copper Conductors: 98% conductive annealed copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.
- F. Conductor Insulation:
  - 1. 600V, 90°C
  - 2. Comply with ANSI/NEMA WC 70/ICEA S-95-658.
  - 3. THHN/THWN-2: Comply with UL 83.
  - 4. XHHW-2: Comply with UL 44.
  - 5. RHW-2: Comply with UL 44 and UL 2196.

## 2.3 SPLICING DEVICES & CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. 3M; Electrical Products Division.
  2. AFC Cable Systems, Inc.
  3. Burndy
  4. Gardner Bender.
  5. Hubbell Power Systems, Inc.
  6. Ideal Industries, Inc.
  7. ILSCO.
  8. NSi Industries LLC.
  9. O-Z/Gedney;
  10. Thomas & Betts.
  11. Tyco Electronics Corp.
- B. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
- C. Material: Tin plated copper
- D. Twist-On Wire Connectors: spring pressure type, 600V, 105°C insulation, capable of connecting two or more wires up to #8 AWG in a pigtail application.
- E. Crimp Sleeve Splices: butt or parallel crimp type, copper sleeve with nylon cover and skirted insulators, capable of permanent connection of two or more wires up to #10 AWG.
- F. Compression Splices: standard or long barrel type, 90°C, with cold shrink tubing, for use with hydraulic crimping tool, capable of permanent connection of wires #6 AWG and larger.
- G. Ring or Flanged Fork Tongue Terminals: crimp type, 600V, 105°C insulation, insulated serrated barrel, capable of terminating wires up to #10 AWG.
- H. No aluminum splicing devices or connectors are permitted.

## 2.4 CONTROL VOLTAGE CONDUCTORS AND CABLE

- A. Control Cable: NFPA 70, Type CMG or CMP
1. Single or Multi-pair, twisted, minimum No. 18 AWG, stranded tinned copper conductors.
  2. PVC insulation.
  3. Shielded or Unshielded.
  4. Flame Resistance:
    - a. CMG: Comply with UL1685

b. CMP: Comply with NFPA 262

B. Class 1, 2, and 3 Control Circuits: Stranded Copper, Type THHN/THWN-2

### PART 3 - EXECUTION

#### 3.1 CONDUCTOR AND INSULATION APPLICATION

- A. Feeders and Branch Circuits: Copper. THHN/THWN-2. Solid for #10 AWG and smaller; stranded for # 8 AWG and larger.
  - 1. Provide XHHW-2 insulation for circuits routed exposed on rooftops.
- B. Conductors for motors or vibrating or oscillating equipment: Extra flexible stranded.
- C. Cord Drops and Portable Appliance Connections: Type SOOW, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.
- D. Conductor sizes indicated on drawings are based upon 75 degree C rating.
- E. Minimum branch circuit or feeder size:
  - 1. Not less than #12 AWG copper wire unless noted otherwise.
- F. Minimum control circuit conductor sizes:
  - 1. Class 1 remote-control and signal circuits; No 14 AWG.
  - 2. Class 2 low-energy, remote-control, and signal circuits; No. 16 AWG.
  - 3. Class 3 low-energy, remote-control, alarm, and signal circuits; No 12 AWG
- G. Provide all wire for the project in new and undamaged condition. Deliver in standard coils or reels. Wires and cables manufactured more than 24 months prior to date of delivery to the site are not acceptable.

#### 3.2 EXAMINATION

- A. Prior to installing conductors and cables:
  - 1. Verify that raceway installation is complete according to Section 260533 "Raceways and Boxes for Electrical Systems" and ready for installation of conductors and cables.
  - 2. Verify that raceways are properly sized in accordance with NEC.
  - 3. Visually inspect exposed raceways to ensure that raceways are not damaged, and bends are not deformed.
  - 4. Verify that raceways do not exceed the maximum number of bends between pull-points.
  - 5. Verify raceways have been cleaned of all dirt and debris.

#### 3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Pulling Conductors in Raceways

1. Pull cables in accordance with cable manufacturer and pulling equipment manufacturer recommendations as well as applicable sections of the National Electric Code.
  2. Use installation equipment, tools, and materials as necessary, such as sheaves, pulling eyes, basket grips, winches, cable reels and/or cable reel jacks, duct entrance funnels, and pulling tension gauges, and approved pulling lubricants where required to facilitate cable pulling without damage to cables or raceway.
  3. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not use lubricants that harden or become adhesive with age. Apply lubricant where cables enter ducts and conduits and at all intermediate access points on long or difficult pulls.
  4. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values. Utilize special remote readout equipment to ensure compliance.
  5. Avoid abrasion and other damage to cables during installation. Provide physical protection of cables, such as using appropriately sized flexible cable guides or feed-in tubes, at the entrance of boxes and raceways.
  6. If basket-grip type cable-pulling devices are used to pull cable in place, cut off the section of cable under the grip before splicing and terminating.
- B. Bend Radius
1. Handle conductors and cables carefully. Make bends in cables and conductors such that cables, conductors, sheaths, armor, etc., are not damaged.
  2. Do not bend conductors and cables to less than the NEC and manufacturer recommended minimum bending radius.
  3. Ensure that tools and accessories used to install conductors and cables, such as rollers, sheaves, trolley assemblies, tube guides, and/or raceways, are properly sized and utilized to be greater than the minimum bending radii of conductors and cables.
  4. Minimize bending where conductors and cables enter or exit raceways, cabinets, and boxes. Do not install cables that have been bent or kinked to a radius less than the recommended dimension.
  5. Install conductors only after insulating bushings are in place.
- C. If multiple circuits are pulled in a single homerun, provide a dedicated neutral for each phase conductor. In these cases, a maximum of seven conductors (six current carrying and one ground) are permitted in a single conduit except for switch legs and travelers in multi-point switching arrangements. De-rate conductors per NEC.
- D. Multi-wire branch circuits with a shared neutral are not permitted unless specifically noted on the drawings. Where indicated, group the phases and neutral together with cable ties in the panelboard and in all pull boxes.
- E. Install conductors for isolated power systems in as short a run of conduit as practicable. The use of pulling compound or lubricant is not permitted on conductors in isolated power systems.

- F. Voltage Drop:
1. Adjust conductors and conduit sizes accordingly based on actual field installed conditions.
  2. Size and Install all feeders and branch circuits for a maximum 2% voltage drop in feeders and 3% in branch circuits with a maximum total voltage drop of 5%.
  3. Calculate using a load equal to 80% of the supply breaker rating unless the circuit breaker is rated to carry 100% of the load.
  4. Where the conductor length from the panel to the first outlet on a circuit exceeds the values below, adjust branch circuit conductors from the panel to the first outlet. Increase the conductor size of remaining branch circuit as needed to meet above voltage drop limitations.
    - a. For 277VAC homeruns exceeding 125-feet, #10 AWG minimum
    - b. For 120VAC homeruns exceeding 50-feet, #10 AWG minimum
    - c. For 120VAC homeruns exceeding 100-feet, #8 AWG minimum
- G. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.
- H. Install cables parallel and perpendicular to surfaces of exposed structural members and follow surface contours.
- I. Bundle cables where run in groups using listed supports. Provide independent supports directly from structure, do not route through structure or on work of other trades.
- J. Metal Clad Cable, Type MC
1. The use of metal clad cable is not permitted, except for connections to ceiling mounted recessed and semi-recessed luminaires concealed in accessible ceiling where the maximum length is limited to 72-inches.
- K. Control Circuit Conductors and Cables
1. Use insulated spade lugs for wire and cable connection to screw terminals.
  2. Conductors installed within environmental air plenums shall be per NEC. Article 800 and other applicable codes, with FEP-type insulation or an approved equivalent. Provide plenum-rated cable supports where plastic straps or other supports, etc., are installed in plenum areas.
  3. Where indicated, systems and control conductors that are installed exposed shall not be routed across ceilings or ductwork. Provide independent supports anchored to building structure or other permanent support members.
  4. Install in such a manner as to not interfere with the access to or operation of equipment or removal of ceiling tiles.
  5. Nylon tie-wraps shall be installed in such a manner so as to bundle conductors neatly, allowing runouts of single conductors or groups to drop down to equipment served.
  6. Install grommets where dropping out of trays or into panels or service columns.
  7. Install sleeves with bushings where penetrating partitions.

8. Provide firestopping for penetrations of fire rated assemblies with approved materials.

### 3.4 SPLICES, TAPS, CONNECTIONS, AND TERMINATIONS

- A. Prepare cable in accordance with the conductor, cable, splice and termination component manufacturers' recommendations and instructions.
- B. Cut conductors and cables using tools and methods which ensure a square cut. Do not nick or damage conductors.
- C. Ensure conductor inserts fully into the connector or termination with the insulation fitting closely to the connector or termination.
- D. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B. Where a tightening torque is indicated as a numeric value on equipment or in installation instructions provided by the manufacturer, a calibrated torque tools shall be used to achieve that indicated torque value, unless the equipment manufacturer has provided installation instructions for an alternative method of achieving the required torque.
- E. Splices and Taps
  1. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than un-spliced conductors.
  2. Make splices and taps in junction boxes or other enclosure approved for the wiring method.
  3. For conductors #10 AWG and smaller conductors, use pressure crimp type connections.
  4. For conductors #8 AWG and larger, use a hydraulic compression type connection, with cold shrink tubing and tape to restore full insulation value of the wire being spliced.
- F. Connections and Terminations
  1. Ensure that conductor temperature and ampacity ratings are compatible with connectors, terminals, and equipment to which they are to be connected.
  2. Provide crimp-applied ring or flanged fork type terminals for motor and equipment terminals where such terminals are provided on motor and equipment leads or on all stranded wire terminations using #10 AWG or smaller conductors.
  3. Motor Connections shall use connection lugs with motor stub splice insulators.
- G. Wiring at Outlets: Install conductors at each outlet with at least 12 inches of slack.
- H. All cables and wiring, regardless of voltage, installed in manholes or cable vaults shall be routed in such a manner to provide a minimum of 10 feet of slack cable for future splicing. Install cables along walls by utilizing the longer route from entry to exit. If both routes are symmetrical, provide a loop of cable secured to wall. All cables shall be tied to insulated cable supports on wall-mounted racks, spaced a maximum of three feet apart.



### 3.5 PROTECTION

- A. Intentional or unintentional painting of exposed low-voltage and/or control-voltage cabling insulation is prohibited. Ensure that exposed cabling is adequately protected from direct painting or overspray whether painting is required within the electrical specifications or required by other disciplines/trades.
- B. Review the project's painting requirements for all disciplines and provide protection as required.
- C. Where exposed cabling is being installed in exposed ceiling or wall spaces that are required to be painted, provide cabling in enclosed raceways, or provide alternate options for cable colors to engineer for approval.

### 3.6 IDENTIFICATION

- A. Comply with Section 260553 "Identification for Electrical Systems."
  - 1. All conductors shall be identified by means of labels placed on conductors in all junction boxes and at each terminal point with labels indicating source, circuit number or terminal number.
  - 2. Identify each spare conductor at each end with identity number and location of other end of conductor and identify as spare conductor.
  - 3. Identify each control voltage conductor or cable on each end and at each terminal with a number-coded identification tag. Each wire must have a unique tag.
- B. Conductors, in all sizes of cable, shall have continuous solid insulation color(s) from the manufacturer. Taped ends shall not be acceptable.
  - 1. Conductors shall be color coded as follows:
    - a. 120/208 Volt Conductors
      - 1) Phase A: Black
      - 2) Phase B: Red
      - 3) Phase C: Blue
      - 4) Neutral: White
      - 5) Ground: Green
    - b. Note: Further identify isolated power conductors with ½" wide purple tape at all terminations and junctions.
  - 2. Control voltage wiring color coding shall be consistent throughout the project and shall match existing equipment and standards where applicable. Color coding for each system shall be unique.
  - 3. Conductors within enclosures that may be energized when enclosure disconnect is off - yellow or taped with 1/2" yellow tape every 6" of length, inside enclosure. Provide lamacoid plate warning sign on front of enclosure where this condition occurs.
  - 4. DC Wiring:
    - a. Positive: Light Blue
    - b. Negative: Dark Blue

### 3.7 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
- B. Visual Inspections:
  - 1. Compare cable data with drawings and specifications.
  - 2. Inspect exposed sections of cable for physical damage and correct connections in accordance with drawings.
  - 3. Inspect bolted electrical connections for high resistance. Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data.
  - 4. Inspect compression-applied connectors for correct cable match and indentation.
  - 5. Inspect for correct identification and arrangements.
  - 6. Inspect cable jacket insulation and condition.
- C. Electrical Tests:
  - 1. Perform insulation resistance testing for all electrical distribution system feeders unless notes otherwise. Testing may be witnessed by the Engineer and/or Commissioning agent. Schedule all tests with Architect with sufficient notice.
  - 2. Insulation resistance tests shall be performed at a DC voltage of 1,000 volts for 600 volt rated equipment, and at a DC voltage of 500 volts for 120-300 volt rated equipment. Test duration shall be one minute. Minimum acceptable (temperature corrected) resistance is 25 megaohms for 120-300 volt rated equipment and 100 megaohms for 600 volt rated equipment and wiring.
  - 3. Test instruments shall be calibrated to national standards within the last 12 months.
- D. Test and Inspection Reports: Prepare a written report to record the following:
  - 1. Test procedures used.
  - 2. Results that comply with requirements.
  - 3. Results that do not comply with requirements and corrective action taken to achieve compliance with requirements.
- E. Cables will be considered defective if they do not pass tests and inspections. Remove and replace malfunctioning units and retest as specified above.
- F. Submit test results to Architect and Engineer for approval

END OF SECTION 260519

## SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions, Division 01 Specification Sections, and Section 260010 “General Requirements for Electrical Systems” apply to this Section.

#### 1.2 SUMMARY

- A. Description: Grounding and Bonding for electrical systems covers several different but interrelated systems including Electrical System Grounding, Equipment Grounding System, Grounding Electrode System, and interfaces with telecommunications bonding infrastructure as well as lighting protection systems.
- B. Section includes requirements for electrical system and equipment grounding, plus the following special applications:
  - 1. Underground distribution grounding.
  - 2. Grounding electrodes.
  - 3. Ground bonding common with lightning protection system.

#### 1.3 REFERENCES

- A. Abbreviations
  - 1. MGB: Main Grounding Busbar
- B. Definitions
  - 1. Grounding: Establishing a direct or indirect connection to Earth or some conducting body that serves in place of Earth.
  - 2. Bonding: Method by which all non-energized conductive materials are effectively interconnected to create a low impedance path.
- C. Reference Standards: The following publications are referred to in the text by the basic designation only. The edition/revision of the referenced publications shall be the latest version as of the date of the Contract Documents, unless otherwise specified.
  - 1. National Electrical Contractors Association (NECA)
    - a. NECA 331 – Standard for Building and Service Entrance Grounding and Bonding

#### 1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.

- B. Field quality-control reports. Provide test reports for each test specified in the field quality control section. Include copies of current equipment calibration certification.
- C. Closeout Submittal:
  - 1. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.
  - 2. In addition to items specified in Division 01 and Section 260010 "General Requirements for Electrical Systems", include the following:
    - a. Instructions for periodic testing and inspection of grounding systems and features based on NETA MTS and NFPA 70B.
      - 1) Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.
      - 2) Include recommended testing intervals.
  - 3. As-Built Data: Plans showing dimensioned as-built locations of grounding features specified in "Field Quality Control" Article, including the following:
    - a. Test wells.
    - b. Grounding electrodes and connections.
    - c. Grounding arrangements and connections for separately derived systems.

## PART 2 - PRODUCTS

### 2.1 GENERAL REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency acceptable to authorities having jurisdiction and marked for intended location and application.
- B. Comply with NFPA 70 and UL 467 for grounding and bonding materials and equipment.

### 2.2 MANUFACTURERS:

- A. Subject to compliance with requirements, provide products by one of the following:
  - 1. ABB Blackburn
  - 2. Eaton B-Line
  - 3. Harger
  - 4. Hubbell Burndy
  - 5. Ilsco
  - 6. nVent Erico
  - 7. Panduit
  - 8. VFC Lyncole

## 2.3 CONDUCTORS

- A. Insulated Copper Conductors: Comply with Section 260519 “Low-Voltage Electrical Power Conductors and Cables”.
- B. Bare Copper Conductors:
  - 1. Solid Conductors: ASTM B 3.
  - 2. Stranded Conductors: ASTM B 8.
  - 3. Tinned Conductors: ASTM B 33.
- C. Straps/Jumpers: Copper tape, braided conductors pre-terminated with copper ferrules, cross-sectional area no less than a No. 6 AWG conductor.

## 2.4 ELECTRICAL SYSTEM BUSBARS

- A. Grounding Busbar: Predrilled rectangular bars of annealed copper, minimum 1/4 by 4 inches in cross section, with 9/32-inch holes spaced 1-1/8 inches apart. Size busbar length to accommodate initial conductor installation plus a 50% growth factor. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 1000 V and shall be Lexan or PVC, impulse tested at 5000 V.

## 2.5 CONNECTORS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
- B. Welded Connectors: Exothermic-welding kits consisting of graphite molds, copper oxide and aluminum weld metal, and electronic ignition system. Provide types recommended by kit manufacturer for materials being joined and installation conditions.
- C. Irreversible Compression Connectors: Tin-plated copper, for installation using a hydraulic compression tool and die matched to connector type. Provide with die code or other visual indicator to ensure proper connector selection and uniform compression for a permanent connection.
  - 1. Taps: C-type, H-type, or Figure 6/8 type.
  - 2. Splices: Long Barrel straight or tee.
  - 3. Terminals: Two-hole lug long barrel type.
- D. Mechanical Connectors: Tin-plated high strength copper alloy or high strength cast bronze
  - 1. Water Service Pipe Clamps: Heavy-Duty, two-piece saddle type with stainless steel bolts.
  - 2. Pipe Clamps: Heavy-Duty, U-bolt type with silicon bronze hardware.
  - 3. Lay-in Lug Connector: Heavy-Duty, open face lug with hex head set screw.

## 2.6 GROUNDING ELECTRODES

- A. Ground Rods: 10 mil pure electrolytic copper coating with molecular bond to high strength steel core; 3/4 inch by 10 feet with chamfered end. Ensure ground rods are die-stamped near the top with the name and trademark of the manufacturer and the length in feet.
- B. Enhanced Composite Backfill: Electrically conductive, environmentally safe, maintenance free backfill material with neutral PH properties that creates a stable, non-corrosive, low resistance connection between a grounding electrode and earth. Basis of Design: Erico Ground Enhancement Material (GEM).
- C. Test Well: Lightweight polymer concrete, Tier 15 rated, non-slipcover, suitable for non-deliberate incidental traffic. 12-inch by 12-inch minimum, 12-inches deep unless noted otherwise, with "GROUND" legend unless noted otherwise.

## PART 3 - EXECUTION

### 3.1 GENERAL

- A. Bond grounding bus and all non-current carrying metallic parts of raceways systems and equipment to common ground in accordance with the National Electrical Code, NECA 331, as shown on the Contract Drawings, and in accordance with the requirements of the local authority having jurisdiction.
- B. The size of the grounding and bonding conductors shall be not less than that given in Article No. 250 of the National Electrical Code, and/or as shown on the Contract Drawings.
- C. Interconnect all grounding systems in or on the structure to provide a common ground potential.
- D. Bond all outlet, junction, pull boxes, and enclosures to the equipment grounding conductor with a grounding pigtail.

### 3.2 APPLICATIONS

- A. Conductors: Install solid conductor for #10 AWG and smaller, and stranded conductors for #8 AWG and larger unless otherwise indicated.
  - 1. Install bare conductors where not specifically identified as bare or insulated except where installed in conduit with associated phase conductors. Install insulated conductors in conduit with insulation of the same material as the associated phase conductors with which it is installed.
  - 2. Provide insulated conductors not exceeding No. 8 AWG in size with green colored insulation. Identify conductors larger than No. 6 AWG with 4-inch green tape at each termination and at all junction and pull boxes.

- B. Underground Grounding Electrode Conductors: Install bare copper conductor, sized per NEC, or as indicated on drawings, whichever is larger.
  - 1. Bury at least 24 inches below grade or below the frost line depth, whichever is greater.
  - 2. Duct-Bank Grounding Conductor: Bury 12 inches above duct bank when indicated as part of duct-bank installation.
  
- C. Electrical System Grounding Busbar: Install in electrical rooms housing service equipment, and elsewhere as indicated to provide a common connection point for individual grounding electrode conductors and bonding jumpers.
  - 1. Install bus horizontally, on insulated spacers 4 inches minimum from wall, 18 inches above finished floor unless otherwise indicated.
  - 2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.
  - 3. Provide green laminated plastic nameplate with 1/2" high white letters indicating function of ground bus (i.e. "Service Main Ground Busbar").
  
- D. Conductor Terminations and Connections:
  - 1. Pipe and Equipment Grounding Conductor Connections: Mechanical connectors.
  - 2. Underground and Exposed Exterior Connections: Exothermic welded connectors except at test wells and as otherwise indicated.
  - 3. Connections to Ground Rods at Test Wells: Mechanical connectors.
  - 4. Connections to Structural Steel: Exothermic welded connectors.
  - 5. Connections to Busbars: Irreversible compression connectors.

### 3.3 GROUNDING AT THE SERVICE

- A. Equipment grounding conductors and grounding electrode conductors shall be connected to the neutral bus except where service equipment neutral and ground bussing complies with exceptions listed in the NEC. Install a main bonding jumper between the neutral bus and ground bus. Provide external grounding busbar and install grounding electrode conductor to interconnect main grounding busbar and neutral bus.
  
- B. Where ground fault protection is installed, ensure interconnection of neutral bus and ground bus does not interfere with correct operation of fault protection.

### 3.4 GROUNDING SEPARATELY DERIVED SYSTEMS

- A. Transformers: Provide grounding in accordance with the NEC and the following:
  - 1. System Bonding Jumper (SBJ): Install at the source enclosure between the grounded terminal (neutral) and the equipment grounding terminal.
  - 2. Supply Side Bonding Jumper (SSBJ): Install wire type SSBJ to bond the source enclosure to the enclosure at the first disconnect or overcurrent protective device.
  - 3. Grounding Electrode Conductor (GEC): Install at the source enclosure from the SBJ connection point to the building grounding electrode system.

4. Bonding Jumpers: Where the metal water piping and/or the metal structural steel building frame in the area served by the separately derived system are not used as a grounding electrode, provide bonding jumper to the GEC connection point at the source enclosure.
5. Equipment Grounding Conductor (EGC): Bond the EGC of the primary feeder to the equipment grounding terminal.

### 3.5 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

- A. Comply with IEEE C2 grounding requirements for utility equipment.
- B. Exterior Pad-Mounted Equipment: Install a minimum of two ground rods and ground ring around the pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with equipment by connecting them to underground grounding conductors and grounding electrodes. Install tinned-copper conductor not less than No. 2 AWG for ground ring and for taps to equipment grounding terminals. Bury ground ring not less than 6 inches from the foundation.

### 3.6 EQUIPMENT GROUNDING AND BONDING

- A. Equipment Grounding Conductors: Install insulated equipment grounding conductors with all feeders and branch circuits. Provide conductors of the same wire/cable type as the ungrounded current carrying conductors.
- B. Increase equipment grounding conductor sizes in accordance with NEC article 250 where ungrounded current carrying conductor sizes are increased to minimize voltage drop.
- C. Provide all circuits with a dedicated equipment grounding conductor unless noted otherwise.
- D. Provide an equipment grounding conductor to each outlet on circuits protected by a GFCI circuit breaker.
- E. At all metallic outlet, junction and pull boxes, bond the equipment grounding conductor to the enclosure.
- F. Metal Poles Supporting Outdoor Lighting Fixtures: Install a ground rod and a separate insulated equipment grounding conductor at each pole in addition to grounding conductor installed with branch-circuit conductors.

### 3.7 INSTALLATION

- A. Grounding Electrode Conductors and Bonding Jumpers: Securely fasten and route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.



1. Route conductors to maintain a downward or horizontal direction to ground with a minimum bend radius of 8-inches.
  2. Protection: Install above grade conductors No 6 AWG or larger exposed to physical damage and all conductors smaller than No. 6 AWG in schedule 80 PVC conduit. Where metallic conduit is required, bond each conduit end to the electrode or ground conductor as close to the openings as possible with a full-size conductor and bonding bushing to create an electrically parallel path.
  3. Clearance: Maintain a minimum separation of 12-inches from open telecommunications cable groups.
- B. Ground Rods: Auger 6 inch diameter hole to depth 6 inches shorter than the ground rod length. Drive rods a minimum of 12 inches into the bottom of the hole until tops are 12 inches below final grade. After installing connections, backfill around ground rod with enhanced composite backfill.
1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
  2. Except at test wells, use exothermic welds for all below-grade connections to ground rods.
  3. For grounding electrode system at the service, install at least three rods spaced at least two-rod lengths from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.
- C. Test Wells: Ground rod driven through drilled hole in bottom of handhole.
1. Install at least one test well for each service unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.
- D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts. Install straps and jumpers such that it does not restrict movement of the structure to which it is connected.
  2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
  3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.
- E. Grounding and Bonding for Piping:
1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes using a mechanical connector. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
  2. Water Meter: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.

3. Other Metal Piping: Bond each aboveground portion of metal piping systems, including gas piping, downstream from its equipment shutoff valve in an accessible location.
  4. Except for water piping, do not utilize piping systems as a ground path where dielectric fittings are utilized. Do not use bonding jumpers to bridge over such fittings.
  5. Do not use underground portions of natural gas, flammable gas, or liquid fuel piping as grounding electrodes.
- F. Grounding for Steel Building Structure:
1. Where the building's steel frame is made discontinuous by masonry breaks or expansion joints, provide an accessible No. 500 kcmil bare copper jumper with exothermic weld connections to bond steel sections together, making the steel frame electrically continuous. The installation of the bonding jumpers shall be reviewed by the Engineer before covering.
- G. Concrete-Encased Grounding Electrode (Ufer Ground): Provide and fabricate in accordance with NFPA 70; use a minimum of 20 feet bare copper conductor no smaller than #4 AWG located in building footing that has direct contact with earth.
1. If concrete foundation is less than 20 feet long, coil excess conductor within base of foundation.
  2. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts using exothermic weld connections. Extend grounding conductor below grade and connect to building's ground ring or to grounding electrode external to concrete.
- H. Exothermic Welded Connections: Provide in kit form and selected for the specific types, sizes, and combinations of conductors and other items to be connected.
1. An electronic ignition system shall be used, and weld metal shall be a self-contained, sealed system with a bi-metallic fuse to start the reaction.
  2. Comply with AWS Standards and manufacturer's instructions for procedures, appearance, and quality of welds; and methods used in correcting welding work.
  3. Ensure process joins all strands and does not cause the parts to be damaged or weakened.
  4. Completed connection or joint must be equal or larger in size than the conductors joined and have the same current-carrying capacity as the largest conductor.
- I. Mechanical Connections: Install mechanical connections in accessible locations.
1. Tighten connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values.
  2. Where manufacturer's torquing requirements are not indicated, tighten connections to comply with tightening torque values specified in UL 486A to assure permanent and effective grounding.
- J. Connections between Dissimilar Metals: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact are galvanically compatible.

1. Clean surfaces and apply antioxidant compound prior to installation of connections.
2. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer in order of galvanic series.
3. Make connections with clean, bare metal at points of contact.
4. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
5. Make aluminum-to-galvanized-steel connections with tin-plated copper jumpers and mechanical clamps.
6. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

### 3.8 FIELD QUALITY CONTROL

- A. Buried or concealed grounding electrode systems shall be accepted by Engineer and Owner Representative before backfilling or covering.
- B. Tests and Inspections:
  1. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
  2. Bond Resistance Test: Test the bonding connections of the system using a certified micro-ohmmeter, taking two-point resistance measurements across each bond in the grounding electrode system. The maximum acceptable value of each bond is 0.5 milliohms.
  3. After completing installation of the grounding electrode system and finished grade, but before permanent electrical circuits have been energized, test for compliance with requirements.
  4. Grounding Electrode Resistance Test: Test completed grounding electrode system at service disconnect enclosure grounding terminal and at ground test wells using a manufacturer calibrated and certified 3-point ground resistance tester.
    - a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
    - b. Perform tests by three-point fall-of-potential method according to IEEE 81.
    - c. Disconnect and isolate the grounding electrode conductor from the electrical system at the main ground bus before testing.
    - d. Install outer test probe outside the sphere of influence of the grounding electrode system. This value is typically 10 times the size of the grounding electrode system, between 300 and 500 feet from the main ground bus.
    - e. Install inner test probe at 10 equally spaced intervals, in a straight line between the grounding electrode system connection and the outer test probe and note the resistance reading at each location.
    - f. The resistance measurements taken from the flat part of the curve shall be averaged to determine the grounding electrode system resistance to earth.
    - g. If large variations are noted in the resistance measurements, the outer test probe should be relocated further from grounding electrode system

(outside its sphere of influence) to achieve some degree of flatness on the resistance curve.

- h. Excessive Ground Resistance: If resistance to ground exceeds 5-ohms, notify Engineer promptly and include recommendations to reduce ground resistance. If deemed necessary by the Engineer, additional electrodes shall be placed, and the measurement process repeated until the desired ground potential achieved.
5. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include test probe locations, observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.
- C. Grounding system will be considered defective if it does not pass tests and inspections.
  - D. Prepare detailed test and inspection reports and submit to Engineer for review.

END OF SECTION 260526

## SECTION 260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions, Division 01 Specification Sections, and Section 260010 – General Requirements for Electrical Systems apply to this Section.

#### 1.2 SUMMARY

- A. This section is intended to specify the raceways, fittings, boxes, cabinets, specialties, and related items necessary to complete the work as shown on the drawings and specified herein.
- B. Section Includes:
  - 1. Metal conduits and fittings
  - 2. Nonmetallic conduits and fittings
  - 3. Surface metal raceway
  - 4. Metal wireways and auxiliary gutters.
  - 5. Boxes, enclosures, and cabinets
  - 6. Wall ducts and trench ducts.
- C. Related Requirements:
  - 1. Refer to Division 07 firestopping section and Section 260010 “General Requirements for Electrical Systems” for penetration firestopping requirements related to electrical pathways and boxes.

#### 1.3 REFERENCES

- A. Abbreviations
  - 1. EMT: Electrical Metallic Tubing
  - 2. FMC: Flexible Metal Conduit
  - 3. GRC: Galvanized Rigid Steel Conduit
  - 4. IMC: Intermediate Metal Conduit
  - 5. LFMC: Liquid-tight Flexible Metal Conduit.
  - 6. RAC: Rigid Aluminum Conduit
  - 7. RMC: Rigid Metal Conduit
- B. Definitions
  - 1. Outlet: A point on the wiring system at which current is taken to supply utilization equipment.

2. Raceway: an enclosed channel designed for enclosing and protecting electrical, communications, and signaling wires and cables.
- C. Reference Standards: The following publications are referred to in the text by the basic designation only. The edition/revision of the referenced publications shall be the latest version as of the date of the Contract Documents, unless otherwise specified.
1. National Electrical Contractors Association (NECA)
    - a. NECA 101 - Standard for Installing Steel Conduits (RMC, IMC, EMT)
    - b. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC)
  2. National Electrical Manufacturers Association (NEMA)
    - a. NEMA FB 2.10 - Selection and Installation Guidelines for Fittings for Use with Non-Flexible Metallic Conduit or Tubing (Rigid Metal Conduit, Intermediate Metal Conduit, and Electrical Metallic Tubing)
    - b. NEMA FB 2.20 - Selection and Installation Guidelines for Fittings for Use with Flexible Electrical Conduit and Cable
    - c. NEMA RV 3 - Application and Installation Guidelines for Flexible and Liquid-tight Flexible Metal Conduits

#### 1.4 SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop drawings: For custom enclosures, cabinets, or boxes.

### PART 2 - PRODUCTS

#### 2.1 GENERAL REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

#### 2.2 METAL CONDUIT AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  1. AFC Cable Systems, Inc.
  2. Allied Tube & Conduit.
  3. Anamet Electrical, Inc.
  4. Calconduit
  5. Electri-Flex Company.
  6. Nucor Tubular Products.

7. O-Z/Gedney.
  8. Picoma Industries.
  9. Robroy Industries.
  10. Southwire Company.
  11. Thomas & Betts Corporation.
  12. Western Tube and Conduit Corporation.
  13. Wheatland Tube Company.
- B. Electrical Metallic Tubing (EMT) and Elbows:
1. Comply with ANSI C80.3 and UL 797.
- C. Galvanized Rigid Steel Conduit (GRC, RMC) and Elbows:
1. Comply with ANSI C80.1 and UL 6.
  2. Zinc coating both inside and outside by means of hot-dip galvanizing.
  3. Use only threaded fittings for GRC.
- D. Intermediate Metal Conduit (IMC) and Elbows:
1. Comply with ANSI C80.6 and UL 1242
- E. Flexible Metal Conduit (FMC):
1. Comply with UL 1.
  2. Continuous interlocked hot-dip zinc galvanized steel with smooth interior and exterior.
  3. Suitable for dry locations.
- F. Liquid-tight Flexible Metal Conduit (LFMC):
1. Comply with UL 360.
  2. Continuous interlocked hot-dip zinc galvanized steel core with smooth interior and exterior.
  3. Suitable for wet and dry locations, direct burial applications, and concrete encasement.
  4. Sunlight resistant, flame retardant thermoplastic PVC jacket resistant to heat, oil, and chemical breakdown.
- G. Metal Fittings
1. Comply with NEMA FB1 and UL 514B.
  2. Listed and labelled for type of conduit, location, and use.
  3. Fittings for EMT:
    - a. Compression type, zinc-plated galvanized steel.
    - b. Concrete-tight- or rain-tight, hardened steel locknuts, and nylon insulating throats.
  4. Fittings for GRC and IMC:
    - a. Threaded zinc plated steel.
    - b. Concrete-tight- or rain-tight, nylon insulating throats.
  5. Conduit Bodies:
    - a. Material: gray iron or heavy copper-free cast aluminum
    - b. Available in varying configurations with integral bushing and gasketed coverplate.

6. Expansion/Deflection Fittings: UL 651 listed, manufactured coupling accommodating 3/4-inch linear movement from normal and 30-degree angular movement in all directions
    - a. Basis of Design: OZ/Gedney DX
    - b. PVC or steel sleeve to match conduit type with neoprene jacket, rated for environmental conditions where installed.
    - c. Integral braided copper bonding jumper.
  7. Fittings for FMC and LFMC:
    - a. LFMC: Tubular Steel, zinc-plated with gland nut, sealing ring, high tensile grounding ferrule, insulated throat, and body for liquid tight connection.
  8. Fittings for Hazardous (Classified) Locations: Comply with UL 1203 and NFPA 70.
  9. "Kwik-Couple" type fittings are not permitted.
  10. Indentation, set-screw, or die-cast fittings are not permitted.
- H. Joint Compound for threaded conduit: UL 2419 listed for use in conduit assemblies and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

## 2.3 NON-METALLIC CONDUITS AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Allied Tube & Conduit
  2. Cantex
  3. Carlon
  4. Heritage Plastics
  5. National Pipe & Plastics
  6. Prime Conduit
- B. Rigid Polyvinylchloride (PVC) Conduit:
1. Comply with NEMA TC-2 and UL 651.
  2. Sunlight resistant and suitable for use with 90 degree C conductors.
  3. Type EPC-40 suitable for normal duty applications.
  4. Type EPC-80 suitable for heavy duty applications.
- C. Non-Metallic Fittings
1. Comply with NEMA TC 3 and UL514B.
  2. Listed and labelled for type of conduit, location, and use.
  3. Compatible with conduit type and material.
  4. Solvents and Adhesives: as recommended by conduit manufacturer.

## 2.4 METAL WIREWAYS AND AUXILIARY GUTTERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:



1. Eaton B-Line
  2. Hubbell Wiegmann.
  3. nVent Hoffman.
  4. Square D.
- B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 unless otherwise required by environmental application, and sized according to NFPA 70. Minimum of 14-gauge steel before finishes are applied.
- C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for a complete system.
1. Provide knockouts on all runs, unless otherwise indicated or prohibited by codes.
  2. Provide dividers to separate conductors of different insulation levels or where required by equipment vendor installation instructions.
- D. Wireway Covers: Furnish with continuous hinged covers on all runs and removable covers on all fittings unless otherwise noted, to allow a continuous unobstructed path for conductor installation.
- E. Finish: Manufacturer's standard enamel finish resistant to corrosion, moisture, and oil.
- F. Size: available in nominal sizes 2-1/2-inch by 2-1/2-inch, 4-inch by 4-inch, 6-inch by 6-inch or 12-inch by 12-inch.
- G. Install supports to allow unobstructed access to wireway interior. Use minimum 1/4-inch rod hangers for up to 4-inch by 4-inch wireway, 3/8-inch rod up to 8-inch by 8-inch wireway, and 1/2-inch rod for 12-inch by 12-inch wireway.

## 2.5 BOXES, ENCLOSURES, AND CABINETS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Eaton Crouse-Hinds.
  2. Emerson/Appleton Electric.
  3. FSR Inc.
  4. Garvin Industries
  5. Hoffman.
  6. Hubbell Killark.
  7. Milbank Manufacturing Co.
  8. Mono-Systems, Inc.
  9. O-Z/Gedney.
  10. RACO / Hubbell.
  11. Stahlin Non-Metallic Enclosures.
  12. Thomas & Betts.
  13. Wiremold / Legrand.

- B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets shall be listed for intended use.
- C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
- D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy or aluminum, Type FD, with gasketed cover.
- E. Luminaire Outlet Boxes: Non-adjustable, designed for attachment of luminaires, listed, and marked for the maximum allowable weight with at least a 2.0 safety factor for the anticipated fixture weight.
- F. Paddle Fan Outlet Boxes: Nonadjustable, designed for attachment of paddle fan weighing 70 lb.
- G. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1, constructed of code gauge, galvanized steel with sides formed and corner seams riveted or welded before galvanizing
- H. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover.
- I. For box extensions and mud rings used to accommodate building finishes, provide with same material as recessed box.
- J. Minimum Device Box Dimensions unless noted otherwise:
  - 1. Single gang: 4-inches square by 2-1/8-inches deep with single gang extension ring.
  - 2. Two gang: 4-inches square by 2-1/8-inches deep with two-gang extension ring.
  - 3. Three gang: 8-5/8-inches by 4-1/2-inches by 2-1/2-inches deep with three gang extension ring.
  - 4. Four gang: 10-7/16-inches by 4-1/2-inches by 2-1/2-inches deep with four gang extension ring.
- K. Gangable boxes are prohibited.
- L. Boxes assembled with sheet metal screws are prohibited.
- M. Hinged Cover Enclosures: Comply with UL 50 and NEMA 250, suitable for installed environment with continuous-hinge cover and flush latch unless noted otherwise.
  - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
  - 2. Nonmetallic Enclosures: Fiberglass
  - 3. Interior Panels: Steel, all sides finished with manufacturer's standard enamel.

## PART 3 - EXECUTION

### 3.1 RACEWAY APPLICATION

- A. Unless more stringent requirements are specified in Contract Documents or manufacturers' written instructions, comply with NFPA 70 for selection of raceways. Consult Architect for resolution of conflicting requirements.
- B. Apply raceway products as specified below unless otherwise indicated:
1. Refer to Section 260543, "Underground Ducts and Raceways for Electrical Systems" for additional requirements related to raceways installed underground outside of the building footprint.
  2. Exterior and Exposed: GRC
  3. Concealed Underslab: GRC or PVC Type EPC-40 where approved.
  4. Interior, Concealed in Ceilings, Walls, and Partitions: EMT, IMC, or GRC
  5. Interior, Concealed in Concrete or Grouted Masonry Walls and Partitions: IMC or GRC
  6. Interior, Damp or Wet Locations: GRC
  7. Interior, Where exposed and Not Subject to Physical Damage: EMT, GRC, or IMC. Raceway locations include the following:
    - a. Electrical Rooms
  8. Interior, Where Exposed and Subject to Severe Physical Damage: GRC. Raceway locations include the following:
    - a. Loading dock.
    - b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
    - c. Mechanical rooms (below 8'-0").
    - d. Gymnasiums.
  9. Interior, where Exposed in washdown area and Subject to Severe Physical Damage: PVC Coated GRC. Raceway locations include the following:
    - a. Exposed stub-ups in Commercial/Institutional Kitchen or Cafeteria.
  10. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
  11. Connection to ceiling mounted recessed and semi-recessed luminaires and electrical devices: FMC.
  12. Boxes and Enclosures: NEMA 250, Type 1 except as follows:
    - a. Damp or Wet locations: NEMA 250, Type 3R
    - b. Commercial/Institutional Kitchens and Cafeterias: NEMA 250, Type 3R
    - c. Corrosive environments: NEMA 250, Type 4X
  13. Exposed Boxes subject to physical damage: Die cast metal boxes with threaded hubs.
  14. EMT is not permitted underslab, embedded in concrete slabs, or where exposed to physical damage.
  15. Non-metallic conduit is not permitted for the following applications unless approved by the Engineer:
    - a. Interior Locations including environmental air plenums.
    - b. Applications where a redundant ground fault path is required by code.
  16. Flexible non-metallic conduit is not permitted.

17. Unless otherwise indicated on the drawings, intermediate metal conduit (IMC) may be used in any location in place of rigid galvanized steel conduit (GRC), where permitted by codes, and where approved by the Engineer.
- C. Minimum Raceway Size: 3/4-inch trade size unless noted otherwise on the drawings.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.
  1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
  2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
  3. EMT: Use compression, steel fittings. Comply with NEMA FB 2.10.
  4. Flexible Conduit: Use only steel fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.
- E. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth or where prolonged contact with construction materials will degrade the aluminum.
- F. Install raceways and fittings in a manner to avoid use of dissimilar metals that would result in galvanic action corrosion.
- G. Install surface conduits or raceways only where indicated on Drawings.
- H. Do not install surface conduits or raceways on exterior facades unless approved by Engineer.
- I. Do not install nonmetallic conduit where ambient temperature or operating temperature of the conductors exceeds the rating of the raceway.
- J. Conduit installed embedded in concrete slabs is not permitted.

### 3.2 RACEWAY INSTALLATION

- A. Comply with requirements in Section 260500 "Common Work Results for Electrical Systems" for hangers and supports.
- B. Comply with NECA 1, NECA 101, NECA 111 and manufacturer's written instruction for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
- C. Complete raceway installation before starting conductor installation.
- D. Comply with utility company requirements for raceways and boxes containing utility company conductors.

- E. Size raceways to conform with Annex C, of the National Electrical Code, unless otherwise shown on the Contract Drawings.
- F. Level and square raceway runs and install at proper elevations and required heights. Hold tight to structure wherever possible, to maximize available space and not restrict other trades.
- G. Conceal conduit within finished walls, ceilings, and floors unless otherwise indicated.
- H. Install conduits with runs parallel or perpendicular to building lines, walls, structural members or intersections of vertical planes and ceilings, with right angle turns consisting of cast metal fittings or symmetrical bends unless otherwise shown. Randomly routed conduits are not acceptable.
- I. Make bends in raceway using large-radius preformed elbows. Provide concentric bends for parallel runs of conduit. Conform with NFPA 70 minimum radii requirements for field bending. Use only equipment specifically designed for material and size involved.
- J. Install no more than the equivalent of three 90-degree bends in any conduit run. Support within 12-inches of changes in direction.
- K. Provide junction boxes or pull boxes so that conduit runs do not exceed 100 feet, or as shown on the Contract Drawings. Size junction boxes per NEC, Article 370.
- L. Provide conduit supports spaced not more than 8-feet apart.
- M. Support conduit within 12-inches of enclosures to which attached.
- N. Do not drill into bar joists to support raceways or cables.
- O. Install conduits at least 12-inches away from flues, steam, or hot water pipes.
- P. Conduit installed under concrete slabs is permitted for feeders and for branch circuits serving floor outlets. Underslab conduit is prohibited for other locations unless noted on the drawings or with permission of the engineer. Where approved, comply with the following:
  - 1. Locate raceway a minimum of 12-inches below the bottom of slab.
  - 2. Provide minimum 2-inch spacing between conduits to ensure proper compaction of structural fill.
  - 3. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
  - 4. Transition underslab RNC to GRC for all bends larger than 20-degrees and for all stub-ups through a slab on grade. Arrange stub-ups so curved portions of bends are not visible above finished slab. Extend GRC stub-ups a minimum of 6" above the concrete slab. Schedule 80 PVC stub-ups are allowed where approved by engineer.
  - 5. Seal around conduits when penetrating vapor barriers.
  - 6. Where installed in corrosive soils, coat all underslab rigid steel conduit with two coats of bitumastic paint such as "Asphaltum".

- Q. Where raceways are subject to environmental changes, locate seals immediately at the boundary so no fittings or boxes are between the seal and the change of environments that would allow migration of condensation within the raceway system. Seal the interior of all raceways at the following points:
1. Where conduits pass from cold to warm locations, such as boundaries of refrigerated spaces and at building wall and roof penetrations.
  2. Where an underground service raceway enters a building or structure.
  3. Conduit extending from interior to exterior of building.
  4. Conduit extending into pressurized duct and equipment.
  5. Conduit extending into pressurized zones that are automatically controlled to maintain different pressure set points.
  6. Where otherwise required by NFPA 70.
- R. Install conduits in a manner so as to ensure against collection of trapped condensation. Arrange all runs of conduit so as to be devoid of traps. Provide trapped conduit runs with explosion proof drains at low points.
- S. At hazardous locations, install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed non-shrink sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces.
- T. Coordinate with other trades, including metal and concrete deck trades, as necessary to interface installation of electrical raceways and components.
- U. Complete installation of electrical raceways before starting installation of cables or wires within raceways.
- V. Take precautions to prevent the lodgment of dirt, plaster, or trash in all conduit or tubing, fittings, and boxes during construction. Use mandrel to clean all conduit for floor boxes or conduit below grade and ensure its swabbed free of debris or moisture before wiring is installed.
- W. Unless using GRC, do not locate conduits, cables, raceways, and enclosures within 2 inches of bottom of metal-corrugated sheet roof decking, measured from the lowest surface of the roof decking to the top of the conduit, cable, raceway, or box.
- X. Conduits, cables, raceways, and enclosures are not permitted in concealed locations of metal-corrugated sheet decking type roofing.
- Y. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72-inches of flexible conduit for ceiling mounted recessed and semi-recessed luminaires, and 36-inches for all other equipment subject to vibration, noise transmission, or movement, and for transformers and motors.
1. Install as a single piece with clamp-on insulated throat connectors designed for the purpose.
  2. Provide strain relief fittings where subject to vibration.
  3. Provide an equipment grounding conductor and bonding jumper at all locations.
  4. For LFMC, provide a minimum of 18-inches and loop to avoid restraining vibrating equipment.

- Z. Stub-ups to Accessible Ceilings:
  - 1. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or into an enclosure.
  - 2. Where conduits terminate at a cable tray pathway, provide listed fitting to secure conduit to cable tray.
  
- AA. Mechanically fasten conduit terminations at a wireway, provide metal insulated bushings, and bond to the wireway with bonding jumper.
  
- BB. Furnish conduit bodies in proper configurations, avoiding excessive openings. Any openings that are left shall be properly plugged. Wiring splices within conduit bodies are not permitted.
  
- CC. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
  
- DD. Provide a completely separate raceway system, including junction boxes and pull-boxes, for each emergency power, optional stand-by, and normal power system for complete separation in accordance with NEC.
  
- EE. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of secured slack at each end of pull wire. Secure pull string at each end and cap raceways.
  
- FF. Coordinate with vendors and provide extra pull-strings as required to ensure sufficient number of pull strings.
  
- GG. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length. Ream inside of conduit to remove burrs.
  
- HH. Raceway Fittings: Install fittings in accordance with NEMA FB 2.10 guidelines
  - 1. Install raceways square to enclosures and terminate with appropriate fitting:
  - 2. For enclosures without hubs, terminate with appropriate fitting, insulated throat liner, and case-hardened locknuts on both sides of enclosure wall.
  - 3. Terminate rigid conduits with threaded hubs or with locknuts on inside and outside of enclosure and insulated throat metal bushing.
  - 4. Install locknuts hand tight, plus one-quarter turn more.
  - 5. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.
  - 6. All threaded fittings shall engage a minimum of seven full threads. Fasteners shall be properly torqued to manufacturer's recommendations.
  - 7. Split sleeve insulators are not permitted.
  
- II. Comply with manufacturer's written instructions for solvent welding RNC and fittings.
  
- JJ. Expansion-Joint Fittings:

1. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
  2. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.
- KK. Where raceways penetrate rooms or walls with acoustical requirements, seal raceway openings on both sides of penetration with acoustically rated putty or sealant.

### 3.3 BOX AND ENCLOSURE INSTALLATION

- A. Provide electrical outlets and enclosures as required for splices, taps, wire pulling, and equipment connections.
- B. Provide pull boxes as required to maintain conduit run and bend limitations specified herein.
- C. Size all outlets, pull boxes, junction boxes, cabinets, etc., per adopted edition of the National Electrical Code.
- D. Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.
- E. Install interior and exterior outlet boxes recessed in building construction with face or cover flush with finished surfaces unless noted otherwise. Where outlet boxes are installed in walls of glazed tile, brick, concrete block, or in walls covered by wood wainscot or paneling, provide deep box to ensure the outlet boxes are installed straight and secure in walls.
- F. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements and architectural elevations. Install boxes with height measured to center of box unless otherwise indicated.
- G. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box. Do not split the mortar joint
- H. Provide 3/4-inch rigid conduit pendants where lighting fixtures, appliances, or wiring devices are to be suspended from ceiling outlet boxes. Outlet boxes shall be malleable iron, provided with self-aligning covers with swivel ball joint and #14 gauge steel locking ring. Provide safety chain between building structure and housing for all fixtures, appliances, or devices greater than 10 lbs. weight. Install fixtures plumb and level. Cover pendants shall be finished to match fixtures.
- I. Horizontally separate boxes mounted on opposite sides of walls, so they are not in the same vertical channel.
- J. Locate boxes so that cover or plate does not span different building finishes.



- K. Provide spanner bars to support all boxes from more than one side by spanning two framing members.
- L. Fasten boxes up to 4-11/16 square size to their mounting surface or support with two fasteners of proper size. Fasten larger sizes with four fasteners, minimum.
- M. Support boxes recessed in ceilings independent of ceiling tiles and ceiling grid.
- N. Fasten junction and pull boxes to, or support from, building structure. Do not support boxes by conduits or ceiling support wires.
- O. Provide all cabinets and boxes for NEMA 1 applications with knockouts, as necessary, or field cut with approved cutting tools which will provide a clean, symmetrically cut opening to maintain UL listing of enclosure.
- P. Replace any unused knockouts or openings with a listed knockout closure.
- Q. Coordinate with equipment vendors to provide special sized outlet boxes to support installed equipment.
- R. Where boxes and enclosures are located in areas or on walls with acoustical requirements, seal openings and knockouts in back and sides of boxes with acoustically rated putty or sealant and provide gasket for wall plates and covers.

### 3.4 GROUNDING AND BONDING

- A. Bond all metal boxes, junction boxes and pull boxes with pigtails to the equipment grounding conductor.
- B. Provide insulated throat grounding bushings with appropriately sized bonding jumpers for the following locations to maintain electrical continuity between the raceway and enclosure:
  - 1. Metal raceways and enclosures that contain service conductors.
  - 2. Metal raceways and enclosures that contain grounding electrode conductors.
  - 3. Where metal raceways containing circuits over 250V terminate in a concentric or eccentric knockout at cabinets, enclosures, or sheet metal pull boxes listed in accordance with UL 50.
  - 4. Where the integrity of a concentric or eccentric knockout has been compromised.
  - 5. Metal raceways and enclosures that contain feeders.

### 3.5 PROTECTION

- A. Protect coatings, finishes, and cabinets from damage and deterioration.
  - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
  - 2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

- B. Protect threads on conduits and fittings with plastic protectors or other means to prevent damage prior to installation.
- C. Provide protection for all conduit stubbed through floor during construction with plastic caps approved for this purpose.

### 3.6 IDENTIFICATION

- A. Comply with Section 260553 "Identification for Electrical Systems."
- B. Identify all junction, outlet and pull boxes in data/mechanical/electrical rooms and above ceilings with panel and circuit designation on outside of covers. Identify all exposed junction, outlet and pull boxes in finished areas with panel and circuit designation on inside of covers.

### 3.7 PAINTING

- A. Raceways installed in exterior locations shall receive one coat of primer, two coats finish paint after preparation of galvanizing, color selected by Architect.
- B. Exposed raceways in painted interior areas shall be painted to match adjacent finishes.

END OF SECTION 260533

## SECTION 260543 - UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions, Division 01 Specification Sections, and Section 260010 “General Requirements for Electrical Systems” apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:

- 1. Direct-buried and concrete-encased conduits, ducts, and duct accessories.
- 2. Handholes and boxes.
- 3. Utility Structure accessories.

- B. Related Requirements:

- 1. Refer to Section 260533 “Raceways and Boxes for Electrical Systems” for pathway requirements installed under building slabs.

#### 1.3 REFERENCES

- A. Abbreviations

- 1. GRC: Galvanized rigid conduit.
- 2. IMC: Intermediate metal conduit.
- 3. RNC: Rigid nonmetallic conduit.

- B. Definitions

- 1. Backfill: Earth or other controlled material placed in trenches for filling and grading back to a finished state.
  - a. Initial Backfill (encasement): Backfill placed beside and over conduit arrangements in a trench, including haunches to support sides of conduits.
  - b. Final Backfill: Backfill placed over initial backfill to fill a trench.
- 2. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying conduit.
- 3. Duct: A single or multiple underground conduits encased in concrete or direct buried.
- 4. Duct Bank: An arrangement of two or more ducts installed together.
- 5. Encasement: Material placed around a duct or duct bank to provide additional protection.
- 6. Trafficways: Locations where vehicular or pedestrian traffic is a normal course of events.

- C. Reference Standards: The following publications are referred to in the text by the basic designation only. The edition/revision of the referenced publications shall be the latest version as of the date of the Contract Documents, unless otherwise specified.
  - 1. National Electrical Manufacturers Association (NEMA):
    - a. NEMA TCB-2 “Guidelines for the Selection and Installation of Underground Nonmetallic Raceways”.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of product.
- B. Field quality-control reports including digital photographs of all concealed work.
- C. Closeout Submittals
  - 1. In addition to items specified in Division 01 and Section 260010 "General Requirements for Electrical Systems", ensure all utilities, structures, and underground conduits are surveyed and recorded on as-built drawings.

#### 1.5 FIELD CONDITIONS

- A. Ground Water: Assume ground-water level is at grade level unless a lower water table is noted on Drawings.

### PART 2 - PRODUCTS

#### 2.1 GENERAL REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with IEEE C2 and NFPA 70.

#### 2.2 CONDUITS AND FITTINGS

- A. Comply with 260533 “Raceways and Boxes for Electrical Systems”.

#### 2.3 DUCT ACCESSORIES

- A. Duct Separators: Factory-fabricated rigid PVC interlocking spacers, sized for type and size of ducts with which used, and selected to provide minimum duct spacing indicated while supporting ducts during encasement or backfilling.

- B. Fabric Innerduct: Continuous, nylon resin polyester, multi -pocket fabric innerduct, with internal pull tape. Maxcell or equal.
- C. Pull Line: Flat, woven, polyester or polyaramid tape, low stretch, pre-lubricated for reduced friction. Strength suitable for required pulling tensions with a minimum of 200-lb. Muletape or equal.
- D. Underground Detectable Warning Tape: Flexible tape constructed with solid aluminum foil backing and clear film laminate, 6-inches wide, 5-mil overall thickness.
  - 1. Suitable for the method of installation and locating underground utility lines.
  - 2. Chemically inert tape material and ink, resistant to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.
  - 3. Comply with APWA Uniform Color Code.
  - 4. Inscriptions for Red-Colored Tapes: "CAUTION BURIED ELECTRIC LINE BELOW".
  - 5. Inscriptions for Orange-Colored Tapes: "CAUTION BURIED COMMUNICATIONS LINE BELOW".
- E. Duct Sealants: Re-enterable, two-part, closed-cell urethane foam capable of sealing conduits with multiple cable configurations.
  - 1. Capable of withstanding temperatures from -40 deg F to 200 deg F and holding 22 feet waterhead pressure continuous.
  - 2. Chemically resistant to gasoline, oils, dilute acids, and bases.
  - 3. Compatible with cable jacket and shall not affect the physical or electrical properties of wire and cable.
  - 4. Workable at temperatures as low as 35 deg F.
  - 5. UL94 Class HBF fire retardant rating.

## 2.4 POLYMER CONCRETE HANDHOLES AND BOXES

- A. Description: Molded of sand and aggregate, bound together with a polymer resin, and reinforced with steel or fiberglass or a combination of the two.
- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Armorcast
  - 2. NewBasis
  - 3. Oldcastle
  - 4. Hubbell Quazite
- C. General Requirements:
  - 1. Comply with SCTE 77. Minimum Tier 15.
  - 2. Color: Gray.
  - 3. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
  - 4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.

5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
6. Cover Legend: Molded lettering, as indicated for each service.

### PART 3 - EXECUTION

#### 3.1 PREPARATION

- A. Coordinate layout and installation of ducts, handholes, and boxes with final arrangement of other utilities, site grading, and surface features as determined in the field. Notify Architect if there are obstructions or conflicts between areas of excavation and existing structures or archaeological features to remain.
- B. Coordinate elevations of ducts and duct-bank entrances into handholes, and boxes with final locations and profiles of ducts and duct banks, as determined by coordination with other utilities, underground obstructions, and surface features. Revise locations and elevations as required to suit field conditions and to ensure that duct runs drain to handholes, and as approved by Architect.
- C. All necessary precautions shall be taken by the contractor during construction to prevent the lodging of dirt, plaster or trash in all conduit, tubing, fittings and boxes.

#### 3.2 UNDERGROUND DUCT APPLICATION

- A. Apply underground duct products as specified unless noted otherwise:
  1. Refer to Section 260533, "Raceways and Boxes for Electrical Systems" for additional requirements related to underground conduit below building slabs.
  2. Ducts for Utility Company primary conductors: comply with utility company standards unless noted otherwise.
  3. Ducts for Electrical Service Secondary Conductors: RNC, Type EPC-40 PVC, in concrete-encased duct bank unless otherwise indicated.
  4. Ducts for Electrical Cables greater than 600 V: RNC, Type EPC-40 PVC, in concrete-encased duct bank unless otherwise indicated.
  5. Ducts for Electrical Feeders 600 V and Less: RNC, Type EPC-40 PVC, in concrete-encased duct bank unless otherwise indicated.
  6. Ducts for Electrical Branch Circuits: RNC, Type EPC-40 PVC, in direct buried duct bank unless otherwise indicated.
  7. Ducts for Communications Cables: RNC, Type EPC-40 PVC, in direct buried duct bank unless otherwise indicated.
  8. Underground Ducts 600V and less Crossing Driveways and Roadways: RNC, Type EPC-40-PVC, encased in reinforced concrete. Extend reinforcement a minimum of 5-feet beyond the edge of paved surfaces.
- B. Minimum Cover Requirements: Provide reinforced concrete encasement where minimum depths are not achievable.
  1. Electrical Primary or Conductors more than 600V: 48-inches unless otherwise indicated by utility company requirements.
  2. Electrical Secondary Service and Feeders: 36-inches

3. Electrical Branch Circuits: 24-inches
  4. Communications: 30-inches
- C. Transition RNC to GRC for all stub-ups and building enclosure penetrations. Use fittings manufactured for RNC-to-GRC transition.
1. Arrange stub-ups so curved portions of bends are not visible above grade. Increase burial depth where required to maintain cover for curves and bends.
  2. Do not use steel raceways for equipment stub-ups where prohibited by utility company standards.
- D. Minimum Underground Raceway Size: 1-inch trade size unless noted otherwise on the drawings.

### 3.3 EARTHWORK

- A. Contractor shall accept the site as they find it and remove all trash, rubbish, and material from the site prior to starting excavation work.
- B. Subsurface Data
1. Subsurface investigations have been performed and the results provided with the contract documents. The information was obtained primarily for use in preparing foundation design. Each contractor may draw their own conclusions therefrom. No responsibility is assumed by the Owner for subsoil quality or conditions other than at the locations and at the time the investigations were made.
  2. Materials to be excavated shall be unclassified, and shall include earth, rock, or any other material encountered in the excavation to the depth and extent indicated on the drawings and specified herein. No adjustment in the contract sum will be made on account of the presence or absence of rock, shale, or other materials encountered in excavating.
- C. Benchmarks and Monuments
1. Carefully maintain all benchmarks, monuments, and other reference points. If disturbed or destroyed, replace as directed.
- D. Excavation:
1. Remove rock by using hand or power tools only. Blasting is not permitted unless authorized in writing by the Architect.
  2. Any damage to existing structures, exterior services, or rock intended for bearing shall be corrected by the Contractor at their own expense.
  3. Take necessary precautions to control runoff of eroded earth onto the property of others or against the structures. All such damage or any other damage incurred in the course of excavation, shall be corrected by the Contractor at their own expense.
- E. Trenching:
1. Cut trenches neatly and uniformly. Work with extreme care near existing ducts, conduits, and other utilities to avoid damaging them.

2. Width: Excavate trench a minimum of 3 inches wider than duct bank on each side with a minimum trench width of 12-inches.
3. Depth: Excavate to a minimum depth that equals ductbank height plus minimum cover requirements.
4. Hand excavate trench bottom to provide uniform bearing and support of conduits on an undisturbed subgrade matching slope requirement. Remove all debris, stones, and other projections.
  - a. For rock or other unyielding soils, excavate trenches 6-inches deeper than required elevation and provide level 6-inch compacted sand bedding course.
  - b. For unstable soils or where bedding course is subject to washout, provide concrete trench bottom.
5. Coordinate protection of roots in tree and plant protection zones with Division 31 requirements.
6. Keep trenches free from water while construction is in progress. Installation of conduit or cable in trenches with water is not permitted. Contractor is responsible for all costs associated with dewatering of trenches.

F. Final Backfill: Comply with Division 31 and as indicated below:

1. Use satisfactory soil to backfill trenches to final subgrade elevation unless required otherwise by Civil or Structural subgrade requirements.
2. Install final backfill in 6-inch layers.
3. Compact all backfill to 95% standard proctor density.
4. Mechanical means for compaction can be used once conduits have been covered with at least 12-inches of hand tamped backfill. Do not use heavy-duty, hydraulic-operated, compaction equipment.

G. Restoration:

1. Replace area immediately after backfilling is completed or after construction in immediate area is complete.
2. Restore all surface features at areas disturbed by excavation, storing of dirt, cable laying, and other work, and re-establish original grades unless otherwise indicated.
3. Restore vegetation and include 6-inches of clean topsoil, fertilizing, liming, seeding, sodding, sprigging, and mulching. Comply with Division 32.

H. Cut and patch existing pavement in the path of underground ducts and utility structures according to the "Cutting and Patching" requirements in Division 01 and Section 260010, "General Requirements for Electrical".

### 3.4 DUCT INSTALLATION

- A. Install ducts, spacers, and accessories into ductbank configurations to accommodate duct quantities and sizes indicated on drawings.
- B. Install ducts according to NEMA TCB 2.
- C. Slope: Pitch ducts a minimum slope of 1:300 down toward handholes and away from buildings and equipment. Slope ducts from a high point in runs between two



handholes, to drain in both directions. Install ducts in such manner to avoid traps and insure against collection of moisture.

D. Curves and Bends:

1. Use 5-degree angle couplings for small changes in direction.
2. Use manufactured long sweep bends with a minimum radius of 36 inches vertically and 60-inches horizontally, unless otherwise indicated.
3. Field manufactured bends are acceptable for a bend radius greater than 35-feet. Install field bends in accordance with NEMA TCB 2.
4. Electrical duct and duct banks: Install no more than the equivalent of three 90-degree bends in any conduit run.
5. Communications duct and duct banks: Install no more than the equivalent of two 90-degree bends in any conduit run and a maximum of 600 feet between pull points.

E. Joints: Use solvent-cemented joints in non-metallic ducts and fittings and make watertight according to manufacturer's written instructions. Stagger couplings so those of adjacent ducts do not lie in same horizontal or vertical plane to ensure encasement or backfill fully surrounds each raceway.

F. Installation Adjacent to High-Temperature Steam Lines: Where duct banks are installed parallel to underground steam lines, provide minimum 6-foot separation, or perform calculations showing the duct bank will not be subject to environmental temperatures above 40 deg C. Where environmental temperatures are calculated to rise above 40 deg C, and anywhere the duct bank crosses above an underground steam line, install insulation blankets listed for direct burial to isolate the duct bank from the steam line.

G. Installation Adjacent to Other Utilities:

1. Provide minimum 12-inches of earth or 3-inches of concrete between power and communications ducts.
2. Provide minimum 24-inches of earth between power or communications ducts and other parallel utilities. At utility crossings, provide minimum 6-inches of separation except provide 12-inches separation where crossing utility is gas or other line that transports flammable material.
3. Do not locate power and communications ducts below water and sewer lines.

H. Duct Entrances to Concrete Handholes: Use end bells, spaced approximately 10 inches o.c. for 5-inch ducts, and vary proportionately for other duct sizes.

1. Begin change from regular spacing to end-bell spacing 10 feet (3 m) from the end bell without reducing duct line slope and without forming a trap in the line.
2. Direct-Buried Duct Banks: Install an expansion and deflection fitting in each conduit in the area of disturbed earth adjacent to handhole. Install an expansion fitting near the center of all straight line direct-buried duct banks with calculated expansion of more than 3/4 inch (19 mm).
3. Grout end bells into structure walls from both sides to provide watertight entrances.

- I. Building Penetrations: Make a transition from underground duct to GRC at least 10 feet outside the building wall, without reducing duct line slope away from the building and without forming a trap in the line. Use fittings manufactured for RNC-to-GRC transition. Provide sleeves at building penetration and make water-tight with sleeve seal.
- J. Duct Support
  1. For concrete encased applications, support ducts on duct separators coordinated with duct size, duct spacing, and outdoor temperature.
  2. Separator Installation: Space separators at a maximum of 5-feet to prevent sagging and deforming of ducts. Place spacers within 24-inches of duct ends. Stagger separators approximately 6 inches between tiers.
  3. Minimum Space between Ducts: 3 inches between ducts and between ducts and exterior envelope wall.
- K. Concrete-Encased Ducts:
  1. Secure separators to earth and to ducts to prevent floating during encasement. Tie entire assembly together using non-ferrous tie-wires or straps; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.
  2. Reinforcement: Where indicated, reinforce concrete-encased duct banks for their entire length. Arrange reinforcing rods and ties without forming conductive or magnetic loops around ducts or duct groups.
  3. Forms: Use walls of trench to form side walls of duct bank where soil is self-supporting and concrete envelope can be poured without soil inclusions; otherwise, use forms.
  4. Concrete Cover: Install a minimum of 3 inches of concrete cover between edge of duct and exterior envelope wall.
  5. Concreting Sequence: Pour each run of envelope between terminations in one continuous operation.
    - a. Start at one end and finish at the other, allowing for expansion and contraction of ducts as their temperature changes during and after the pour. Use expansion fittings installed according to manufacturer's written recommendations or use other specific measures to prevent expansion-contraction damage.
    - b. If more than one pour is necessary, terminate each pour in a vertical plane and install 3/4-inch reinforcing-rod dowels extending a minimum of 18 inches into concrete on both sides of joint near corners of envelope.
  6. Concrete Encasement:
    - a. Use normal strength concrete, minimum 3000 psi at 28 days, 6 to 8 inch slump, with maximum 1/2 inch aggregate.
    - b. Comply with requirements in "Concrete Placement" Article in Division 03. Place concrete carefully during pours to prevent voids under and between conduits and at exterior surface of envelope.
    - c. Do not allow a heavy mass of concrete to fall directly onto ducts. Allow concrete to flow to center of bank and rise up in middle, uniformly filling all open spaces.
    - d. Do not use power-driven agitating equipment unless specifically designed for duct-bank application.

7. Complete final backfilling after concrete has cured.

L. Direct-Buried Duct Banks:

1. Set elevation of bottom of duct bank below frost line.
2. After installing first tier of ducts, install initial backfill and compact.
3. Start at tie-in point and work toward end of duct run, leaving ducts at end of run free to move with expansion and contraction as temperature changes during this process.
4. Perform initial backfilling/encasement in 2-inch lifts. Compact to 95% standard proctor density.
5. Repeat procedure after placing each tier. After placing last tier, hand place backfill to 4 inches over ducts and hand tamp.
6. Firmly tamp initial backfill around ducts to provide maximum supporting strength. Use hand tamper only.
7. After placing initial backfill over final tier, make final duct connections at end of run and complete backfilling.
8. Initial backfill/encasement material shall be crushed stone, sand, or pea gravel with a maximum aggregate size of 1/2-inch.

- M. Warning Tape: Bury warning tape approximately 12 inches above all ducts. Align tape parallel to and within 3 inches of centerline of duct bank. Provide an additional warning tape for each 12-inch increment of duct-bank width over a nominal 18 inches. Space additional tapes 12 inches apart, horizontally.

- N. Install pull tape in all spare ducts with 3ft of slack tied off and secured at each pull point.

O. Duct Sealing:

1. Provide temporary plugs of all ducts upon completion of each portion of work to prevent ingress of foreign material into the duct.
2. After conductors have been installed seal all ducts, including spare ducts, at building entrances and equipment terminations. Use sealing compound and foam plugs capable of withstanding at least 15-psig hydrostatic pressure.

### 3.5 INSTALLATION OF HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE

- A. Install hand-holes and boxes level and plumb and with orientation and depth coordinated with connecting ducts, to minimize bends and deflections required for proper entrances. Use box extension if required to match depths of ducts, and seal joint between box and extension as recommended by manufacturer.
- B. Unless otherwise indicated, support units on a 12-inch thick level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.
- C. Elevation: In paved areas and trafficways, set cover flush with finished grade. Set covers of other handholes 1 inch above finished grade. Install handholes and boxes with bottom below frost line.

- D. Field cut openings for ducts and conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.
- E. For enclosures installed in asphalt paving, form and pour a concrete ring encircling, and in contact with, enclosure and with top surface screeded to top of box cover frame. Bottom of ring shall rest on compacted earth.
  - 1. Concrete: 3000 psi, 28-day strength, complying with Division 03, with a troweled finish.
  - 2. Dimensions: minimum 10 inches wide and 12 inches deep or as shown on drawings.

### 3.6 GROUNDING

- A. Comply with Section 260526 "Grounding and Bonding for Electrical Systems".
  - 1. Grounding Handholes: Install a driven ground rod through handhole floor, close to wall, and set rod depth so 4 inches will extend above finished floor. If necessary, install ground rod before handhole is placed and provide #1/0 AWG bare, tinned-copper conductor from ground rod into through a waterproof sleeve in handhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches above to 6 inches below concrete. Seal floor opening with waterproof, non-shrink grout.

### 3.7 IDENTIFICATION

- A. Comply with Section 260553 "Identification for Electrical Systems"
  - 1. Where ducts transition through handholes, and at each termination point, provide each duct with a unique identifier to indicate origination point.
  - 2. Cover legends shall be consistent with the owner's standard practices, especially within existing facilities, unless otherwise require by codes.

### 3.8 FIELD QUALITY CONTROL

- A. Prior to covering duct or underground structures, perform visual inspections to verify the following:
  - 1. Proper installation depths and slopes have been maintained.
  - 2. Proper vertical and horizontal spacing in multi-duct formations.
  - 3. All conduit sections have been properly jointed.
  - 4. Proper bend radius of curved sections have been maintained.
  - 5. Check for damage at changes in grades or at bends.
- B. Perform the following tests and inspections and prepare test reports:

1. Demonstrate capability and compliance with requirements on completion of installation of underground ducts and utility structures.
  2. Pull solid aluminum or wood test mandrel through duct to prove joint integrity and adequate bend radii, and test for duct deflections or out of round conditions. Provide a minimum 6-inch- long mandrel 1/2-inch smaller in diameter than diameter of duct. If obstructions are discovered, remove obstructions and retest.
- C. Correct deficiencies, replace affected duct sections, and retest as specified above to demonstrate compliance.
- D. Prepare detailed test and inspection reports with accompanying digital photographs.
- E. Concealed Work Photographs: Before proceeding with installing backfill that will conceal work, take photographs sufficient in number, with annotated descriptions, to record nature and location of concealed Work.

### 3.9 CLEANING

- A. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full length of all ducts until duct cleaner indicates that duct is clear of dirt and debris. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.
- B. Clean internal surfaces of handholes. Remove dirt and foreign material.

END OF SECTION 260543

## SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions, Division 01 Specification Sections, and Section 260010 “General Requirements for Electrical Systems” apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Equipment Nameplates.
  - 2. Cable and Conductor Labels.
  - 3. Wiring Device Labels
  - 4. Safety Labels.
  - 5. Instruction Signs.
  - 6. Miscellaneous identification products.
- B. Related Requirements
  - 1. Refer to Section 260573, “Power System Studies” for additional requirements

#### 1.3 REFERENCES

- A. Reference Standards: The following publications are referred to in the text by the basic designation only. The edition/revision of the referenced publications shall be the latest version as of the date of the Contract Documents, unless otherwise specified.
  - 1. American National Standards Institute (ANSI)
    - a. ANSI Z535.4, “Product Safety Signs and Labels”
  - 2. National Fire Protection Association (NFPA)
    - a. NFPA 70E, “Standard for Electrical Safety in the Workplace”
  - 3. Occupational Safety and Health Administration (OSHA)
    - a. 29 CFR 1910.144, “Safety color code for marking physical hazards”
    - b. 29 CFR 1910.145, “Specifications for accident prevention signs and tags”
  - 4. Underwriters Laboratories Inc (UL)
    - a. UL 969, “Marking and Labeling Systems”

#### 1.4 SUBMITTALS

- A. Product Data: For each electrical identification product indicated.

1. Include project specific examples of each label type.
- B. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.
- C. Closeout Submittal:
  1. In addition to items specified in Division 01 and Section 260010 "General Requirements for Electrical Systems", include the following:
    - a. Provide electronic Excel files of all panelboard directories to owner as part of Close-out Documentation.

## 1.5 COORDINATION

- A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes and standards. Use consistent designations throughout Project.
- B. All identifications shall be consistent with the owner's standard practices, especially within existing facilities, unless otherwise require by codes. Where the requirements herein are in conflict, the contractor shall notify the engineer in writing prior to ordering any material.
- C. All room names and/or numbers for labeling or programming shall use the Owner's approved room name and numbering scheme, not names and numbers indicated on floor plans. All reprogramming shall be included as required to accommodate construction phasing.
- D. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- E. Coordinate installation of identifying devices with location of access panels and doors.
- F. Install identifying devices before installing acoustical ceilings and similar concealment.

## PART 2 - PRODUCTS

### 2.1 EQUIPMENT SIGNS AND NAMEPLATES

- A. Engraved Plastic Signs and Nameplates.
  1. 3-layer melamine plastic laminate
  2. Weather and UV-resistant for Wet and Damp Locations.
  3. Thickness:
    - a. For signs up to 20 sq. in., minimum 1/16 inch thick.
    - b. For signs larger than 20 sq. in. or 8 inches in length, 1/8 inch thick.

- c. Punched or drilled for mechanical fasteners with 1/4-inch grommets in corners for mounting.
- d. Framed with mitered melamine molding and arranged for attachment at applicable equipment.
- 4. Color: Comply with color legend.

## 2.2 RACEWAY AND CONDUCTOR LABELS

- A. Raceway Labels: Pre-printed, self-adhesive, polyester, suitable for indoor or outdoor use, resistant to abrasion, humidity, and weather.
  - 1. Color: Black Letters on an orange field.
  - 2. Size: For each raceway size, comply with ANSI/ASME A13.1 for recommended letter height and field length.
- B. Wire and Cable Labels: Machine printed, self-adhesive, polyester, self-laminating, suitable for indoor or outdoor use on flexible cables, resistant to abrasion, humidity, and weather.

## 2.3 SAFETY SIGNS AND LABELS

- A. Comply with NFPA 70 and 29 CFR 1910.145.
- B. All field-applied hazard markings shall warn of hazards using effective words, colors, symbols, or any combination thereof as recommended by ANSI Z535.4-2011. This applies to all instances where caution, warning, or danger signs are required per the NEC and applicable OSHA standards.
- C. Self-Adhesive Safety Labels: Polyester, Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for intended use and suitable for installed environment.
- D. Provide UV overlaminating film for outdoor locations.

## 2.4 INSTRUCTION SIGNS

- A. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch.
- B. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch. Overlay shall provide a weatherproof and UV-resistant seal for label.

## 2.5 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Floor Marking Tape: 2-inch wide, 5-mil pressure-sensitive vinyl tape, with black and white stripes and clear vinyl overlay.



- B. Paint: Comply with requirements in Division 09 painting Sections for paint materials and application requirements. Select paint system suitable for surface material and location (exterior or interior).
- C. Fasteners for Labels and Signs:
  - 1. Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.
  - 2. Pop-Rivets.
  - 3. Two-Part Epoxy Adhesive
- D. Cable Ties: Self-extinguishing, one-piece, self-locking, UV-stabilized or plenum rated where required by installed environmental conditions. 3/16-inch minimum width.

### PART 3 - EXECUTION

#### 3.1 GENERAL REQUIREMENTS

- A. Verify identity of each item before installing identification products.
- B. Before installation of labels, clean all surfaces using materials and methods recommended by manufacturer of identification device.
- C. Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.
- D. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- E. Install all labels in a neat manner, plumb and parallel to equipment lines.
- F. Attach plastic signs and labels to equipment with mechanical fasteners appropriate to the location and substrate. Where screws cannot or should not penetrate substrate use two-part epoxy adhesive listed for use with intended substrate and environmental conditions.
- G. Handwritten, non-permanent, or stenciled labels are not permitted unless noted otherwise.
- H. For surfaces that require finish work, apply identification devices to surfaces after completing finish work.
- I. Identification shall consist of all UPPER-CASE LETTERS.
- J. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.

### 3.2 EQUIPMENT IDENTIFICATION

- A. Provide all new and modified equipment with a nameplate consisting of 1/2" letters for equipment designation and 1/4" letters for voltage, source, and feeder information. This includes but is not limited to panelboards, switchboards, switchgear, disconnect switches, transformers, power transfer equipment, generators, motor starters, variable frequency drives, lighting control panels, contactors, cabinets, push button stations, and auxiliary system control panels.
- B. Distribution equipment labels shall indicate the following:
  - 1. Equipment designation.
  - 2. Voltage system.
  - 3. Equipment ampacity.
  - 4. Source equipment designation and location.
  - 5. Feeder size.
- C. Transformer labels shall indicate the following:
  - 1. Equipment designation.
  - 2. Primary voltage system and primary feeder ampacity.
  - 3. Source equipment designation and location.
  - 4. Primary feeder size.
  - 5. Secondary voltage system and load equipment designation
- D. Equipment disconnect labels shall indicate the following:
  - 1. Equipment designation.
  - 2. Voltage system and feeder ampacity
  - 3. Source equipment designation and location.
- E. Locate equipment nameplates at center of top of trim for branch circuit panels, switchgear, and centered at side for branch circuit switches.
- F. Where equipment is provided with a factory installed disconnecting means or motor controller, install label on factory provided unit.
- G. For equipment with multiple power sources, such as transfer switches and control panels, identify each source and its function.
- H. Color Legend
  - 1. Normal Power Systems: Black field with white letters
- I. Where the premise wiring system has feeders and/or branch circuits supplied from more than one nominal voltage system, provide sign at each switchgear, switchboard, and panelboard displaying color coded identification method for each ungrounded, grounded, and equipment grounding conductor.
- J. Service Equipment and Building Feeder, Branch Circuit Disconnects.
  - 1. Provide label for service disconnecting means to permanently identify it as the "SERVICE DISCONNECT".
  - 2. Where a building or structure has any combination of feeders, branch circuits, or services passing through it or supplying it, provide a permanent sign at each

disconnect location identifying all other feeders, branch circuits, or services and the area served by each.

### 3.3 IDENTIFICATION OF CONDUCTORS

- A. Service, Feeder, and Branch-Circuit Conductors: Refer to Section 260519, “Low Voltage Electrical Power Conductors and Cables” for conductor and cable color coding requirements.
- B. Indicate source and circuit number of conductors to be extended in the future.
- C. Auxiliary Systems Alarm, Signal, and Control Wire Identification: At termination points, identify each conductor by its system, designation, and function.

### 3.4 IDENTIFICATION OF RACEWAYS AND BOXES

- A. Identify all junction, outlet, device, and pull boxes with wiring system, voltage, and circuit designations of conductors.
  - 1. In concealed locations above accessible ceilings and in exposed unfinished areas such as data, mechanical, or electrical rooms, provide designations on outside of box covers.
  - 2. For exposed boxes in finished areas, provide designations on inside of box covers.
  - 3. System Legend shall be as follows:
    - a. Power
- B. The inside of all junction and backboxes shall be marked with panel and circuit number in permanent marker.
- C. All empty conduit runs and conduit with conductors for future use shall be identified for use and shall indicate where they terminate.

### 3.5 IDENTIFICATION OF WIRING DEVICES

- A. All new and existing receptacle cover plates in area of work shall be marked with their panel and circuit number(s) with clear, machine printed adhesive labels with black lettering.

### 3.6 PANELBOARD CIRCUIT DIRECTORIES

- A. For Distribution Panelboards, Switchboards, and Switchgear, provide nameplates at each switch or circuit breaker to indicate load designation.
- B. Provide clearly legible typewritten directories in each electrical panel indicating the area, item of equipment, etc. controlled by each switch, breaker, fuse, etc. These directories are to be inserted into plastic cardholders on back door in each panel. Descriptions shall identify each circuit as to its clear, evident, and specific purpose or

use. The identification shall include an approved degree of detail that allows each circuit to be distinguished from all others. Spaces and Spare positions shall be described accordingly.

1. At a minimum, provide the following panel information for each panel directory:
  - a. Panel name
  - b. Panel bus rating
  - c. Voltage System
  - d. Mains Configuration and Rating
  - e. Short Circuit Current Rating
2. Circuit Designation Examples:
  - a. LIGHTS, ROOM 100
  - b. FLOOR RECEPTACLES, ROOM 200
  - c. ERV-1 RECEPTACLE, ROOF

C. Panel Schedules and circuit numbers on Record Drawings shall match.

### 3.7 SAFETY SIGNS

- A. Install Warning, Caution, and Danger signs in accordance with NFPA 70 and OSHA requirements to ensure safe operation of electrical equipment and the items to which they connect.
- B. Comply with 29 CFR 1910.145 and ANSI Z535.4.
- C. Apply to exterior of door, cover, or other access point.
- D. Labels and signs shall include, but are not limited to, the following legends:
  1. Identify system voltage with black letters on an orange background.
  2. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
  3. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES"
  4. Where series combination ratings are allowed: "CAUTION - SERIES COMBINATION SYSTEM RATED \_\_\_\_ AMPERES. IDENTIFIED REPLACEMENT COMPONENTS REQUIRED."

### 3.8 INSTRUCTION SIGNS

- A. Operating Instruction Signs: Install instruction signs with minimum 3/8-inch letters to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation, power transfer, and load shedding.

3.9 WORKSPACE INDICATION

- A. Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

END OF SECTION 260553

## SECTION 260573 - POWER SYSTEM STUDIES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions, Division 01 Specification Sections, and Section 260010 "General Requirements for Electrical Systems" apply to this Section.

#### 1.2 SUMMARY

- A. Section includes the following computer-based studies:
  - 1. Fault-current study to determine the minimum interrupting capacity of circuit protective devices.
  - 2. Overcurrent protective device coordination studies to determine overcurrent protective devices and to determine overcurrent protective device settings for selective tripping.
  - 3. Arc-flash study to determine the arc-flash hazard distance and the incident energy to which personnel could be exposed during work on or near electrical equipment.
- B. Related Requirements
  - 1. Refer to Section 260553, "Identification for Electrical Systems" for label material and performance requirements.

#### 1.3 REFERENCES

- A. Abbreviations
  - 1. SCCR: Short-circuit current rating.
- B. Definitions
  - 1. One-Line Diagram: A diagram that shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.
  - 2. Power System Analysis Software Developer: An entity that commercially develops, maintains, and distributes computer software used for power system studies.
  - 3. Power Systems Analysis Specialist: Professional engineer in charge of performing the study and documenting recommendations, licensed in the state where Project is located.
  - 4. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion of the circuit from the system.
  - 5. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.
  - 6. Single-Line Diagram: See "One-Line Diagram."

- C. Reference Standards: The following publications are referred to in the text by the basic designation only. The edition/revision of the referenced publications shall be the latest version as of the date of the Contract Documents, unless otherwise specified.
1. Institute of Electrical and Electronics Engineers (IEEE)
    - a. IEEE 141 - Recommended Practice for Electric Power Distribution and Coordination of Industrial and Commercial Power Systems
    - b. IEEE 241 - Recommended Practice for Electric Power Systems in Commercial Buildings
    - c. IEEE 242 - Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems
    - d. IEEE 399 - Recommended Practice for Industrial and Commercial Power System Analysis
    - e. IEEE 551 - Recommended Practice for Calculating AC Short-Circuit Currents in Industrial and Commercial Power Systems
    - f. IEEE 1015 - Recommended Practice for Applying Low-Voltage Circuit Breakers Used in Industrial and Commercial Power Systems
    - g. IEEE 1584 - Guide for Performing Arc-Flash Hazard Calculations
    - h. IEEE 3002.3 - IEEE Recommended Practice for Conducting Short-Circuit Studies and Analysis of Industrial and Commercial Power Systems
  2. American National Standards Institute (ANSI)
    - a. ANSI C57.12.00 - Standard General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers
    - b. ANSI C37.13 - Standard for Low Voltage AC Power Circuit Breakers Used in Enclosures
    - c. ANSI C37.010 - Standard Application Guide for AC High Voltage Circuit Breakers Rated on a Symmetrical Current Basis
    - d. ANSI C 37.41 - Standard Design Tests for High Voltage Fuses, Distribution Enclosed Single-Pole Air Switches, Fuse Disconnecting Switches and Accessories
  3. The National Fire Protection Association (NFPA)
    - a. NFPA 70E - Standard for Electrical Safety in the Workplace

#### 1.4 SEQUENCING

- A. The short-circuit and protective device coordination studies shall be submitted for review prior to receiving final approval of the distribution equipment shop drawings and/or prior to release of equipment drawings for manufacturing.
- B. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Architect for preliminary submittal of sufficient study data to ensure that selection of devices and associated characteristics is satisfactory.

#### 1.5 SUBMITTALS

- A. Product Data: For computer software program to be used for studies.

- B. Initial Study Report: The study shall provide sufficient data to ensure that selection of equipment and devices will have adequate ratings and the protective device trip characteristics will be satisfactory. Include the following:
  - 1. Study input data, including completed computer program input data sheets including assumptions on worst case project conditions.
  - 2. Study and equipment evaluation report; signed, dated, and sealed by a qualified professional engineer.
- C. Final Study and Report: Submit final study at the end of the construction when all circuits are installed, and all equipment is on site and installed such that complete and accurate data can be obtained.
- D. Closeout Submittals
  - 1. In addition to items specified in Division 01 and Section 260010 "General Requirements for Electrical Systems", include the following:
    - a. Provide five (5) bound copies of the complete final report. Additional copies shall be provided on CD or USB in PDF format.
    - b. Certification Document to confirm system settings have been implemented.
    - c. At the owner's option, provide the study project files in electronic format including all project files and libraries to allow the owner to update and print additional copies, labels, etc.

#### 1.6 QUALITY ASSURANCE

- A. Study shall be performed using commercially developed and distributed software designed specifically for power system analysis.
- B. Software algorithms shall comply with requirements of standards and guides specified in this Section.
- C. Manual calculations are not acceptable.
- D. Power Systems Analysis Specialist Qualifications: Professional engineer licensed in the state where Project is located and skilled in performing and interpreting the power system studies. All elements of the study shall be performed under the direct supervision and control of this professional engineer.
  - 1. Engineer shall be a full-time employee of the electrical equipment manufacturer.
  - 2. The engineer shall have a minimum of five (5) years' experience performing power system studies.
- E. Power System Study Certification: Report shall be signed and sealed by Power Systems Analysis Specialist.
- F. Field Adjusting Personnel Qualifications:
  - 1. Technician shall be a full-time employee of the electrical equipment manufacturer.
  - 2. Technician responsible for all field adjusting of the Work shall have a minimum NICET Electrical Power Testing Level III certification or equivalent.



## PART 2 - PRODUCTS

### 2.1 POWER SYSTEM ANALYSIS SOFTWARE DEVELOPERS

- A. Perform studies using the latest version of Power Tools for Windows by SKM Systems Analysts.
- B. Comply with IEEE 242, IEEE 399, IEEE 551, IEEE 1584, IEEE 3002.3, and NFPA 70E.
- C. Analytical features of power systems analysis software program shall have capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.
- D. Computer software program shall be capable of plotting and diagramming time-current-characteristic curves as part of its output. Computer software program shall report device settings and ratings of all overcurrent protective devices and shall demonstrate selective coordination by computer-generated, time-current coordination plots.

### 2.2 POWER SYSTEM STUDY REPORT CONTENTS

- A. Executive summary of study findings.
- B. Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpretation of results.
- C. One-line diagram of modeled power system, showing the following:
  - 1. Protective device designations and ampere ratings.
  - 2. Conductor types, sizes, and lengths.
  - 3. Motor designations and kVA ratings.
  - 4. Panelboard designations and ratings.
  - 5. Derating factors and environmental conditions.
  - 6. Any revisions to electrical equipment required by the study.
- D. Study Input Data
  - 1. Available Power source data.
  - 2. Manufacturer, model, and interrupting rating of protective devices.
  - 3. Conductors.
- E. Comments and recommendations for system improvements or revisions in a written document, separate from one-line diagram.
- F. Protective Device Evaluation:
  - 1. Evaluate equipment and protective devices and compare to available short-circuit currents. Verify that equipment SCCR ratings exceed available short-circuit current at equipment installation locations.
  - 2. Tabulations of circuit breaker, fuse, and other protective device ratings versus calculated short-circuit duties.

3. For 600-V overcurrent protective devices, ensure that interrupting ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.
4. For devices and equipment rated for asymmetrical fault current, apply multiplication factors listed in standards to 1/2-cycle symmetrical fault current.
5. Verify adequacy of phase conductors at maximum three-phase bolted fault currents; verify adequacy of equipment grounding conductors and grounding electrode conductors at maximum ground-fault currents. Ensure that SCCR ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.

G. Short-Circuit Study Output Reports:

1. Low-Voltage Fault Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:
  - a. Voltage.
  - b. Calculated fault-current magnitude and angle.
  - c. Fault-point X/R ratio.
  - d. Equivalent impedance.
2. Momentary Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:
  - a. Voltage.
  - b. Calculated symmetrical fault-current magnitude and angle.
  - c. Fault-point X/R ratio.
  - d. Calculated asymmetrical fault currents:
    - 1) Based on fault-point X/R ratio.
    - 2) Based on calculated symmetrical value multiplied by 1.6.
    - 3) Based on calculated symmetrical value multiplied by 2.7.
3. Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:
  - a. Voltage.
  - b. Calculated symmetrical fault-current magnitude and angle.
  - c. Fault-point X/R ratio.
  - d. No AC Decrement (NACD) ratio.
  - e. Equivalent impedance.
  - f. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a symmetrical basis.
  - g. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a total basis.

H. Protective Device Coordination Study:

1. Report recommended settings of protective devices, ready to be applied in the field. Use manufacturer's data sheets for recording the recommended setting of overcurrent protective devices when available.
  - a. Phase and Ground Relays:
    - 1) Device tag.

- 2) Relay current transformer ratio and tap, time dial, and instantaneous pickup value.
      - 3) Recommendations on improved relaying systems, if applicable.
    - b. Circuit Breakers:
      - 1) Adjustable pickups and time delays (long time, short time, and ground).
      - 2) Adjustable time-current characteristic.
      - 3) Adjustable instantaneous pickup.
      - 4) Recommendations on improved trip systems, if applicable.
  2. Fuses: Show current rating, voltage, and class.
- I. Time-Current Coordination Curves: Determine settings of overcurrent protective devices to achieve selective coordination. Graphically illustrate that adequate time separation exists between devices installed in series, including power utility company's upstream devices. Prepare separate sets of curves for the switching schemes and for emergency periods where the power source is local generation. Show the following information:
  1. Device tag and title, one-line diagram with legend identifying the portion of the system covered.
  2. Terminate device characteristic curves at a point reflecting maximum symmetrical or asymmetrical fault current to which the device is exposed.
  3. Identify the device associated with each curve by manufacturer type, function, and, if applicable, tap, time delay, and instantaneous settings recommended.
  4. Plot the following listed characteristic curves, as applicable:
    - a. Power utility's overcurrent protective device.
    - b. Medium-voltage equipment overcurrent relays.
    - c. Medium- and low-voltage fuses including manufacturer's minimum melt, total clearing, tolerance, and damage bands.
    - d. Low-voltage equipment circuit-breaker trip devices, including manufacturer's tolerance bands.
    - e. Transformer full-load current, magnetizing inrush current, and ANSI through-fault protection curves.
    - f. Cables and conductors damage curves.
    - g. Ground-fault protective devices.
    - h. Motor-starting characteristics and motor damage points.
    - i. Generator short-circuit decrement curve and generator damage point.
    - j. The largest feeder circuit breaker in each motor-control center and panelboard.
  5. Maintain selectivity for tripping currents caused by overloads.
  6. Maintain maximum achievable selectivity for tripping currents caused by overloads on series-rated devices.
  7. Provide adequate time margins between device characteristics such that selective operation is achieved.
  8. Comments and recommendations for system improvements.
- J. Arc-Flash Study Output Reports:
  1. Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each equipment location included in the report:

- a. Voltage.
- b. Calculated symmetrical fault-current magnitude and angle.
- c. Fault-point X/R ratio.
- d. No AC Decrement (NACD) ratio.
- e. Equivalent impedance.
- f. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a symmetrical basis.
- g. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a total basis.

K. Incident Energy and Flash Protection Boundary Calculations:

1. Arcing fault magnitude.
2. Protective device clearing time.
3. Duration of arc.
4. Arc-flash boundary.
5. Restricted approach boundary.
6. Limited approach boundary.
7. Working distance.
8. Incident energy.
9. Hazard risk category.
10. Recommendations for arc-flash energy reduction.

## 2.3 ARC-FLASH WARNING AND AVAILABLE FAULT CURRENT LABELS

- A. Comply with requirements in Section 260553 "Identification for Electrical Systems" for self-adhesive equipment labels. Produce a 3.5-by-5-inch self-adhesive equipment label for each location indicated in the analysis unless noted otherwise.
- B. Arc Flash Warning Labels shall have an orange header with the wording, "WARNING, ARC-FLASH HAZARD," and shall include all information required by NFPA 70E and the following information taken directly from the arc-flash hazard analysis:
  1. Location designation.
  2. Engineering report number, revision number, and issue date.
- C. Available Fault Current Labels shall have an orange header with the wording, "WARNING", and shall include the following information taken directly from the short circuit study.
  1. Location designation.
  2. Maximum available fault current.
  3. Calculation date.
  4. Engineering report number, revision number, and issue date.
- D. Labels shall be machine printed, with no field-applied markings.

## PART 3 - EXECUTION

### 3.1 POWER SYSTEM DATA

- A. Obtain all data necessary for conduct of the study.
1. Verify completeness of data supplied on one-line diagram. Call any discrepancies to Engineer's attention.
  2. For equipment included as Work of this Project, use characteristics submitted under provisions of action submittals and information submittals for this Project.
  3. For relocated equipment and that which is existing to remain, obtain required electrical distribution system data by field investigation and surveys, conducted by qualified technicians and engineers. Qualifications of technicians and engineers shall be as defined by NFPA 70E.
- B. Electrical Survey Data: Gather and tabulate the required input data to support the short-circuit study. Comply with requirements in Section 017839 "Project Record Documents" for recording circuit protective device characteristics. Record data on a Record Document copy of one-line diagram. Comply with recommendations in IEEE 551 as to the amount of detail that is required to be acquired in the field. Field data gathering shall be under direct supervision and control of the engineer in charge of performing the study. Data includes, but is not limited to, the following:
1. Product Data for Project's overcurrent protective devices involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
  2. Electrical power utility impedance and available short circuit current at the service.
  3. Power sources and ties.
  4. Short-circuit current at each system bus (three phase and line to ground).
  5. Full-load current of all loads.
  6. Voltage level at each bus.
  7. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in percent, and phase shift.
  8. For reactors, provide manufacturer and model designation, voltage rating, and impedance.
  9. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip, SCCR, current rating, and breaker settings.
  10. Generator short-circuit current contribution data, including short-circuit reactance, rated kVA, rated voltage, and X/R ratio.
  11. For relays, provide manufacturer and model designation, current transformer ratios, potential transformer ratios, and relay settings.
  12. Busway manufacturer and model designation, current rating, impedance, lengths, and conductor material.
  13. Motor horsepower and NEMA MG 1 code letter designation.
  14. Conductor sizes, lengths, number, conductor material and conduit material (magnetic or nonmagnetic).
  15. Derating factors.
  16. Data sheets to supplement electrical distribution system one-line diagram, cross-referenced with tag numbers on diagram, showing the following:

- a. Special load considerations, including starting inrush currents and frequent starting and stopping.
- b. Transformer characteristics, including primary protective device, magnetic inrush current, and overload capability.
- c. Motor full-load current, locked rotor current, service factor, starting time, type of start, and thermal-damage curve.
- d. Generator thermal-damage curve.
- e. Ratings, types, and settings of utility company's overcurrent protective devices.
- f. Special overcurrent protective device settings or types stipulated by utility company.
- g. Time-current-characteristic curves of devices indicated to be coordinated.
- h. Manufacturer, frame size, interrupting rating in amperes root mean square (rms) symmetrical, ampere or current sensor rating, long-time adjustment range, short-time adjustment range, and instantaneous adjustment range for circuit breakers.
- i. Manufacturer and type, ampere-tap adjustment range, time-delay adjustment range, instantaneous attachment adjustment range, and current transformer ratio for overcurrent relays.
- j. Switchgear, switchboards, motor-control centers, and panelboards ampacity, and SCCR in amperes rms symmetrical.
- k. Identify series-rated interrupting devices for a condition where the available fault current is greater than the interrupting rating of downstream equipment. Obtain device data details to allow verification that series application of these devices complies with NFPA 70 and UL 489 requirements.

### 3.2 POWER SYSTEMS STUDY

- A. Perform study following the general study procedures contained in IEEE 399.
- B. Base study on device characteristics supplied by device manufacturer.
- C. Gather all necessary data from the existing facility as needed to perform the study.
- D. The Contractor shall be responsible for modifying settings on existing equipment only at over-current protection devices upstream of new equipment unless noted otherwise.
- E. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Study all cases of system-switching configurations and alternate operations that could result in maximum fault conditions.
- F. Include the ac fault-current decay from induction motors, synchronous motors, and asynchronous generators and apply to low- and medium-voltage, three-phase ac systems. Also account for the fault-current dc decrement to address asymmetrical requirements of interrupting equipment.
- G. Identify in the report any protective device applied outside its capacity.
- H. Short Circuit Study
  1. Calculate short-circuit currents according to IEEE 551.

2. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault and a single line-to-ground fault at each equipment indicated on one-line diagram.
    - a. For grounded systems, provide a bolted line-to-ground fault-current study for areas as defined for the three-phase bolted fault short-circuit study.
  3. Evaluate equipment and protective devices and compare to short-circuit ratings.
- I. Coordination Study
1. Comply with IEEE 242 for calculating short-circuit currents and determining coordination time intervals.
  2. Transformer Primary Overcurrent Protective Devices:
    - a. Device shall not operate in response to the following:
      - 1) Inrush current when first energized.
      - 2) Self-cooled, full-load current or forced-air-cooled, full-load current, whichever is specified for that transformer.
      - 3) Permissible transformer overloads according to IEEE C57.96 if required by unusual loading or emergency conditions.
    - b. Device settings shall protect transformers according to IEEE C57.12.00, for fault currents.
  3. Motor Protection:
    - a. Select protection for low-voltage motors according to IEEE 242 and NFPA 70.
    - b. Select protection for motors served at voltages more than 600 V according to IEEE 620.
  4. Conductor Protection: Protect cables against damage from fault currents according to ICEA P-32-382, ICEA P-45-482, and protection recommendations in IEEE 242. Demonstrate that equipment withstands the maximum short-circuit current for a time equivalent to the tripping time of the primary relay protection or total clearing time of the fuse. To determine temperatures that damage insulation, use curves from cable manufacturers or from listed standards indicating conductor size and short-circuit current.
  5. Generator Protection: Select protection according to manufacturer's written instructions and to IEEE 242.
- J. Arc Flash Hazard Analysis
1. Comply with NFPA 70E and its Annex D for hazard analysis study.
  2. Preparatory Studies: Perform the Short-Circuit and Protective Device Coordination studies prior to starting the Arc-Flash Hazard Analysis.
  3. Calculate maximum and minimum contributions of fault-current size.
    - a. Maximum calculation shall assume a maximum contribution from the utility and shall assume motors to be operating under full-load conditions.
    - b. Calculate arc-flash energy at 85 percent of maximum short-circuit current according to IEEE 1584 recommendations.
  4. Calculate the arc-flash protection boundary and incident energy at locations in electrical distribution system where personnel could perform work on energized parts.
  5. Include medium- and low-voltage equipment locations, except equipment rated 240 V ac or less fed from transformers less than 125 kVA.

6. Calculate the limited, and restricted approach boundaries for each location.
7. Incident energy calculations shall consider the accumulation of energy over time when performing arc-flash calculations on buses with multiple sources. Iterative calculations shall take into account the changing current contributions, as the sources are interrupted or decremented with time. Fault contribution from motors and generators shall be decremented as follows:
  - a. Fault contribution from induction motors shall not be considered beyond three to five cycles.
  - b. Fault contribution from synchronous motors and generators shall be decayed to match the actual decrement of each as closely as possible (for example, contributions from permanent magnet generators will typically decay from 10 per unit to three per unit after 10 cycles).
8. Arc-flash energy shall generally be reported for the maximum of line or load side of a circuit breaker. However, arc-flash computation shall be performed and reported for both line and load side of a circuit breaker as follows:
  - a. When the circuit breaker is in a separate enclosure.
  - b. When the line terminals of the circuit breaker are separate from the work location.
9. Base arc-flash calculations on actual overcurrent protective device clearing time. Cap maximum clearing time at two seconds based on IEEE 1584, Section B.1.2.

### 3.3 LABELING

- A. All labels will be based on recommended overcurrent device settings and will be provided to owner after the results of the analysis have been presented and after any system changes, upgrades, or modifications have been incorporated in the system.
- B. Arc Flash Labeling:
  1. Provide and install an arc-flash label for each piece of electrical equipment listed below and each piece of equipment that is likely to require examination, adjustment, servicing, or maintenance while energized:
    - a. Motor-control centers.
    - b. Switchboards.
    - c. Switchgears.
    - d. Meter Enclosures.
    - e. Medium voltage and low voltage transformers
    - f. Panelboards.
    - g. Equipment Control panels.
    - h. Motor Controllers.
    - i. Disconnect Switches.
  2. Apply arc-flash label on the front cover of each section of the equipment and on side or rear covers with accessible live parts and hinged doors or removable plates for each equipment included in the study. Base arc-flash label data on highest values calculated at each location.



- C. Available Fault Current Labeling
  - 1. Provide and install an available fault current label for each piece of electrical equipment listed below:
    - a. Service equipment.
    - b. Elevator Control Panel.
- D. Install warning labels under the direction of the Power System Analysis Specialist.
- E. Provide new labels for any existing equipment to remain with updated values based on the results of the analysis.

### 3.4 FIELD ADJUSTING

- A. Adjust relay and protective device settings according to recommended settings provided by the coordination study. Field adjustments shall be completed by a qualified technician from the engineering service division of the equipment manufacturer.
- B. Make modifications to equipment as required to accomplish compliance with short-circuit and protective device coordination studies.
- C. Notify Architect and Engineer in writing of any required major modifications.
- D. Equipment shall not be energized until all breakers or protective relays are set either to the recommended values indicated by the studies or to minimum trip settings.
- E. Certification: Prior to project Substantial Completion, submit four signed copies of a document certifying that the settings and selection scope has been completed as specified.

### 3.5 DEMONSTRATION

- A. Acquaint personnel in fundamentals of operating the power system in normal and emergency modes.
- B. Hand-out and explain the power system study objectives, study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpreting time-current coordination curves.
- C. Arc Flash Training
  - 1. Train Owner's maintenance personnel in potential arc-flash hazards associated with working on energized equipment and the significance of arc-flash warning labels (minimum of 4 hours).
  - 2. The training shall be certified for continuing education units (CEUs) by the International Association for Continuing Education Training (IACET) or equivalent.
  - 3. Include in Project Close-out Documents training notes, outlines, and Power Point presentation of training session. Also include attendance record of personnel attending the training session.

4. Training session shall be videotaped. Include copy of DVD of training session in Project Close-out Documents.

END OF SECTION 260573

## SECTION 262416 - PANELBOARDS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions, Division 01 Specification Sections, and Section 260010 "General Requirements for Electrical Systems" apply to this Section.

#### 1.2 SUMMARY

- A. Description: Section includes requirements for the provision of Panelboards including manufacturing, fabrication, configuration, and installation as required for the complete performance of the Work, as shown on the Drawings, as specified herein.
- B. Section Includes:
  - 1. Distribution panelboards
  - 2. Lighting and appliance branch-circuit panelboards
  - 3. Disconnecting and overcurrent protective devices.
- C. Related Requirements:
  - 1. Refer to Section 260500, "Common Work Results for Electrical Systems" for requirements related to equipment supports.

#### 1.3 REFERENCES

- A. Abbreviations
  - 1. AFCI: Arc-fault circuit interrupter.
  - 2. GFCI: Ground-fault circuit interrupter.
  - 3. GFPE: Ground-fault protection of equipment.
  - 4. MCCB: Molded Case Circuit Breaker
  - 5. SWD: Switching Duty
  - 6. VPR: Voltage protection rating.
- B. Definitions
  - 1. Panelboard: A single panel or group of panel units designed for assembly in the form of a single panel, including buses and automatic overcurrent devices, and equipped with or without switches for the control of light, heat, or power circuits; designed to be placed in a cabinet or cutout box placed in or against a wall, partition, or other support; and accessible only from the front.

- C. Reference Standards: The following publications are referred to in the text by the basic designation only. The edition/revision of the referenced publications shall be the latest version as of the date of the Contract Documents, unless otherwise specified.
1. National Electrical Contractors Association (NECA):
    - a. NECA 407, "Standard for Installing and Maintaining Panelboards"
  2. National Electrical Manufacturers Association (NEMA):
    - a. NEMA AB 1, "Molded Case Circuit Breakers and Molded Case Switches."
    - b. NEMA PB 1, "Panelboards."
    - c. NEMA PB 1.1, "General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less."
  3. Underwriter Laboratories (UL):
    - a. UL 50, "Enclosures for Electrical Equipment, Non-Environmental Considerations."
    - b. UL 67, "Standard for Panelboards."
    - c. UL 489, "Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures."

#### 1.4 SEQUENCING

- A. Submit the preliminary power system study prior to receiving final approval of equipment and system protective devices submittals and prior to release of equipment drawings for manufacturing. Adjust equipment sizes, frame sizes, and trip units as necessary to achieve performance requirements outlined in Section 260573, "Power Systems Studies".

#### 1.5 SUBMITTALS

- A. Product Data: For each type of panelboard,
1. Include materials, switching and overcurrent protective device, accessories, and component indicated.
  2. Include manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: For each panelboard and related equipment.
1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
  2. Detail enclosure types and details for types other than NEMA 250, Type 1.
  3. Detail bus configuration, current, and voltage ratings.
  4. Short-circuit current rating of panelboards and overcurrent protective devices.
  5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
  6. Include wiring diagrams for power, signal, and control wiring.
- C. Closeout Submittals

1. Operation and Maintenance Data: For Panelboards and components to include in operation and maintenance manuals.
2. In addition to items specified in Division 01 and Section 260010 "General Requirements for Electrical Systems", include the following:
  - a. Routine maintenance requirements for panelboards and all installed components.
  - b. Manufacturer's written instructions for testing and adjusting overcurrent protective devices
  - c. Time-current coordination curves for each type and rating of overcurrent protective device included in Panelboards.

#### 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of qualified workers as defined in NEMA PB 1.1 and trained in electrical safety as required by NFPA 70E.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Handle and prepare panelboards for installation according to NECA 407 and NEMA PB 1. Handle carefully to avoid damage to internal components, enclosure, and finish.
- B. Comply with manufacturer instructions for storage of electrical equipment to prevent damage from condensation or other environmental concerns.

#### 1.8 COORDINATION

- A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Distribution equipment sizes and equipment layouts shall be considered basis of design. Equipment sizes vary by manufacturer. If proposed equipment is larger than the sizes illustrated, the burden shall be on the Contractor to provide equipment which fits in the space allotted while maintaining all code-required and manufacturer-recommended clearances.
- C. Drawings indicate space available for electrical equipment, including clearances between equipment and adjacent surfaces and other items. Equipment installed must comply with all clearance, access and replacement working space requirements of the NEC and Owner.

## 1.9 WARRANTY

- A. **Manufacturer's Warranty:** Manufacturer agrees to repair or replace panelboards, circuit breakers, finishes, controls, components, and accessories that fail in materials or workmanship within 12 months from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
  - 1. ABB.
  - 2. Eaton.
  - 3. Siemens.
  - 4. Square D.
- B. **Source Limitations:** Obtain panelboards, overcurrent protection devices, and all other electrical distribution equipment through one source from a single manufacturer.

### 2.2 GENERAL REQUIREMENTS FOR PANELBOARDS

- A. **Electrical Components, Devices, and Accessories:** Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70 and NEMA PB 1.
- C. Provide circuit breaker type panelboards unless noted otherwise.
- D. **Enclosures:** Flush- or surface-mounted, dead-front cabinets as indicated on drawings.
  - 1. Rated for environmental conditions at installed location.
    - a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
    - b. Outdoor and Wet Locations: NEMA 250, Type 3R.
  - 2. **Hinged Front Cover:** Entire front trim hinged to box and with standard door within hinged trim cover
  - 3. **Front:** Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box and keep tight to wall with no gaps allowing access to live parts. Oversize trims will not be acceptable
  - 4. Interior trim shall be of dead-front construction to shield user from all energized parts.
  - 5. **Gutter Extension and Barrier:** Same gage and finish as panelboard enclosure; integral with enclosure body. Arrange to isolate individual panel sections.
  - 6. **Materials and Finishes:**

- a. Panels, Back Boxes and Trim: Galvanized Steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
  - b. Boxes: Galvanized steel with same finish as panels and trim. Unpainted galvanized steel is not acceptable.
7. Boxes shall have removable end walls. End walls shall not be provided with concentric knockouts. Boxes shall have welded interior mounting studs. Interior mounting brackets are not required.
  8. Directory Card: Inside panelboard door, mounted in metal frame with transparent protective cover.
  9. All lock assemblies shall be keyed alike.
- E. Incoming Mains:
1. Circuit breaker or Lugs only as indicated on drawings
  2. Location: Top or bottom to match feeder conduit entry.
  3. Feeders routed through the side gutters to reach the top or bottom main breakers from the opposite end of the panel are not acceptable.
  4. Main lugs or main breakers shall have barriers on five sides.
- F. Phase, Neutral, and Ground Busses:
1. Material: Hard-drawn copper, 98 percent conductivity.
    - a. Bus shall be fully rated the entire length, with one continuous bus bar per phase.
  2. Phase bussing shall be pre-drilled to accommodate field installable options.
  3. Interiors shall be factory assembled into a unit. Replacing switching and protective devices shall not disturb adjacent units or require removing the main bus connectors.
  4. Equipment Ground Bus: Extend full length of panelboard and adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
  5. Full-Sized Neutral: Equipped with full-capacity bonding strap for service entrance applications. Mount electrically isolated from enclosure. Do not mount neutral bus in gutter.
- G. Conductor Connectors: Suitable for use with conductor material and sizes.
1. Material: Tin-plated aluminum.
  2. Terminations shall allow use of 75 deg C rated conductors without derating.
  3. Size: Lugs suitable for indicated conductor sizes, with additional gutter space, if required, for larger conductors.
  4. Main and Neutral Lugs: Mechanical type.
  5. Ground Lugs and Bus-Configured Terminators: Mechanical type.
  6. Feed-Through Lugs: Where indicated provide mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device. Provide where indicated on drawings.
  7. Subfeed (Double) Lugs: Where indicated provide mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.

8. Extra-Capacity Neutral Lugs: Rated 200 percent of phase lugs mounted on extra-capacity neutral bus where indicated.
- H. Service Entrance: Where panelboards are used as service equipment with one or more main service disconnecting and overcurrent protective devices, provide marking by an NRTL acceptable to authority having jurisdiction indicating panelboard is suitable for use as service equipment. Coordinate with utility company for any additional requirements.
- I. Future Devices: Provide mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices. Where panelboards are noted to have “space” or “space only”, this shall be prepared space with all bussing, lugs, etc. as required to accept future installation of over-current devices.
- J. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals. Panelboard and overcurrent protective device short circuit ratings shall be at least 110 percent of the actual available fault current.
  1. Panelboards rated 240V or less: minimum 10,000 A.
  2. Panelboards rated above 240V: minimum 14,000 A.

## 2.3 DISTRIBUTION PANELBOARDS

- A. Panelboards: NEMA PB 1, power and feeder distribution type.
- B. Provide bolt-on circuit breakers for overcurrent protective devices.
- C. Doors: Secured with three point vault-type latch with tumbler lock; keyed alike. For doors more than 48 inches high, provide two latches.
- D. All panelboards shall be capable of accepting 225 amp 3 pole branch breakers as a minimum unless otherwise noted.

## 2.4 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.
- B. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- C. Doors: Door-in-door construction with concealed hinges; secured with multipoint latch with tumbler lock; keyed alike. Outer door shall permit full access to the panel interior. Inner door shall permit access to breaker operating handles and labeling, but current carrying terminals and bus shall remain concealed.
- D. All panelboards shall have space to accept forty-two 20 amp single pole circuit breakers unless otherwise noted.



## 2.5 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.
1. Thermal-Magnetic Circuit Breakers:
    - a. Inverse time-current element for low-level overloads.
    - b. Instantaneous magnetic trip element for short circuits.
    - c. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
  2. Adjustable Instantaneous-Trip Circuit Breakers:
    - a. Magnetic trip element with front-mounted, field-adjustable trip setting.
  3. Electronic trip circuit breakers:
    - a. RMS sensing.
    - b. Field-replaceable rating plug or field-replicable electronic trip.
    - c. Digital display of settings, trip targets, and indicated metering displays.
    - d. Multi-button keypad to access programmable functions and monitored data.
    - e. Ten-event, trip-history log. Each trip event shall be recorded with type, phase, and magnitude of fault that caused the trip.
    - f. Integral test jack for connection to portable test set or laptop computer.
    - g. Field-adjustable Instantaneous, Long- and short-time pickup, and Ground-fault pickup settings.
  4. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
  5. GFEP Circuit Breakers: Class B ground-fault protection (30-mA trip).
  6. AFCI Circuit Breakers: Comply with UL 1699; 120/240-V, single-pole configuration.
  7. MCCB features and accessories:
    - a. Standard frame sizes, trip ratings, and number of poles.
    - b. Breaker handle indicates tripped status.
    - c. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
    - d. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
    - e. Shunt Trip: 120 V or 24V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage.
    - f. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage with field-adjustable 0.1- to 0.6-second time delay.
    - g. Multipole units enclosed in a single housing or factory assembled to operate as a single unit.
    - h. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in on or off position.
- B. Provide Ground Fault protection for circuit breakers rated 1000 A and higher on solidly grounded wye systems more than 150V to ground.
- C. Provide Arc Flash energy reducing maintenance switch with local status indicator for circuit breakers rated 1200A and higher or where circuit breaker trip setting can be adjusted to 1200A or greater.

## 2.6 SURGE PROTECTION DEVICES

- A. Where panelboards are indicated with integral SPD, comply with requirements in Section 264300, "Surge Protective Devices". Factory install SPDs prior to shipment.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify actual conditions with field measurements prior to ordering panelboards to verify that equipment fits in allocated space in, and comply with, minimum required clearances specified in NFPA 70.
- B. Receive, inspect, handle, and store panelboards according to NECA 407 and NEMA PB 1.1.
- C. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.
- D. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work. Ensure area to receive panelboard has adequate clearance for panelboard installation.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Install panelboards and accessories according to NECA 407 and NEMA PB 1.1.
- C. Temporary Lifting Provisions: Remove any temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.
- D. Mount top of trim 90 inches above finished floor unless otherwise indicated or where required to maintain center of trip handle on overcurrent protection devices below 79-inches. Where mounted in groups, align top of trim or tub for all panels in an area.
- E. Mount panelboard cabinet plumb and rigid without distortion of box.
- F. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
- G. Provide steel slotted support structures where required for freestanding equipment or where building mounting surface is unsuitable.

- H. Install overcurrent protective devices and controllers not already factory installed. Set field-adjustable, circuit-breaker trip ranges.
- I. Install filler plates in unused spaces.
- J. Stub four (4) 1-inch and two (2) 1-1/4-inch empty conduits from recessed panelboard into accessible ceiling space or space designated to be ceiling space in the future. Provide suitable closures for spare conduits and identify with a suitable label.
- K. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.
- L. Comply with NECA 1.

### 3.3 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B. Where a tightening torque is indicated as a numeric value on equipment or in installation instructions provided by the manufacturer, use a calibrated torque tool to achieve that indicated torque value, unless the equipment manufacturer has provided installation instructions for an alternative method of achieving the required torque.

### 3.4 IDENTIFICATION

- A. Comply with requirements in Section 260553, "Identification for Electrical Systems" and as noted below:
  - 1. Provide a directory card inside each door, covered with a plastic non-yellowing shield. Directory Card to indicate installed circuit loads after balancing panelboard loads. Obtain approval before installing. Use a computer to create directory in Microsoft Excel; handwritten directories are not acceptable. Digital versions to be provided to Owner.
  - 2. The room numbers used to fill out the panel directories shall match the actual final name and numbering scheme selected by the Owner. They shall not be filled out per the construction drawing numbering scheme unless the Contractor is directed to do so by the Architect or Engineer.
  - 3. Provide nameplate for each panelboard.
  - 4. For distribution panelboards, provide nameplate for each branch circuit device.
  - 5. All distribution equipment shall be shipped from the manufacturer with factory-applied warning labels affixed to the outside front of the equipment (as it will be installed per the plans). All labeling shall be in compliance with NFPA 70 requirements.
  - 6. Labels affixed to equipment by the equipment manufacturer shall comply with drawing and specification labeling requirements or shall be omitted by the manufacturer and field-installed by the Contractor. Labels which are factory-installed and not in compliance shall be removed and replaced and equipment enclosures refinished or replaced by the manufacturer to repair finish.

### 3.5 FIELD QUALITY CONTROL

#### A. Perform the following Tests and Inspections:

##### 1. Visual and Mechanical Inspection:

- a. Examine equipment nameplate data and confirm proper identification.
- b. Inspect the physical, electrical, and mechanical condition of the equipment and all components in accordance with the manufacturers' instructions.
- c. Inspect anchorage, alignment, and grounding.
- d. Inspect bolted electrical connections and terminations for high resistance by verifying tightness with calibrated torque-wrench method in accordance with manufacturer's published data.
- e. Exercise all active components.
- f. Inspect all mechanical indicating devices for correct operation.
- g. Physically test key interlock systems to check for proper functionality prior to energizing.

##### 2. Electrical Acceptance Testing:

- a. Perform insulation resistance test for one minute on each panelboard bus, component, connecting supply, feeder, and control circuit. Open control and metering circuits within the panelboard and remove neutral connection to surge protection and other electronic devices prior to insulation test. Reconnect after test. Test voltages and minimum resistance shall be in accordance with manufacturer's published data.
3. Circuit Breaker Testing: For all circuit breakers with electronic trip units, determine minimum pickup current, long-time and short-time pickup and delay, and instantaneous pickup by secondary current injection. Certify compliance with test parameters and ensure settings match recommendations from final approved power system study.
4. Test ground-fault protection of equipment for service equipment per NFPA 70.
5. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

#### B. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

#### C. Panelboards will be considered defective if they do not pass tests and inspections.

#### D. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

### 3.6 CLEANING

#### A. On completion of installation, inspect interior and exterior of panelboards. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

3.7 ADJUSTING

- A. Adjust moving parts and operable component to function smoothly and lubricate as recommended by manufacturer.
- B. Set field-adjustable circuit-breaker trip ranges as specified in Section 260573, "Power System Studies".
- C. All circuit breakers identified as spares shall be left in the OFF position.

END OF SECTION 262416

## SECTION 262726 - WIRING DEVICES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions, Division 01 Specification Sections, and Section 260010 “General Requirements for Electrical Systems” apply to this Section.

#### 1.2 SUMMARY

- A. This section of the specifications covers all wiring devices and cover plates, standard, weatherproof and dust tight.
- B. Section Includes:
  - 1. Straight Blade receptacles.
  - 2. GFCI receptacles.
  - 3. Twist-locking receptacles.
  - 4. Controlled receptacles.
  - 5. General use snap switches.
  - 6. Manual Motor Control switches.
  - 7. Wall Plates.

#### 1.3 REFERENCES

- A. Abbreviations
  - 1. AFCI: Arc-fault circuit interrupter.
  - 2. CR: Corrosion Resistant
  - 3. EMI: Electromagnetic interference.
  - 4. GFCI: Ground-fault circuit interrupter.
  - 5. IG: Isolated Ground
  - 6. SPD: Surge Protective Device
  - 7. TR: Tamper Resistant.
  - 8. USB: Universal Serial Bus.
  - 9. WR: Weather Resistant.
- B. Definitions
  - 1. Emergency Electrical Systems: Those systems legally required and classed as emergency by NFPA 70 Article 700, municipal, state, other codes, or by any government agency having jurisdiction.
  - 2. Essential Electrical Systems: Those systems designed to ensure continuity of electrical power to designated areas and functions of a healthcare facility during disruption of normal power sources, and also to minimize disruption within the internal wiring system as defined by NFPA 70 Article 517 and NFPA 99.

3. Outlet: A point on the wiring system at which current is taken to supply utilization equipment.
  4. Pigtail: Short lead used to connect a device to a branch-circuit conductor.
  5. Receptacle. A receptacle is a contact device installed at the outlet for the connection of an attachment plug. A single receptacle is a single contact device with no other contact device on the same yoke. A multiple receptacle is two or more contact devices on the same yoke.
- C. Reference Standards: The following publications are referred to in the text by the basic designation only. The edition/revision of the referenced publications shall be the latest version as of the date of the Contract Documents, unless otherwise specified.
1. National Electrical Contractors Association (NECA):
    - a. NECA 130, "Standard for Installing and Maintaining Wiring Devices"
  2. National Electrical Manufacturers Association (NEMA)
    - a. NEMA WD 1, "General Color Requirements for Wiring Devices"
    - b. NEMA WD 6, "Wiring Devices—Dimensional Specifications"

#### 1.4 SUBMITTALS

- A. Product Data: For each type of product.
- B. Schedules: List of legends and description of materials and process used for pre-marking wall plates.
- C. Samples: Where requested by architect or engineer, one for each type of device and wall plate, in each color specified.
- D. Closeout Submittals
  1. Operation and Maintenance Data: For Wiring Devices to include in operation and maintenance manuals.
  2. In addition to items specified in Division 01 and Section 260010 "General Requirements for Electrical Systems", include the following:
    - a. Manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide product indicated or equal from one of the following:
  1. Eaton/Arrow Hart
  2. Hubbell
  3. Leviton
  4. Pass & Seymour/Legrand

- B. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 GENERAL WIRING-DEVICE REQUIREMENTS

- A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.
- C. RoHS compliant.
- D. Devices for Fixtures, Furnishings, and Equipment:
  - 1. Receptacles: Match plug configurations.
- E. All terminations shall be side-wired clamping type. “Backstab” terminations or modular connectors are not permitted.
- F. Device Color:
  - 1. Wiring devices in finished spaces connected to normal power system: As selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.
  - 2. Wiring Devices in unfinished spaces connected to normal power system: Grey unless otherwise indicated or required by NFPA 70 or device listing.
  - 3. Wiring Devices Connected to Emergency or Essential Electrical System: Red.
  - 4. SPD Devices: Blue.
  - 5. Isolated-Ground Receptacles: Orange or as specified above with orange triangle on face.
- G. Wall Plate Color:
  - 1. For plastic covers, match device color unless noted otherwise.
  - 2. Where normal and essential system devices are ganged under a common wall plate, the plate shall be the color of normal power plates.

2.3 SPECIFICATION GRADE STRAIGHT-BLADE RECEPTACLES

- A. Specification Grade Receptacle, Comply with NEMA WD 6, UL 498, FS W-C-596.

TYPE	RATING	CONFIGURATION	BASIS OF DESIGN
Duplex	15A, 125V	NEMA 5-15R	Hubbell 5262
Duplex	20A, 125V	NEMA 5-20R	Hubbell 5362
Single	20A, 125V	NEMA 5-20R	Hubbell 5361



Duplex-TR	20A, 125V	NEMA 5-20R	Hubbell 5362TR
Duplex-IG	20A, 125V	NEMA 5-20R	Hubbell IG5362
Duplex-WR	20A, 125V	NEMA 5-20R	Hubbell 5362WR
Duplex-CR	20A, 125V	NEMA 5-20R	Hubbell HBL53CM62
Single	30A, 250V	NEMA 6-30R	Hubbell HBL9330
Single	50A, 250V	NEMA 6-50R	Hubbell HBL9367
Single	20A, 250V	NEMA 10-20R	Hubbell HBL9326

#### 2.4 SPECIFICATION GRADE GFCI RECEPTACLES

- A. Specification Grade GFCI Receptacles, Comply with UL 498, FS W-C-596, and UL 943 Class A.
- B. Non-feed through type unless otherwise required, Integral self-testing GFCI with "Test" and "Reset" buttons and LED indicator light that is lighted when the unit is tripped. If critical components are damaged and ground fault protection is lost, power to receptacle shall be discontinued.

TYPE	RATING	CONFIGURATION	BASIS OF DESIGN
Duplex GFCI	15A, 125V	NEMA 5-15R	Hubbell GFRST15
Duplex GFCI	20A, 125V	NEMA 5-20R	Hubbell GFRST20
Duplex GFCI with Alarm	20A, 125V	NEMA 5-20R	Hubbell GFRST20A
Duplex GFCI - TR	20A, 125V	NEMA 5-20R	Hubbell GFTRST20
Duplex GFCI - WR	20A, 125V	NEMA 5-20R	Hubbell GFTWRST20
Duplex GFCI - CR	20A, 125V	NEMA 5-20R	Hubbell GFRST52M
GFCI Blank Face	20A, 125V		Hubbell GFBFST20

#### 2.5 SPECIFICATION GRADE SPD RECEPTACLES

- A. Specification Grade SPD Receptacles, Comply with UL 498, FS W-C-596, and UL 1449, Type 3:

- B. Self-grounding. Integral SPD in line to ground, line to neutral, and neutral to ground. Visual and audible SPD indication, with LED indicator light visible in face of device to indicate device is "active" or "no longer in service."
- C. SPD Components: Multiple metal-oxide varistors; with a nominal clamp-level rating of 500 V and minimum single transient pulse energy dissipation of 340 J in each mode, according to IEEE C62.41.2 and IEEE C62.45.

TYPE	RATING	CONFIGURATION	BASIS OF DESIGN
Duplex SPD	20A, 125V	NEMA 5-20R	Hubbell HBL5362SA

## 2.6 TWIST-LOCKING RECEPTACLES

- A. Twist-Lock, Single Receptacles, with matching plug as required by equipment. Comply with NEMA WD 6, UL 498, FS W-C-596.

TYPE	RATING	CONFIGURATION	BASIS OF DESIGN
Single	20A, 125V	NEMA L5-20R	Hubbell HBL2310
Single	20A, 250V	NEMA L6-20R	Hubbell HBL2320
Single	20A, 277V	NEMA L7-20R	Hubbell HBL2330

## 2.7 GENERAL USE SNAP SWITCHES

- A. Switches, 120/277 V, Comply with UL 20 and FS W-S-896.

TYPE	RATING	CONFIGURATION	BASIS OF DESIGN
Single Pole	20A, 120/277V		Hubbell 1221
Double Pole	20A, 120/277V		Hubbell 1222
Three Way	20A, 120/277V		Hubbell 1223
Four Way	20A, 120/277V		Hubbell 1224

- B. Pilot-Light Switches, illuminated when switch is ON:

TYPE	RATING	CONFIGURATION	BASIS OF DESIGN
Single Pole	20A, 120/277V		Hubbell 1221PL

C. Illuminated Switches, illuminated when switch is OFF:

TYPE	RATING	CONFIGURATION	BASIS OF DESIGN
Single Pole	20A, 120/277V		Hubbell 1221IL

D. Key-Operated Switches, Factory-supplied key in lieu of switch handle:

TYPE	RATING	CONFIGURATION	BASIS OF DESIGN
Single Pole	20A, 120/277V		Hubbell 1221L
Three Way	20A, 120/277V		Hubbell 1223L
Four Way	20A, 120/277V		Hubbell 1224L

## 2.8 MANUAL MOTOR CONTROL SWITCHES

- A. Motor-Starting Switches (MSS): "Quick-make, quick-break" toggle type for manual control of single or three phase motors up to 3/4 HP where overload protection is not required or is provided separately, marked to indicate whether unit is on or off.
1. Standard: Comply with NEMA ICS 2, general purpose, Class A.
- B. Fractional Horsepower Manual Controllers (FHPMC): "Quick-make, quick-break" toggle type with integral overload protection for use with single phase motors up to 1HP; marked to show whether unit is off, on, or tripped.
1. Configuration: Non-reversing unless noted otherwise on drawings.
  2. Overload Relays: Inverse-time-current characteristics; NEMA ICS 2, Class 10 tripping characteristics; heaters matched to nameplate full-load current of actual protected motor and ambient temperature; external reset push button; melting alloy type.
  3. Red pilot light where indicated on drawings.
  4. HOA selector switch with dry contact inputs where indicated on drawings.
- C. Provide with NEMA 1, NEMA 3R or other enclosure suitable for the location and atmosphere.
- D. All manual starters located in finished areas shall be in flush-mounted enclosures.

## 2.9 WALL PLATES

- A. Single and combination types shall match corresponding wiring devices.
1. Plate-Securing Screws: Type 304 stainless steel.
  2. Material: Smooth, type 304 stainless steel. Provide foam gasket behind plate to help prevent water infiltration.

- B. Material for Interior Damp Locations: Cast aluminum with spring-loaded lift cover and listed and labeled for use in wet and damp locations.
- C. Wet-location, Weatherproof, in-use cover plates: extra duty, suitable for use with and decorator style devices, die-cast aluminum lockable cover, self-closing, gasketed, standard box mounting.
  - 1. Vertical mounting - Hubbell WP26E or equal.
  - 2. Horizontal mounting - Hubbell WP26EH or equal.
- D. Cover plates for lighting control devices exposed to severe physical damage: Low profile, flip-up clear polycarbonate cover. STI Stopper or equal.

### PART 3 - EXECUTION

#### 3.1 APPLICATION

- A. Provide receptacles and cover plates listed for the installed environment.
- B. Outdoor receptacles and receptacles located in wet locations shall be weather resistant, GFCI type, with weatherproof enclosure.
- C. Provide GFCI receptacles where required by the NEC in addition to the locations noted on the drawings.
- D. Provide weather-resistant rating for GFCI receptacles installed in wet locations.
- E. Where GFCI receptacles are located in areas that are not readily accessible, provide GFCI blank face device in readily accessible location approved by Architect.
- F. Provide GFCI receptacles with audible alarm for refrigeration and vending applications.
- G. Provide tamper resistant receptacles where required by the NEC in addition to the locations noted on the drawings.

#### 3.2 INSTALLATION

- A. Unless more stringent requirements are specified in Contract Documents or manufacturers' instructions, comply with installation instructions in NECA 130.
- B. Mounting Heights: Unless otherwise indicated in Contract Documents, comply with mounting heights recommended in NECA NEIS 1.
- C. Devices that have been installed before painting shall be masked. No plates or covers shall be installed until all finishing and cleaning has been completed. Replace stained or improperly painted wiring devices and coverplates.
- D. Install non-feed-through GFCI receptacles where protection of downstream receptacles is not required. Where GFCI receptacles share a single circuit with other devices, a ground fault on any GFCI receptacle shall not interrupt power to downstream devices.

- E. Coordination for all receptacles: Confirm receptacle configuration of all special purpose receptacles with approved submittals prior to installation and provide devices to match equipment plugs. Contractor shall replace any incompatible receptacle discovered during owner move-in.
  
- F. Coordination with Other Trades:
  - 1. Adjust locations of outlets to suit arrangement of partitions and furnishings. Locate outlets to avoid blocking by supports, furnishings, and other architectural fixtures.
  - 2. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
  - 3. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
  - 4. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
  - 5. Install wiring devices after all wall preparation, including painting, is complete.
  
- G. Conductors:
  - 1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
  - 2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
  - 3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
  - 4. Where re-using existing conductors:
    - a. Cut back and pigtail or replace all damaged conductors.
    - b. Straighten conductors that remain and remove corrosion and foreign matter.
    - c. Pigtailling existing conductors is permitted, provided the outlet box is large enough.
  
- H. Device Installation:
  - 1. Replace all devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
  - 2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
  - 3. Do not remove surface protection, such as plastic film and smudge covers, until all finish work is complete.
  - 4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
  - 5. Use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
  - 6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
  - 7. When conductors larger than #12 AWG are installed on 15- or 20-A circuits, splice #12 AWG pigtails for device connections.

8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.
10. Install devices and assemblies' level, plumb, and square with building lines. Align devices vertically and horizontally. Securely fasten devices into boxes.

I. Device Orientation:

1. Install switches with "OFF" position down.
2. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the left so the neutral blade is at the top.

J. Device Plates:

1. Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.
2. All outlets not provided with wiring devices shall be closed with a blank plate matching other plates in the area.
3. Align coverplate mounting screw slots in the same direction, either vertical or horizontal. Do not overtighten coverplate mounting screws. Overtightening can cause the coverplate to warp, dimple, bend, crack, or break.

3.3 IDENTIFICATION:

- A. Comply with Section 260553 "Identification for Electrical Systems."
1. All device wall plates shall have panel and circuit designation engraved in the face.
  2. All device boxes shall have circuit number identified within the box.

3.4 FIELD QUALITY CONTROL

- A. Test Instruments: Use instruments that comply with UL 1436.
- B. Using a test plug, perform the following tests and inspections for receptacles:
1. Insert and remove test plug to verify that devices are securely mounted.
  2. Verify correct configuration of hot, neutral, and ground pins.
  3. Verify correct operation of ground fault protective devices.
- C. Nonconforming Work:
1. Device will be considered defective if it does not pass tests and inspections.
  2. Remove and replace defective units and retest.
- D. Prepare test and inspection reports.

END OF SECTION 262726

## SECTION 262813 - FUSES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions, Division 01 Specification Sections, and Section 260010 “General Requirements for Electrical Systems” apply to this Section.

#### 1.2 SUMMARY

- A. Description: Provide labor, material, equipment, related services, and supervision required for the installation of cartridge fuses where utilized for overcurrent and/or current limitation applications.
- B. Section Includes:
  - 1. Cartridge fuses rated 600V-AC and less for use in control circuits, enclosed switches, panelboards, switchboards, and motor controllers.
  - 2. Spare fuse cabinet.

#### 1.3 REFERENCES

- A. Definitions
  - 1. Fuse: A protective device that opens a circuit during specified overcurrent conditions by means of a current responsive element.
- B. Reference Standards: The following publications are referred to in the text by the basic designation only. The edition/revision of the referenced publications shall be the latest version as of the date of the Contract Documents, unless otherwise specified.
  - 1. National Electrical Contractors Association (NECA)
    - a. NECA 420, “Fuse Applications”

#### 1.4 SEQUENCING

- A. Submit the preliminary power system study prior to receiving final approval of equipment and system protective devices submittals and prior to release of equipment drawings for manufacturing. Adjust equipment sizes, frame sizes, and trip units as necessary to achieve performance requirements outlined in Section 260573, “Power Systems Studies”.

## 1.5 SUBMITTALS

- A. Product Data: For each fuse type indicated:
  - 1. Include let-through current curves for fuses with current-limiting characteristics.
  - 2. Time-current curves, coordination charts and tables, and related data.
  
- B. Ambient Temperature Adjustment Information: Where ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses with adjusted ratings.
  - 1. For each fuse having adjusted ratings, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.
  - 2. Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.
  
- C. Closeout Submittals
  - 1. Operation and Maintenance Data: For Fuses include in emergency, operation, and maintenance manuals.
  - 2. In addition to items specified in Division 01 and Section 260010 "General Requirements for Electrical Systems", include the following:
    - a. Let-through current curves for fuses with current-limiting characteristics.
    - b. Time-current curves, coordination charts and tables, and related data.
    - c. Ambient temperature adjustment information.

## 1.6 COORDINATION

- A. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels indicated in power system study.

## 1.7 MAINTENANCE MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Fuses: Equal to one spare for every 10 installed units, but not less than 5 units for each size and type.
  - 2. Fuse Pullers: Two for each size and type.

## 1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to replace fuses that fail in materials or workmanship within 12 months from date of Substantial Completion.



## 1.9 FIELD CONDITIONS

- A. Where ambient temperature to which fuses are exposed is less than 40 deg F or more than 100 deg F, apply manufacturer's ambient temperature adjustment factors to fuse ratings.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Bussmann, Inc.
  - 2. Littelfuse, Inc.
  - 3. Mersen USA.
- B. Source Limitations: Obtain fuses, for use within a specific product or circuit, from single source from single manufacturer.

### 2.2 GENERAL REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with:
  - 1. NEMA FU 1 – Low Voltage Cartridge Fuses.
  - 2. UL 248 – Standard for Low Voltage Fuses.
  - 3. UL 512 – Fuseholders.

### 2.3 CARTRIDGE FUSES

- A. Characteristics: NEMA FU 1, current limiting, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.
  - 1. Type RK-1: 250 or 600-V, zero- to 600-A rating, 200 kAIC minimum, fast acting or time delay.
  - 2. Type RK-5: 250 or 600-V, zero- to 600-A rating, 200 kAIC minimum, fast acting or time delay.
  - 3. Type CC: 600-V, zero- to 30-A rating, 200 kAIC minimum, fast acting or time delay.
  - 4. Type L: 600-V, 601- to 6000-A rating, 200 kAIC minimum, time delay option.
- B. Voltage: Rating suitable for circuit phase-to-phase voltage.
- C. Provide dual element fuses with separate overload and short circuit elements.

## 2.4 SPARE-FUSE CABINET

- A. Manufacturer: Bussmann #SFC-FUSE-CAB spare fuse cabinet or equal.
- B. Characteristics: Wall-mounted steel unit with full-length, recessed piano-hinged door and key-coded cam lock and pull.
  - 1. Size: Adequate for storage of spare fuses specified with 15 percent spare capacity minimum.
  - 2. Finish: Gray, baked enamel.
  - 3. Identification: "SPARE FUSES" in 1-1/2 inch high white letters on black lamicoid plate. Mount plate on exterior of door.
  - 4. Fuse Pullers: For each size of fuse, where applicable and available, from fuse manufacturer.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine fuses before installation. Reject fuses that are moisture damaged or physically damaged.
- B. Examine holders to receive fuses for compliance with installation tolerances and other conditions affecting performance, such as rejection features.
- C. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.
- D. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 FUSE APPLICATIONS

- A. Service, Feeders, and Branch Circuits (601-6000A): Class L, time delay. Bussmann HI-CAP Fuses KRP-C or equal. Fuses shall hold 500% of rated current for a minimum of 4 seconds.
- B. Feeders and Branch Circuits (0-600A): Class RK1, time delay. Bussmann Low-Peak Dual Element Fuses, LPN-RK (250 volts) or LPS-RK (600 volts) or equal. The fuse shall hold 500% of rated current for a minimum of 10 seconds.
- C. Motor Circuits – Class RK1 or Class L, time delay as indicated above.
  - 1. Motor with 1.15 service factor: Size at 125% of motor FLA. For high inrush current applications size 150% to 200% of motor FLA.
  - 2. Motor with 1.0 service factor: Size at 115% of motor FLA.

- D. Control Circuits: Class CC, time delay. Bussmann Low-Peak Fuses LP-CC or equal. Fuses shall hold 200% of rated current for a minimum of 12 seconds.
- E. Adjust fuse type and selection as required to ensure available fault current at equipment controllers indicated in power systems study does not exceed labeled SCCR values.

### 3.3 INSTALLATION

- A. Fuses shall be shipped separately. Any fuses shipped installed in equipment, shall be replaced by the Electrical Contractor with new fuses as specified above prior to energizing at no additional expense to Owner. All fuses shall be stored in moisture free packaging at job site and shall be installed immediately prior to energizing of the circuit in which it is applied.
- B. No fuses shall be installed in the equipment until the installation is complete, including tests and inspections required prior to being energized. All fuses shall be of the same manufacturer to ensure retention of selective coordination, as designed.
- C. Provide a complete set of fuses for all fusible devices. Arrange fuses so rating information is readable without removing fuse.
- D. Install spare-fuse cabinet(s). Locate in Main Electrical Room.
- E. Upon completion of the building, the Contractor shall provide the Owner with spare fuses in Spare-Fuse Cabinet.

### 3.4 IDENTIFICATION

- A. Install labels complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems".
  - 1. Indicate fuse rating and type on the outside door of each fused switch.

END OF SECTION 262813

## SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions, Division 01 Specification Sections, and Section 260010 "General Requirements for Electrical Systems" apply to this Section.

#### 1.2 SUMMARY

- A. Description: Section includes requirements for the provision of individually enclosed switches and circuit breakers including manufacturing, fabrication, configuration, and installation as required for the complete performance of the Work, as shown on the drawings and specifications
- B. Section includes:
  - 1. Fusible and Non-Fusible Switches.
  - 2. Enclosed Circuit Breakers.
  - 3. Elevator Shunt trip switches.
  - 4. Enclosures.

#### 1.3 REFERENCES

- A. Abbreviations
  - 1. HD: Heavy Duty
  - 2. MCCB: Molded Case Circuit Breaker
  - 3. NC: Normally Closed
  - 4. NO: Normally Open
  - 5. SCCR: Short Circuit Current Rating
- B. Definitions
  - 1. Disconnect: A switch, device, group of devices, or other means used to disconnect conductors of a circuit from their source of supply.
  - 2. Switch (switching device): A device, manually operated, unless otherwise designated, for opening and closing or for changing the connection of a circuit. Also referred to as safety switches or disconnect switches.

#### 1.4 SEQUENCING

- A. Submit the preliminary power system study prior to receiving final approval of equipment and system protective devices submittals and prior to release of equipment drawings for manufacturing. Adjust equipment sizes, frame sizes, and trip units as

necessary to achieve performance requirements outlined in Section 260573, "Power Systems Studies".

## 1.5 SUBMITTALS

- A. Product Data: For each product type.
  - 1. Enclosure types and details for types other than NEMA 250, Type 1.
  - 2. Short-circuit current ratings (interrupting and withstand, as appropriate).
  - 3. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
  
- B. Shop Drawings: For each type of enclosed switch, circuit breaker, accessory, and component indicated.
  - 1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
  - 2. Detail enclosure types and details for types other than NEMA 250, Type 1.
  - 3. Detail bus configuration, current, and voltage ratings.
  - 4. Short-circuit current rating of overcurrent protective devices.
  - 5. Include evidence of NRTL listing for series rating of installed devices.
  - 6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
  - 7. Include wiring diagrams for power, signal, and control wiring.
  - 8. Cable terminal size and quantity.
  
- C. Closeout Submittals
  - 1. Operation and Maintenance Data: For enclosed switches and circuit breakers include in emergency, operation, and maintenance manuals.
  - 2. In addition to items specified in Division 01 and Section 260010 "General Requirements for Electrical Systems", include the following:
    - a. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

## 1.6 COORDINATION

- A. Product Selection for Restricted Space: Drawings indicate space available for enclosed switches including clearances between enclosed switches and adjacent surfaces and other items. Furnish and install equipment to comply with NEC clearances.

## 1.7 WARRANTY

- A. Manufacturer's Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace devices that fail in materials or workmanship within 12 months from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. ABB/General Electric.
  - 2. Eaton Electrical Inc.
  - 3. Siemens.
  - 4. Square D
- B. Source Limitations: Obtain enclosed switches, overcurrent protection devices, and all other electrical distribution equipment through one source from a single manufacturer unless approved otherwise.

### 2.2 GENERAL REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.
- C. Service-Rated Switches and Circuit Breakers: Labeled for use as service equipment.
- D. Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals. Switch and overcurrent protective device short circuit ratings shall be at least 110% of the actual available fault current.

### 2.3 FUSIBLE AND NON-FUSIBLE SWITCHES

- A. Type HD, Heavy Duty, Single Throw, 250-VAC, or 600-VAC, 1200 A and Smaller unless noted otherwise.
- B. Quick-make, quick-break operating handle and switch mechanism integral to box.
- C. UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate fuses where indicated.
- D. Externally operable dual interlocked handle to prevent opening front cover with switch in ON position, or closing switch when door is open. Visible load interrupter knife switch blades in the off position with door open.
- E. Lockable handle with capability to accept three padlocks and interlocked with cover in closed position.
- F. All current carrying parts shall be plated by an electrolytic process to resist corrosion and to promote cooling.

G. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Lugs: UL Listed, mechanical type, front removeable, and suitable for number, size, and conductor material at 75 deg C.
4. Auxiliary Contact Kit: NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open. Contact rating as required for application.
5. Electrical Interlock Kit: Pivot arm operated from the switch mechanism, breaking a control circuit before the main switch blades break.

- H. For receptacle switches provide interlocking linkage between the receptacle and switch mechanism to prevent inserting or removing plug while switch is in the on position, inserting any plug other than specified, and turning switch on if an incorrect plug is inserted or correct plug has not been fully inserted into the receptacle.

## 2.4 ENCLOSED MOLDED-CASE CIRCUIT BREAKERS

- A. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.
- B. Circuit breakers shall be constructed using glass-reinforced insulating material. Current carrying components shall be completely isolated from the handle and the accessory mounting area.
- C. Circuit breakers shall have a toggle operating mechanism with common tripping of all poles, which provides quick-make, quick-break contact action. The circuit-breaker handle shall be over center, be trip free, and reside in a tripped position between on and off to provide local trip indication. Circuit-breaker escutcheon shall be clearly marked on and off in addition to providing international I/O markings. Equip circuit breaker with a push-to-trip button, located on the face of the circuit breaker to mechanically operate the circuit-breaker tripping mechanism for maintenance and testing purposes.
- D. MCCBs shall be equipped with a device for locking in the open position.
- E. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
- F. Electronic Trip Circuit Breakers: Field-replaceable rating plug, rms sensing, with the following field-adjustable settings:
1. Long-time, Short-time, and Instantaneous trip unless noted otherwise on drawings.
- G. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.

- H. Ground-Fault, Circuit-Interrupter (GFCI) Circuit Breakers: Single-, two-pole, and three-pole configurations with Class A ground-fault protection (6-mA trip).
- I. Ground-Fault Equipment-Protection (GFEP) Circuit Breakers: With Class B ground-fault protection (30-mA trip).
- J. Features and Accessories:
  - 1. Standard frame sizes, trip ratings, and number of poles.
  - 2. Lugs: UL Listed, mechanical type, suitable for number, size, trip ratings, and conductor material at 75 deg C.
  - 3. Ground-Fault Protection: Comply with UL 1053; integrally mounted, self-powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.
  - 4. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact. Coordinate coil voltage and provide control circuits as required for application.

## 2.5 ELEVATOR SHUNT TRIP SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Bussmann
  - 2. Littlefuse
  - 3. Mersen
- B. General Requirements: Comply with ASME A17.1, UL 50, and UL 98, with Class J fuse block and 200-kA interrupting and short-circuit current rating.
- C. Type HD, Heavy-Duty, Three Pole, Single-Throw Fusible Switch; UL 98 and NEMA KS 1; integral shunt trip mechanism; horsepower rated, with clips or bolt pads to accommodate fuses; lockable handle with capability to accept three padlocks; interlocked with cover in closed position.
- D. Control Circuit: 120-V ac; obtained from integral control power transformer, with primary and secondary fuses.
- E. Accessories:
  - 1. Key switch for key-to-test function.
  - 2. Red ON pilot light.
  - 3. Isolated neutral lug.
  - 4. Mechanically interlocked auxiliary contacts that change state when switch is opened and closed.
  - 5. Form C alarm contacts that change state when switch is tripped.
  - 6. Three-pole, double-throw, fire-safety, and alarm relay; 24-V dc coil voltage.
- F. Three-pole, double-throw, fire-alarm voltage monitoring relay complying with NFPA 72.



## 2.6 ENCLOSURES

- A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
  - 1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
  - 2. Outdoor and Wet Locations: NEMA 250, Type 3R.
  - 3. Kitchen and Wash-Down Areas: NEMA 250, Type 3R, stainless steel.
- B. Enclosure Finish: The enclosure shall be finished with the standard manufacturer gray finish.
- C. Conduit Entry: NEMA 250 Types 4, 4X, and 12 enclosures shall contain no knockouts.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
- C. Securely fasten each switch and circuit breaker to the supporting structure or wall, utilizing a minimum of four (4) 1/4-inch bolts. Do not mount in an inaccessible location or where the passageway to the switch may become obstructed.
- D. After equipment has been installed, inspected, and is ready to be energized, install fuses in fusible devices in accordance with equipment nameplates and Section 262816, "Fuses".
- E. Comply with NFPA 70 and NECA 1.
- F. Provide electrical interlock kit and low voltage wiring where utilized on the line side of VFD controller to shut down VFD prior to disconnection of power. Coordinate control wire termination with Division 25.
- G. Provide electronic trip breakers where required to achieve performance requirements outlined in Section 260573, "Power Systems Studies".

- H. Provide fusible switches with current limiting fuses or current limiting circuit breaker for equipment disconnecting means where equipment short circuit current rating is insufficient for available fault current.
- I. Where battery lowering devices are specified with Hydraulic Elevators, provide connection between an auxiliary contact at the elevator disconnect and the battery lowering device.

### 3.3 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B. Where a tightening torque is indicated as a numeric value on equipment or in installation instructions provided by the manufacturer, use a calibrated torque tool to achieve that indicated torque value, unless the equipment manufacturer has provided installation instructions for an alternative method of achieving the required torque.

### 3.4 IDENTIFICATION

- A. Comply with requirements in Section 260553, "Identification for Electrical Systems"
  - 1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
  - 2. Label each enclosure with nameplate.

### 3.5 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
  - 1. Visual and Mechanical Inspection:
    - a. Examine equipment nameplate data and confirm proper identification.
    - b. Verify and record fuses sizes and types are in accordance with nameplates and power systems study.
    - c. Inspect the physical, electrical, and mechanical condition of the equipment and all components in accordance with the manufacturers' instructions.
    - d. Inspect anchorage, alignment, and grounding.
    - e. Inspect bolted electrical connections and terminations for high resistance by verifying tightness with calibrated torque-wrench method in accordance with manufacturer's published data.
    - f. Exercise all active components to ensure proper mechanical operation.
    - g. Check all interlocking systems for correct operation.
  - 2. Test ground-fault protection of equipment for service equipment per NFPA 70.
  - 3. Test all auxiliary devices/system interfaces and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Switches and Circuit Breakers will be considered defective if they do not pass tests and inspections.

- C. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
- D. Prepare test and inspection reports, including a certified report that identifies switches and circuit breakers included and that describes results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

### 3.6 ADJUSTING

- A. Adjust moving parts and operable components to function smoothly and lubricate as recommended by manufacturer.
- B. Set field-adjustable circuit-breaker trip ranges as specified in Section 260573 "Power System Studies".

END OF SECTION 262816

## SECTION 262900 - MOTOR CONTROLLERS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions, Division 01 Specification Sections, and Section 260010 “General Requirements for Electrical Systems” apply to this Section.

#### 1.2 SUMMARY:

- A. Extent of motor starter work is indicated by drawings and schedules.
- B. Section includes:
  - 1. Combination full voltage, non-reversing Motor Controllers.
  - 2. Combination Soft Start Motor Controllers
- C. Related Requirements:
  - 1. Refer to Section 260500 “Common Work Results for Electrical Systems” for additional requirements related to motors connections.
  - 2. Refer to Section 262726 “Wiring Devices” for information on manual motor controllers.
  - 3. Refer to Division 25 for coordinating requirements related to control system interface points.

#### 1.3 REFERENCES

- A. Abbreviations
  - 1. FVNR: Full Voltage Non-Reversing
  - 2. MCP: Motor Circuit Protector
  - 3. OCPD: Overcurrent protective device
  - 4. SCCR: Short Circuit Current Rating
  - 5. SCPD: Short-circuit protective device
  - 6. SCR: Silicon Controlled Rectifier
- B. Definitions
  - 1. Soft Starter: Solid state reduced voltage non-reversing motor controller

#### 1.4 SEQUENCING

- A. Submit the preliminary power system study prior to receiving final approval of equipment and system protective devices submittals and prior to release of equipment drawings for manufacturing. Adjust equipment sizes, frame sizes, and trip units as necessary to

achieve performance requirements outlined in Section 260573, "Power Systems Studies".

#### 1.5 SUBMITTALS:

- A. Product Data: For each type of product.
- B. Shop Drawings: For each type of product.
  - 1. Include wiring diagrams for signal and control wiring. Clearly identify manufacturer-installed and field installed wiring.
  - 2. Include features and factory settings of individual protective devices and auxiliary components.
- C. Closeout Submittal:
  - 1. Operation and Maintenance Data: For motor controllers to include in operation and maintenance manuals.
  - 2. In addition to items specified in Division 01 and Section 260010 "General Requirements for Electrical Systems", include the following:
    - a. Routine maintenance requirements for magnetic controllers and installed components.
    - b. Manufacturer's written instructions for testing and adjusting circuit breaker and motor circuit protector trip settings.
    - c. Manufacturer's written instructions for setting field-adjustable overload relays.
    - d. Load-Current and List of Settings of Adjustable Overload Relays: Compile after motors have been installed and arrange to demonstrate that switch settings for motor-running overload protection suit actual motors to be protected.

#### 1.6 MAINTENANCE MATERIAL

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Fuses: Equal to one spare for every 10 installed units, but not less than 5 units for each size and type.
  - 2. Overloads: Equal to one spare for every 9 installed units, but not less than 3 units for each size and type.

#### 1.7 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace enclosures, starters, overcurrent protective devices, accessories, and factory installed interconnection wiring that fail in materials or workmanship within 12 months from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 GENERAL REQUIREMENTS:

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency acceptable to authorities having jurisdiction and marked for intended location and application.
- B. UL Compliance and Labeling: Fabricate and label motor controllers to comply with UL 508.
- C. NEC Compliance: Comply with NEC as applicable to wiring methods, construction, and installation of motor starters.
- D. NEMA Compliance: Comply with applicable portions of NEMA standards pertaining to motor controllers/starters and enclosures.

### 2.2 MANUFACTURERS:

- A. Manufacturer: Subject to compliance with requirements, provide products from one of the following:
  - 1. ABB/General Electric
  - 2. Allen Bradley Co.
  - 3. Eaton
  - 4. Siemens.
  - 5. Square D. Co.

### 2.3 MANUAL MOTOR CONTROLLERS

- A. Refer to Section 262726 "Wiring Devices" for manual motor controller requirements.

### 2.4 COMBINATION FULL VOLTAGE MOTOR CONTROLLER

- A. Description: Factory-assembled, combination full-voltage, non-reversing magnetic motor controller consisting of the controller, indicated disconnecting means, SCPD, OCPD, pushbuttons, selector switch(es), and indicator lights in a single enclosure.
- B. All combination starter/disconnect switches shall have low-voltage protection, solid state overloads, start / stop pushbuttons, Hand-Off-Auto selector switch and Red and Green pilot lights.
- C. All combination starter/disconnect switches shall be Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

- D. Combination motor starters shall be rated in accordance with NEMA sizes and horsepower ratings. No starter shall be listed as a fractional size. Contactor contacts shall be silver alloy, double break, and shall allow for inspection on NEMA Sizes 00 through 4 without the use of tools. Size 5 and larger shall allow for inspection utilizing standard tools. They shall be replaceable without removing the line, load, or control wiring from the starter, and replaceable without removing the starter from the enclosure.
- E. Contactor coils shall be the encapsulated type and shall be replaceable on NEMA Sizes 00 through 4 without the use of tools. Size 5 and larger shall be replaceable with standard tools. They shall be replaceable without removing the line, load, or control wiring from the starter, and replaceable without removing the starter from the enclosure.
- F. Overload protection shall be provided by solid state electronic overload relay. Single-phase starters shall provide one- or two-leg overload protection; three-phase starters shall provide three-leg overload protection. Overload protection shall be class 10/20 selectable, have visible trip indicator, and manual or remote reset function.
- G. Starter shall include phase failure relay with under-voltage protection.
- H. Starter shall have integral controls transformer with primary and secondary fusing.
- I. Starter to have two normally closed and two normally open auxiliary contacts.
- J. Combination starter shall be suitable for straight through wiring.
- K. Fusible Disconnecting Means: Heavy Duty, quick-make, quick-break, load break rated, such that during normal operation of the switch, the operation of the contacts shall not be capable of being restrained by the operating handle after the closing and opening action of the contacts has started. The handle and mechanism shall be an integral part of the box (not cover) with facilities for pad locking in the open or closed position with up to three padlocks. Switch doors shall be interlocked with switch handle so that the door can only be opened when the switch is in the "OFF" (open) position.
- L. All safety switches shall have a factory installed neutral lug, when a neutral is necessary.
- M. All current carrying parts shall be plated by an electrolytic process to resist corrosion and to promote cooling.
- N. Provide the following Accessories:
  - 1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
  - 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
  - 3. Lugs: Mechanical type, suitable for number, size, and conductor material.

## 2.5 COMBINATION SOFT START MOTOR CONTROLLER

- A. Description: Factory Assembled, Solid state, reduced voltage, non-reversing motor controller consisting of controller, disconnecting means, protection devices, microprocessor with digital keypad in a single enclosure.

- B. Enclosure shall include a door mounted digital keypad for adjusting the soft starter parameters and viewing process values and viewing the motor and soft starter status without opening the enclosure door. Provisions shall be available for padlocking the enclosure door.
- C. The enclosed product shall be provided with molded case disconnect switch and in-line fuse block for Class J power fuses from 10 to 600A or Class L power fuses from 601 to 1600A for Type 1 short circuit protection.
- D. The motor must be automatically protected from solid state component failure by an isolation contactor that opens when the motor is stopped or when the controller detects a fault condition including a shorted SCR.
- E. The soft starter shall utilize an SCR bridge consisting of at least two SCRs per phase to control the starting and stopping of industry standard motors.
- F. The soft start shall provide torque control for linear acceleration independent of motor load or application type without external feedback. The gating of the SCRs will be controlled in such a manner to ensure stable and linear acceleration ramp.
- G. The soft starter shall be controlled by a microprocessor that continuously monitors the current and controls the phasing of the SCRs. Analog control algorithms shall not be allowed.
- H. A shorting contactor shall be standard on soft starters in all enclosure configurations. Protective features and deceleration control options integral to the soft starter shall be available even when the shorting contactor is engaged.
- I. The SCRs shall have a minimum P.I.V. rating of 1800 Vac. Lower rated SCRs with MOV protection are not acceptable.
- J. All programming/configuration devices, display units, and field control wiring terminals shall be accessible on the front of the control module. Exposure to control circuit boards or electrical power devices during routine adjustments is prohibited.
- K. Digital indication shall provide, as a minimum, the following conditions:
  - 1. Soft starter status - ready, starting/stopping, run.
  - 2. Motor status - current, torque, thermal state, power factor, operating time, power in kW.
  - 3. Fault status - Motor thermal overload, soft starter thermal fault, loss of line or motor phase, line frequency fault, low line voltage fault, locked rotor fault, motor underload, maximum start time exceeded, external fault, serial communication fault, line phase reversal fault, motor overcurrent fault.
- L. The soft starter must be preset to the following for adjustment-free operation in most applications:
  - 1. Linear (torque-controlled) acceleration ramp of 15 seconds.
  - 2. Current limitation to 400% of the motor full load current rating.
  - 3. Class 10 overload protection.
  - 4. Motor current preset per NEC / NFPA 70 table 430.150 for standard hp motors.



- M. A digital keypad shall be utilized to configure operating and controller parameters such as FLA, acceleration ramp, torque, braking type, thermal overload Class, reset functions, etc.
- N. Provide output relays to provide the following status indications:
  - 1. One Form A (N.O.) minimum for indication of fault.
  - 2. One Form A (N.O.) for indication that acceleration ramp is complete, and current is below 130% motor FLA (end of start).
  - 3. One Form A (N.O.) assignable to one of the following functions: motor thermal alarm, motor current level alarm, and motor underload alarm.
- O. A microprocessor-based thermal protection system shall be included which continuously calculates the temperature-rise of the motor and soft starter and provides:
  - 1. A motor overload pre-alarm that indicates by relay contact or logic output that the motor windings have exceeded 130% of its rated temperature rise. This function shall be for alarm only.
  - 2. A motor overload fault will stop the motor if the windings have exceeded 140% of temperature-rise.
  - 3. An electronic circuit with a time-constant adjustable to the motor's thermal cooling time-constant ensuring the memorization of the thermal state even if power is removed from the soft starter.
  - 4. The soft starter shall provide line and motor phase loss, phase reversal, underload, stall, and jam protection.
  - 5. The integral protective features shall be active even when the shorting contactor is used to bypass the SCRs during steady state operation.
  - 6. The soft starter control circuit shall be fed from the line supply and be completely independent of the power circuit and separate from the control logic.
- P. The peripheral soft starter control circuitry shall be operated at 120 Vac 60 Hz from a control power transformer included within the enclosure.
- Q. Operator devices shall be door mounted and shall be:
  - 1. Red STOP and black START push buttons.
  - 2. Three position H-O-A switch which provides for manual (HAND) start or remote signal (AUTO) start from user-supplied relay contacts.
  - 3. Three position FWD-OFF-REV switch provides forward, off and reverse selector switch mounted on the door (available with reversing starter only).
  - 4. Red RUN pilot light illuminated whenever the soft starter is provided a run command and no-fault condition is present.
  - 5. Green OFF pilot light illuminated whenever the soft starter is supplied with control power and no run command is present.
  - 6. All operator devices shall be remote mounted using supplied 120 Vac control logic. Clearly labeled terminals shall be provided for field installation.
- R. Provide a shorting contactor that shall close, shorting the SCRs after the acceleration ramp is complete and motor current is below 130% of motor FLA, and open on a stop command to allow a deceleration ramp. Overload protection integral to the soft starter shall continue to protect the motor when shorting is engaged. A microprocessor shall control the operation of the shorting contactor via an output relay.

- S. Provide full voltage bypass starter with overload protection to provide motor operation in the event of soft starter failure. Provide “NORM/BYPASS” selector switch on enclosure door.

### PART 3 - EXECUTION

#### 3.1 MOTOR CONTROLLER APPLICATION

- A. FVNR and Soft Starter type motor controllers shall be combination type starter and disconnect switch unless noted otherwise on plans.
- B. Starters smaller than 10HP shall be full voltage non-reversing type (FVNR). Starters 10HP and larger shall be soft starters.
- C. SCCR ratings shall exceed the available fault current calculated by the power system study as required by Section 260573, “Power System Studies”.
- D. The starter shall be designed to operate in the environment in which installed including ambient temperature, humidity, and elevation.
- E. Enclosure:
  - 1. Type of each starter to comply with environmental conditions at installed location:
    - a. Indoor, Dry and Clean Locations: NEMA 250, Type 1
    - b. Outdoor Locations: NEMA 250, Type 3R.
    - c. Kitchen and Wash-Down Areas: NEMA 250, Type 4X, stainless steel.
  - 2. Provide provisions for padlocking the enclosure door.

#### 3.2 EXAMINATION

- A. Examine elements and surfaces to receive motor starters for compliance with installation tolerances, relationship to motors, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.3 INSTALLATION OF MOTOR CONTROLLERS:

- A. Install motor starters as indicated, in accordance with manufacturer's written instructions, applicable requirements of NEC, NEMA, and NECA standards, and in compliance with recognized industry practices to ensure that products fulfill requirements.
- B. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
- C. Securely fasten each switch, circuit breaker and combination starter to the supporting structure or wall, utilizing a minimum of four (4) 1/4 inch bolts.

- D. Maintain minimum clearances and workspace at equipment according to manufacturer's written instructions and NEC. Do not mount in an inaccessible location or where the passageway to the switch may become obstructed.
- E. Install fuses in fusible devices in accordance with Section 262813, "Fuses".
- F. Select and set overloads on the basis of full-load current rating as shown on motor nameplate.
- G. Verify that overcurrent and overload protection devices are properly matched to actual motor nameplate data and service class.
- H. Provide conductor reducers, taps and splices, as required, for proper termination of all branch circuits and feeders at disconnect switches, panelboards, motor starters, VFDs, etc. This shall include where conductors have been oversized to accommodate voltage drop, motor circuit conductor protection, and all instances where conductors are unable to terminate at factory lugs.
- I. Final 18 inch of power wiring to motor shall be in liquid tight flexible conduit.

### 3.4 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B. Where a tightening torque is indicated as a numeric value on equipment or in installation instructions provided by the manufacturer, use a calibrated torque tool to achieve that indicated torque value, unless the equipment manufacturer has provided installation instructions for an alternative method of achieving the required torque.

### 3.5 IDENTIFICATION

- A. Comply with requirements in Section 260553, "Identification for Electrical Systems"
  - 1. Identify field-installed conductors, interconnecting wiring, and components.
  - 2. Provide Warning Signs.
  - 3. Label each enclosure with nameplate.

### 3.6 FIELD QUALITY CONTROL:

- A. Perform Test and Inspections:
  - 1. Visual and Mechanical Inspection:
    - a. Compare equipment nameplate data with drawings and specifications.
    - b. Inspect physical and mechanical condition.
    - c. Inspect anchorage, alignment, and grounding.
    - d. Verify the unit is clean.
    - e. Inspect contactors:
      - 1) Verify mechanical operation.

- 2) Verify contact gap, wipe, alignment, and pressure are according to manufacturer's published data.
- f. Motor Protection:
  - 1) Verify overload element rating is correct for its application.
  - 2) If motor-running protection is provided by fuses, verify correct fuse rating.
- g. Verify tightness of accessible bolted electrical connections by calibrated torque-wrench or low resistance ohmmeter. Bolt-torque levels and/or bolted connection resistance values shall be according to manufacturer's published data.
- h. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
2. Electrical Tests:
  - a. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with switch closed, and across each open pole. Insulation-resistance values shall be according to manufacturer's published data.
  - b. Test motor protection devices according to manufacturer's published data.
  - c. Verify voltages at the controller locations are within plus or minus 10 percent of the motor nameplate rated voltages. If outside the range for any motor, notify the design team before starting the motor.
  - d. Perform operational tests by initiating control devices.
  - e. Test all auxiliary devices/system interfaces and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Motor controller will be considered defective if it does not pass tests and inspections.
- C. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance, otherwise replace with new units and retest.
- D. Prepare test and inspection reports, including a certified report that identifies motor controllers included and that describes results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

END OF SECTION 262913

## SECTION 264300 - SURGE PROTECTION DEVICES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions, Division 01 Specification Sections, and Section 260010 “General Requirements for Electrical Systems” apply to this Section.

#### 1.2 SUMMARY

- A. Description: The Contractor shall provide the necessary labor, materials, wiring and services necessary to provide the complete electrical surge protection systems as specified herein. This work shall include but is not necessarily limited to provision of Surge Suppression Units at certain points in the power distribution network and proper installation in accordance with manufacturer’s instructions.
- B. Section includes:
  - 1. Requirements for both field mounted SPDs (externally mounted), and integrated SPDs (installed from the factory) for low voltage power distribution and control equipment.

#### 1.3 REFERENCES

- A. Abbreviations
  - 1. MCOV: Maximum continuous operating voltage.
  - 2. OCPD: Overcurrent protective device.
  - 3. SCCR: Short-circuit current rating.
  - 4. SPD: Surge protective device.
  - 5. VPR: Voltage protection rating.
- B. Definitions
  - 1. Inominal: Nominal discharge current.
  - 2. Mode(s), also Modes of Protection: The pair of electrical connections where the VPR applies.
  - 3. MOV: Metal-oxide varistor; an electronic component with a significant non-ohmic current-voltage characteristic.
  - 4. Type 1 SPDs: Permanently connected SPDs intended for installation between the secondary of the service transformer and the line side of the service disconnect overcurrent device.
  - 5. Type 2 SPDs: Permanently connected SPDs intended for installation on the load side of the service disconnect overcurrent device, including SPDs located at the branch panel.
  - 6. Type 3 SPDs: Point of utilization SPDs.

- C. Reference Standards: The following publications are referred to in the text by the basic designation only. The edition/revision of the referenced publications shall be the latest date as of the date of the Contract Documents, unless otherwise specified.
1. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
    - a. ANSI/IEEE C62.41.1, "Guide on the Surges Environment in Low Voltage (1000 V and Less) AC Power Circuits."
    - b. ANSI/IEEE C62.41.2, "Recommended Practice on Characterization of Surges in Low Voltage (1000 V and Less) AC Power Circuits."
    - c. ANSI/IEEE Standard C62.45, "Guide on Surge Testing for Equipment Connected to Low-Voltage Ac Power Circuits"
  2. Underwriters Laboratories, Inc. (UL)
    - a. UL 1283, "Standard for Safety for Electromagnetic Interference Filters."
    - b. UL 1449, "Standard for Surge Protective Devices."

#### 1.4 SUBMITTALS

- A. Product Data: For each type of product.
1. Indicate all capacity ratings, clamp times, maximum capacities, physical characteristics, and listing agency approvals.
  2. Copy of UL certification, as a minimum, listing the tested values for VPRs, Inominal ratings, MCOVs, type designations, OCPD requirements, model numbers, system voltages, and modes of protection.
  3. Wiring diagram showing all manufacturer installed wiring including wire size, type, routing, and exact length of conductors.
- B. Product Schedule: Indicate where each type of SPD is installed.
- C. Closeout Submittal
1. Operation and Maintenance Data: For surge protection devices and components to include in emergency, operation, and maintenance manuals.

#### 1.5 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to replace or replace SPDs that fail in materials or workmanship within a period of ten years from the date of Substantial Completion.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. ABB/General Electric Company.
2. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
3. Siemens.
4. Square D; a brand of Schneider Electric.

- B. Source Limitations: SPDs installed internal to the distribution system shall be of the same manufacturer as the equipment. The equipment shall be fully tested and certified in accordance with UL standards.

## 2.2 GENERAL SPD REQUIREMENTS

- A. SPD with Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.
- B. SPDs: Comply with UL 1449
1. Provide Type 1 SPDs installed on the line side of the service entrance OCPD and Type 2 SPDs installed on the load side of the service entrance OCPD.
- C. Electrical Noise Filter: Comply with UL 1283 for Type 2 SPDs.
1. Each Type 2 unit shall include a high-performance EMI/RFI noise rejection filter. Noise attenuation for electric line noise shall be up to 50 dB from 10 kHz to 100 MHz
- D. Unit Operating Voltage: Refer to drawings.
- E. MCOV of the SPD shall not be less than 115% of the nominal system voltage.
- F. The suppression system shall incorporate thermally protected MOVs as the core surge suppression component for all distribution levels. Each MOV shall be individually fuse-protected to avoid cascading faults. The thermal protection assembly shall disconnect the MOV(s) from the system in a fail-safe manner should a condition occur, that would cause them to enter a thermal runaway condition.
- G. SPDs shall be provided with the following features and accessories:
1. Integral disconnect switch for externally mounted SPDs. SPDs integrated into factory supplied equipment shall have an input disconnect switch or circuit breaker unless indicated on the equipment drawings/data sheets.
  2. Internal fusing that disconnects the SPD before damaging internal suppressor components.
  3. Indicator light display (Red and Green) for power and protection status with push-to-test capabilities.
  4. Audible alarm with silencing switch. Alarm shall activate when any one of the surge current modules has faulted or reached an end-of-life condition.
  5. Form-C contacts, one normally open and one normally closed, for remote monitoring of protection status. Contacts shall reverse on failure of any surge diversion module or on opening of any current-limiting device.
  6. Surge counter with LCD display, reset switch, non-volatile memory, and battery backup to retain memory upon loss of AC power.

- H. All SPDs shall be tested and demonstrate suitability for application within ANSI/IEEE C62.41 Category C, B, and A environments.
- I. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than the following values. The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in a given mode.
  - 1. Category C, Service Entrance larger than 1200A: 400 kA/phase.
  - 2. Category C, Service Entrance 1200A and below: 240 kA/phase.
  - 3. Category B, Distribution larger than 1200A: 300 kA/phase.
  - 4. Category B, Distribution 1200A and below: 160 kA/phase.
  - 5. Category B, Branch: 120kA/phase.
- J. Protection modes and UL 1449 VPR for grounded wye circuits shall not exceed the following:
  - 1. Line to Neutral: 1200 V for 480Y/277 V and 700 V for 208Y/120 V.
  - 2. Line to Ground: 1200 V for 480Y/277 V and 700 V for 208Y/120 V.
  - 3. Neutral to Ground: 1200 V for 480Y/277V and 700 V for 208Y/120 V.
  - 4. Line to Line: 2000 V for 480Y/277 V and 1200 V for 208Y/120 V.
- K. SCCR: The short circuit current rating of the SPD shall be a minimum of 200kA and equal to or greater than the available short circuit current at the point on the system where installed.
- L. Minimum nominal Rating: 20 kA

## 2.3 SURGE SUPPRESSORS FOR OTHER SYSTEMS

- A. Refer to specific specification sections for additional information on surge suppressors related to other building systems.

## 2.4 ENCLOSURES

- A. Enclosure shall meet or exceed the ratings for the environment to be installed as indicated on drawings.
  - 1. Indoor locations: NEMA 250, Type 1.
  - 2. Outdoor or wet locations: NEMA 250, Type 3R.
  - 3. Corrosive Environments: NEMA 250, Type 4X.

## 2.5 CONDUCTORS AND CABLES

- A. Power Wiring: Provide sizes to match SPD leads, complying with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."



## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Comply with NECA 1.
- B. Factory install integral SPDs as part of the distribution equipment and connect through a disconnect.
  - 1. SPDs shall be installed immediately following the load side of the main breaker. SPDs installed in main lug only panelboards shall be installed immediately following the incoming main lugs.
- C. Provide a minimum 30A circuit breaker as required to comply with the UL listing of the SPD.
- D. Install SPDs with properly rated conductors between suppressor and points of attachment as short and straight as possible with no sharp bends and adjust circuit-breaker positions to achieve shortest and straightest leads.
- E. Do not splice and extend SPD leads unless specifically permitted by manufacturer.
- F. Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground.
- G. Twist input conductors together to reduce the input inductance.
- H. Use crimped connectors and splices only. Wire nuts are not acceptable.

### 3.2 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
  - 1. Compare equipment nameplate data for compliance with Drawings and Specifications.
  - 2. Inspect anchorage, alignment, grounding, and clearances.
  - 3. Verify that electrical wiring installation complies with manufacturer's written installation requirements.
- B. An SPD will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

### 3.3 STARTUP SERVICE

- A. Complete startup checks according to manufacturer's written instructions.
- B. Do not perform insulation-resistance tests of the distribution wiring equipment with SPDs installed. Disconnect SPDs before conducting insulation-resistance tests and reconnect them immediately after the testing is over.

- C. Energize SPDs after power system has been energized, stabilized, and tested.

### 3.4 DEMONSTRATION

- A. Train Owner's maintenance personnel to operate and maintain SPDs.

END OF SECTION 264300

## SECTION 265000 - LIGHTING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions, Division 01 Specification Sections, and Section 260010 “General Requirements for Electrical Systems” apply to this Section.

#### 1.2 SUMMARY

- A. This section is intended to specify in conjunction with the Light Fixture Schedule, the luminaires, supports, accessories, specialties, and related items necessary to complete the work as shown on the drawings.
- B. Section Includes:
  - 1. Interior light fixture
  - 2. Exterior light fixtures including building mounted
  - 3. Exit signs
  - 4. Emergency lighting units
  - 5. LEDs and drivers
  - 6. Light fixture supports and accessories
  - 7. Light fixture poles and bases

#### 1.3 COORDINATION

- A. This work consists of providing all labor, materials, accessories, mounting hardware and equipment necessary for an operationally and aesthetically complete installation of all luminaires, including power wiring, control wiring and accessories, in accordance with the contract documents.
- B. Contractor shall provide all luminaires, as herein specified, complete with lamps, drivers, power supplies, ballasts, and accessories for safe and effective operation. All fixtures shall be installed and left in an operable condition with no broken, damaged, or soiled parts.
- C. Contractor shall coordinate all infrastructure requirements with all approved lighting equipment prior to infrastructure installation, including, but not limited to appropriately sized, positioned and located junction boxes, structural supports, feeds, power and control conduits, and remote code-compliant power-supply enclosures.
- D. All available finishes and colors, for each luminaire, shall be submitted to the Architect for selection during shop drawing review. Premium finishes, where indicated, shall be provided at no additional cost premium.

- E. Specifications and drawings are intended to convey all salient features, functions, and characteristics of the luminaires only, and do not undertake to illustrate or set forth every item or detail necessary for the work. Minor details, not usually indicated on the drawings nor specified, but that are necessary for proper execution and completion of the luminaires, shall be included, the same as if they were herein specified or indicated on the drawings.
- F. The Owner, Architect and Engineer shall not be held responsible for the omission or absence of any detail, construction feature, etc. which may be required in the production of the light fixtures. The responsibility of accurately fabricating the light fixtures to the fulfillment of the specification rests with the Contractor.
- G. Refer to architectural details, as applicable, for recessed soffit fixtures or wherever fixture installations depend upon work of other trades. Coordinate all installations with other trades. Verify dimensions of spaces for fixtures, and if necessary, adjust lengths to assure proper fit and illumination of diffuser and/or area below.
- H. In accordance with the above and the criteria established herein, the Contractor is responsible for assuring the final design, fabrication and installation which fulfills the requirements of the Contract Documents.

#### 1.4 REFERENCES

##### A. Abbreviations and Acronyms

- 1. CCT: Correlated color temperature
- 2. CRI: Color-rendering index
- 3. CU: Coefficient of utilization
- 4. IECC: International Energy Conservation Code
- 5. LER: Luminaire efficacy rating, which is calculated according to NEMA LE 5.
- 6. NRTL: Nationally Recognized Testing Laboratory
- 7. SPD: Surge Protective Device
- 8. RCR: Room cavity ratio.
- 9. UL: Underwriters Laboratory

##### B. Definitions

- 1. Unless otherwise specified or indicated, electrical and electronics terms used in these specifications, and on the drawings, shall be as defined in the IESNA Lighting Library.
- 2. Light Fixture (Luminaire): Complete lighting unit consisting of a lamp(s) and driver(s)/ballast(s) (when applicable) together with the parts designed to distribute the light, to position and protect the lamp(s), and to connect the lamps to the power supply.
- 3. Lumen: Delivered output of luminaire.
- 4. Total harmonic distortion (THD): The root mean square (RMS) of all the harmonic components divided by the total fundamental current.
- 5. Pole: Luminaire support structure, including tower used for large area illumination.
- 6. Standard: Same definition as "Pole" above.

- C. Reference Standards: The following publications are referred to in the text by the basic designation only. The edition/revision of the referenced publications shall be the latest version (including amendments, addenda, revisions, supplements, and errata) as of the date of the Contract Documents, unless otherwise specified.
1. Illuminating Engineering Society of North America (IESNA)
    - a. IES LS-1-20, Lighting Science: Nomenclature and Definitions for Illuminating Engineering
  2. National Electrical Manufacturer's Association (NEMA)
    - a. NEMA SSL 1, Electronic Drivers for LED Devices, Arrays or Systems
    - b. NEMA SSL 3, High-Power White LED Binning for General Illumination

## 1.5 SUBMITTALS

- A. Product Data: For each type and model of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:
1. Physical description of lighting fixture including dimensions.
  2. Emergency lighting units including battery and charger.
  3. All available finishes and colors for each luminaire type shall be submitted to the Architect for selection during review.
  4. Life, output (lumens, CCT, and CRI), and energy-efficiency data for light fixtures.
  5. Dimensions, effective projected area (EPA), accessories, installation details and construction details.
  6. Poles: Include dimensions, materials, wind load determined in accordance with AASHTO, pole deflection, pole class, and other applicable information.
  7. Distribution data according to IESNA classification type as defined in IESNA handbook.
  8. Anchor bolts.
  9. US DOE LED Lighting Facts Label and IESNA L70 rated life.
  10. Amount of shielding on luminaires.
  11. Control type: 0-10V, DMX, bi-level, etc.
- B. Shop Drawings: Including plans, elevations, sections, details, and attachment to other work.
1. Include detailed equipment assemblies and indicate electrical ratings, dimensions, emergency section, control type, wiring, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  2. Wiring Diagrams: For power, signal, and control wiring.
  3. Anchor-bolt templates keyed to specific poles and certified by manufacturer.
- C. Pole and Support Component Certification Certificates: Signed by manufacturers of poles, certifying that products are designed for indicated load requirements in AASHTO LTS and that load imposed by luminaire and attachments has been included in design. The certification shall be based on design calculations by a professional engineer.
- D. Sample Warranty

E. Closeout Submittals

1. Maintenance Contract
2. Operation and Maintenance Data
3. Warranty Documentation
4. Record Documentation
5. Sustainable Design Closeout Documentation
6. Software

1.6 MAINTENANCE MATERIAL

A. Furnish the following extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing content:

1. Single Sided Exit Sign: One for every 15 of each type. Furnish at least two of each type.
2. Double Sided Exit Sign: One for every 15 of each type. Furnish at least one of each type.
3. LED Drivers: One for every 50 of each type and rating installed. Furnish at least 5 of each type.
4. LED Lamps/Boards: One for every 100 of each type and rating installed. Furnish at least two of each type.
5. Emergency battery pack: One for every 50 units. Furnish at least one of each type.

1.7 QUALITY ASSURANCE

- A. In each of the publications referred to herein, consider the advisory provisions to be mandatory.
- B. Manufacturer Qualifications: Equipment shall be supported by service organizations which are reasonably convenient (less than 100 miles from project site) to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.
- C. Where groups of luminaire types exhibit the same list of acceptable Manufacturers, such as downlights, accents, and wall washers, the intent is to have a final installation with the same Manufacturer's equipment across the groupings as specified for consistency of optics, aesthetics, and similarity of maintenance procedures. Mixing/matching across groups is unacceptable. This also applies to multi-phased projects with single or multiple, but related luminaire types exhibiting the same list of acceptable Manufacturers, except where products have subsequently been discontinued or significantly redesigned in size, appearance, lamping, or gear. Lamps shall be from a single manufacturer and batch.

1.8 DELIVERY, STORAGE AND HANDLING:

- A. The Contractor shall provide, receive, unload, uncrate, store, protect and install lamps, luminaires, and auxiliary equipment, as specified herein, in accordance with respective manufacturers' project conditions of temperature and humidity and with appropriate

protection against dust and dirt. Lamps for miscellaneous equipment shall be provided and installed by the Contractor according to equipment manufacturers' guidelines.

- B. All products shall be stored in manufacturer's unopened packaging until ready for installation.
- C. Luminaire Poles: Do not store poles on ground. Support poles so they are at least one foot above ground level and growing vegetation. Support poles to prevent distortion and arrange to provide free air circulation. Retain factory-applied pole wrappings on poles until right before pole installation. For poles with nonmetallic finishes, handle with web fabric straps.

## 1.9 COORDINATION

- A. Coordinate layout and installation of exterior lighting fixtures with all other construction including all underground utilities and geothermal well fields.
- B. Coordinate layout and installation of lighting fixtures with all other construction that penetrates ceilings or is supported by them, including HVAC equipment, plumbing, fire-suppression system, and partition assemblies.
- C. Contractor shall coordinate all infrastructure requirements with all approved lighting equipment prior to infrastructure installation, including, but not limited to appropriately sized, positioned and located junction boxes, structural supports, feeds, power and control conduits, and remote code-compliant power-supply enclosures.
- D. Prior to procurement of light fixtures:
  - 1. Confirm application and required voltage.
  - 2. Confirm the proper and complete catalog number with distributor and agent.
  - 3. Ensure wiring, driver, etc. meets the specifications and proper requirements.
  - 4. Provide additional parts and pieces required to complete the installation in the location and manner intended by the design.
- E. Light fixture locations in mechanical and electrical equipment rooms/areas are approximate. Locate light fixtures to avoid equipment, ductwork, and piping. Locate around and between equipment to maximize the available light. Coordinate mounting heights and locations of light fixtures to clear equipment. Request a meeting with the Engineer if uncertain about an installation.
- F. Coordinate between the electrical and ceiling trades to ascertain that approved luminaires are furnished in the proper sizes, with the proper flange details, and installed with the proper devices (hangers, clips, trim frames, flanges), to match the ceiling system being installed.

## 1.10 WARRANTIES

- A. Manufacturer Warranty: All luminaries, finishes, poles, batteries, supports, accessories and all of its component parts, workmanship, and controls shall have an unconditional five (5) year on-site replacement warranty. Warranty shall include all light fixtures, lamps,

drivers, poles, finishes and all components to be free from defects in materials and workmanship for a period of five (5) years from date of Owner's acceptance. On-site replacement includes transportation, removal, and installation of new products. Replacement of luminaires, faulty materials, and the cost of labor to make the replacement shall be the responsibility of the Contractor.

1. Luminaires: Five (5) years from date of substantial completion.
2. LED drivers: Ten (10) years from the date of substantial completion. The warranty shall state the malfunctioning LED driver shall be exchanged by the manufacturer and promptly installed by the Contractor. The replacement LED driver shall be identical to, or an improvement upon, the original design of the malfunctioning LED driver.

## PART 2 - PRODUCTS

### 2.1 GENERAL REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency acceptable to authorities having jurisdiction and marked for intended location and application.
- B. Comply with NFPA 70.

### 2.2 MANUFACTURERS

- A. Subject to compliance with requirements, provide one of the products indicated on Light Fixture Schedule. Refer to Light Fixture Schedule for manufacturers and model numbers. Basis of Design for each light fixture type shall be the first fixture manufacturer and model number for each type listed.
- B. Manufacturer's catalog numbers together with the descriptions on the drawings and these specifications are indicative of required design, appearance, quality, and performance. Report any discrepancies between any of these to the Engineer for resolution prior to bid. In absence of such notice to the Engineer, provide the greater requirement as directed by the Engineer, without additional cost.
- C. All luminaires shall be DLC (Design Lights Consortium) or Energy Star Certified.

### 2.3 EQUAL MANUFACTURERS

- A. Manufacturers listed as "Equal" to the Basis of Design on the light fixture schedule shall submit product cutsheets to the Engineer prior to bid for final written approval. This written approval will only be issued in addendum form. "Equal" fixtures shall be of equal or better quality and performance to the fixture(s) listed with manufacturer's model numbers. Burden of proof shall be on the Contractor, Vendor, and manufacturer.
- B. Upon request by Engineer, the Contractor shall submit manufacturer's computerized horizontal illumination levels using AGI32 software in footcandles at workplane (30"



above finished floor), taken every 3 feet in every interior room and area. Include average maintained footcandle levels and maximum and minimum ratio.

- C. Upon request by Engineer, the Contractor shall submit manufacturer's computerized horizontal illumination levels using AGI32 software in footcandles, taken every ten (10) feet at grade for the entire exterior site. Include average maintained footcandle levels and maximum and minimum ratio.
- D. Refer to specification Section 260010 "General Requirements for Electrical Systems" for additional requirements.

## 2.4 GENERAL REQUIREMENTS FOR LUMINAIRES AND COMPONENTS

- A. Complete luminaires shall be in accordance with NFPA 70, NEMA, and UL 1598 listed and labeled.
- B. Ballasts, drivers, or transformers, unless otherwise specified, shall be field replaceable and shall be serviceable while the fixture is in its normally installed position, and shall not be mounted to removable reflectors or wireway covers unless so specified.
- C. Luminaires shall be entirely factory wired by the luminaire manufacturer in accordance with code and UL requirements and shall be furnished fully compatible with the project electrical wiring and controls system for smooth, continuous, dimming or on/off flicker-free operation.
- D. Exterior building mounted light fixtures shall be UL classified for damp or wet locations as applicable and shall be complete with gaskets, cast aluminum outlet box and grounding. Luminaires shall be suitably gasketed and vented according to manufacturer's instructions. All dissimilar metal materials shall be separated by non-conductive materials to prevent galvanic action.
- E. All luminaires supplied for recessing in suspended ceilings shall be supplied with pre-wired junction boxes, unless otherwise specified.
- F. Metal parts: Free of burrs, sharp corners, and sharp edges.
- G. Doors, frames, and other internal access: Smooth operating, free of light leakage under operating conditions. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during maintenance and when secured during operating position.
- H. Mounting Frames and Rings: If ceiling system and luminaire type requires, each recessed and semi-recessed luminaire shall be furnished with a mounting frame or ring compatible with the ceiling in which they are to be installed as coordinated by Contractor. The frames and rings shall be one piece and of sufficient size and strength to sustain the weight of the luminaire and maintain plumb. Luminaires shall be braced such that the force required to close and/or latch lens or door frame does not lift or shift luminaire.
- I. Pendant Supports: Contractor shall be responsible for coordination with Manufacturer, Architect, Structural Engineer, and related trades to ensure that proper and adequate

structural reinforcement is provided within ceilings to support pendant mounted lighting equipment for a secure, neat, square, plumb appearance. Pendants shall not sag, droop, snake or otherwise appear out of plumb or alignment in finished installation with lamps, globes, lenses, lens frames or doors etc. in place.

- J. Wall Bracket (Sconce) Supports: Contractor shall be responsible for coordination with Manufacturer, Architect, Structural Engineer, and related trades to ensure that proper and adequate structural reinforcement is provided within walls to support wall mounted lighting equipment for a secure, neat, square, plumb appearance. Wall brackets shall not sag, droop, snake or otherwise appear out of plumb or alignment in finished installation with lamps, globes, lenses, lens frames or doors etc. in place.
- K. All lenses or other light diffusing elements shall be removable for access to lamp and electrical and electronic components and luminaire cleaning, however, they must otherwise be positively and securely held in-place, unless otherwise specified.
- L. All lens door or holder trim flanges shall fit plumb and flush with the ceiling or wall surface. There shall be no light leaks around the interface between lens door or holder trim flanges and the ceiling or wall.
- M. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility.
- N. Recessed luminaires mounted in an insulated ceiling shall be listed for use in insulated ceilings, IC-rated, or provisions made to maintain code-compliant 3" airspace around luminaires in accordance with Manufacturers' instructions.
- O. Mechanical Safety: Unless otherwise specified, luminaire closures (lens doors, trim frame, hinged housings, etc.) shall be retained in a secure manner by captive screws, chains, captive hinges, or fasteners such that they cannot be accidentally dislodged during normal operation or routine maintenance.
- P. Unless otherwise specified, luminaires with louvers or light transmitting panels shall have hinges, latches, and safety catches to facilitate safe, convenient cleaning and re-lamping. Vapor tight luminaires shall have stainless steel pressure clamping devices.
- Q. Yokes, brackets, and supplementary supporting members necessary for mounting lighting equipment shall be furnished and installed by the Contractor and approved by the Architect. All materials, accessories, and any other equipment necessary for the complete and proper installation of luminaires, lamps, ballasts/neon transformers included in the contract shall be furnished and installed by the Contractor. All yokes, brackets and supplementary supports shall provide a neat, square, plumb, and level appearance, and shall not sag, droop, snake or otherwise appear out of plumb or alignment in finished installation with all lamps, globes, lenses, lens frames or doors etc. in place.
- R. All connections shall be fixed rigid by screws, rivets and/or soldering. Screws and rivets shall not be visible except as necessary for maintenance and/or aesthetic appearance. All connections shall provide a neat, square, plumb, and level appearance, and shall not sag, droop, snake or otherwise appear out of plumb or alignment in finished installation with lamps, globes, lenses, lens frames or doors etc. in place.

- S. All housings shall be free from tool marks and dents and shall have accurate angles bent as sharp as compatible with the gauges of the required metal and the luminaire styling. All intersections and joints shall be formed true and of adequate strength and structural rigidity to prevent any distortion after assembly.
- T. For steel and aluminum luminaires, all screws, bolts, nuts and other fastening and latching hardware shall be a cadmium or equivalent plated. For stainless steel luminaires, all hardware shall be stainless steel. For all bronze luminaires, all hardware shall be bronze.
- U. Extruded aluminum frames and trims shall be rigid and manufactured from quality aluminum without blemishes in the installed product. Miter cuts shall be accurate; joints shall be flush and without burrs and cut alignment maintained with the luminaire located in its final position.
- V. Castings shall exactly replicate the approved pattern(s) and shall be free of sand pits, blemishes, scales, and rust and shall be smoothly finished, excepted as necessary for an authentic historic appearance, and as agreed by Architect. Tolerances shall be provided for any shrinkage in order that the finished castings accurately fit their locations resulting in plumb and level fit and consistently tight-seamed fittings.
- W. Luminaires in Hazardous Areas: Luminaires shall be suitable for installation in flammable atmospheres (Class and Group) as defined in NFPA 70 and shall comply with UL 844.
- X. Each light fixture shall be packaged with complete instructions and illustrations on how to install.
- Y. Each light fixture box, container, etc. shall be labeled at the factory with the type designation as indicated on the Light Fixture Schedule.
- Z. Provide factory cut custom stem lengths, as required.
- AA. Exit signs and fixtures that are hatched or where the fixture type contains the suffix "E" for emergency operation, the fixture shall have an integral 90-minute battery inverter if not powered from an emergency generator.
- BB. All battery powered fixtures shall have test switches factory installed integral to the reflector. Remote test switches will not be accepted.

## 2.5 LUMINAIRE REFLECTORS AND TRIMS

- A. Alzak cones, reflectors, baffles, and louvers shall be warranted against discoloration.
- B. All trims, reflectors and canopies shall fit snugly and securely to the ceiling or wall so that no light leak occurs.
- C. Trims shall be self-flanged, unless otherwise specified.
- D. For trimless or flangeless luminaires, Contractor shall coordinate with other Trades to achieve a trimless/flangeless installation acceptable to the Architect. Where ceilings are

drywall or plaster, this involves Level 5 finishes or as otherwise directed by the Architect. In drywall, plaster, wood, or stone ceilings, special luminaire collars and exacting coordination are required of Contractor.

## 2.6 LIGHT EMITTING DIODE (LED) ELECTRONIC DRIVERS

- A. The electronic drivers shall as a minimum meet the following characteristics:
1. LED drivers shall comply with NEMA SSL 1, NFPA 70, and UL 8750 unless otherwise specified.
  2. Drivers remote from luminaires shall be housed in NEMA enclosures so rated for the driver and located in code-compliant, sound-isolated, well-ventilated, and easily accessible areas. Wire shall be sized according to run length and LED Manufacturer's size and distance-of-run requirements and all in accordance with all code requirements.
  3. Driver shall comply with UL 1310 Class 2 requirements for dry and damp locations, NFPA 70 unless specified otherwise. Drives shall be designed for the wattage of the LEDs used in the indicated application. Drivers shall be designed to operate on the voltage system to which they are connected.
  4. LED driver shall withstand up to a 1,000-volt surge without impairment of performance as defined by ANSI C62.41 Category A.
  5. LED driver shall tolerate  $\pm 10$  percent supply voltage fluctuation with no adverse effects to driver or LEDs.
  6. Drivers for luminaires controlled by dimming devices shall be as specified herein and equipped for dimming and conform to the recommendations of the manufacturer of the associated dimming devices to assure satisfactory operation of the lighting system. Contractor shall coordinate all wiring infrastructure to accommodate final-selected drivers and controls systems for smooth, continuous, and flicker-free operation.
  7. Flicker: The flicker shall be less than 5 percent at all frequencies below 1000 Hz and without visible flicker.
  8. Provide with short circuit, open circuit, and overload protection.
  9. Drivers shall meet or exceed NEMA 410 driver inrush standard.
  10. Total Harmonic Distortion shall be less than 20 percent.
  11. Power Factor to be greater than 95%
  12. Drivers to be reduction of hazardous substances (ROHS) compliant

## 2.7 LIGHT EMITTING DIODE (LED)

- A. The light emitting diodes shall as a minimum meet the following characteristic:
1. LED lamps shall comply with ANSI C78.1, IESNA LM-79 and IESNA LM-80.
  2. Light emitting diodes shall be tested under IES LM-80 standards.
  3. Color Rendering Index (CRI) shall be 84 (minimum).
  4. Rated lumen maintenance of 90% lumen output at 50,000 hours (minimum).
  5. Rated lumen maintenance of 70% lumen output at 100,000 hours (minimum).

## 2.8 SUSPENDED LUMINAIRES

- A. Provide hangers capable of supporting twice the combined weight of fixtures supported by hangers. Provide with swivel hangers to ensure a plumb installation. Hangers shall be cadmium-plated steel with a swivel-ball tapped for the conduit size indicated. Hangers shall allow fixtures to swing within an angle of 45 degrees. Brace pendants 4 feet or longer to limit swinging. Single-unit suspended fixtures shall have twin-stem hangers. Multiple-unit or continuous row fixtures shall have a tubing or stem for wiring at one point and a tubing or rod suspension provided for each unit length of chassis, including one at each end. Rods shall be a minimum 0.18 inch diameter.
- B. All suspended luminaires with a weight in excess of 50 pounds shall be fitted with safety cable of sufficient strength and length to meet all UL safety cable load-bearing requirements. Cable shall exhibit a finish (but not painted) compatible with that of the metal finish of the stem/chain/suspension-cable assembly or alternatively finished in black as approved by Architect. Shop drawings shall indicate luminaire weight. Contractor shall coordinate structural support/attachment requirements including independent structure for safety cable attachment with Vendor, Architect, and Structural Engineer and all respective trades. Safety cable shall exhibit sufficient length to wrap tightly and entirely around structural member at least twice before attachment subject to Vendor confirmation of UL requirements and pending Structural Engineer review. Contractor shall provide labor necessary for the stem/chain-assembly-wiring-threading and safety-cable-attachment as instructed by Vendor.

## 2.9 DOWNLIGHT FIXTURES AND COMPONENTS

- A. Downlights shall be listed for thru-branch circuit wiring, recessing in ceilings and damp locations.
- B. Where installed in plaster or drywall or other inaccessible ceiling types, they shall be UL listed for bottom access.
- C. Provide with tool-less hinged junction box access cover and thermal protection accessible from below through reflector opening.
- D. Provide telescoping channel bar hangers that adjust vertically and horizontally.

## 2.10 EXIT SIGNS

- A. General requirements: Comply with UL 924, NFPA 70, AND NFPA 101.
- B. All exit signs shall be LED type.
- C. Provide single or double face as scheduled, indicated on plans, or as required by the local Authority Having Jurisdiction. Adjust installation position if required for clear visibility, in accordance with applicable codes.
- D. Provide directional arrows (chevrons) as indicated on floor plans and to suit the means of egress or as required by the local Authority Having Jurisdiction.

- E. Where emergency backup battery packs are provided with exit lights, they shall have capacities for continuous operation per applicable codes. All exit signs with battery backup shall be provided with self-diagnostics.
- F. Complete unit to be furnished in color/finish as selected by the Architect.

## 2.11 EMERGENCY DRIVER

- A. Description: Self-contained, modular, battery-inverter unit, factory mounted within luminaire body and compatible with driver. Complying with UL924.
  - 1. Provide a minimum of 90 minutes of battery back-up upon loss of power.
  - 2. Constant Power Output: minimum 10W, uon.
  - 3. Battery: High temperature Nickel Cadmium or Lithium Iron Phosphate, uon.
  - 4. Charger: Fully automatic, solid-state type with sealed transfer relay.
  - 5. Operation: Solid state switching circuit automatically turns light fixture on upon absence of power-supply circuit voltage and switches back to normal operation upon restoration of AC power.
  - 6. Test Push-Button and Indicator Light: Visible and accessible without opening luminaire or entering ceiling space.
    - a. Push-Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
    - b. Indicator Light: LED indicates normal power on and charger operation.
  - 7. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

## 2.12 EMERGENCY INVERTER

- A. Description: Stand alone, modular, modified sine wave output battery-inverter unit, remote mounted from luminaire. Complying with UL924.
  - 1. Provide a minimum of 90 minutes of battery back-up upon loss of power.
  - 2. Power Output: suitable for powering designated emergency light fixtures.
  - 3. Battery: Sealed, maintenance-free, nickel-cadmium or lead-acid type.
  - 4. Charger: Fully automatic, solid-state, constant-current type.
  - 5. Operation: Solid state switching circuit automatically turns connected fixtures on upon absence of power-supply circuit voltage and switches back to normal operation upon restoration of AC power.
  - 6. Steel Housing: Type 1 enclosure listed for installation inside, on top of, or remote from luminaire.
  - 7. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

## 2.13 EMERGENCY LIGHTING UNITS

- A. General Requirements for Emergency Lighting Units: Self-contained units complying with UL 924.
  - 1. Provide a minimum of 90 minutes of battery back-up.

2. Battery: Sealed, maintenance-free, lead-acid type, UON.
3. Charger: Fully automatic, solid-state type with sealed transfer relay.
4. Operation: Relay automatically turns lamp on when power-supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
5. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
6. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
7. Wire Guard: Heavy-chrome-plated wire guard protects lamp heads or fixtures. Install wire guards in gymnasiums.
8. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

#### 2.14 LUMINAIRE SUPPORT HANGERS AND COMPONENTS

- A. Wires: ASTM A641/A641M, Class 3, soft temper, galvanized regular coating, 0.1055 inches in diameter (12 gage).
- B. Straps: Galvanized steel, one by 3/16 inch, conforming to ASTM A653/A653M, with a light commercial zinc coating or ASTM A1008/A1008M with an electrodeposited zinc coating conforming to ASTM B633, Type RS.
- C. Rod Hangers: Threaded steel rods, 3/16 inch diameter, zinc or cadmium coated.

#### 2.15 GENERAL REQUIREMENTS FOR POLES AND SUPPORT COMPONENTS

- A. Provide poles designed for site specific wind loading (minimum of 120 miles per hour) determined in accordance with AASHTO LTS while supporting luminaires and all other appurtenances indicated. The effective projected areas of luminaires and appurtenances used in calculations shall be specific for the actual products provided on each pole. Poles shall be anchor-base type designed for use with underground supply conductors. Poles shall have full base metal covers with matching finish to conceal the mounting hardware, pole-base welds, and anchor bolts.
- B. Structural Characteristics: Comply with AASHTO LTS
  1. Wind-Load Strength of Poles: Adequate at indicated heights above grade without failure, permanent deflection, or whipping in steady winds of speed indicated in "Structural Analysis Criteria for Pole Selection" Article.
  2. Strength Analysis: For each pole, multiply the actual equivalent projected area of luminaires and brackets by a factor of 1.3 to obtain the equivalent projected area to be used in pole selection strength analysis.
- C. Luminaire Attachment Provisions: Comply with luminaire manufacturers' mounting requirements. Use stainless-steel fasteners, unless otherwise indicated.

- D. Mountings, Fasteners, and Appurtenances: Corrosion-resistant items compatible with support components.
  - 1. Materials: Shall not cause galvanic action at contact points.
  - 2. Anchor Bolts, Leveling Nuts, Bolt Caps, and Washers: Hot-dip galvanized after fabrication unless otherwise indicated.
  - 3. Anchor-Bolt Template: Plywood or steel.
- E. Handhole: Oval-shaped, with minimum clear opening of 2-1/2 by 5 inches, with cover secured by stainless-steel captive screws.
- F. Pole Base Concrete Foundations:
  - 1. Cast in place, with anchor bolts to match pole-base flange. Anchor bolts shall be steel rod having minimum yield strength of 50,000 psi and shall be galvanized in accordance with ASTM A153/A153M. Concrete shall be as specified in Division 03 Section, Cast-In-Place Concrete.
  - 2. Use 4000-psi, 28-day compressive-strength concrete unless otherwise noted. Comply with Division 03 Section "Cast-in-Place Concrete" and ACI standards for subbase requirements, concrete materials, reinforcement, placement, and cover requirements.
- G. Breakaway Supports: Provide frangible breakaway supports where noted on plans, tested by an independent testing agency acceptable to authorities having jurisdiction, according to AASHTO LTS.
- H. Brackets and Supports
  - 1. ANSI C136.3, ANSI C136.13, and ANSI C136.21, as applicable. Pole brackets shall be not less than 1-1/4 inch secured to pole. Slip-fitter or pipe-threaded brackets may be used, but brackets shall be coordinated to luminaires provided, and brackets for use with one type of luminaire shall be identical. Brackets for pole-mounted streetlights shall correctly position luminaire no lower than mounting height indicated. Mount brackets not less than 24 feet above street. Special mountings or brackets shall be as indicated and shall be of metal which will not promote galvanic reaction with luminaire head. Detachable, cantilever, without underbrace.
- I. Cable Support Grip: Wire-mesh type with rotating attachment eye, sized for diameter of cable and rated for a minimum load equal to weight of supported cable times a 5.0 safety factor.
- J. Grounding and Bonding Lugs: Welded 1/2-inch threaded lug, complying with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems," listed for attaching grounding and bonding conductors of type and size listed in that Section, and accessible through handhole. Provide a pole grounding connection designed to prevent electrolysis when used with copper ground wire.
- K. Finish: Same as luminaire.



## 2.16 FUSING

- A. All luminaires shall be provided with fuse(s) and in-line fuse holder(s) sized per manufacturer's recommendation.
- B. Fuse pole mounted luminaires at handhole.

## 2.17 POLE ACCESSORIES

- A. Duplex Receptacle: Where indicated on plans, provide 120 V, 20 A receptacle in a weatherproof assembly complying with Division 26 Section "Wiring Devices" for a weather resistant, ground-fault circuit-interrupter type. Recessed, 12 inches above pole base. Weatherproof, metal, in-use cover, color to match pole, that when mounted results in NEMA 250, Type 4X enclosure with cord opening and lockable hasp and latch that complies with OSHA lockout and tag-out requirements.
  - 1. Minimum 1800-W transformer, protected by replaceable fuses, mounted behind access cover for poles supplied by voltage other than 120 V.
- B. Base Covers: Provide Manufacturers' standard metal units, arranged to cover pole's mounting bolts and nuts. Finish same as pole.

## 2.18 LUMINAIRE-MOUNTED PHOTOELECTRIC RELAYS

- A. Comply with UL 773 or UL 773A.
- B. Contact Relays: Factory mounted, single throw, designed to fail in the on position, and factory set to turn light unit on at 1.5 to 3 fc (16 to 32 lx) and off at 4.5 to 10 fc (48 to 108 lx) with 15-second minimum time delay. Relay shall have directional lens in front of photocell to prevent artificial light sources from causing false turnoff.
  - 1. Relay with locking-type receptacle shall comply with ANSI C136.10.
  - 2. Adjustable window slide for adjusting on-off set points.

## 2.19 FACTORY APPLIED FINISH

- A. Electrical equipment shall have factory-applied painting systems which shall, as a minimum, meet the requirements of NEMA 250 corrosion-resistance test.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

- B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before luminaire installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Architect's reflected ceiling plan (RCP) indicates actual locations of all light fixtures, diffusers, and system devices. Report to the Architect/Engineer any conflicts. Do not scale plans for exact location of lighting fixtures.
- B. Coordinate mounting for lighting fixtures on the job before commencing installation and, where applicable, after coordinating with the type, style, and pattern of the ceiling being installed.
- C. Install luminaires in accordance with luminaire manufacturer's written instructions, applicable requirements of NEC, NECA, and NEMA standards.
- D. Installed luminaires shall be provided with protective covering by Contractor until such time as the space(s) is cleaned and ready for occupancy.
- E. Set luminaires plumb, square, and level with ceiling and walls, in alignment with adjacent lighting fixtures, and secured in accordance with manufacturers' directions and approved drawings.
- F. Lighting Fixture Supports:
  - 1. Comply with Section 260500, Common Work Results for Electrical Systems.
  - 2. Sized and rated for luminaire weight.
  - 3. Shall maintain the fixture positions after cleaning and re-lamping.
  - 4. Ensure that the luminaires are supported such that there is no resultant bowing or deflection of the ceiling or wall system.
  - 5. Capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.
- G. Recessed, semi-recessed and surface fixtures shall be independently supported from the buildings structure. Do not support any luminaire solely from ceiling grid or ceiling. Ceiling grid clips are not allowed as an alternative to independently supported light fixtures.
- H. Ceiling Grid mounted light fixtures:
  - 1. Lighting fixtures installed in suspended ceilings shall also comply with the requirements of Division 09 Specification Sections for ceilings.
  - 2. Support fixtures with four (4) wires with one (1) at each corner.
  - 3. Hanger wires: Install within 15 degrees of plumb or additional support shall be provided. Wires shall be attached to fixture body and to the building structure (not to the supports of other work or equipment). Where building structure is located such that 15 degrees cannot be maintained, provide "strut" or similar supports secured to structure to meet this requirement.
  - 4. Support Clips: Provide four (4) clips per fixture minimum. Fasten to light fixtures and to ceiling grid members at or near each fixture corner with clips that are UL

- listed for the application. Install clips per manufacturer's requirements. If screws are required, they shall be provided. Installation shall meet applicable seismic codes.
5. Where fixtures of sizes less than the ceiling grid are indicated to be centered in the acoustical panel, support such fixtures independently and provide at least two 3/4-inch metal channels spanning, and secured to, the ceiling tees for centering and aligning the fixture.
  6. Downlights, exit signs and battery pack supported by or attached to ceiling grid or tile shall be provided with one hanger wire at each end. Provide a minimum of two, located at opposite corners.
  7. Round fixtures or fixtures smaller in size than the ceiling grid shall be independently supported from the building structure by a minimum of four wires per fixture spaced approximately equidistant around the fixture. Do not support fixtures by ceiling acoustical panels.
- I. Suspended fixtures:
1. Hang plumb and shall be located with no obstructions within the 45 degree range in all directions. The stem, cable, canopy and fixture shall be capable of 45 degree swing.
  2. Suspended fixtures in continuous rows shall have internal wireway systems for end to end wiring and shall be properly aligned to provide a straight and continuous row without bends, gaps, light leaks or filler pieces. Aligning splines shall be used on extruded aluminum fixtures to assure hairline joints. Steel fixtures shall be supported to prevent "oil-canning" effects.
  3. Pendants shall be finished to match fixtures. Aircraft cable shall be stainless steel.
  4. Canopies shall be finished to match the ceiling and shall be low profile unless otherwise shown.
  5. Whenever a luminaire or its hanger canopy is installed directly to a surface mounted junction box, a finishing ring painted to match the ceiling, shall be used to conceal the junction box.
- J. Wall mounted fixtures:
1. Do not attach light fixtures directly to gypsum board.
  2. Attach to structural members in walls or backing plate attached to wall structural members.
- K. Rigidly align continuous rows of light fixtures for true in-line appearance.
- L. Exit Signs and Emergency Lighting Units: Wire exit signs ahead of the switch to the un-switched branch circuit located in the same room or area. Connect to emergency system branch circuit where applicable.
- M. Where emergency battery packs are provided with fixtures (if any), they shall be connected to an un-switched power line and wired in accordance with applicable codes and the manufacturer's recommendations.
- N. Light fixture whips shall be independently supported from the building structure. Do not clip to lay-in ceiling support wires. Independent support wires shall be distinguishable by colors, tagging, or other effective means.

O. Exterior Fixtures:

1. Exterior building mounted light fixtures shall not be installed until after the building exterior has been rinsed clean of any corrosive cleaning materials. Damaged fixtures shall be replaced by the Contractor at no cost.
2. Provide exterior rated weatherproof junction boxes for all fixtures and splices.
3. Utilize weatherproof silicone filled wire nuts and seal all junction boxes and conduit with potting compound to create waterproof barriers. Inspect all splices and fixtures for continuity prior to potting.
4. Lubricate all threaded parts with a high temperature waterproof anti-seize lubricant to prevent seizing and corrosion.
5. All low-voltage wiring to be UV resistant, UL approved for use without conduit, stranded low-voltage wire for use in outdoor and underground applications, gauge as appropriate to avoid voltage drop.
6. Provide surface mounted fixtures with conduit hub for end of fixture entrance.

P. Transformers (applies to all transformers including (but not limited to) low voltage, neon, remote ballast, LED power supplies, exterior locations):

1. Electrical Contractor to locate all transformers (including low voltage, neon, remote ballasts, led power supplies, etc.) near fixtures in a well-ventilated and accessible location. Transformers must be installed (per codes) in accessible areas large enough to dissipate the heat of the transformer. Temperatures should not exceed 100°F (38°C) or that required by manufacturer if more stringent.
2. Electrical Contractor to determine wire size according to load and wire length to eliminate voltage drop. If voltage drop is a problem after installation, the Electrical Contractor is responsible for reinstallation (at no additional cost) of transformer and wire to solve problem.
3. Electrical Contractor to label front of transformer/driver. Example: "Large Display Case @ Entry to Main Dining Room."

Q. Seal all knock-outs, conduit, and wire entrances for all luminaires in wet and damp locations to prevent water wicking.

R. All reflecting surfaces, glass or plastic lenses, ballast housings, parabolic louvers, downlighting alzak cones and specular reflectors and other decorative elements shall be installed after completion of ceiling tile installation, plastering, painting and general cleanup.

S. Handle all reflecting surfaces, glass or plastic lenses, ballast housings, parabolic louvers, downlighting alzak cones and specular reflectors and other decorative elements with care during installation or lamping to avoid fingerprints or dirt deposits.

T. Luminaires installed and used for working light during construction shall be replaced prior to turnover to the Owner if more than 3 percent of their rated life has been used. Fixtures shall be tested for proper operation prior to turn-over and shall be replaced if necessary.

### 3.3 POLE, LIGHT COLUMN AND BOLLARD INSTALLATION

A. Alignment: Align foundations, poles light columns and bollards for optimum directional alignment of luminaires and their mounting provisions on the pole.

- B. Clearances: Maintain the following minimum horizontal distances of poles from surface and underground features unless otherwise indicated on Drawings:
  - 1. Fire Hydrants and Storm Drainage Piping: 60 inches
  - 2. Water, Gas, Electric, Communication, and Sewer Lines: 10 feet
  - 3. Trees: 15 feet from tree trunk.
- C. Excavation: Restrict excavation in size to that which will provide sufficient working space for installation of concrete forms. Should soil conditions at the bottom of the excavation be unsuitable as a foundation, as determined by the Architect, take the excavation down to firm soil and fill to required grade with concrete or satisfactory soil materials as directed.
- D. Backfill: Thoroughly compact backfill with compacting arranged to prevent pressure between conductor, jacket, or sheath and the end of conduit ell.
- E. Concrete Pole Foundations:
  - 1. Concrete materials, installation, and finishing requirements are specified in Division 03 Section "Cast-in-Place Concrete."
  - 2. Concrete Pole Foundations shall be cast-in-place concrete, having 3000 psi minimum 28-day compressive strength.
  - 3. Set anchor bolts according to anchor-bolt templates furnished by pole manufacturer.
  - 4. Formwork: Construct forms of wood, plywood, steel, or other acceptable materials fabricated to conform to the configuration, line, and grade required. Reinforce formwork to prevent deformation while concrete is being placed and consolidated. Wet or coat formwork with a parting agent before placing concrete.
  - 5. Cast conduit into concrete pole foundations.
  - 6. Prior to concrete pour, install a ground rod and a separate insulated equipment grounding conductor at each pole, light column, and bollard in addition to grounding conductor installed with branch-circuit conductors.
  - 7. Finish by troweling and rubbing smooth. Round all above-grade concrete edges to approximately 0.25" radius.
  - 8. Refer to Pole Base Detail on drawings for additional requirements.
- F. Foundation-Mounted Poles:
  - 1. Install according to pole manufacturer's instructions using a template supplied by pole manufacturer in accordance with the lighting standard manufacturer's recommendations.
  - 2. Use galvanized steel anchor bolts, threaded at the top end, and bent 90 degrees at the bottom end, and nuts selected to resist seismic forces defined for the application and approved by manufacturer.
  - 3. Grout void between pole base and foundation. Use non-shrink or expanding concrete grout firmly packed to fill space.
  - 4. Mount pole with leveling nuts and tighten top nuts to torque level recommended by pole manufacturer. Provide base covers.
- G. Poles and Pole Foundations Set in Concrete Paved Areas (Slabs): Install poles with minimum of 6-inch wide, unpaved gap between the pole or pole foundation and the edge of adjacent concrete slab. Fill unpaved ring with pea gravel to a level 1 inch below top of concrete slab.

- H. Raise and set poles using web fabric slings (not chain or cable). Adjust poles as necessary to provide a permanent vertical position with the bracket arm in proper position for luminaire location. Alterations to poles after fabrication will void manufacturer's warranty and shall not be allowed.
- I. Bollard and light column luminaire installation:
  - 1. Install on concrete base with top level with finished grade or surface at luminaire location. Shape base to match shape and diameter of bollard and/or light column base.

### 3.4 GROUND-MOUNTING LUMINAIRE INSTALLATION

- A. Align units for optimum directional alignment of light distribution.
- B. Install on concrete base with top 4 inches above finished grade or surface at luminaire location.

### 3.5 IN-GRADE LUMINAIRE INSTALLATION

- A. All in-grade fixtures shall be installed per manufacturer's installation instructions.
- B. Verify design type, Flow Through or Sealed, prior to installation.
- C. Flow Through in-grades fixtures shall have drainage system installed below fixture per manufacturer's requirements. If site has poor drainage soil, a sealed in-grade shall be installed. Coordinate soil type with civil engineer prior to submittals.
- D. Provide all conduit connections to in-grade fixture with seal off compound.

### 3.6 CORROSION PREVENTION

- A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.

### 3.7 GROUNDING

- A. Bond luminaires and metal accessories to the grounding system per NEC.
- B. Ground noncurrent-carrying parts of equipment including metal poles, luminaires, mounting arms, brackets, and metallic enclosures. Where copper grounding conductor is connected to a metal other than copper, provide specially treated or lined connectors suitable for this purpose.
- C. At each light pole, light column, light bollard, and support structures, provide a driven ground rod into the earth so that after the installation is complete, the top of the ground rod will be approximately 1 foot below finished grade. Install grounding conductor pigtail in the base for connecting luminaire to grounding system.

### 3.8 IDENTIFICATION

- A. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
  - 1. Light fixtures served from multiple power sources, such as emergency fixtures fed from emergency transfer relay or split wired fixtures, shall have the following label affixed to it: "DANGER - ELECTRICAL SHOCK HAZARD - LIGHT FIXTURE HAS MULTIPLE POWER SOURCES"
- B. Manufacturer's Nameplate: Each item of equipment shall have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.
- C. Factory-Applied Labels: Provide labeled luminaires in accordance with UL 1598 requirements. All light fixtures shall be clearly marked for operation of specific LED's and drivers according to proper type. The following characteristics shall be noted in the format "Use Only \_\_\_\_\_":
  - 1. LED or lamp type, and nominal wattage
  - 2. Driver or ballast type
  - 3. Correlated color temperature (CCT) and color rendering index (CRI)
  - 4. All markings related to lamp type shall be clear and located to be readily visible to service personnel, but unseen from normal viewing angles when lamps are in place. Drivers and ballasts shall have clear markings indicating multi-level outputs and indicate proper terminals for the various outputs.

### 3.9 FIELD QUALITY CONTROL:

- A. The lighting and lighting controls systems shall be synchronized and fully operable to address the lighting operation in a complete and code-compliant manner.
- B. Upon completion of installation, verify that equipment is properly installed, connected, and adjusted. Conduct an operating test to show that equipment operates in accordance with requirements of this section. Replace defective light fixtures, controls, lamps, ballasts, and drivers at no cost to Owner.
- C. Illumination Observations: Verify normal operation of lighting units after installing luminaires and energizing circuits with normal and emergency power sources.
- D. Illumination Tests:
  - 1. Measure light intensities at night. Use certified photometers with calibration referenced to NIST standards. Record footcandle results and furnish to the Engineer. Comply with the following IESNA testing guide(s):
    - a. IESNA LM-5, "Photometric Measurements of Area and Sports Lighting Installations."
    - b. IESNA LM-50, "Photometric Measurements of Roadway Lighting Installations."
    - c. IESNA LM-52, "Photometric Measurements of Roadway Sign Installations."
    - d. IESNA LM-64, "Photometric Measurements of Parking Areas."
    - e. IESNA LM-72, "Directional Positioning of Photometric Data."

- E. Dimming Drivers. Test for full range of dimming capability. Observe for visually detectable flicker over full dimming range. Replace defective light fixtures, controls, lamps, ballasts, and drivers at no cost to Owner.
- F. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal. Replace defective light fixtures at no cost to Owner.
- G. Inspect each light fixture for damage. Replace damaged light fixtures at no cost to the Owner.
- H. Fixtures showing dirt, dust or fingerprints shall be restored to like new condition or shall be replaced at no cost.

### 3.10 CLEANING

- A. At completion of each phase and the time of final acceptance by the Owner, all lighting fixtures shall have been thoroughly cleaned with materials and methods recommended by the manufacturer.
- B. All fingerprints, dirt, tar, smudges, drywall mud and dust, etc. shall be removed by the Contractor from the luminaire bodies, reflectors, trims, and lens/louvers prior to final acceptance. Cleaned with solvent recommended by the manufacturer to a like-new condition or replaced. All reflectors shall be free of paint other than factory-applied, if any.

### 3.11 ADJUSTING

- A. All adjustable luminaires shall be aimed, focused, locked, etc., by the Contractor under the observation of the Architect and Engineer. As aiming and adjusting is completed, locking setscrews and bolts and nuts shall be tightened securely by the Contractor. All aiming and adjusting shall be performed after the entire installation is complete for each phase or area. The Contractor shall be responsible for notifying the Architect of appropriate time for final luminaire adjustment. Where possible, units shall be focused during the normal working day. However, where daylight interferes with seeing lighting effects, aiming shall be accomplished at night at no premium cost.
- B. All ladders, scaffolds, lifts, gloves, cleaning cloths, access/adjustment tools, etc. required for aiming and adjusting luminaires shall be furnished by the Contractor.
- C. Occupancy Adjustments: When requested within 12 months of date of Completion, provide on-site assistance in adjusting aimable luminaires to suit actual occupied conditions. Provide up to two (2) visits to Project during other-than-normal occupancy hours for this purpose. Some of this work may be required after dark.
  - 1. Adjust aimable luminaires in the presence of Architect/Engineer.

END OF SECTION 265000



DIVISION 28 – FIRE ALARM

SECTION 283100 - FIRE ALARM SYSTEM

PART 1 – GENERAL:

- 1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specifications sections apply to work of this section.

PART 2 - SCOPE AND RELATED DOCUMENTS:

- 2.1 The work covered by and the intent of this section of the specifications includes the furnishing of all labor, equipment, materials, testing, programming and performance of all operations in connection with the installation of the Fire Alarm System as shown on the drawings, as herein specified and as required by the applicable codes.
- 2.2 The requirements of all other applicable conditions of the Contract, Supplementary Conditions and General Requirements, apply to the work specified in this section.
- 2.3 The complete installation shall conform to the applicable sections of NFPA-71, NFPA-72A, B, C, D, Local Code Requirements and National Electrical Code (Article 760). The requirements of any local fire department and the Authority Having Jurisdiction shall also be observed in the system installation and device layout.
- 2.4 The work specified under this section shall be coordinated with related work specified elsewhere in these specifications.

PART 3 - DESCRIPTION OF WORK:

- 3.1 Extent of fire alarm and detection system work is indicated by drawings and schedules.
- 3.2 Types of fire alarm and detection systems in this section include the following:
  - 3.2.1 New devices, equipment, cabling, etc. shall be UL listed as a system with existing fire alarm control panel. Simplex, Siemens, Notifier and Edwards are approved manufacturers.

PART 4 - QUALITY ASSURANCE:

- 4.1 Manufacturers: A firm regularly engaged in manufacture of fire alarm and detection systems, of types and sizes, and electrical characteristics required, whose products have been in satisfactory use in similar service for not less than 5 years.
- 4.2 Installer: Qualified with at least 5 years of successful installation experience on projects with fire alarm and detection system installation work similar to that required for project.
- 4.3 Code Compliance: Comply with all NFPA Requirements as applicable to construction and installation of fire alarm and detection components and accessories.
- 4.4 UL Compliance and Labeling: Provide fire alarm and detection system components which are UL listed and labeled.

- 4.5 Each and all items of the Fire Alarm System shall be listed as a product of a single fire alarm system manufacturer. Exception as needed of: Door holders, sprinkler water flow and tamper switches. All fire alarm devices used within the system shall be listed for fire alarm service under the appropriate category by the Underwriters' Laboratories, Inc. (UL), and shall bear the "U.L." label.
- 4.6 The system controls shall be UL listed for Power Limited Applications per NEC 760. All circuits shall be marked in accordance with NEC Article 760.

#### PART 5 – GENERAL:

- 5.1 All panels and peripheral devices shall be the standard product of a single manufacturer and shall display the manufacturer's name of each component. Any catalog numbers specified under this section are intended only to identify the type, quality of design, materials, and operating features desired. Contractor shall visit the site prior to bid to determine existing system.
- 5.2 The listing of specific catalog numbers and equipment parameters is not intended to limit competition among other manufacturers that propose to supply equivalent equipment and services.
- 5.3 Equipment submissions for shop drawing review must include a minimum of the following:
  - 5.3.1 Complete descriptive data indicating UL listing for all system components.
  - 5.3.2 Complete sequence of operations of the system.
  - 5.3.3 Complete system wiring diagrams for components capable of being connected to the system and interfaces to equipment supplied by others.
  - 5.3.4 A copy of any state or local Fire Alarm System equipment approvals.
  - 5.3.5 An AutoCAD Version 2010 or later, produced wiring diagram illustrating the basic floor plan of the building, showing all system wiring and equipment, as well as addressable device locations, with device addresses and schedule of device legends as intended to appear on the main panel and annunciator displays. Provide three disk copies of as-built drawings at close of project, to be included in operation and maintenance manuals.

#### PART 6 - SUBMITTALS:

- 6.1 Product Data: Submit manufacturer's data on fire alarm and detection systems including, but not limited to, rough-in diagrams and instructions for installation, operation and maintenance, suitable for inclusion in maintenance manuals.
- 6.2 Shop Drawings: Provide shop drawings showing equipment/device locations and connecting wiring of entire fire alarm and detection system. Include wiring diagrams, riser diagrams, and point to point drawings.

#### PART 7 - ACCEPTABLE MANUFACTURERS:

- 7.1 Manufacturer: Subject to compliance with requirements, provide new fire alarm and

detection system devices and cabling new and existing equipment, devices and cabling shall be UL listed as a system.

#### PART 8 - FIRE ALARM AND DETECTION SYSTEMS:

- 8.1 General: Provide fire alarm and detection system products of types, sizes and capacities indicated, which comply with manufacturer's standard design, materials, components; construct in accordance with published product information, and as required for complete installation. Provide fire detection systems for applications indicated, and with the following sequence of operations, components and function features:
  - 8.2 Either manual activation of a fire alarm station or activation of an automatic initiating device shall sound a non-coded alarm and provide device identification on an annunciator.
  - 8.3 Equip and wire system so that energizing the fire alarm audible visual signaling devices also activates the following:
    - 8.3.1 Smoke door releases
    - 8.3.2 Fire door releases
  - 8.4 System Operating Features:
    - 8.4.1 The system shall automatically transmit an alarm to the local fire department.
    - 8.4.2 Activation of any fire alarm device shall cause the associated device to indicate an alarm at the fire alarm control panel and annunciator panels, and a signal to be transmitted to the fire department.
    - 8.4.3 Activation of any manual pull station shall cause all A/V devices to operate and release magnetic hold open devices.
    - 8.4.4 Activation of any ceiling mounted smoke or heat detector shall cause all A/V devices to operate, release magnetic hold open devices, and transmit an alarm to the Fire Department.
    - 8.4.5 Activation of an AHU duct smoke detector shall cause the associated air handling unit to shut down and the operations described for ceiling mounted smoke and heat detectors. Otherwise, air handling units shall continue to operate.
    - 8.4.6 Activation of a fire protection system flow or tamper switch shall cause all A/V devices to operate and release magnetic hold open devices.
    - 8.4.7 Provide static pressure switch in main supply air duct at all air handling units with smoke dampers in the supply air duct systems. Connect switch to shut down A.H.U. on static pressure of 2.0" water gauge (+ 1.0" field adjustable).
    - 8.4.8 Provide all smoke damper closure and air handling unit shut-down similar to the existing system.
    - 8.4.9 System shall operate smoke control as shown on drawings and required by code. Verify all requirements prior to installation.

PART 9 - MATERIALS AND EQUIPMENT:

- 9.1 Wiring System Materials: Provide basic wiring materials which comply with Division 16 Basic Materials and Methods sections, "Raceways", "Wires and Cables", and "Electrical Boxes and Fittings"; types to be selected by Engineer.
- 9.2 All conductors shall be solid copper, stranded copper or bunch tinned stranded copper for A.W.G. sizes 16 and 18 (stranded), a maximum of 7 strands shall be permitted. In A.W.G. sizes 16 and 18 (stranded) a maximum of 9 strands shall be permitted if strands are bunch tinned. In A.W.G. size 14 (stranded) a maximum of 19 strands shall be permitted.
- 9.3 Junction boxes and terminal panels shall be painted red and be provided with a suitable number of terminals and of proper size for their use.
- 9.4 All wiring shall be installed in strict compliance with all the provisions of NEC-Article 760, Power-Limited Protective Signaling circuits. Wiring color code shall be maintained throughout the installation.
- 9.5 Manual Fire Alarm Stations: Provide manufacturer's standard construction, red enclosure, manual fire alarm stations to be similar to and compatible with the existing system.
  - 9.5.1 Semi-flush mounted (finished areas).
  - 9.5.2 Addressable
- 9.6 Automatic Fire Detectors: Provide manufacturer's standard construction addressable automatic fire detectors similar to and compatible with the existing system.
- 9.7 Automatic Smoke (Combustion Products) Detectors: Provide manufacturer's standard construction True Alarm automatic smoke detectors to be similar to and compatible with the existing system.
- 9.8 Automatic Alarm Initiative Switches and Extinguishing Systems: Provide manufacturer's standard construction automatic switches for the following applications:
  - 9.8.1 Main type water flow switch.
  - 9.8.2 Pressure or flow type switches for fixed extinguishing system.
- 9.9 Chimes: Provide manufacturer's standard construction electronic fire alarm chimes to be similar to and compatible with the existing system.
- 9.10 Combination Alarm Unit: Provide manufacturer's standard construction combination bell and light unit or combination chime and light as indicated on the drawings to meet provisions of ADA.
- 9.11 Annunciators: Modify all existing annunciators as required to accommodate all work of this project.

- 9.12 Control Panels: Modify all existing control panels and/or install new control panels as required to accommodate all work of this project.

PART 10 – POWER REQUIREMENTS:

- 10.1 The system shall be provided with sufficient battery capacity to operate the entire system upon loss of normal 120 VAC power in a normal supervisory mode for a minimum of 24hrs, or a period of time as required by codes for the building occupancy. There shall be reserve battery capacity to drive all alarm appliances for five minute indication at the end of this period. The system shall automatically transfer to the standby batteries upon power failure. All battery charging and recharging operating shall be automatic. Batteries, once discharged, shall recharge at a rate that will provide a minimum of 70% capacity in 12 hours, or sooner if required by codes. All batteries used within the system shall be of the same manufacturer, and labeled with their date when put in service.
- 10.2 All circuits requiring system operating power shall be 24 VDC and shall be individually fused at the control panel.

PART 11 - AUDIO VISUAL UNITS:

- 11.1 Alarm speaker/strobe assemblies shall include separate wire leads or terminals for proper in/out wiring of each leg of the associated signal circuit. T-tapping of signal device conductors to signal circuit conductors shall not be accepted. The speakers shall have field selectable wattage taps. Speaker tap shall be ½ watt per location unless otherwise noted on prints. The audio visual units shall be equipped with a Xenon-type strobe which shall be semi-flush mounted on compatible 4" square outlet box. The speaker/strobes shall be listed under UL 1971 for signal devices for the hearing impaired. All building strobes shall be synchronized.
- 11.2 If an Audio-Visual unit is required to mounted in a: location, units shall be weather proof, and mounted upon appropriate weather proof back box. One alarm speaker only shall be mounted outside each of the building entrance/exits. Refer to prints for correct location.
- 11.3 The output intensity of all visual units, their locations and mountings shall be in compliance with the latest version of the Americans with Disabilities Act requirements. Provide additional units as needed to meet these requirements

PART 12 - INSTALLATION OF FIRE ALARM AND DETECTION SYSTEMS:

- 12.1 Install fire alarm and detection systems as indicated, in accordance with equipment manufacturer's written instructions and complying with applicable portions of NEC.

PART 13 - INSTALLATION OF BASIC IDENTIFICATION:

- 13.1 Install electrical identification in accordance with Division 16 Basic Materials and Methods Section "Electrical Identification".
- 13.2 All conductors shall be marked at each termination and junction point. Markings shall be permanent. Markings shall be same as those which appear on "As Built Drawings".

PART 14 - INSTALLATION OF BASIC WIRING SYSTEM MATERIALS:

- 14.1 Provide and install the system in accordance with the plans and specifications, all applicable codes and the manufacturer's recommendations. All wiring shall be in a completely separate conduit system from power wiring or other raceway systems. Minimum conduit size shall be 3/4" trade size.
- 14.2 All junction boxes shall be colored red and labeled "Fire Alarm". A consistent wiring color code shall be maintained throughout the installation. The number of wiring splices shall be minimized throughout. Excessive wire splicing shall be cause for rejection of the work, if so determined by the Engineer.
- 14.3 Installation of equipment and devices that pertain to other work in the contract shall be closely coordinated with the appropriate tradesmen or other contractors.
- 14.4 The Contractor shall clean all dirt and debris from the inside and the outside of the fire alarm equipment after completion of installation.
- 14.5 The manufacturer's authorized representative shall provide on-site supervision of installation, and shall perform the initial "power-up" of the system after he has thoroughly checked the installation.
- 14.6 All submittals for this project shall list names, license numbers, and telephone numbers of two installers that are employed full time by the manufacturer to install and test fire alarm systems in the installation location.
- 14.7 A floor plan drawing indicating fire alarm devices, their addresses, and labels shall be provided by the installing company for job site use. These drawings must be approved by the State Fire Marshal's Office or local authority having jurisdiction, as appropriate and in accord with their requirements. A copy of this drawing shall be submitted to the Engineer for his review and project records.

PART 15 - FIELD QUALITY CONTROL:

- 15.1 Inspect relays and signals for malfunctioning, and where necessary, adjust units for proper operation to fulfill project requirements. Clean smoke detector chambers with gas to clear them of all foreign material.

PART 16 – TESTING:

- 16.1 The completed fire alarm system shall be fully tested in accordance with NFPA-72H by the contractor in the presence of the Owner's representative prior to the Fire Marshal inspection. Upon completion of a successful test, the Contractor shall certify the test results in writing to the Fire Marshal, Owner and Engineer. Provide written 72 hour advance notice of the test to all concerned parties.
- 16.2 All auxiliary devices the fire alarm system is connected to, including tamper switches, flow switches, etc., shall be fully tested for proper operation where interfacing with the fire alarm system.
- 16.3 The Contractor shall provide a minimum of eight hours of instructional time to the Owner in the operation and maintenance of all equipment and components. A receipt shall be

obtained from the Owner that this has been accomplished, and a copy forwarded to the Engineer.

- 16.4 Contractor and manufacturer shall be required to accompany the engineer on a complete system verification after the installation has been certified. This shall include physically testing each device and reviewing descriptive device readout. This shall apply to all buildings of this project.

PART 17 - DEMONSTRATE AND INSTRUCTION:

- 17.1 Demonstrate and instruct Owner's representative in operation, service, and maintenance of units. Obtain receipt that this has been accomplished.
- 17.2 Provide a minimum of 4 hours of detailed instruction to the Owner's Representative at completion of the project.
- 17.3 At 4 months after completion and at 8 months after completion, provide 4 hours of detailed instructions and problem solving at the project for the Owner's Representatives.

PART 18 – WARRANTY:

- 18.1 The Contractor shall unconditionally guarantee (except for vandalism or misuse) the completed fire alarm system wiring and equipment to be free from inherent mechanical and electrical defects for a period of one (1) year from the date of beneficial occupancy.
- 18.2 The equipment manufacturer shall make available to the owner a maintenance contract proposal to provide a minimum of two (2) inspections and tests per year in compliance with NFPA-72H guidelines.

END OF SECTION 283100

FINANCE AND ADMINISTRATION CABINET  
 DEPARTMENT FOR FACILITIES MANAGEMENT  
 DIVISION OF ENGINEERING AND CONTRACT  
 ADMINISTRATION  
 FRANKFORT, KENTUCKY  
 ANDY BESHEAR, GOVERNOR

CAMPUS HVAC REVISIONS  
 KENTUCKY DEPARTMENT OF EDUCATION  
 FFA LEADERSHIP CENTER RECREATION HALL  
 HARDINSBURG, KENTUCKY

READY TO ADVERTISE (RTA)  
 OCT 09, 2024

ACCT# 540CBANFF2500

studio kremer architects  
 1231 S Shelby St, Louisville, KY 40203  
 TEL 502.499.1100



**S2I** STRUCTURAL SERVICES, INC.  
 5948 Timber Ridge Dr., Suite 201  
 Prospect, KY 40059  
 (502) 292-2100

DRAWING INFORMATION		FUTURE FARMERS OF AMERICA - RECREATION HALL	
2023-33	VKYS23	111 FFA Camp Road, Hardinsburg, KY 40143	
DRAWING DATE	10/09/2024	COVER SHEET	
DRAWN BY	MS	ENGR. FILE NO.	COMMONWEALTH OF KENTUCKY FINANCE AND ADMINISTRATION CABINET DEPARTMENT FOR FACILITIES AND SUPPORT SERVICES DIVISION OF ENGINEERING AND CONTRACT ADMINISTRATION FRANKFORT, KENTUCKY
CHECKED BY	SKA	# 540CBANFF2500	G-001
PHASE	RTA	DECA Reviewed TY For Intent Only DECA LOG #	
RTA DATE		CMTA 10411 Meeting Street Prospect, KY 40059 T: 502.326.3085 F: 502.326.2691	
AGENCY AUTHORIZED AGENT		DATE 11/7/24	
DIVISION OF ENGINEERING		DATE 11/6/2024	

DATE: 11/06/2024 11:58:58 AM  
 USER: jkramer  
 PROJECT: 2023-33 - FFA LEADERSHIP CENTER RECREATION HALL  
 DRAWING: 111 FFA Camp Road, Hardinsburg, KY 40143  
 11/06/2024 11:58:58 AM



# SHEET INDEX

## GENERAL

G-001 COVER SHEET  
G-002 SHEET INDEX

## ARCHITECTURAL

A-100 FLOOR PLAN  
A-101 WINDOW AND DOOR DETAILS

## ARCHITECTURAL

S-100 PARTIAL ROOF/ CEILING FRAMING PLAN

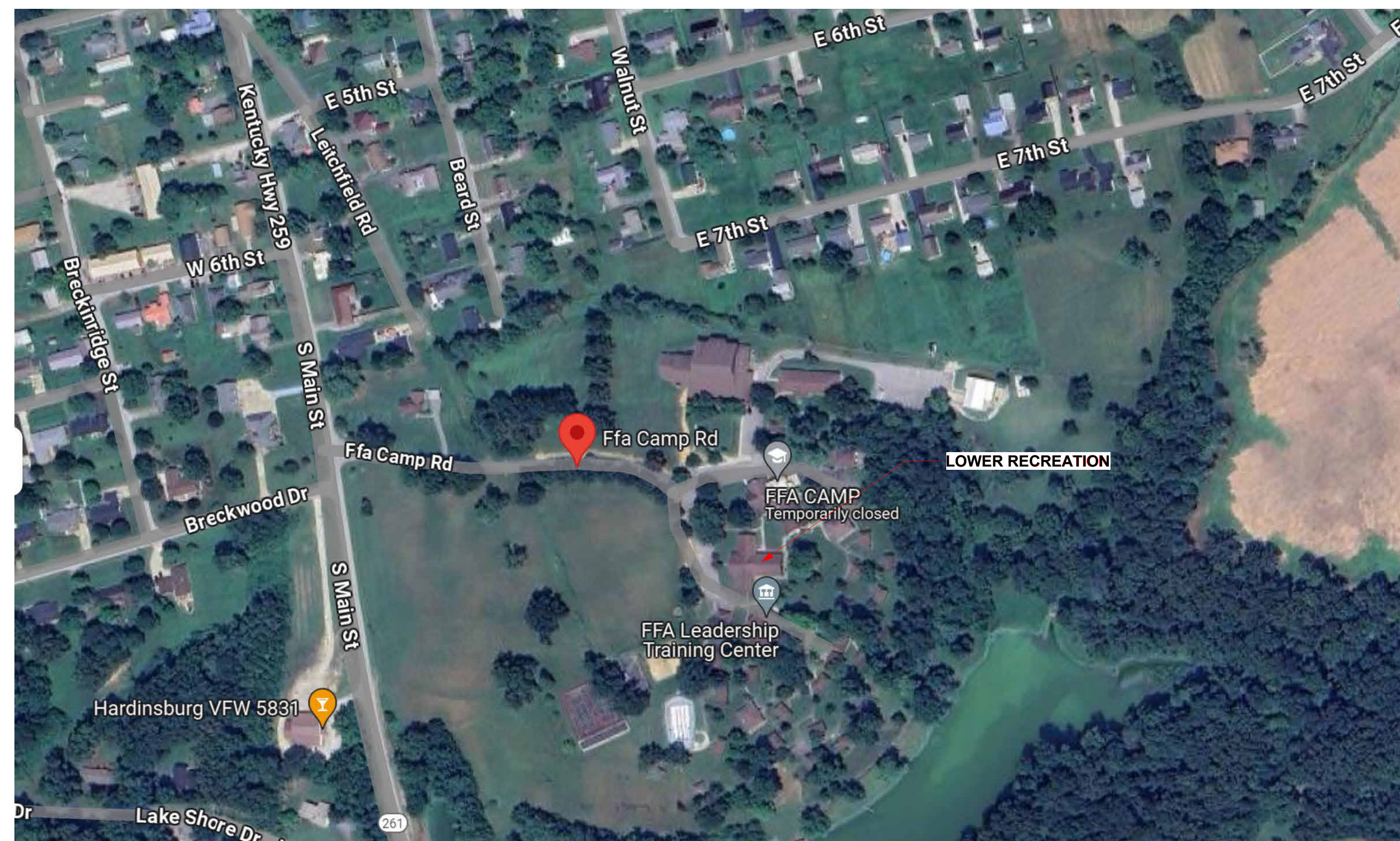
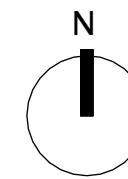
## MECHANICAL

M-100 MECHANICAL LEGEND  
M-200 FIRST FLOOR PLANS – MECHANICAL DEMOLITION  
M-201 FIRST FLOOR PLANS – MECHANICAL NEW WORK  
M-300 MECHANICAL SECTIONS  
M-400 MECHANICAL DETAILS  
M-500 MECHANICAL CONTROLS

## ELECTRICAL

E-100 ELECTRICAL LEGEND  
E-200 FIRST FLOOR PLANS -ELECTRICAL  
E-300 ELECTRICAL DETAILS  
E-301 ELECTRICAL DETAILS

# SITE LOCATION



**ACCT# 540CBANFF2500**

DRAWING INFORMATION		<b>FUTURE FARMERS OF AMERICA - RECREATION HALL</b>	
2023-33	VKYS23	111 FFA Camp Road, Hardinsburg, KY 40143	
DRAWING DATE 10/09/2024		<b>SHEET INDEX</b>	
DRAWN BY MG	CHECKED BY SKA	ENGR. FILE NO. # 540CBANFF2500	COMMONWEALTH OF KENTUCKY FINANCE AND ADMINISTRATION CABINET DEPARTMENT FOR FACILITIES AND SUPPORT SERVICES DIVISION OF ENGINEERING AND CONTRACT ADMINISTRATION FRANKFORT, KENTUCKY
PHASE RTA	RTA DATE	AS BUILT DATE	
REVISION HISTORY OF THIS DRAWING		DESCRIPTION OF REVISIONS	
1	DATE	5	DATE
2	6	3	7
3	7	4	8
4	8		



10411 Meeting Street  
Prospect, KY 40059  
T: 502.326.3085 F: 502.326.2691

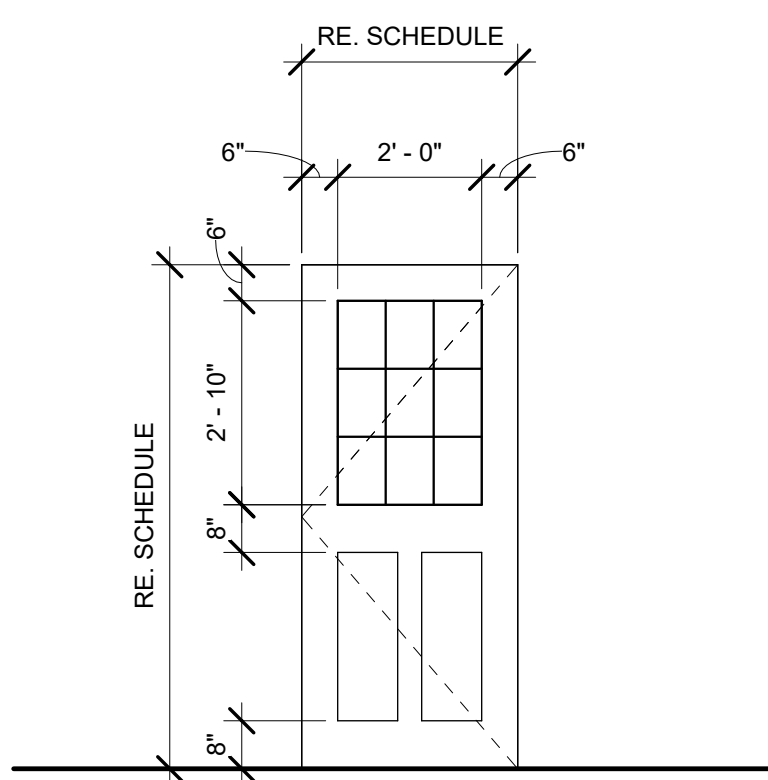
**G-002**

DATE PLOTTED: 10/09/2024 11:00:00 AM  
DRAWN BY: MG  
CHECKED BY: SKA  
ENGR. FILE NO.: # 540CBANFF2500  
PROJECT: 2023-33  
SHEET: G-002



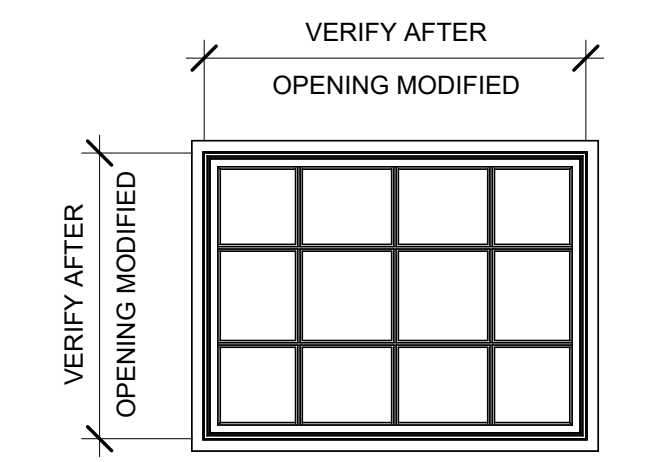


DOOR SCHEDULE															
DOOR NO.	ROOM NUMBER	LOCATION		WIDTH	HEIGHT	DOOR			FRAME		DETAILS		HARDWARE LOCKSET	COMMENTS	
		ROOM NAME				TYPE	MATERIAL	FINISH	TYPE	MATERIAL	FINISH	HEAD DETAIL			JAMB DETAIL
001A	001	MAIN		5'-4"	7'-0"	AA	WD/CLAD	PAINT	EXISTING	WOOD	PAINT			01	
001B	001	MAIN		5'-4"	7'-0"	AA	WD/CLAD	PAINT	EXISTING	WOOD	PAINT			01	
001C	001	MAIN		5'-4"	7'-0"	AA	WD/CLAD	PAINT	EXISTING	WOOD	PAINT			01	
006	006	VESTIBULE		3'-0"	7'-0"	A	WD/CLAD	PAINT	EXISTING	WOOD	PAINT			02	



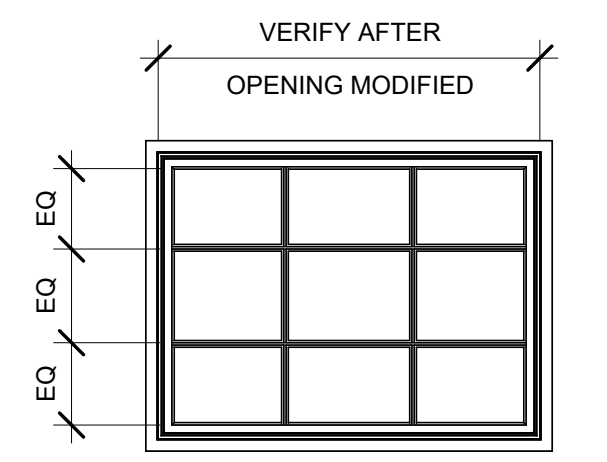
A: SINGLE  
AA: DOUBLE

ALUMINUM CLAD WOOD DOOR  
HALF GLASS VIEW LITE  
(2) LOWER PANELS  
PANIC DEVICES WHERE SCHEDULED



O: 4 LITE x 3 LITE

ALUMINUM CLAD  
WOOD WINDOW



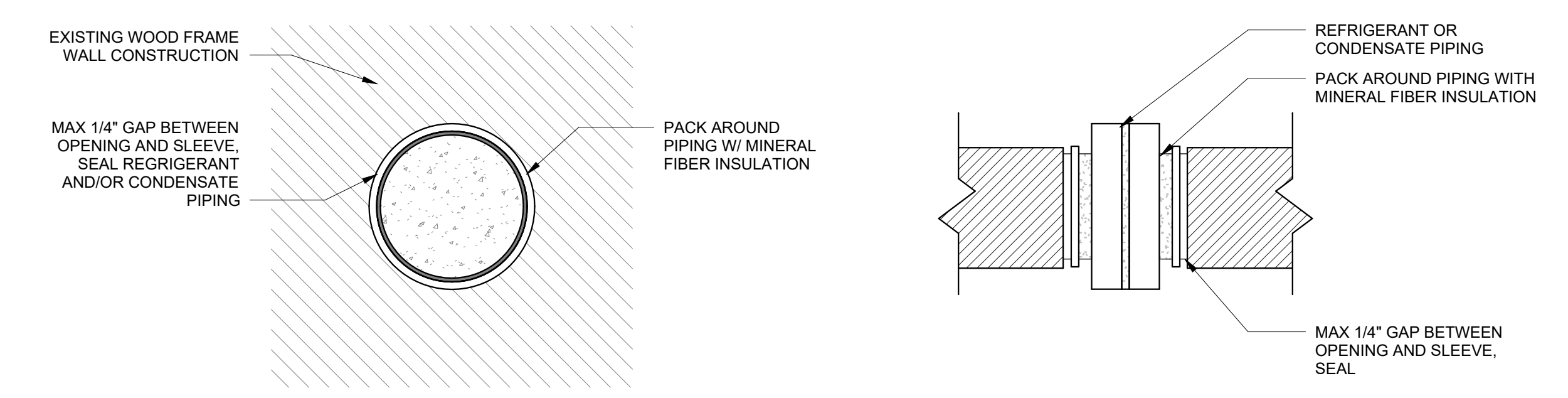
P: 3 LITE x 3 LITE

ALUMINUM CLAD  
WOOD WINDOW

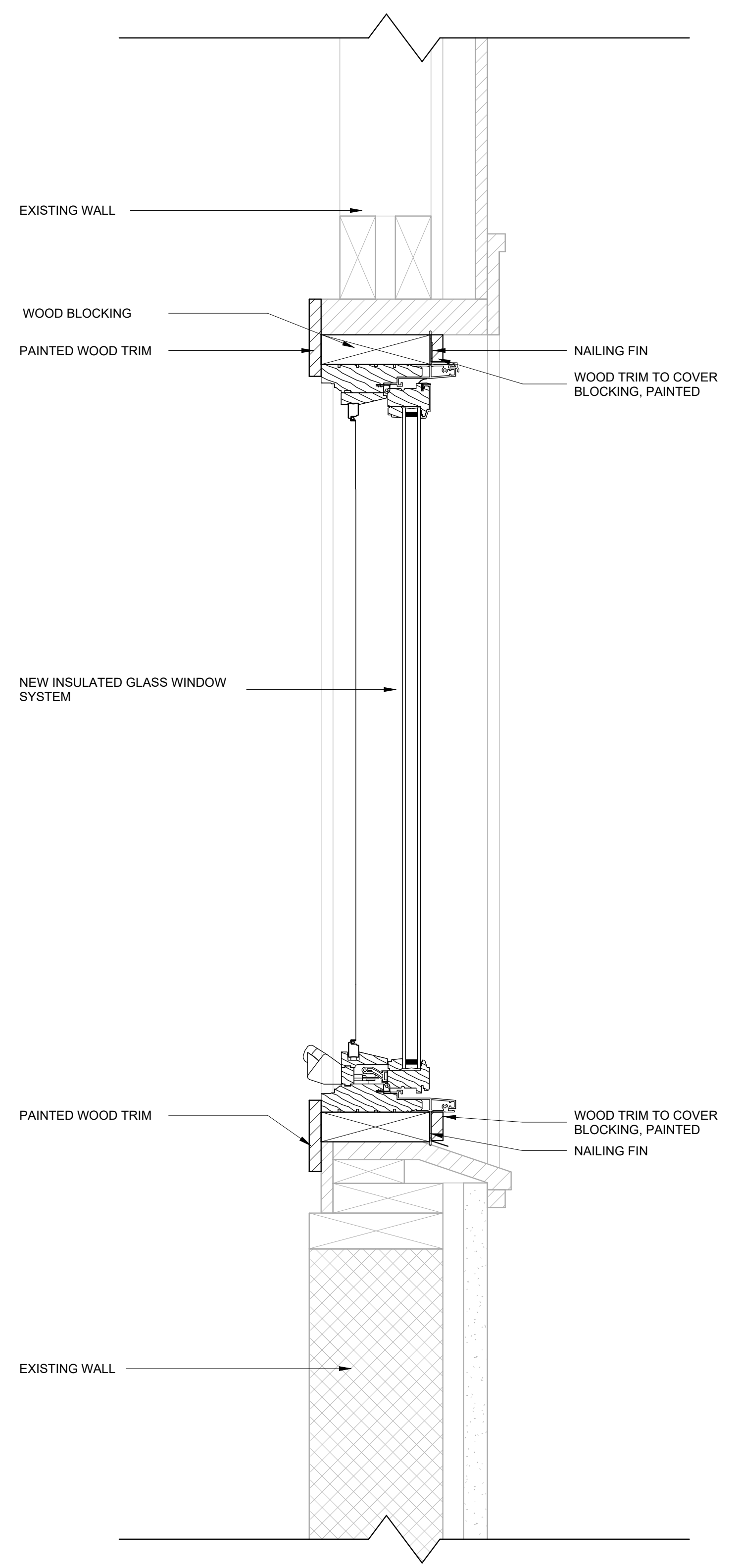
DOOR TYPES  
3/8" = 1'-0"

WINDOW TYPES  
1/2" = 1'-0"

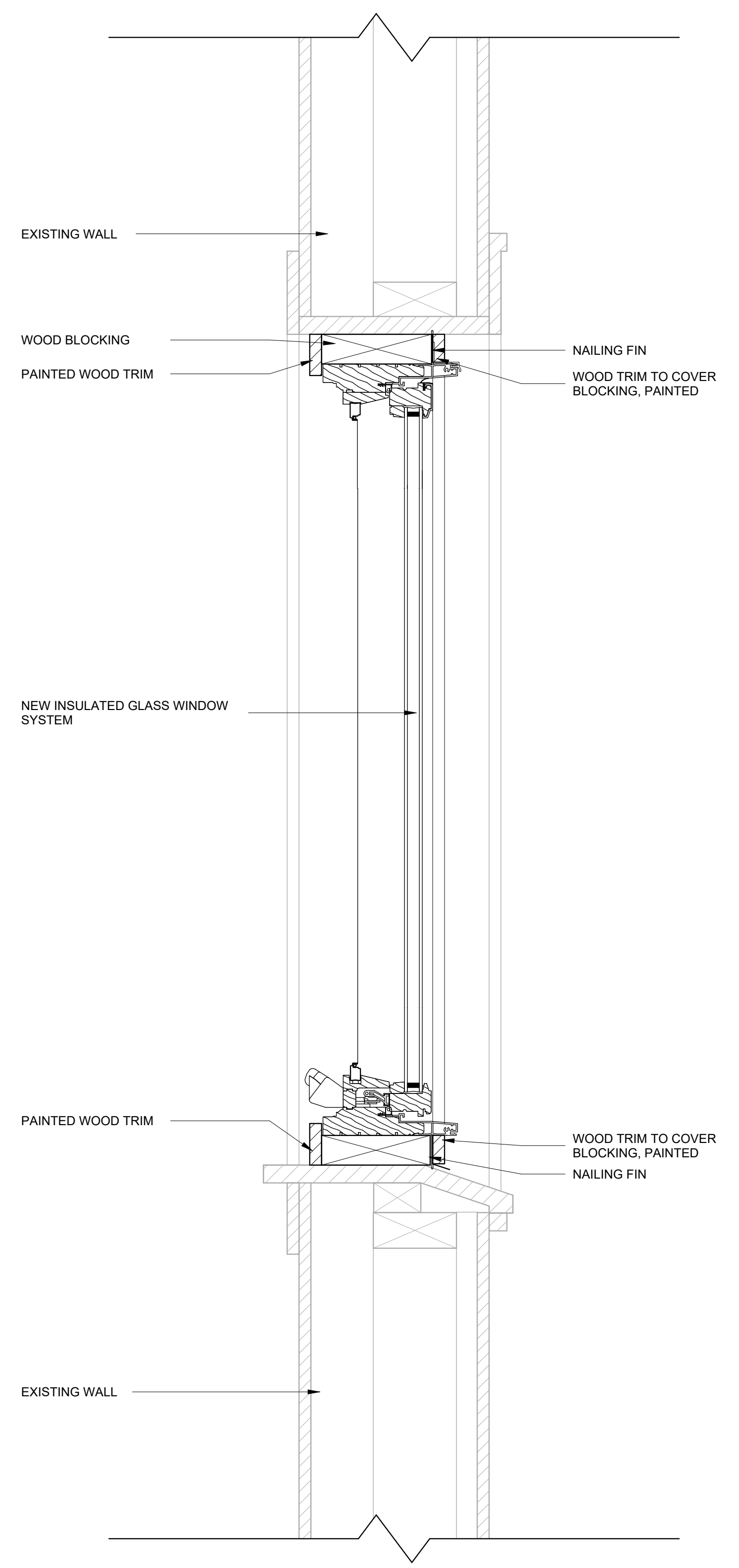
NOTE: STEEL SLEEVE: CYLINDRICAL SLEEVE FABRICATED FROM MIN. 0.031" THICK GALVANIZED SHEET STEEL AND HAVING A MIN. 2" LAP ALONG THE LONGITUDINAL SEAM. SLEEVE INSTALLED BY COILING THE SHEET STEEL TO A DIAMETER SMALLER THAN THE OPENING, INSERTING THE COIL THROUGH THE OPENING, AND RELEASING THE COIL TO ALLOW IT TO UNCOIL AGAINST THE CUT OUT OPENING. ALLOW STEEL TO EXTEND MAX. 1/4" BEYOND EACH SURFACE OF THE WALL.



3 SLEEVE CONDITION  
3\"/>



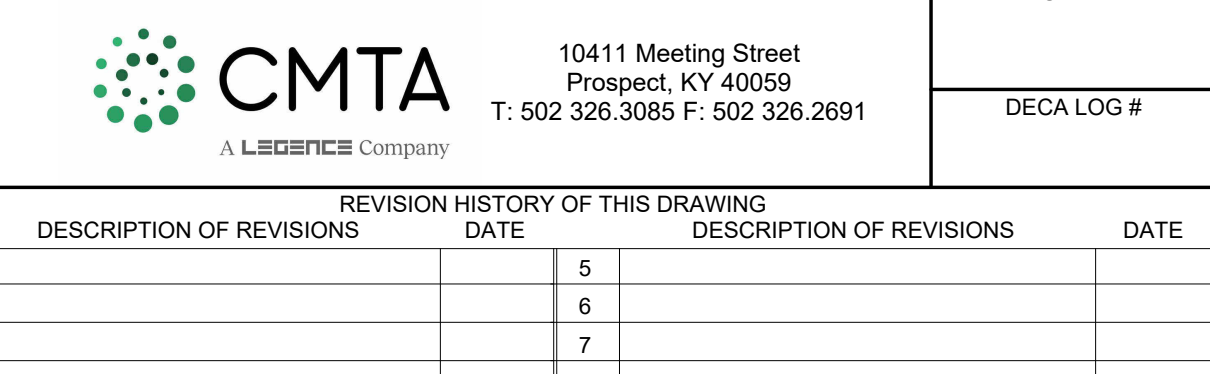
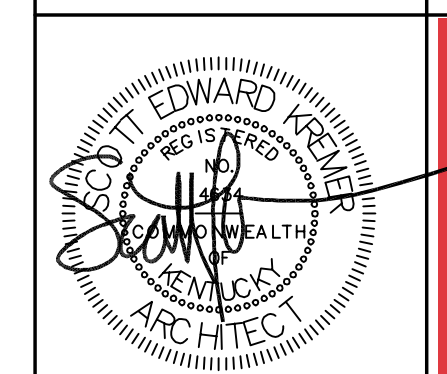
1 WINDOW DETAIL - TYPE A  
3\"/>



2 WINDOW DETAIL - TYPE B  
3\"/>

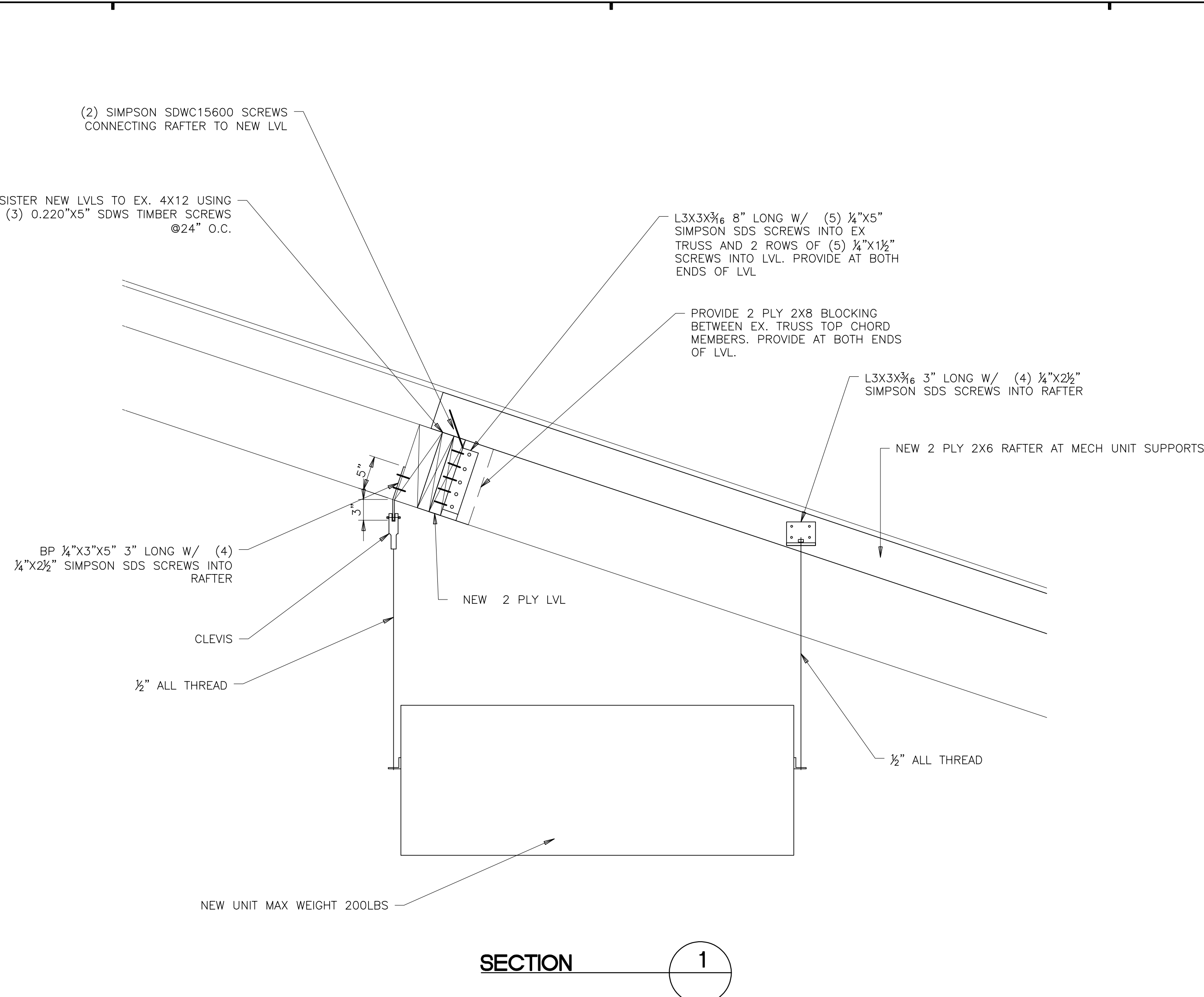
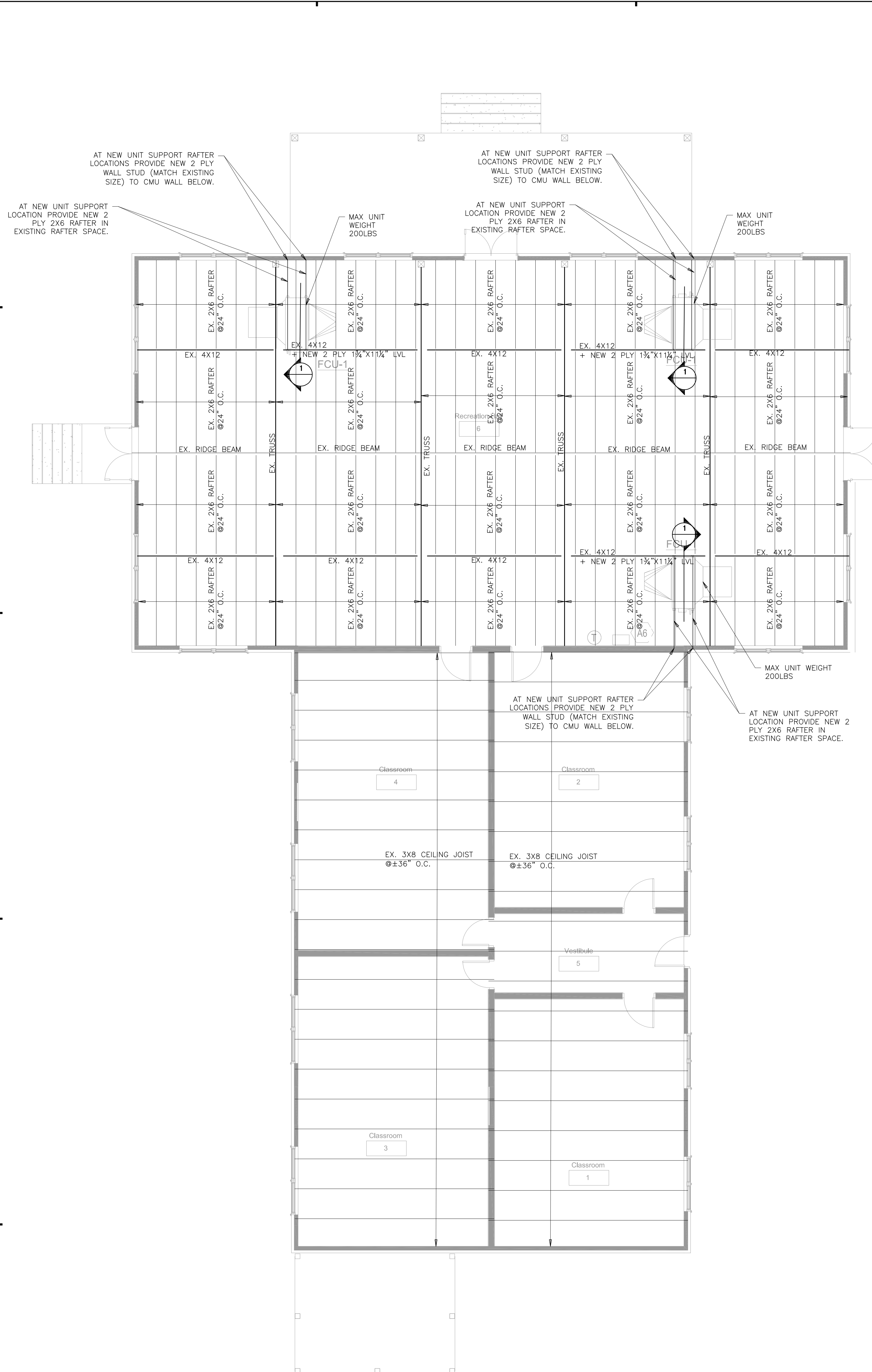
ACCT# 540CBANFF2500

DRAWING INFORMATION		FUTURE FARMERS OF AMERICA - RECREATION HALL		DRAWING NO. <b>A-101</b>
2023-33	VKYS23	111 FFA Camp Road, Hardinsburg, KY 40143		
DRAWING DATE: 10.09.2024		<b>WINDOW AND DOOR DETAILS</b>		AS BUILT DATE
DRAWN BY: MMG	ENGR. FILE NO. # 540CBANFF2500	COMMONWEALTH OF KENTUCKY FINANCE AND ADMINISTRATION CABINET DEPARTMENT FOR FACILITIES AND SUPPORT SERVICES DIVISION OF ENGINEERING AND CONTRACT ADMINISTRATION FRANKFORT, KENTUCKY		DECA LOG #
CHECKED BY: SKA	RTA DATE	CMTA 10411 Meeting Street Prospect, KY 40059 T: 502.326.3085 F: 502.326.2691		
REVISION HISTORY OF THIS DRAWING				
DESCRIPTION OF REVISIONS	DATE	DESCRIPTION OF REVISIONS	DATE	
1	5			
2	6			
3	7			
4	8			



ALL WINDOW AND DOOR DETAILS  
 SHALL BE CONFORMANT WITH THE  
 2021 IBC CODES AND ALL APPLICABLE  
 LOCAL ORDINANCES AND REGULATIONS.  
 11/18/23 10:54 AM





- GENERAL NOTES:**
- BUILDING CODE: 2018 KENTUCKY BUILDING CODE (2015 IBC)
  - BUILDING RISK CATEGORY II
  - MINIMUM DESIGN LIVE LOADS:  
MINIMUM ROOF LIVE LOAD 20 PSF\*\*  
\*\*UNLESS EXCEED BY SNOW DRIFT
  - THE CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING ARCHITECTURAL, STRUCTURAL, MECHANICAL AND ELECTRICAL DETAILS AND DIMENSIONS. ANY DISCREPANCY BETWEEN SUCH DETAILS AND DIMENSIONS AS MAY OCCUR SHALL BE REPORTED TO THE ARCHITECT FOR CLARIFICATION BEFORE THE WORK COMMENCES.

- STRUCTURAL STEEL**
- STRUCTURAL STEEL HAS BEEN DESIGNED AND SHALL BE FABRICATED AND ERECTED IN ACCORDANCE WITH THE AISC SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS 14TH EDITION.
  - ALL MATERIALS SHALL CONFORM TO THE FOLLOWING SPECIFICATIONS; LATEST EDITIONS ADOPTED BY THE KENTUCKY BUILDING CODE SHALL APPLY:  
STRUCTURAL WIDE FLANGE SHAPES INCLUDING COLUMNS, BEAMS, ETC ASTM A992  
STRUCTURAL ANGLES, PLATE & MISCELLANEOUS ITEMS ASTM A36  
STRUCTURAL TUBING ASTM A500, GRADE B  
STRUCTURAL BOLTS ASTM A325-N  
HEADED STUD ASTM A108  
WELDING ELECTRODES E70XX
  - ALL BOLTED CONNECTIONS SHALL BE DESIGNED BY THE FABRICATOR IN ACCORDANCE WITH THE SPECIFICATION FOR STRUCTURAL JOINTS USING ASTM A325 BOLTS USING 3/4" INCH DIAMETER BOLTS. WASHERS SHALL BE LOAD INDICATOR TYPE OR BOLTS SHALL BE TENSION CONTROL TYPE.
  - ALL WELDING SHALL BE IN ACCORDANCE WITH "THE STRUCTURAL WELDING CODE" AWS D1.1. QUALIFY PROCEDURES AND PERSONNEL ACCORDING TO AWS D1.1. WELDER CERTIFICATES FOR PERSONNEL SHALL BE KEPT ON SITE IN JOB TRAILER AT ALL TIMES
  - ALL BEAM CONNECTIONS SHALL BE DESIGNED FOR 1/2 OF THE MAXIMUM UNIFORM LOAD FOR THE SIZE, SPAN AND GRADE OF STEEL LISTED IN UNIFORM LOAD CONSTANTS TABLES FROM PART 2 OF THE AISC MANUAL (14TH EDITION) UNLESS OTHERWISE NOTED.
  - WELDING OF HEADED STUD, DEFORMED BAR ANCHORS (DBA), AND WELDABLE REINFORCING SHALL BE SIZED TO DEVELOP THE FULL TENSILE STRENGTH OF THE MEMBER.
  - ALL CONDITIONS AND DIMENSIONS PRIOR TO FABRICATION AND ERECTION OF STEEL SHALL BE VERIFIED. ANY AMBIGUITY FOUND SHALL IMMEDIATELY BE BROUGHT TO THE NOTICE OF THE ARCHITECT.
  - BEFORE SHIPPING FROM THE SHOP ALL STEEL SHALL BE CLEANED. REMOVE HEAVY RUST AND DIRT. SCALE, SPATTER, SLAG OR FLUX DEPOSITS. COMPLY WITH STEEL STRUCTURES PAINTING COUNCIL SP-2 "HAND TOOL CLEANING" OR SP-3 "POWER TOOL CLEANING". REMOVE OIL, GREASE AND SIMILAR CONTAMINATES; COMPLY WITH SSPC SP-1 "SOLVENT CLEANING".
  - ALL FIELD WELDS SHALL BE CLEANED AND PAINTED WITH PRIMER AFTER WELDING HAS BEEN INSPECTED AND APPROVED.
  - STEEL FABRICATOR AND CONTRACTOR SHALL BE RESPONSIBLE FOR ALL MISC. STEEL INDICATED ON THE ARCHITECTURAL PLANS INCLUDING BUT NOT LIMITED TO ROOF LADDERS.
  - ALL FERROUS METALS IN UNCONDITIONED SPACE OR ON THE EXTERIOR SHALL BE HOT-DIP GALVANIZED AFTER FABRICATION. APPLY ZINC-COATING BY THE HOT-DIP PROCESS IN COMPLIANCE WITH THE FOLLOWING REQUIREMENT:  
A. ASTM A153 FOR GALVANIZING IRON AND STEEL HARDWARE.  
B. ASTM A123 FOR GALVANIZING BOTH FABRICATED AND UNFABRICATED IRON AND STEEL PRODUCTS MADE OF UNCOATED ROLLED, PRESSED, AND FORGED SHAPES, PLATES, BARS, AND STRIP 0.0299 INCH THICK AND HEAVIER.
  - ALL EXTERIOR COLUMNS SUPPORTING CANOPIES SHALL BE HOT DIP GALVANIZED PER SPECIFICATION NOTED ABOVE

- ROUGH CARPENTRY**
- WOOD CONSTRUCTION SHALL CONFORM TO ALL REQUIREMENTS SPECIFIED IN CHAPTER 23 OF THE INTERNATIONAL BUILDING CODE.
  - STACK LUMBER, SHEATHING AND OTHER PANELS; PLACE SPACERS BETWEEN EACH BUNDLE TO PROVIDE AIR CIRCULATION.
  - FACTORY MARK EACH PIECE OF LUMBER WITH GRADE STAMP OF GRADING AGENCY. WHEN LUMBER IS TO BE EXPOSED AND FINISHED PROVIDE GRADE DOCUMENTATION.
  - PROVIDE DRESSED LUMBER, S4S, UNLESS OTHERWISE INDICATED
  - PROVIDE DIMENSION LUMBER FOR ALL WOOD FRAMING SOUTHERN PINE #2. PROPERTIES SHALL MEET OR EXCEED THOSE ADOPTED BY THE AMERICAN WOOD COUNCIL (AWC) JUNE 1, 2013.
  - LVL'S SHALL HAVE THE FOLLOWING MINIMUM PROPERTIES:  
F<sub>b</sub>=2,900PSI  
E=2,000,000
  - WOOD FASTENING NOT SPECIFICALLY DETAILED IN THESE DOCUMENTS SHALL CONFORM TO FASTENING REQUIREMENTS NOTED IN TABLE 2304.9.1 OF THE INTERNATIONAL BUILDING CODE.
  - PROVIDE DRY LUMBER WITH 19 PERCENT MAXIMUM MOISTURE CONTENT AT TIME OF DRESSING FOR 2 INCH NOMINAL THICKNESS, UNLESS OTHERWISE INDICATED
  - PROVIDE ENGINEERED WOOD PRODUCTS WITH ALLOWABLE DESIGN STRESSES, AS PUBLISHED BY THE MANUFACTURER, THAT MEET OR EXCEED THOSE INDICATED. MANUFACTURER'S PUBLISHED VALUES SHALL BE DETERMINED FROM EMPIRICAL DATA OR BY RATIONAL ENGINEERING ANALYSIS AND DEMONSTRATED BY COMPREHENSIVE TESTING PERFORMED BY A QUALIFIED INDEPENDENT TESTING AGENCY.
  - OBTAIN EACH TYPE OF ENGINEERED WOOD PRODUCT THROUGH ONE SOURCE FROM A SINGLE MANUFACTURER.
  - AT MULTI-PLY LVL'S, PROVIDE INTERCONNECTING FASTENING PER VENDOR'S REQUIREMENTS FOR SIDE LOADED MEMBERS.
  - PROVIDE FRAMING ANCHORS MADE FROM METAL INDICATED, OF STRUCTURAL CAPACITY, TYPE AND SIZE INDICATED. ZINC COATING SHALL BE MINIMUM G90 OR AS RECOMMENDED BY PRESSURE TREATED LUMBER CHEMICAL VENDOR, WHICHEVER IS MORE STRINGENT.
  - SET ROUGH CARPENTRY TO REQUIRED LEVELS AND LINES, WITH MEMBERS PLUMB, TRUE TO LINE, CUT, AND FITTED. FIT ROUGH CARPENTRY TO OTHER CONSTRUCTION, SCRIBE AND COPE AS NEEDED FOR ACCURATE FIT. LOCATE NAILERS, BLOCKING, AND SIMILAR SUPPORTS TO COMPLY WITH REQUIREMENTS FOR ATTACHING OTHER CONSTRUCTION.
  - STEEL HANGERS AND CLIPS SPECIFIED IN THESE DOCUMENTS SHALL BE INSTALLED IN STRICT COMPLIANCE WITH MANUFACTURERS INSTRUCTIONS. WHERE NAILING OPTIONS ARE GIVEN THE "MAX" NAILING OPTION SHALL BE USED.

**PARTIAL ROOF/CEILING FRAMING PLAN**

- DRAWING NOTES:**
- ALL NEW LUMBER SHALL BE SOUTHERN PINE #2.
  - SIMPSON HANGERS SHALL BE INSTALLED IN STRICT COMPLIANCE W. MANUFACTURERS SPECIFICATIONS.

**ACCT# 540CBANFF2500**

DRAWING INFORMATION		FUTURE FARMERS OF AMERICA - RECREATION HALL	
A & E FILE NO.	VKYS23	111 FFA Camp Road, Hardinsburg, KY 40143	
DRAWING DATE	10.09.2024	<b>ROOF/CEILING FRAMING PLAN</b>	
DRAWN BY	NDC	ENGR. FILE NO.	COMMONWEALTH OF KENTUCKY FINANCE AND ADMINISTRATION CABINET
CHECKED BY	NDC	# 540CBANFF2500	DEPARTMENT FOR FACILITIES AND SUPPORT SERVICES DIVISION OF ENGINEERING AND CONTRACT ADMINISTRATION FRANKFORT, KENTUCKY
PHASE	RTA	DRAWING NO. <b>S-100</b>	
RTA DATE		AS BUILT DATE	
		DECA LOG #	
		10411 Meeting Street Prospect, KY 40059 T: 502.326.3085 F: 502.326.2691	
REVISION HISTORY OF THIS DRAWING			
DESCRIPTION OF REVISIONS	DATE	DESCRIPTION OF REVISIONS	DATE
1		5	
2		6	
3		7	
4		8	



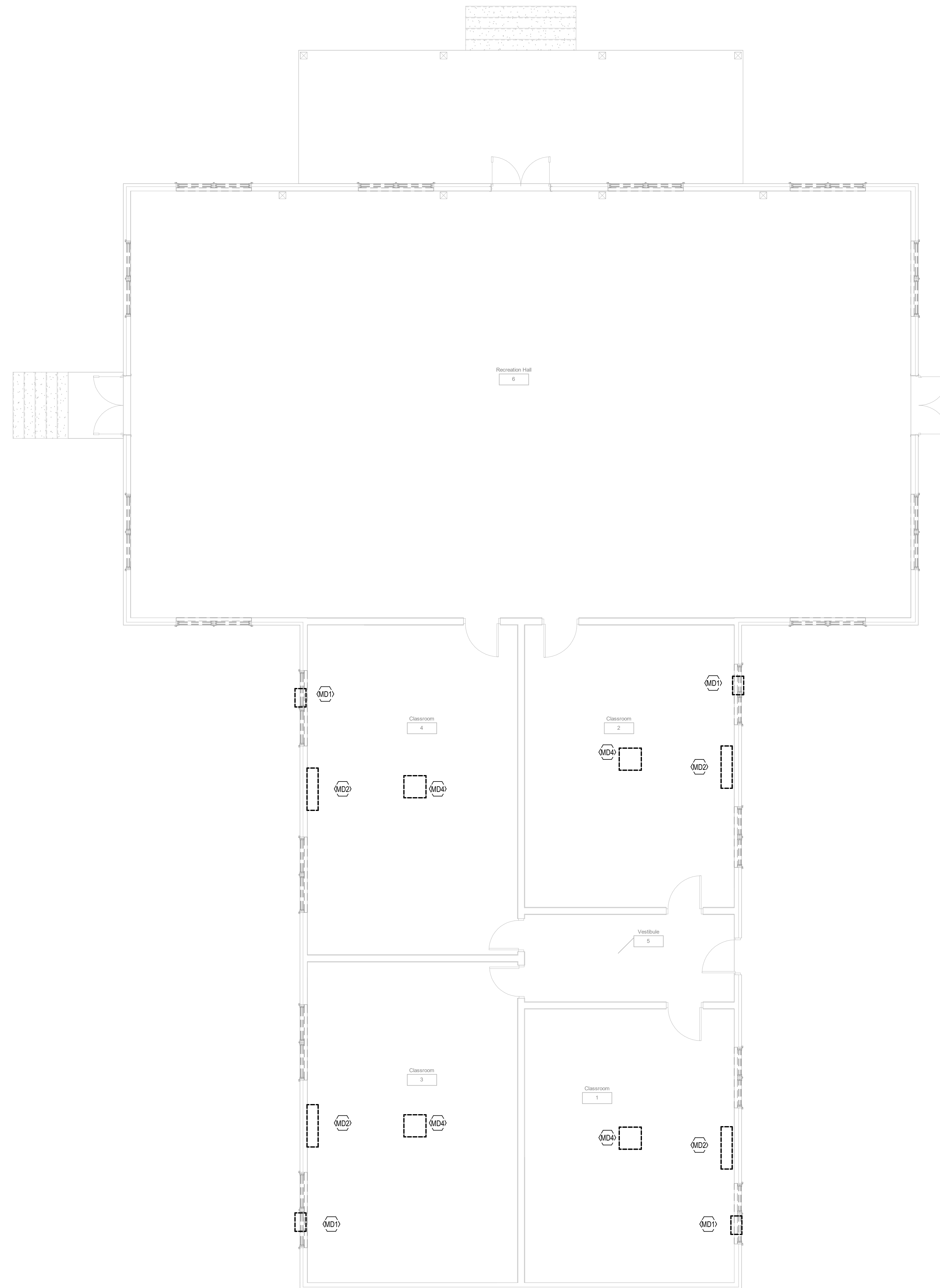






**KEYNOTES**

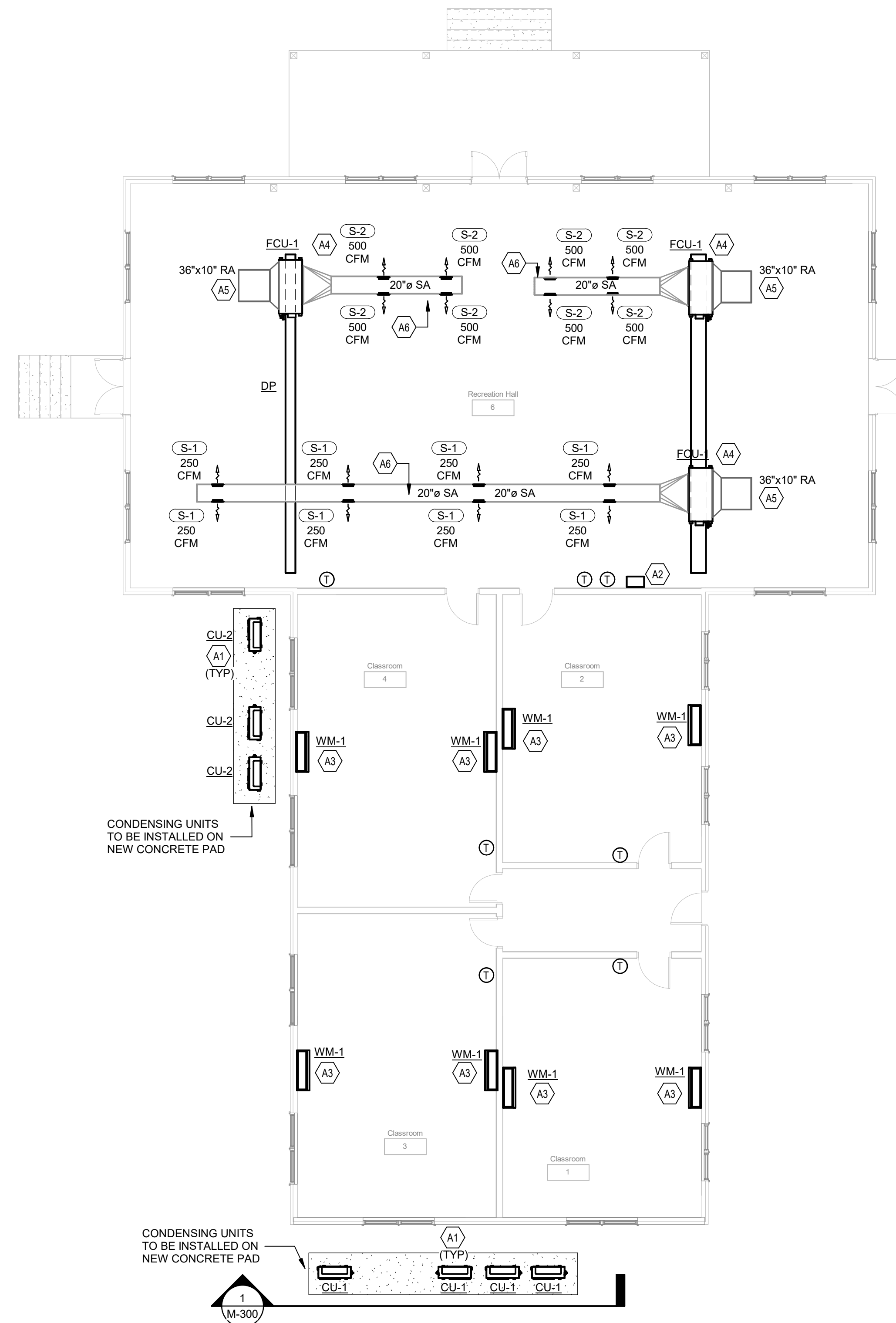
- MD1 REMOVE WINDOW AIR CONDITIONER UNIT.
- MD2 REMOVE BASEBOARD FINNED-TUBBED RADIATOR. REMOVE ALL ELECTRICAL CONNECTIONS; REFER TO ELECTRICAL DRAWINGS FOR DEMOLITION SCOPE.
- MD4 REMOVE EXISTING FAN ABOVE ACCESS PANEL IN CLASSROOM. REMOVE ALL ASSOCIATED CONNECTIONS.



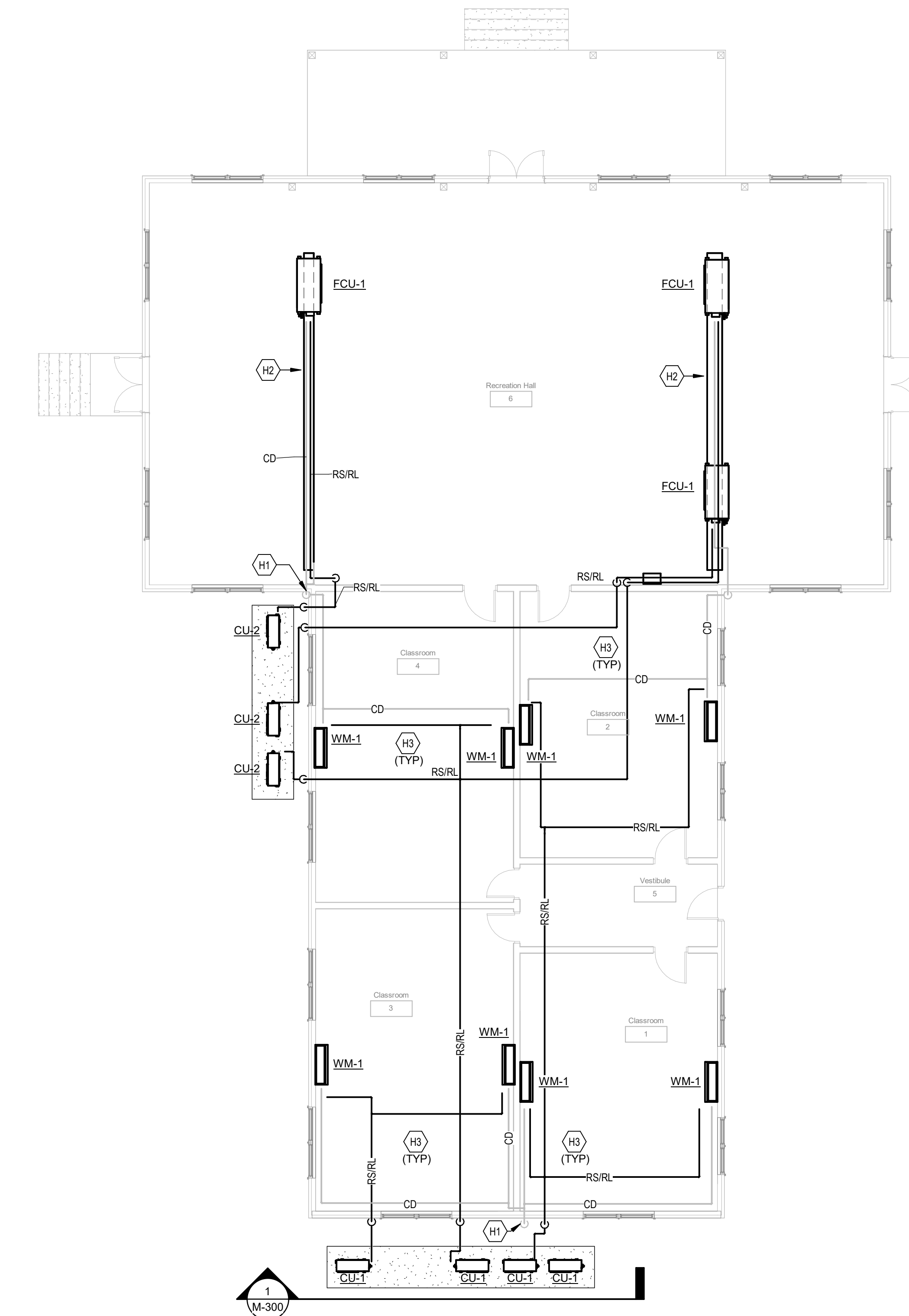
**1 FIRST FLOOR PLAN - MECHANICAL DEMOLITION**  
SCALE: 3/16" = 1'-0"

**ACCT# 540CBANFF2500**

	DRAWING INFORMATION		FUTURE FARMERS OF AMERICA - RECREATION HALL	
	A & E FILE NO.	VKYS23	111 FFA Camp Road, Hardinsburg, KY 40143	
	DRAWING DATE	10.09.2024	<b>RECREATION HALL MECHANICAL DEMOLITION</b>	
	DRAWN BY	AKP	ENGR. FILE NO.	# 540CBANFF2500
CHECKED BY	PMG	COMMONWEALTH OF KENTUCKY FINANCE AND ADMINISTRATION CABINET DEPARTMENT FOR FACILITIES AND SUPPORT SERVICES DIVISION OF ENGINEERING AND CONTRACT ADMINISTRATION FRANKFORT, KENTUCKY		
PHASE	RTA			<b>M-200</b>
RTA DATE				AS BUILT DATE
		10411 Meeting Street Prospect, KY 40059 T: 502.326.3085 F: 502.326.2691		DECA LOG #
REVISION HISTORY OF THIS DRAWING				
DESCRIPTION OF REVISIONS	DATE	DESCRIPTION OF REVISIONS	DATE	
1	5			
2	6			
3	7			
4	8			



**1 RECREATION HALL FIRST FLOOR PLAN - AIR DISTRIBUTION**  
SCALE: 1/8" = 1'-0"



**2 FIRST FLOOR PLAN - HYDRONICS**  
SCALE: 1/8" = 1'-0"

**KEYNOTES**

- A1 INSTALL OUTDOOR CONDENSING UNIT ON CONCRETE PAD. CONNECT ALL PIPING AND ELECTRICAL CONNECTIONS TO UNITS. MAINTAIN ALL MANUFACTURER'S SERVICE CLEARANCES.
- A2 INSTALL REFRIGERANT MONITOR.
- A3 INSTALL WALL MOUNTED INDOOR UNITS 7'-9" AFF. MAINTAIN ALL MANUFACTURER'S SERVICE CLEARANCES.
- A4 INSTALL FAN COIL UNIT. COORDINATE DUCTWORK RUNOUT WITH EXISTING STRUCTURE. MAINTAIN ALL MANUFACTURER'S SERVICE CLEARANCES.
- A5 TERMINATE RETURN AIR DUCT OPEN-ENDED WITH BIRD SCREEN.
- A6 SPIRAL DUCT. REFER TO ARCHITECT FOR COLOR.
- H1 SPILL CONDENSATE 6" ABOVE GRADE.
- H2 INSTALL DRAIN PAN UNDERNEATH REFRIGERANT AND CONDENSATE PIPING. DRAIN PAN TO RUN UNDER INDOOR FAN COIL UNITS. COORDINATE INSTALLATION WITH EXISTING STRUCTURE.
- H3 CONTRACTOR TO ROUTE ALL NEW PIPING TIGHT TO BEAM. INDICATE IN SHOP DRAWINGS FOR DESIGN TEAM TO REVIEW.

VRF INDOOR UNITS																				
TAG	MANUFACTURER	MODEL #	SERVICE	DIMENSIONS (IN.)				AIRFLOW (CFM)	FAN TYPE / DRIVE	TOTAL COOLING CAPACITY (MBH)	SENSIBLE COOLING CAPACITY (MBH)	LATENT COOLING CAPACITY (MBH)	LAT (COOLING)	HEATING CAPACITY (MBH)	LAT (HEATING)	ELECTRICAL			REMARKS	
				LENGTH	WIDTH	HEIGHT	WEIGHT (LBS)									MCA	MOCP	VOLTAGE		PHASE
FCU-1	LG	ARNU7658B84	RECREATION HALL	68.25	27.100	18.125	192.00 Lbf	2260 CFM	SIROCCO / DIRECT	76.4	53.5	22.9	59.3	86.0	103.3	6.5 A	15	240 V	1	ALL
WM-1	LG	ARNU245SK54	CLASSROOM	39.28	8.280	13.590	28.70 Lbf	537 CFM	CROSS FLOW / DIRECT	24.1	16.7	7.4	52.9 F	24.3	112.2 F	0.7 A	15	240 V	1	ALL

- REMARKS:
- PROVIDE WITH CONDENSATE PUMP.
  - ALL VRF SYSTEM WIRING IS TO BE PROVIDED BY MANUFACTURER.
  - PROVIDE WITH FACTORY START-UP UTILIZING MANUFACTURER'S STANDARD FORMS. PROVIDE TRAINING BY A VENDOR CERTIFIED TECHNICIAN.
  - REFRIGERANT PIPING TO BE INSTALLED WITH FACTORY PIPING AND FITTINGS.
  - PROVIDE A 10 YEAR WARRANTY ON COMPRESSOR AND ALL PARTS.
  - PROVIDE ALL UNITS WITH PROGRAMMABLE THERMOSTAT CONTROLLER.

VRF OUTDOOR UNIT															
TAG	MANUFACTURER	MODEL #	DIMENSIONS (LxWxH)	WEIGHT	FAN TYPE / DRIVE	COOLING CAPACITY (MBH)	HEATING CAPACITY (MBH)	EER	COP	Noise Criteria (dBA)	MCA (A)		ELECTRICAL		REMARKS
											MOP (A)	VOLTAGE	PHASE		
CU-1	LG	ARUM06G5S5	37.41x13x54.34"	263	AXIAL FLOW FAN / DIRECT	48.0	54.0	13.1	9.0	54	24	40	208 V	1	ALL
CU-2	LG	ARUB06G5S4	37.41x13x54.34"	260	AXIAL FLOW FAN / DIRECT	60.0	64.0	10.2	9.2	57	25.4	40	208 V	1	ALL

- REMARKS:
- PROVIDE WITH AUTO CHANGEOVER FUNCTIONS.
  - ALL VRF SYSTEM CONTROL WIRING IS TO BE PROVIDED BY MANUFACTURER.
  - PROVIDE WITH FACTORY START-UP UTILIZING MANUFACTURER'S STANDARD FORMS. PROVIDE TRAINING BY A VENDOR CERTIFIED TECHNICIAN.
  - REFRIGERANT PIPING TO BE INSTALLED WITH FACTORY PIPING AND FITTINGS.
  - PROVIDE SYSTEM WITH "1 TOUCH" SYSTEM CONTROLLER.
  - PROVIDE A 10 YEAR WARRANTY ON COMPRESSOR AND ALL PARTS.
  - SUBMITTED PERFORMANCE DATA MUST BE FULLY DE-RATED FOR ALL COMPONENTS AND ACCESSORIES, INCLUDING BUT NOT LIMITED TO, LINE LENGTH, VERTICAL SEPARATION, CONNECTION RATIO, DESIGN CONDITIONS, CONDENSER COIL COATING.
  - SUBSTITUTE MANUFACTURERS SHALL BE RESPONSIBLE FOR ADDITIONAL PIPING AND REFRIGERANT.
  - CONTRACTOR TO VERIFY PIPING DIMENSIONS.
  - CONTRACTOR SHALL BE RESPONSIBLE FOR ALL DIRECT COSTS ASSOCIATED WITH ANY DEVIATIONS RESULTING FROM CHANGES IN DESIGN.
  - INCLUDE BACNET CONTROLLER AND FACTORY PROGRAMMING TO OBTAIN SEQUENCES. PROVIDE WITH FIELD-MOUNTED, WIRED, PROGRAMMED CONTROLLER FOR INTERFACE WITH BUILDING AUTOMATION SYSTEM.

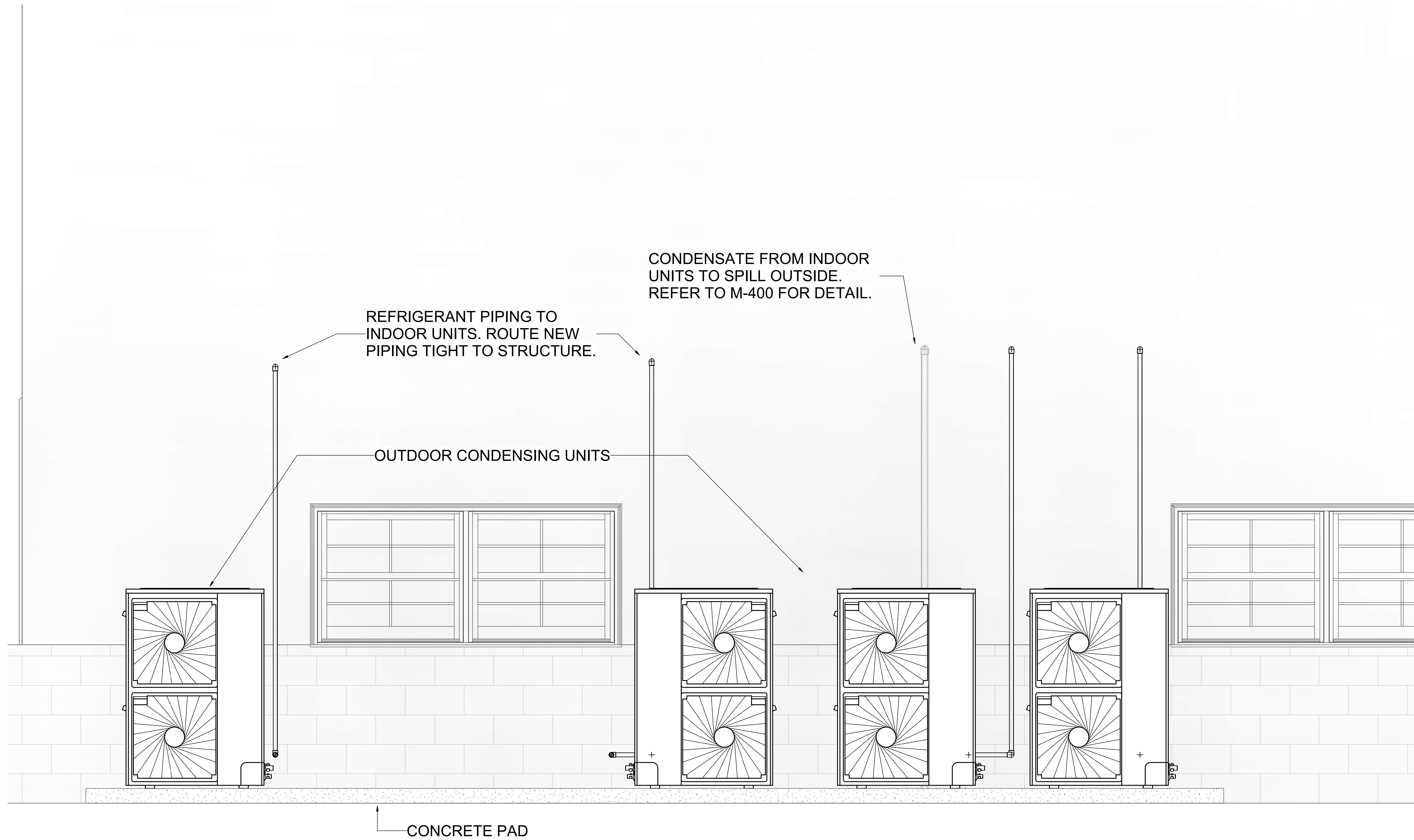
REGISTERS, GRILLES, DIFFUSERS SCHEDULE						
MARK	MANUFACTURER	MODEL	TYPE	CFM	GRILLE SIZE	REMARKS
S-1	TITUS	S300 FL	SPIRAL DUCT MOUNTED ALUMINUM DOUBLE DEFLECTION SUPPLY GRILLE, 3/4" BLADE SPACING	0-325	12x12"	ALL
S-2	TITUS	S300 FL	SPIRAL DUCT MOUNTED ALUMINUM DOUBLE DEFLECTION SUPPLY GRILLE, 3/4" BLADE SPACING	326-550	18x12"	ALL

- REMARKS:
- SIDEWALL OR DUCT MOUNTED.
  - COLOR SHALL BE SELECTED BY ARCHITECT. PROVIDE SAMPLES TO ARCHITECT.
  - PROVIDE WITH BLADE ADJUSTMENT AT GRILLE.
  - ACCEPTABLE MANUFACTURERS: TITUS, PRICE, ANEMOSTAT.

**ACCT# 540CBANFF2500**

	DRAWING INFORMATION		FUTURE FARMERS OF AMERICA - RECREATION HALL		DRAWING NO. <b>M-201</b>
	A & E FILE NO.	VKYS23	111 FFA Camp Road, Hardinsburg, KY 40143		
	DRAWING DATE	10.09.2024	<b>RECREATION HALL MECHANICAL NEW WORK</b>		
	DRAWN BY	AKP	ENGR. FILE NO.	# 540CBANFF2500	
CHECKED BY	PMG	COMMONWEALTH OF KENTUCKY FINANCE AND ADMINISTRATION CABINET DEPARTMENT FOR FACILITIES AND SUPPORT SERVICES DIVISION OF ENGINEERING AND CONTRACT ADMINISTRATION FRANKFORT, KENTUCKY		AS BUILT DATE	
PHASE	RTA			DECA LOG #	
RTA DATE		10411 Meeting Street Prospect, KY 40059 T: 502.326.3085 F: 502.326.2691			
REVISION HISTORY OF THIS DRAWING					
DESCRIPTION OF REVISIONS		DATE	DESCRIPTION OF REVISIONS		DATE
1		5			
2		6			
3		7			
4		8			





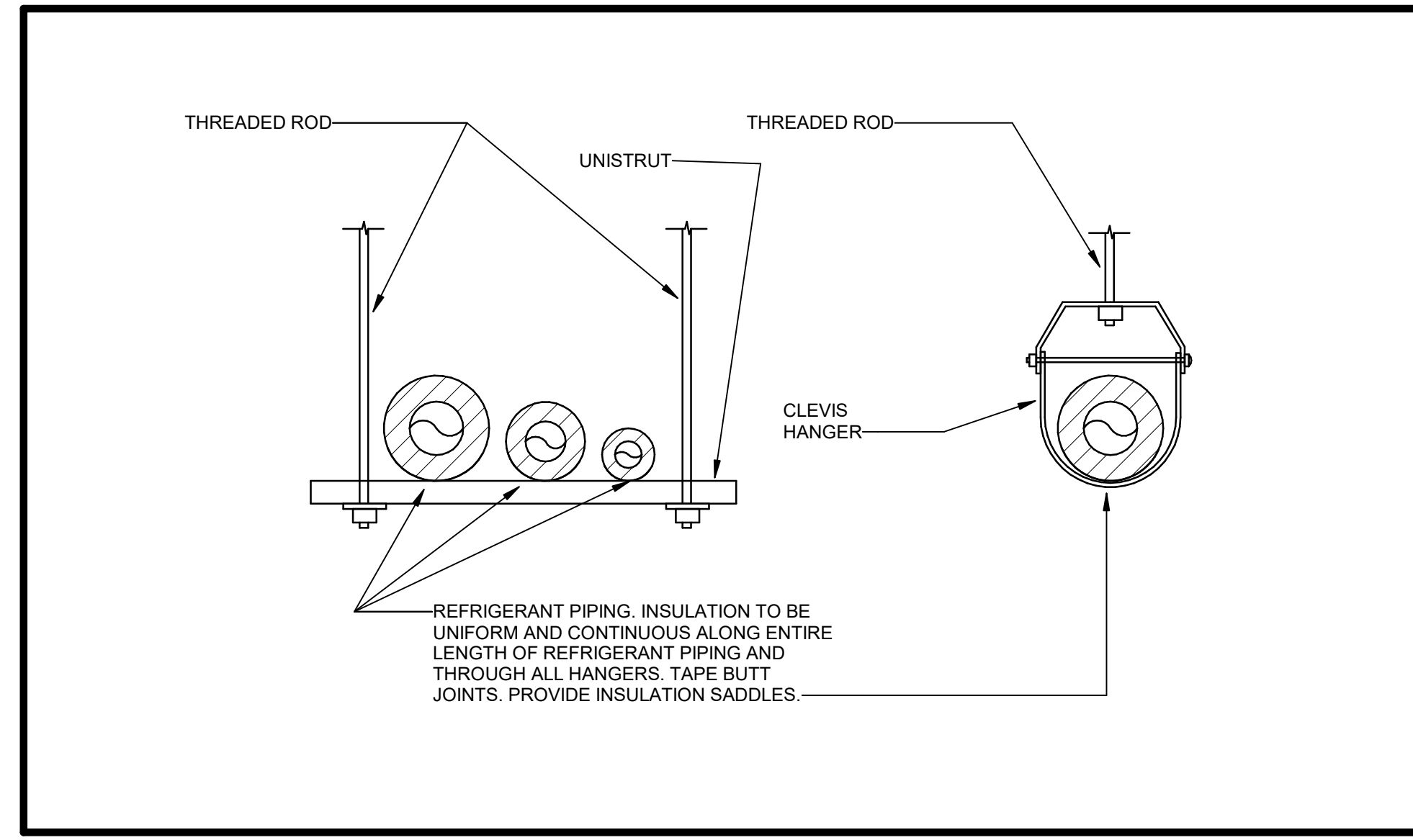
1 RECREATION HALL CONDENSING UNIT SECTION VIEW  
SCALE: 1" = 1'-0"

ACCT# 540CBANFF2500

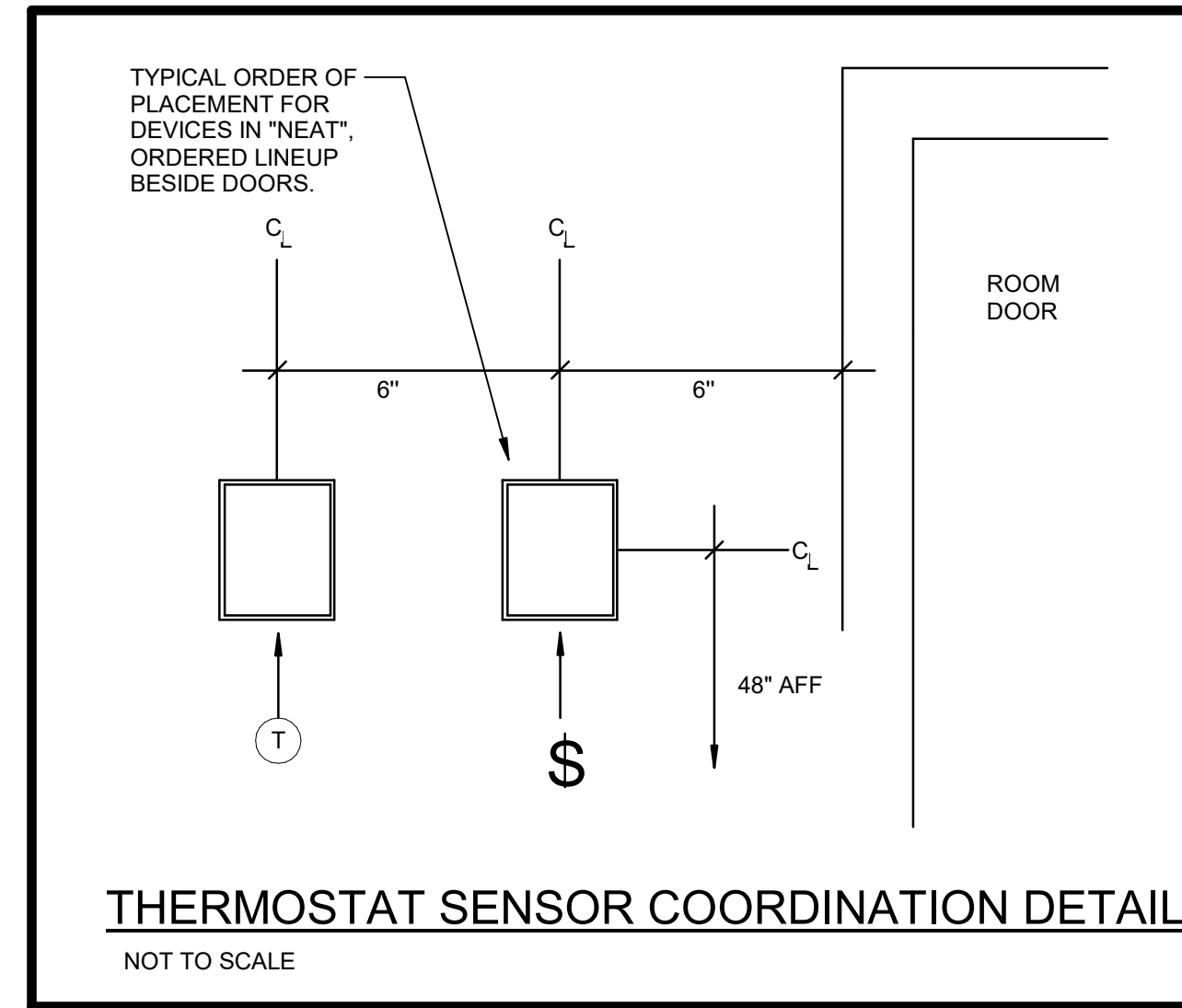
	DRAWING INFORMATION		FUTURE FARMERS OF AMERICA - RECREATION HALL		DRAWING NO. <b>M-300</b>																																				
	A & E FILE NO.	VKYS23	111 FFA Camp Road, Hardinsburg, KY 40143																																						
	DRAWING DATE	10.09.2024	<b>MECHANICAL SECTIONS</b>		AS BUILT DATE																																				
	DRAWN BY	AKP	ENGR. FILE NO.	COMMONWEALTH OF KENTUCKY FINANCE AND ADMINISTRATION CABINET DEPARTMENT FOR FACILITIES AND SUPPORT SERVICES DIVISION OF ENGINEERING AND CONTRACT ADMINISTRATION FRANKFORT, KENTUCKY	DECA LOG #																																				
CHECKED BY	PMG	# 540CBANFF2500		10411 Meeting Street Prospect, KY 40059 T: 502.326.3085 F: 502.326.2691																																					
PHASE	RTA	RTA DATE		<table border="1"> <thead> <tr> <th colspan="6">REVISION HISTORY OF THIS DRAWING</th> </tr> <tr> <th>NO.</th> <th>DESCRIPTION OF REVISIONS</th> <th>DATE</th> <th>NO.</th> <th>DESCRIPTION OF REVISIONS</th> <th>DATE</th> </tr> </thead> <tbody> <tr> <td>1</td> <td></td> <td></td> <td>5</td> <td></td> <td></td> </tr> <tr> <td>2</td> <td></td> <td></td> <td>6</td> <td></td> <td></td> </tr> <tr> <td>3</td> <td></td> <td></td> <td>7</td> <td></td> <td></td> </tr> <tr> <td>4</td> <td></td> <td></td> <td>8</td> <td></td> <td></td> </tr> </tbody> </table>			REVISION HISTORY OF THIS DRAWING						NO.	DESCRIPTION OF REVISIONS	DATE	NO.	DESCRIPTION OF REVISIONS	DATE	1			5			2			6			3			7			4			8	
REVISION HISTORY OF THIS DRAWING																																									
NO.	DESCRIPTION OF REVISIONS	DATE	NO.	DESCRIPTION OF REVISIONS	DATE																																				
1			5																																						
2			6																																						
3			7																																						
4			8																																						

ALL DIMENSIONS UNLESS OTHERWISE SPECIFIED SHALL BE IN FEET AND INCHES.  
 DIMENSIONS IN PARENT PARENTHESES ARE IN METERS.  
 10/10/2024 10:00 AM

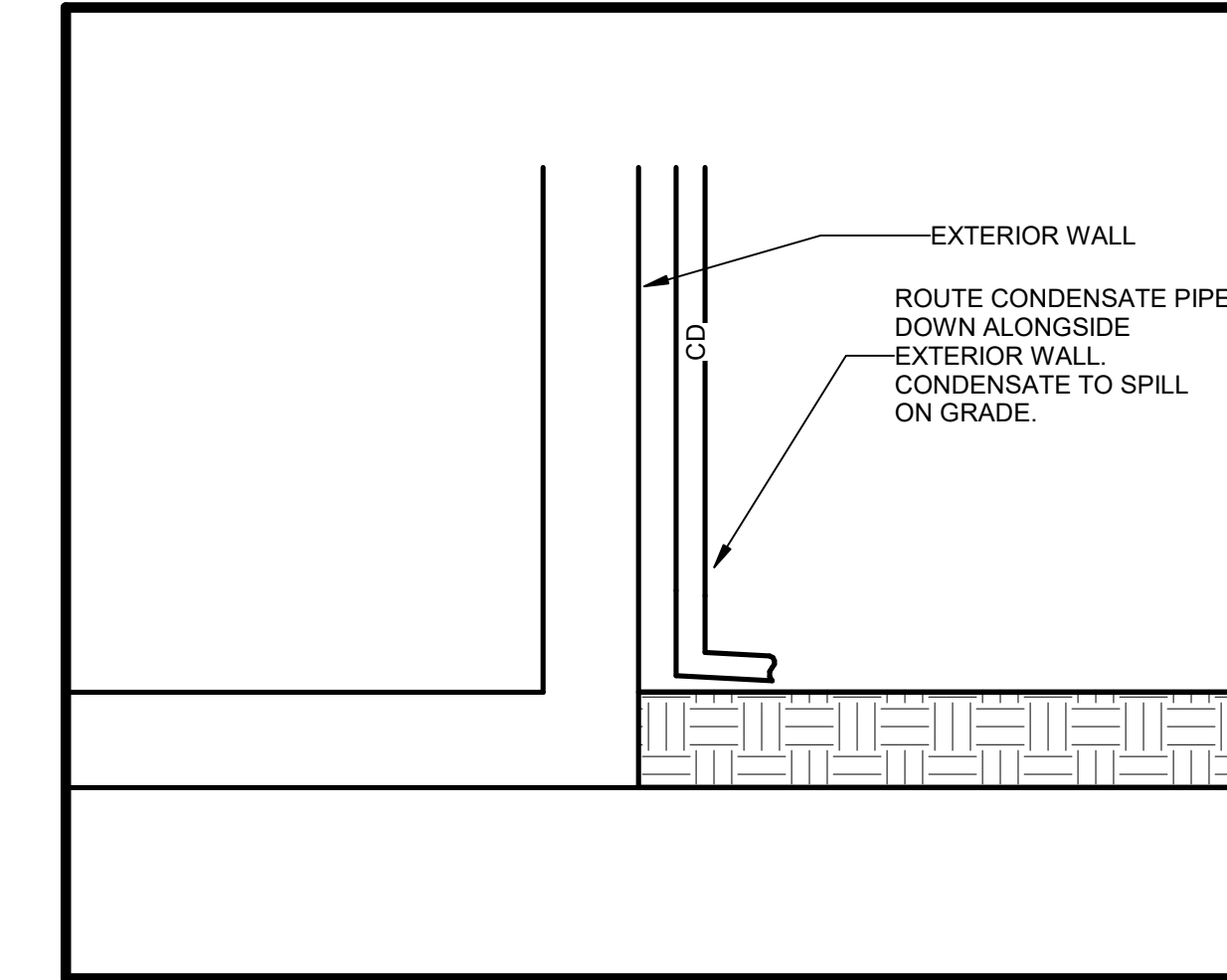




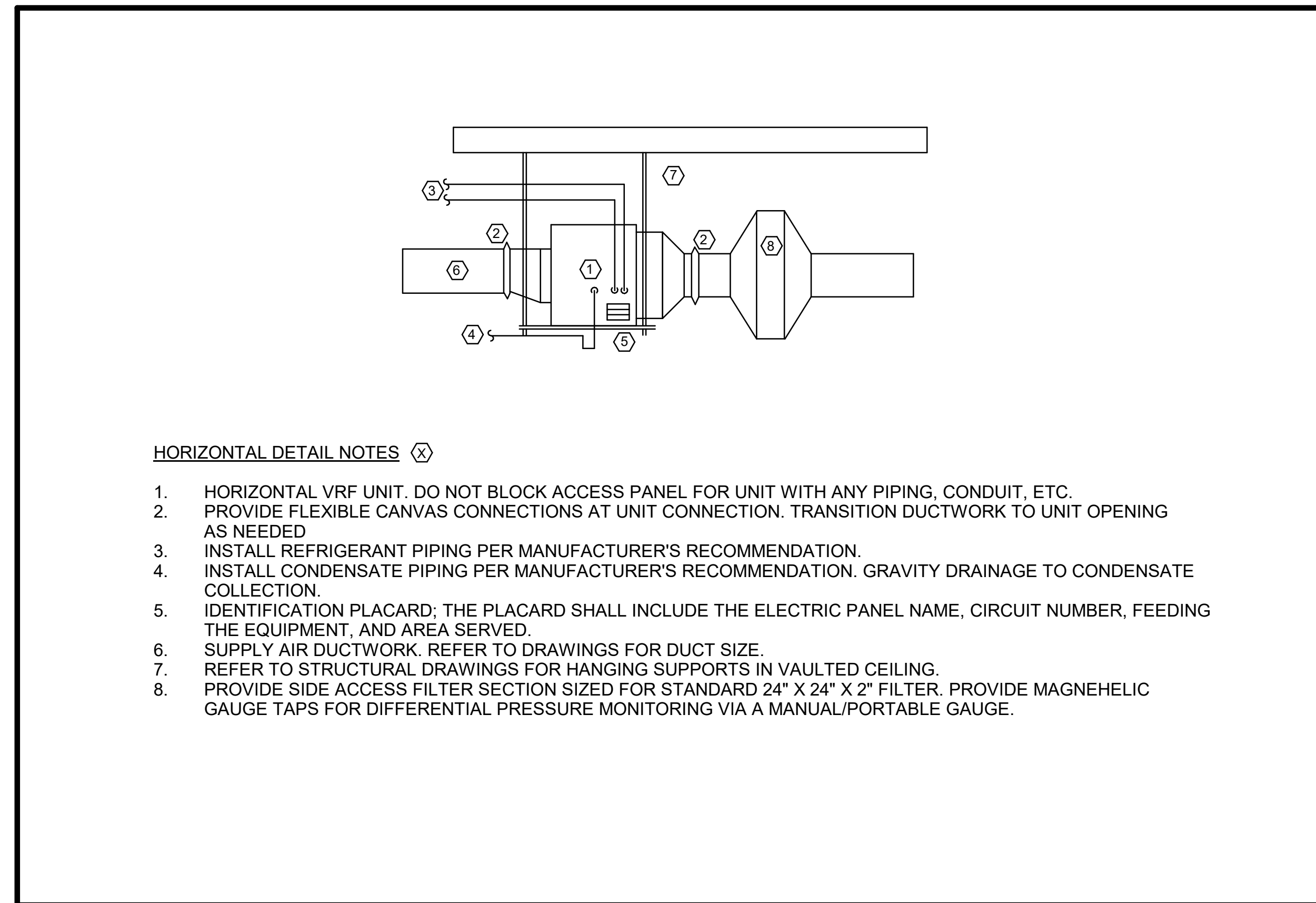
1 REFRIGERANT PIPING INSULATION DETAIL  
NO SCALE



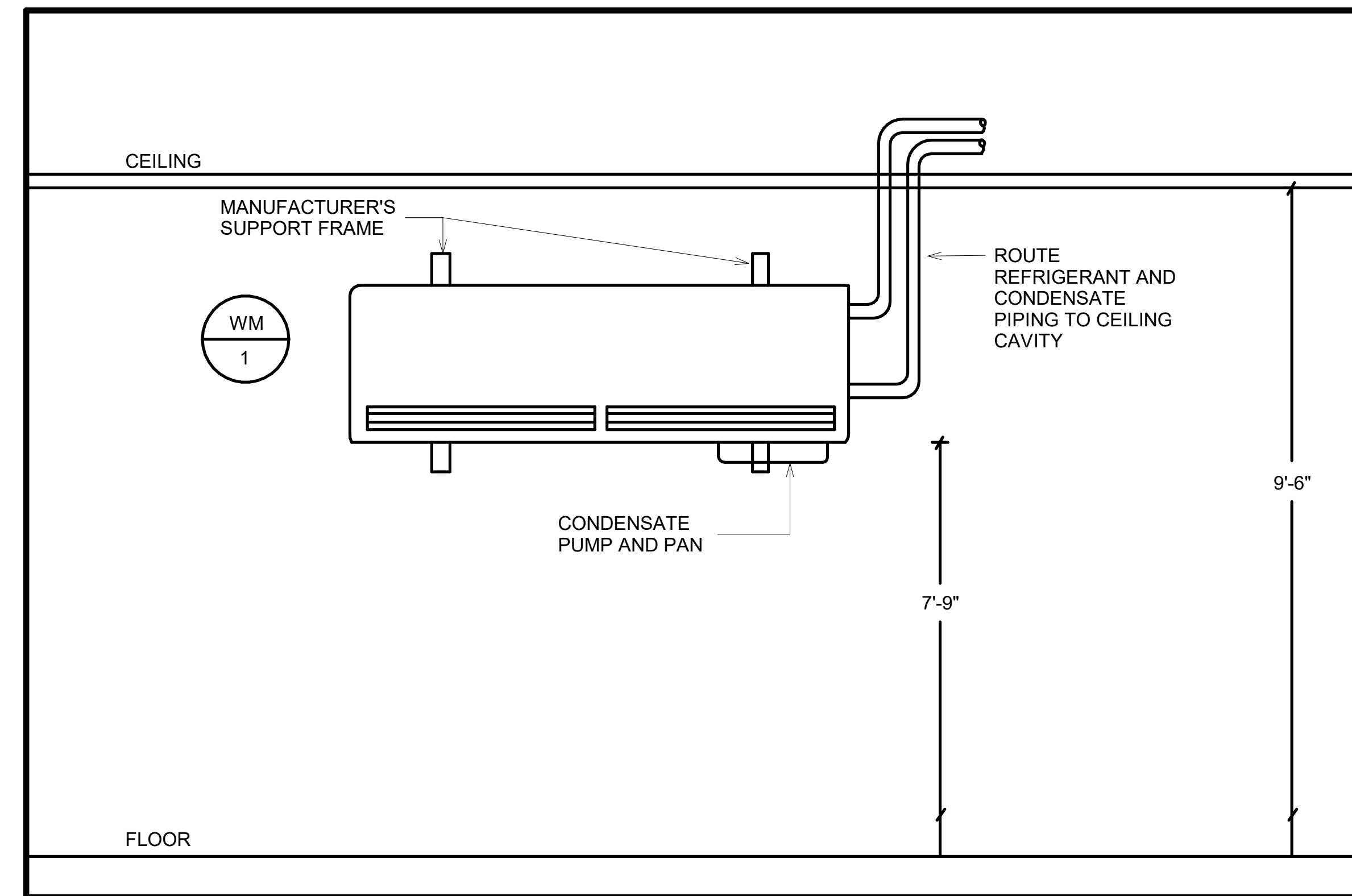
2 THERMOSTAT SENSOR COORDINATION DETAIL  
NO SCALE



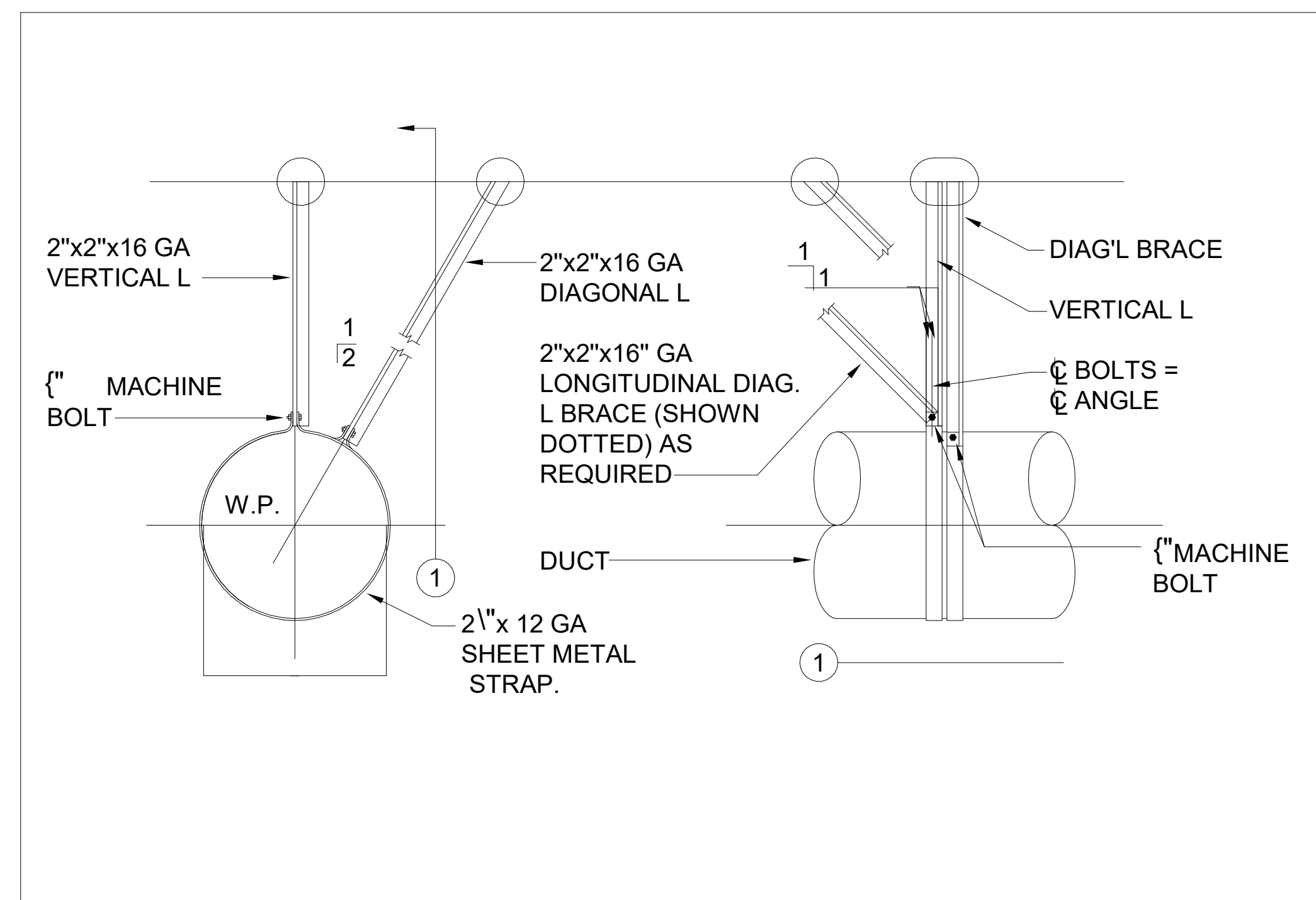
3 CONDENSATE EXTERIOR SPILL DETAIL  
NO SCALE



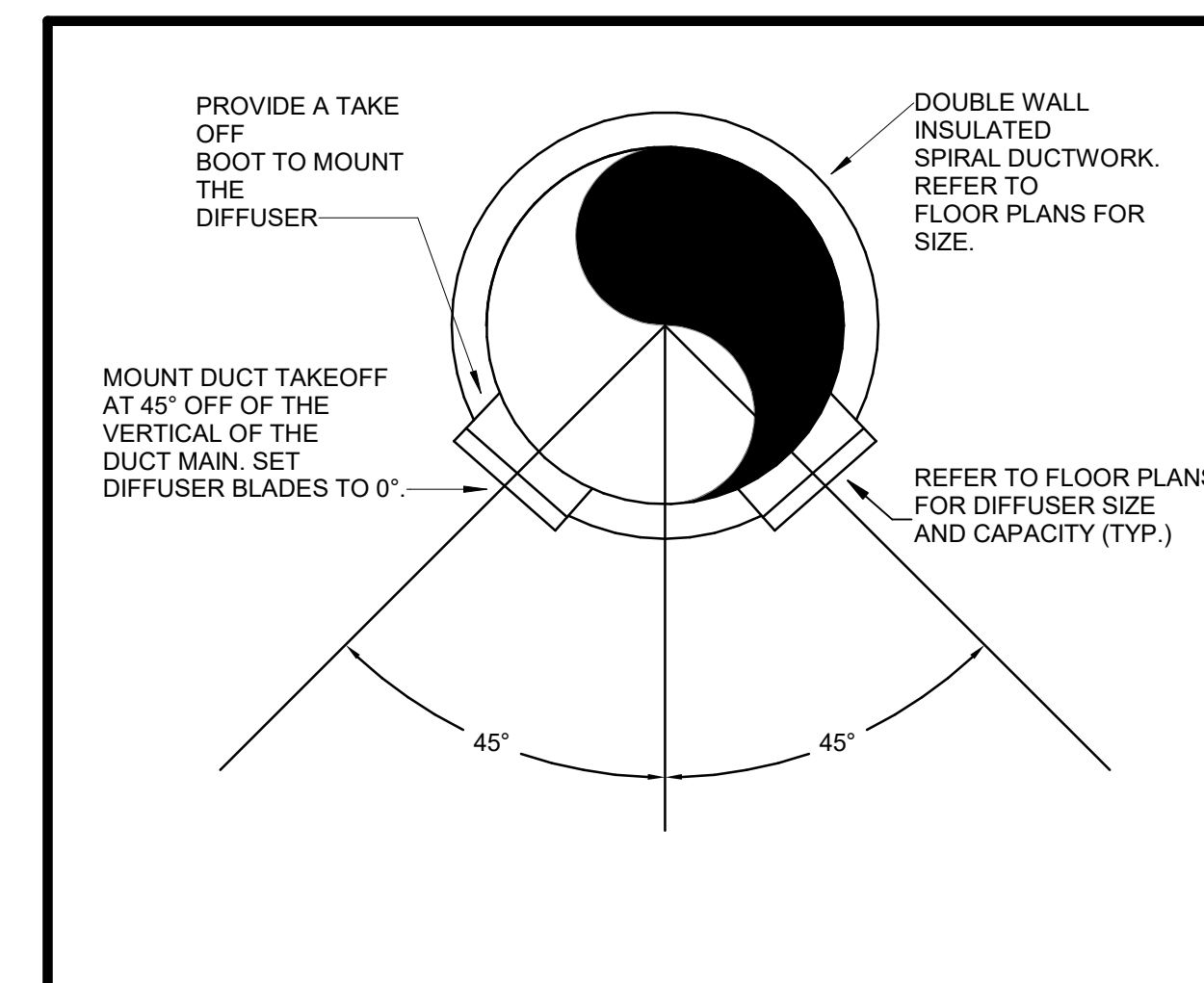
4 FAN COIL UNIT DETAIL  
NO SCALE



5 WALL MOUNTED UNIT DETAIL  
NO SCALE



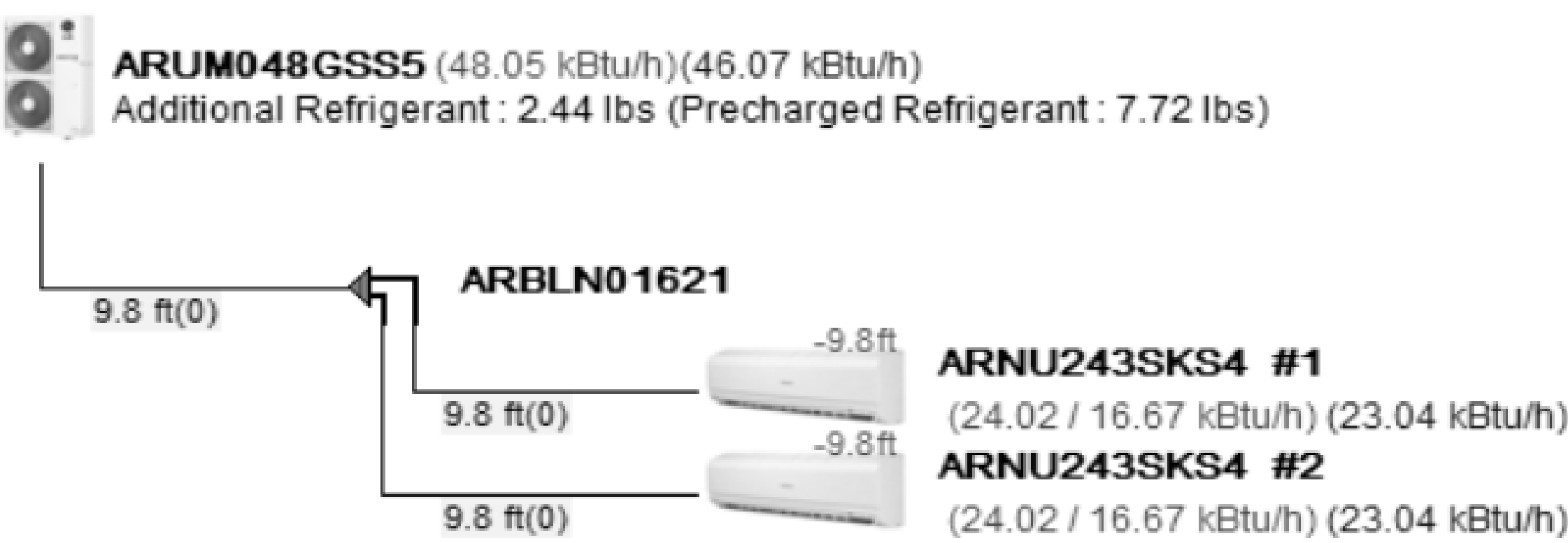
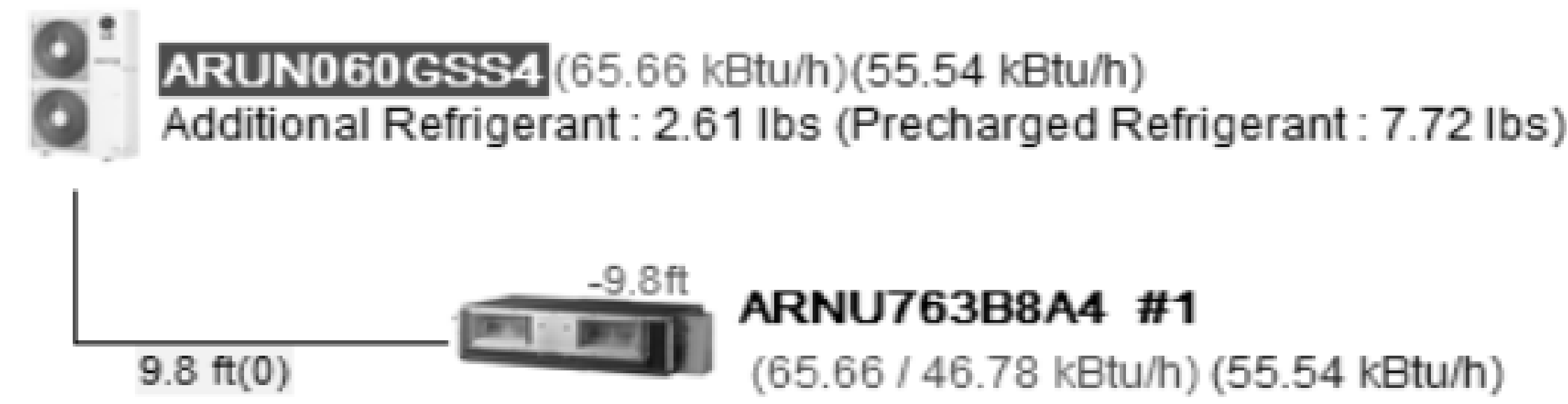
6 DUCT SUPPORT DETAIL  
NO SCALE



7 SIDEWALL DIFFUSER TAKEOFF DETAIL  
NO SCALE

ACCT# 540CBANFF2500

DRAWING INFORMATION		FUTURE FARMERS OF AMERICA - RECREATION HALL		DRAWING NO.																										
A & E FILE NO.	VKYS23	111 FFA Camp Road, Hardinsburg, KY 40143		M-400																										
DRAWING DATE	10.09.2024	<b>MECHANICAL DETAILS</b>		AS BUILT DATE																										
DRAWN BY	AKP	ENGR. FILE NO.	# 540CBANFF2500	DECA LOG #																										
CHECKED BY	PMG	COMMONWEALTH OF KENTUCKY FINANCE AND ADMINISTRATION CABINET DEPARTMENT FOR FACILITIES AND SUPPORT SERVICES DIVISION OF ENGINEERING AND CONTRACT ADMINISTRATION FRANKFORT, KENTUCKY																												
PHASE	RTA	10411 Meeting Street Prospect, KY 40059 T: 502.326.3085 F: 502.326.2691																												
RTA DATE		REVISION HISTORY OF THIS DRAWING <table border="1"> <thead> <tr> <th>NO.</th> <th>DESCRIPTION OF REVISIONS</th> <th>DATE</th> <th>DESCRIPTION OF REVISIONS</th> <th>DATE</th> </tr> </thead> <tbody> <tr> <td>1</td> <td></td> <td>5</td> <td></td> <td></td> </tr> <tr> <td>2</td> <td></td> <td>6</td> <td></td> <td></td> </tr> <tr> <td>3</td> <td></td> <td>7</td> <td></td> <td></td> </tr> <tr> <td>4</td> <td></td> <td>8</td> <td></td> <td></td> </tr> </tbody> </table>				NO.	DESCRIPTION OF REVISIONS	DATE	DESCRIPTION OF REVISIONS	DATE	1		5			2		6			3		7			4		8		
NO.	DESCRIPTION OF REVISIONS	DATE	DESCRIPTION OF REVISIONS	DATE																										
1		5																												
2		6																												
3		7																												
4		8																												



**VARIABLE REFRIGERANT FLOW SYSTEM (VRF) CONTROL:**

1. PROVIDE THE VRF SYSTEM WITH A MASTER CONTROLLER (TE-200A OR EQUAL AS BASIS OF DESIGN) ALONG WITH THE NECESSARY EXPANSION CONTROLLERS.
2. MINIMAL POINT LIST AS FOLLOWS
  - ON/OFF – SETUP, STATE, QUANTITY, CUMULATIVE OPERATION TIME.
  - ALARM SIGNALS AND ERROR CODES.
  - OPERATIONAL MODE SETUP AND STATE.
  - FAN SPEED SETUP AND STATE.
  - ALL ROOM (SPACE) TEMPERATURES.
  - UNIT OPERATING MODE – HEATING, COOLING, AND AUTO MODE.
  - FILTER.
  - PROHIBITION MODES, ON/OFF, TEMPERATURE LIMITS, ETC.
  - COMMUNICATION STATUS.
  - HIGH AND LOW TEMPERATURE LIMITS AND ALARMS.
  - SYSTEM LEVEL ALARMS.
  - NIGHT SET BACK, PURGE, MORNING START UP, ETC.
  - ALL TREND LOGS, INCLUDING ROOM TEMPERATURES.

**VARIABLE REFRIGERANT FLOW SYSTEM, SEQUENCE OF OPERATIONS:**

**DEFINITIONS:**

1. THERMAL MODE STATE: THE INTERNAL OPERATING MODE OF THE INDOOR EQUIPMENT. THE EQUIPMENT IS ALWAYS IN A THERMO STATE, REGARDLESS OF THE CURRENT EQUIPMENT MODE SETTING.
  - A. THERMO ON: THE LINEAR EXPANSION VALVE (LEV) IS MODULATED AND THE SPEED OF THE FAN IS STAGED TO ACHIEVE THE SPACE TEMPERATURE SETPOINT.
  - B. THERMO OFF: THE LEV IS CLOSED AND THE FAN IS OFF. SPACE TEMPERATURE CONTROL IS NOT ACTIVE.
  - C. DRY THERMO ON: SPACE TEMPERATURE > SPACE TEMPERATURE SETPOINT + 2°F. THE LINEAR EXPANSION VALVE (LEV) IS MODULATED AND THE SPEED OF THE FAN IS STAGED TO ACHIEVE THE SPACE TEMPERATURE SETPOINT.
  - D. DRY THERMO OFF: SPACE TEMPERATURE < SPACE TEMPERATURE SETPOINT. THE LEV IS CLOSED AND THE FAN IS OFF. SPACE TEMPERATURE CONTROL IS NOT ACTIVE.

**INDOOR POWER ON/OFF OPERATION:**

1. INITIAL EQUIPMENT STATE IS OFF. WHEN THE POWER BUTTON IS PRESSED ON THE REMOTE CONTROLLER, THE EQUIPMENT WILL TURN ON. WHEN THE POWER BUTTON IS PRESSED ON THE REMOTE CONTROLLER AGAIN, THE EQUIPMENT WILL TURN OFF. UPON THE TRANSITION FROM ON TO OFF A STARTUP DELAY IS TIMER IS ENABLED AND SET TO 3 MINUTES. DURING THIS TIME PERIOD THE EQUIPMENT IS PROHIBITED FROM TURNING ON. THIS FUNCTION IS ENABLED REGARDLESS OF EQUIPMENT MODE.

**THERMOSTAT FUNCTION:**

- WHEN THE UNIT IS CONFIGURED FOR AUTO (SINGLE) SETPOINT CONTROL:
1. WHEN SPACE TEMPERATURE IS > SPACE TEMPERATURE SETPOINT + 2°F, THE THERMAL MODE STATE IS SET TO THERMO ON. IF SPACE TEMPERATURE < SPACE TEMPERATURE SETPOINT, THE THERMAL MODE STATE IS SET TO THERMO OFF.
  2. WHEN THE UNIT IS CONFIGURED FOR AUTO (DUAL) SETPOINT CONTROL:
  3. WHEN SPACE TEMPERATURE > OCCUPIED COOLING SETPOINT + 2°F, THERMAL MODE STATE IS THERMO ON. WHEN SPACE TEMPERATURE < OCCUPIED COOLING SETPOINT, THERMAL MODE STATE IS THERMO OFF.

**ANTI-FREEZING CONTROL:**

1. THE LIQUID PIPE TEMPERATURE IS MONITORED. IF THE LIQUID PIPE TEMPERATURE IS 32°F OR LESS IN 16 MINUTES FROM COMPRESSOR STARTUP, ANTI-FREEZING CONTROL STARTS. THE EQUIPMENT TRANSITIONS TO THERMO OFF AND THE STARTUP DELAY TIMER IS ENABLED AND SET TO 3 MINUTES. THE EQUIPMENT WILL REMAIN IN THIS STATE UNTIL ONE OF THE RELEASE CONDITIONS ARE MET.

**ANTI-FREEZING RELEASE CONDITIONS:**

1. THE EQUIPMENT WILL EXIT ANTI-FREEZING CONTROL WHEN THE STARTUP DELAY TIMER HAS EXPIRED, AND ANY ONE OF THE FOLLOWING CONDITIONS IS SATISFIED.
  - A. LIQUID PIPE TEMPERATURE RISES TO 50°F OR ABOVE.
  - B. THE INDOOR UNIT ENTERS THE THERMO OFF MODE BECAUSE THE CALL FOR COOLING HAS BEEN SATISFIED IN THE ZONE.
  - C. THE EQUIPMENT MODE IS CHANGED TO A VALUE OTHER THAN COOL.
  - D. THE EQUIPMENT IS POWERED OFF VIA THE REMOTE CONTROLLER.

**FAN SPEED:**

1. THE SPEED OF THE FAN IS CONTROLLED VIA THE REMOTE CONTROLLER. WHEN AUTO IS SELECTED, FAN SPEED IS CHANGED BASED ON THE VALUE OF THE TEMPERATURE DELTA BETWEEN THE SPACE TEMPERATURE AND THE SPACE TEMPERATURE SETPOINT. WHEN FAN SPEED IS SET TO SPEED 1, SPEED 2, SPEED 3, OR SPEED 4 THE FAN WILL MAINTAIN THIS SPEED UNTIL FAN SPEED IS CHANGED TO ANOTHER STATE.
2. THE SPEED OF THE FAN IS LOWEST AT SPEED 1 AND INCREASES IN STEPS. THE SPEED OF THE FAN IS MAXIMUM AT SPEED 3 OR 4. THE NUMBER OF FAN SPEEDS AVAILABLE IS DEPENDENT ON INDOOR EQUIPMENT MODEL INSTALLED. THREE FAN SPEED CONFIGURATIONS ARE POSSIBLE: 4 SPEED + AUTO, 3 SPEED + AUTO, 4 SPEED ONLY.

**FAN MODE:**

1. WHEN FAN MODE IS SELECTED, THE INDOOR EQUIPMENT THERMAL MODE STATE IS THERMO OFF.

**FAN SPEED:**

1. THE SPEED OF THE FAN IS CONTROLLED VIA THE REMOTE CONTROLLER. WHEN FAN SPEED IS SET TO SPEED 1, SPEED 2, SPEED 3, OR SPEED 4 THE FAN WILL MAINTAIN THIS SPEED UNTIL FAN SPEED IS CHANGED TO ANOTHER STATE VIA THE REMOTE CONTROLLER. WHEN AUTO IS SELECTED THE FAN SPEED IS SET TO SPEED 1.
2. THE SPEED OF THE FAN IS LOWEST AT SPEED 1 AND INCREASES IN STEPS. THE SPEED OF THE FAN IS MAXIMUM AT SPEED 3 OR 4. THE NUMBER OF FAN SPEEDS AVAILABLE IS DEPENDENT ON INDOOR EQUIPMENT MODEL INSTALLED. THREE FAN SPEED CONFIGURATIONS ARE POSSIBLE: 4 SPEED + AUTO, 3 SPEED + AUTO, 4 SPEED ONLY.

**VANE:**

1. VANE POSITION CONTROL IS THE SAME AS COOL MODE OPERATION, BUT WITH NO RESTRICTION ON THE VANE'S DOWNWARD DISCHARGE POSITION. HEAT MODE.

**THERMOSTAT FUNCTION:**

1. THE UNIT IS CONFIGURED FOR AUTO (SINGLE) SETPOINT CONTROL WHEN SPACE TEMPERATURE < SPACE TEMPERATURE SETPOINT -2°F, THERMAL MODE STATE IS THERMO ON. WHEN SPACE TEMPERATURE > SPACE TEMPERATURE SETPOINT, THERMAL MODE STATE IS THERMO OFF.
2. THE UNIT IS CONFIGURED FOR AUTO (DUAL) SETPOINT CONTROL WHEN SPACE TEMPERATURE < OCCUPIED HEATING SETPOINT -2°F, THERMAL MODE STATE IS THERMO ON. WHEN SPACE TEMPERATURE > OCCUPIED HEATING SETPOINT, THERMAL MODE STATE IS THERMO OFF.

**NOTE:** REFRIGERANT PIPING DESIGN IS DELEGATED TO THE EQUIPMENT SUPPLIER. EQUIPMENT SUPPLIER ALONG WITH CONTRACTOR ARE RESPONSIBLE FOR DESIGNING, SIZING, AND PROVIDING REFRIGERANT PIPING AND ACCESSORIES REQUIRED BY THE HVAC EQUIPMENT MANUFACTURER TO DELIVER A COMPLETE AND FULLY FUNCTIONAL SYSTEM. THE CONTRACTOR AND HVAC EQUIPMENT MANUFACTURER SHALL COORDINATE LOCATIONS OF CONDENSING UNITS AND EVAPORATING UNITS TO MINIMIZE REFRIGERANT PIPING DISTANCES AND ADJUST PIPE SIZES AS ALLOWED BY MANUFACTURER FOR LONG REFRIGERANT PIPE RUNS. THE CONTRACTOR SHALL INFORM THE DESIGN TEAM WHEN CONDENSING UNITS ARE REQUIRED TO BE MOVED FROM THE LOCATIONS SHOWN ON THE DESIGN DOCUMENTS.

**NOTE:** PIPING DIAGRAM REPRESENTATIVE OF BASIS OF DESIGN SYSTEM. ANY DEVIATIONS FROM THE BASIS OF DESIGN VENDOR OR ALTERNATIVE VENDOR SHALL BE CONTRACTORS RESPONSIBILITY. FINAL LAYOUT SHALL BE APPROVED BY ENGINEER.

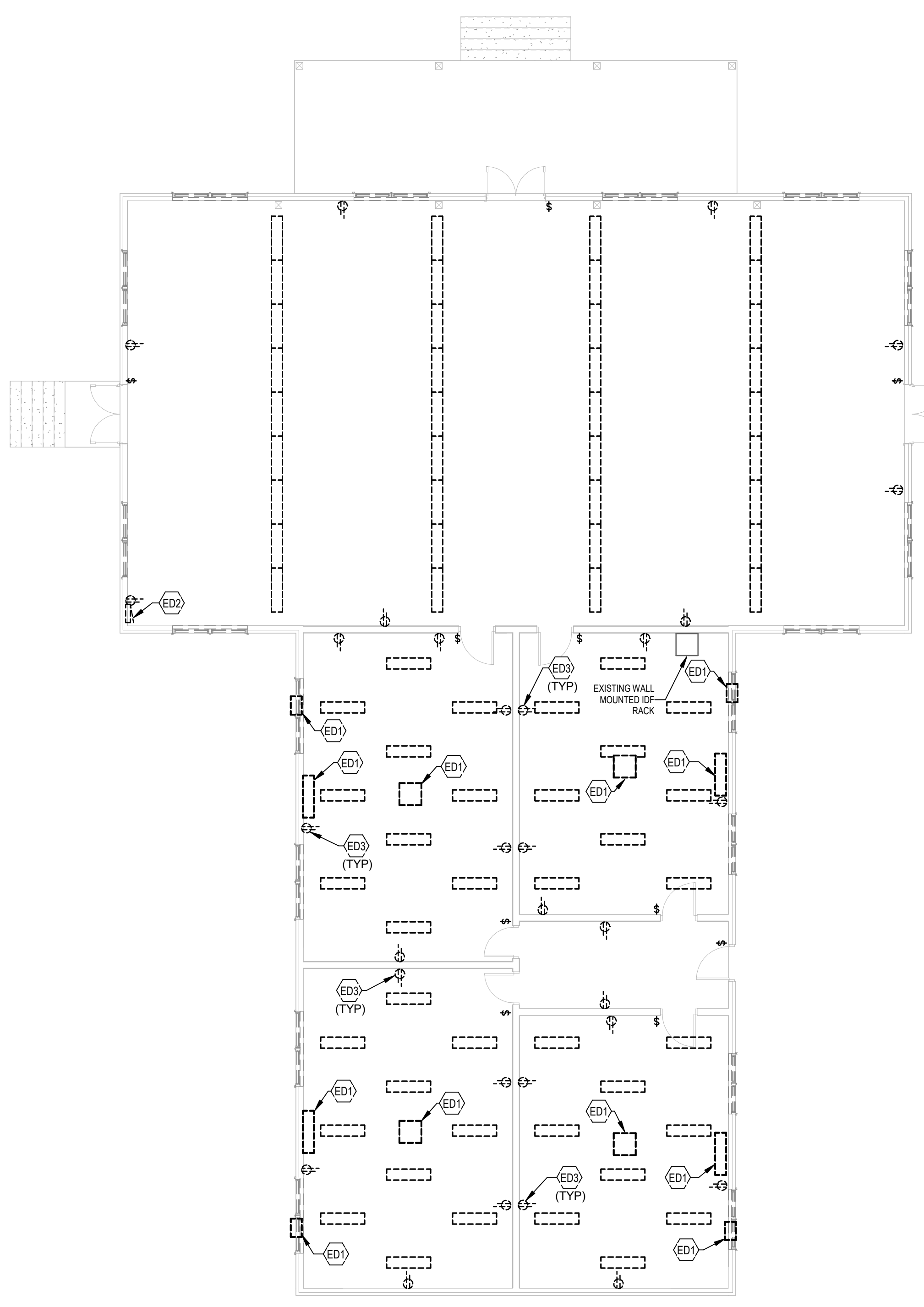
**ACCT# 540CBANFF2500**

	DRAWING INFORMATION		FUTURE FARMERS OF AMERICA - RECREATION HALL		DRAWING NO. <b>M-500</b>
	A & E FILE NO.	VKYS23	111 FFA Camp Road, Hardinsburg, KY 40143		
	DRAWING DATE	10.09.2024	<b>MECHANICAL CONTROLS</b>		
	DRAWN BY	AKP	ENGR. FILE NO.	COMMONWEALTH OF KENTUCKY FINANCE AND ADMINISTRATION CABINET DEPARTMENT FOR FACILITIES AND SUPPORT SERVICES DIVISION OF ENGINEERING AND CONTRACT ADMINISTRATION FRANKFORT, KENTUCKY	
CHECKED BY	PMG	# 540CBANFF2500		AS BUILT DATE	
PHASE	RTA			DECA LOG #	
RTA DATE					
				10411 Meeting Street Prospect, KY 40059 T: 502.326.3085 F: 502.326.2691 A LEIBERTE Company	
REVISION HISTORY OF THIS DRAWING					
DESCRIPTION OF REVISIONS	DATE	DESCRIPTION OF REVISIONS	DATE		
1		5			
2		6			
3		7			
4		8			

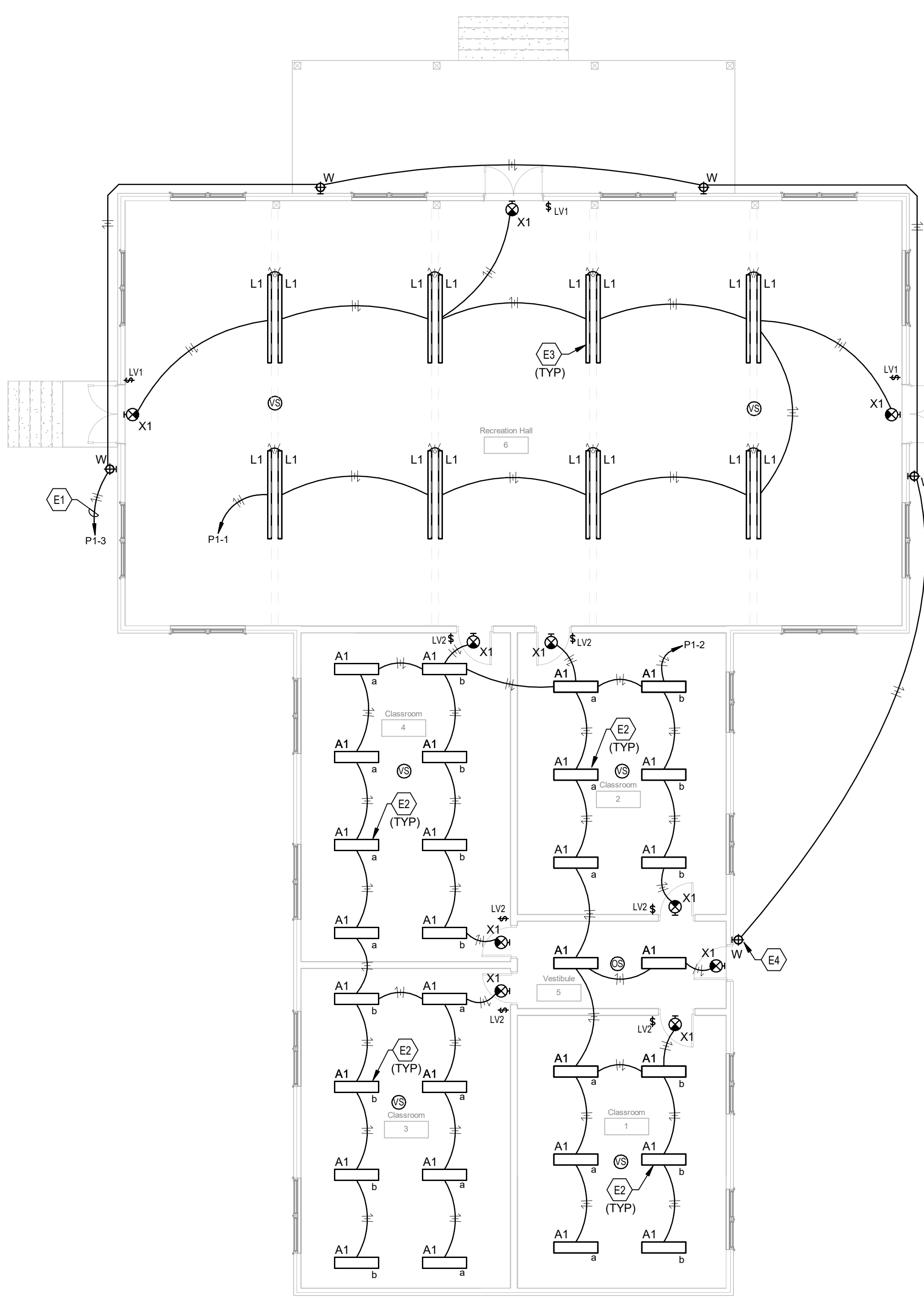




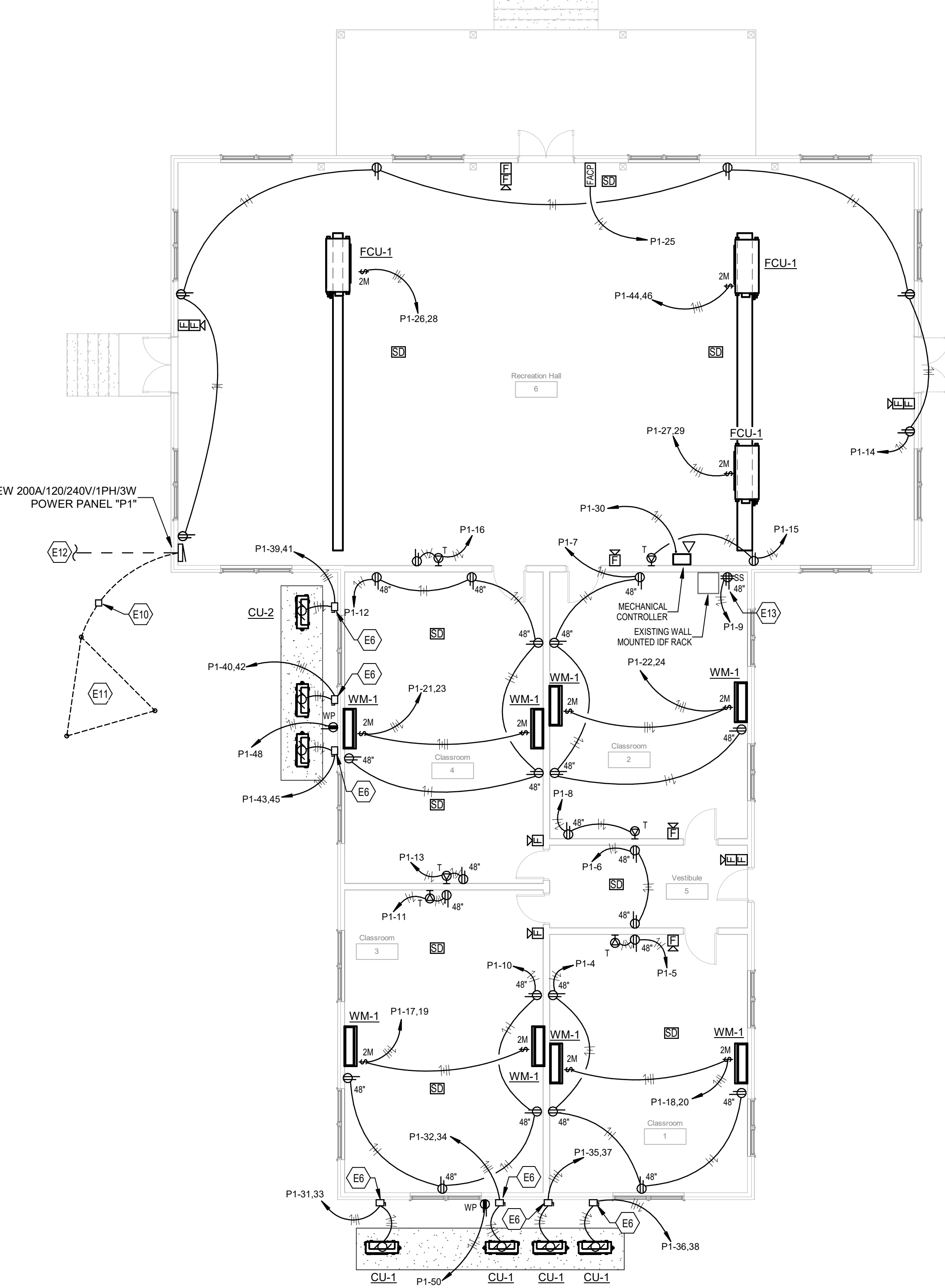




1 FIRST FLOOR PLAN - ELECTRICAL DEMOLITION  
SCALE: 1/8" = 1'-0"



2 FIRST FLOOR PLAN - LIGHTING  
SCALE: 1/8" = 1'-0"



3 FIRST FLOOR PLAN - POWER/SYSTEMS  
SCALE: 1/8" = 1'-0"

**KEYNOTES**

- E1 PROVIDE CIRCUIT(S) INDICATED THROUGH OUTDOOR LIGHTING CONTROL CONTACTOR LOCATED AT PANEL INDICATED. REFER TO OUTDOOR LIGHTING CONTROL SCHEMATIC FOR FURTHER REQUIREMENTS. CIRCUITS SHALL NOT BE ROUTED SURFACE MOUNTED ON EXTERIOR OF BUILDING.
- E2 ELECTRICAL CONTRACTOR SHALL COORDINATE MOUNTING LOCATION OF NEW LIGHT FIXTURES WITH EXISTING CEILING SYSTEM TO MOUNT LIGHT FIXTURE EVENLY IN THE SPACE.
- E3 LIGHT FIXTURE INDICATED SHALL BE MOUNTED TO SIDE OF JOIST. COORDINATE EXACT LOCATION WITH EXISTING CONDITIONS PRIOR TO CONSTRUCTION.
- E4 EXTERIOR WALL PACKS SHALL BE MOUNTED ABOVE INTERIOR CEILING LEVEL. ALL RACEWAYS SHALL BE CONCEALED ABOVE ACCESSIBLE CEILING. COORDINATE EXACT PENETRATIONS OF CONDUITS THROUGH EXTERIOR WALLS WITH ARCHITECT AND STRUCTURAL ENGINEER.
- E6 PROVIDE 60A/250V/2P FUSIBLE DISCONNECT IN NEMA-3R ENCLOSURE FUSED AT EQUIPMENT NAMEPLATE RATING. PROVIDE UNISTRUT AS REQUIRED FOR MOUNTING. COORDINATE EXACT MOUNTING LOCATION WITH ALL TRADES TO ENSURE 36" MINIMUM CLEARANCE.
- E10 PROVIDE IN GRADE PULL BOX PER DETAIL FOR GROUND TEST WELL WITH THE EXCEPTION OF PROVIDING PVC CONDUIT ELLS INTO BOX TO AVOID BONDING REQUIREMENTS. PROVIDE BURNDY TERMINAL BLOCKS FOR MECHANICAL CONNECTION POINT IN GROUNDING SYSTEM. LABEL BOX 'GROUND TEST WELL'.
- E11 ROUTE ONE (1) #250 KCMIL GROUND FROM NEW GROUND BAR AT NEW PANELBOARD "P1" TO THREE NEW 5/8"x10'-0" COPPERWELD GROUND RODS AT LEAST 20' AWAY FROM EACH OTHER AT 12" BELOW GRADE. ROUTE WIRING IN 1-1/2" CONCRETE ENCASED SCHEDULE #40 PVC CONDUIT. NO METAL RACEWAYS, ELLS OR FITTINGS SHALL BE INSTALLED. CONTRACTOR SHALL TEST GROUND SYSTEM IMPEDANCE LEVEL AND IF NOT 5-OHM CONTRACTOR SHALL ADD GROUND RODS AS NECESSARY TO MEET THIS REQUIREMENT. GROUND RODS SHALL ALSO BE CONNECTED TO BUILDING STEEL AND COLD-WATER PIPING AS REQUIRED. FIELD VERIFY BEST GROUNDING LOCATION IN UNPAVED LOCATION. PATCH AND REPAIR ALL DISTURBED SURFACES TO MATCH EXISTING. CONTRACTOR SHALL COORDINATE GROUND FIELD WITH EXISTING SANITARY PIPING. LOCATE IN GRASS FIELD VERIFY.
- E12 TO EXISTING "P7" DIST. PANELBOARD. COORDINATE EXACT LOCATION PRIOR TO BID.
- E13 COORDINATE MOUNTING LOCATION OF DEDICATED POWER FOR EXISTING IDF RACK WITH EXISTING LOCATIONS.
- ED1 REMOVE EXISTING ELECTRICAL CONNECTIONS TO MECHANICAL EQUIPMENTS BEING REMOVED. ALL WIRING SHALL BE REMOVED BACK TO ELECTRICAL PANEL COMPLETELY. COORDINATE REMOVAL AND EXACT EQUIPMENT LOCATIONS WITH MECHANICAL WORK (TYPICAL).
- ED2 EXISTING PANEL AND FEEDER SHALL BE COMPLETELY REPLACED. CONTRACTOR SHALL REWORK EXISTING RECEPTACLE CIRCUITS REMAINING AFTER DEMOLITION TO NEW REPLACEMENT PANEL. CONTRACTOR SHALL PATCH AND REPAIR ALL SURFACES AS REQUIRED TO MATCH EXISTING. WHERE EXISTING CIRCUIT IS FED UNDERGROUND AND CONTRACTOR IS UNABLE TO PULL NEW CIRCUIT THROUGH, CONTRACTOR SHALL PROVIDE WIRE MOLD BOX EXTENSION AND FEED ALL DEVICES DOWNSTREAM WITH NEW WIRING. PROVIDE METAL SURFACE MOUNTED WIRE MOLD RACEWAYS AS REQUIRED. CONTRACTOR SHALL REWORK EXISTING NON-LIGHTING CIRCUITS INCLUDING RECEPTACLE CIRCUITS SCHEDULED TO REMAIN TO NEW REPLACEMENT PANEL. FIELD VERIFY EXACT REQUIREMENTS. INTERCEPT AND EXTEND CABLING AS REQUIRED.
- ED3 ELECTRICAL CONTRACTOR SHALL LEAVE EXISTING PATHWAY IN WOOD SLATE WALL FOR ROUTING TO NEW ELECTRICAL DEVICES. COORDINATE EXACT REQUIREMENTS WITH EXISTING CONDITIONS PRIOR TO CONSTRUCTION.

**GENERAL NOTES (DEMOLITION):**

- A. DOTTED LINES INDICATE ITEMS FOR REMOVAL (UON) AND GRAY SOLID LINES INDICATE EXISTING ITEMS TO REMAIN.
- B. DEVICES INDICATED WITH AN "R" SHALL BE RELOCATED, REMOVE, PROTECT, AND REINSTALL IN NEW LOCATION INDICATED ON NEW WORK PLANS. INTERCEPT AND EXTEND ALL EXISTING CABLING TO NEW LOCATION. CLEAN AND RE-LAMP RELOCATED LUMINAIRES.
- C. THE CONTRACTOR SHALL MAINTAIN THE CONTINUITY OF EXISTING CIRCUITS THAT CONTAIN DEVICES OR EQUIPMENT THAT ARE TO REMAIN, WHEN DEMOLITION OF AN ELECTRICAL DEVICE (OR CIRCUIT) IS INDICATED ON THE DRAWINGS. THE CONTRACTOR SHALL ENSURE THAT OTHER DEVICES OR EQUIPMENT "UPSTREAM" OR "DOWNSTREAM" ON THE CIRCUITS SHALL REMAIN IN "PRE-DEMOLITION" WORKING ORDER. "LEFT-OVER" CIRCUIT BREAKERS SHALL REMAIN, BE SWITCHED TO OFF POSITION, AND BE LABELED AS SPARES IN THEIR PANELS. PROVIDE NEW TYPEWRITTEN DIRECTORIES FOR ALL PANELS AFFECTED.
- D. LOCATIONS OF DEVICES, CONNECTIONS, ETC. INDICATED ON THIS DRAWING WERE TAKEN FROM VARIOUS SOURCES. THEY ARE DIAGRAMMATIC ONLY AND ARE SUBJECT TO VARIATION FROM EXISTING CONDITIONS. CERTAIN EXISTING ELEMENTS MAY NOT BE INDICATED AT ALL. THE CONTRACTOR PROPORSING TO DO ANY PART OF THE WORK INDICATED HEREON SHALL VISIT THIS SITE AND DETERMINE TO HIS SATISFACTION THAT THEY MAY COMPLETE ALL WORK REQUIRED FOR THE BID WHICH HE PROPOSES.
- E. REMOVE ALL ASSOCIATED BACKBOXES, CONDUIT AND CONDUCTORS FOR DEVICES / FIXTURES / ETC. BEING REMOVED (BACK TO SOURCE), WHETHER INDICATED OR NOT (UON). CONTRACTOR SHALL PATCH AND REPAIR ANY EXISTING WALLS, FLOORS OR CEILINGS WHERE DEVICES ARE SHOWN TO BE REMOVED (PATCH AND REPAIR TO RECEIVE NEW FINISHES - SEE ARCHITECTURAL PLANS).
- F. COORDINATE DISPOSAL OF ALL FIXTURES, DEVICES, ETC. (INDICATED FOR DEMOLITION) WITH OWNER. TURN OVER ITEMS REMOVED TO OWNER AT THEIR OPTION.
- G. COORDINATE WITH OTHER TRADES FOR THE REMOVAL AND/OR RELOCATION OF ELECTRICAL DEVICES AND CONNECTIONS ASSOCIATED WITH THEIR EQUIPMENT.
- H. PROVIDE TEMPORARY EMERGENCY EXIT LIGHTS AT CONSTRUCTION BARRIERS AS REQUIRED.
- I. CONTRACTOR SHALL PATCH AND REPAIR ALL EXISTING WALLS / CEILINGS AS REQUIRED WHERE DEVICES ARE BEING REMOVED OR INSTALLED.
- J. UNUSED/ABANDONED CONDUCTORS DISCOVERED ABOVE ACCESSIBLE CEILINGS SHALL BE REMOVED IN ACCORDANCE WITH NEC REQUIREMENTS.
- K. EXISTING ELECTRICAL SYSTEMS IN CONFLICT WITH CONSTRUCTION SHALL BE RELOCATED TO PERMIT INSTALLATION OF DEVICES AND EQUIPMENT SHOWN ON PLANS.
- L. CONTRACTOR SHALL SEAL ALL EXISTING AND NEW PENETRATIONS OF BUILDING ENVELOPE (EXTERIOR WALLS, ROOF, ETC.) WATER-TIGHT AND AS APPROVED BY ARCHITECT AND ENGINEER. ROOFING SHALL BE RESTORED BY A LICENSED ROOFING CONTRACTOR BASED ON WRITTEN INSTRUCTIONS AND DETAILS FROM ROOFING MANUFACTURER AS REQUIRED TO MAINTAIN ROOF WARRANTY. REFER TO ARCHITECTURAL AND ENGINEERING PLANS AND SPECIFICATIONS FOR FURTHER REQUIREMENTS.
- M. ALL EXISTING PANELS AFFECTED BY THIS CONTRACTOR'S WORK SHALL BE PROVIDED WITH NEW TYPE-WRITTEN PANEL DIRECTORIES AND INSERT SLEEVES. PANEL DIRECTORIES SHALL NOT USE ROOM NAMES OR NUMBERS FROM THESE DRAWINGS. DIRECTORIES SHALL BE DETAILED AND COORDINATED WITH OWNER'S SUITE NUMBERS, FINAL ROOM NUMBERS, IT RACK NAMES, WORKSTATION DESIGNATIONS, ETC. UNUSED BREAKERS SHALL BE IN OFF POSITION.
- N. DEMOLISH ALL LIGHTING CONTROLS.

**GENERAL NOTES (LIGHTING):**

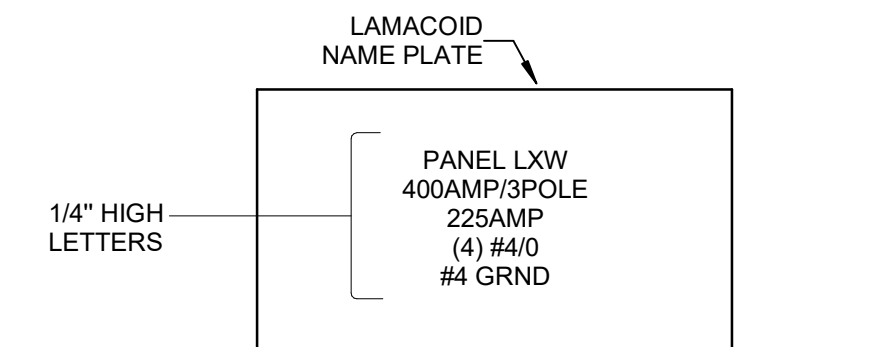
- A. REFER TO THE ARCHITECT'S REFLECTED CEILING PLANS, ELEVATIONS, AND CASEWORK DETAILS FOR EXACT LOCATIONS OF ALL WALL AND CEILING MOUNTED ELECTRICAL DEVICES.
- B. CONTRACTOR SHALL FOLLOW BRANCH CIRCUITING LAY-OUT, AS INDICATED ON THE FLOOR PLANS, WITH A MAXIMUM OF THREE (3) BRANCH CIRCUITS PER HOMERUN. EACH BRANCH CIRCUIT SHALL BE PROVIDED WITH A DEDICATED NEUTRAL CONDUCTOR. DEDICATED NEUTRAL CONDUCTORS SHALL BE CONSIDERED CURRENT CARRYING. IF ADDITIONAL CONDUCTORS ARE RAN IN THE SAME CONDUIT WITH THOSE INDICATED, CONTRACTOR SHALL DERATE ALL CURRENT CARRYING CONDUCTORS PER N.E.C. #310.15(B)(3), AND UPSIZE CONDUIT AS REQUIRED PER N.E.C. #310.17 AND ANNEX C. MULTIWIRE BRANCH CIRCUITS AS DEFINED IN N.E.C. #100 / 210.4 (CIRCUITS SHARING A COMMON NEUTRAL CONDUCTOR) SHALL NOT BE PERMITTED.
- C. IDENTIFY THE PANEL AND CIRCUIT NUMBER FOR ALL RECEPTACLES, SWITCHES, ETC. IN AREA OF CONSTRUCTION. PROVIDE CLEAR ADHESIVE LABELS WITH BLACK LETTERING. IN HEALTHCARE FACILITIES, ENGRAVE EMERGENCY DEVICE COVERPLATES IN PATIENT CARE AREAS. ALSO, MARK INSIDES OF ALL DEVICE BOXES WITH PANEL AND CIRCUIT NUMBER.
- D. LOCATE CHAIN-HUNG INDUSTRIAL FIXTURES IN MECHANICAL ROOMS TO AVOID DUCTWORK AND PIPING, TO MAXIMIZE AVAILABLE LIGHT. SPACE AROUND EQUIPMENT, AIR HANDLERS, ETC. TO PROVIDE ADEQUATE LIGHTING TO ALL AREAS OF ROOM. PROVIDE ADDITIONAL FIXTURES OF SAME TYPE AS NEEDED TO FULFILL THIS REQUIREMENT.
- E. LOCATE EXIT SIGNS FOR MAXIMUM VIEWING AREA TO IDENTIFY EGRESS PATHS AS INDICATED ON PLANS. COORDINATE LOCATIONS SUCH THAT ARCHITECTURAL FEATURES OR EQUIPMENT FROM OTHER TRADES DO NOT OBSTRUCT VIEW.
- F. LUMINAIRES INDICATED WITH MULTI-LEVEL SWITCHING SHALL HAVE SIMILAR LAMPS CONTROLLED TOGETHER, I.E. INBOARD AND OUTBOARD LAMPS OR RIGHT AND LEFT HAND LAMPS.
- G. ALL LIGHTING FIXTURE LENSES, PARABOLIC LOUVERS, DOWNLIGHTING ALZAK CONES AND "PARACUBE" LOUVERS SHALL BE HANDLED WITH COTTON GLOVES DURING INSTALLATION AND LAMPING TO AVOID FINGERPRINTS OR DIRT DEPOSITS. IT IS PREFERRED THAT FIXTURES BE SHIPPED AND INSTALLED WITH CLEAR PLASTIC BAGS TO PROTECT LOUVERS. AT CLOSE OF PROJECT, AND AFTER CONSTRUCTION AIR FILTERS ARE CHANGED, REMOVE BAGS. ANY LOUVER OR CONE SHOWING DIRT OR FINGER PRINTS SHALL BE CLEANED WITH SOLVENT RECOMMENDED BY THE MANUFACTURER. OR REPLACED AS NECESSARY IN ORDER TO TURN OVER TO THE OWNER NEW FIXTURES AT OCCUPANCY.
- H. RECESSED LUMINAIRES SHALL BE SECURED SUCH THAT THE FORCE REQUIRED INSERTING LAMPS, TRIMS, LENSES, LOUVERS, OR DOOR FRAMES DOES NOT SHIFT HOUSING. ALL TRIMS SHALL BE COMPLETELY FLUSH WITH FINISHED CEILINGS AT COMPLETION OF CONSTRUCTION.
- I. CONTRACTOR SHALL PROVIDE UNSWITCHED CONDUCTOR TO ALL EXIT SIGNS, EMERGENCY INVERTER BATTERY PACKS, AND NIGHT LIGHTS AS REQUIRED.

**GENERAL NOTES (POWER/SYSTEMS):**

- A. REFER TO THE ARCHITECT'S REFLECTED CEILING PLANS, ELEVATIONS, AND CASEWORK DETAILS FOR EXACT LOCATIONS OF ALL WALL AND CEILING MOUNTED ELECTRICAL DEVICES.
- B. CONTRACTOR SHALL FOLLOW BRANCH CIRCUITING LAY-OUT, AS INDICATED ON THE FLOOR PLANS, WITH A MAXIMUM OF THREE (3) BRANCH CIRCUITS PER HOMERUN. EACH BRANCH CIRCUIT SHALL BE PROVIDED WITH A DEDICATED NEUTRAL CONDUCTOR. DEDICATED NEUTRAL CONDUCTORS SHALL BE CONSIDERED CURRENT CARRYING. IF ADDITIONAL CONDUCTORS ARE RAN IN THE SAME CONDUIT WITH THOSE INDICATED, CONTRACTOR SHALL DERATE ALL CURRENT CARRYING CONDUCTORS PER NEC 310.15(B)(3), AND UPSIZE CONDUIT AS REQUIRED PER NEC 300.17 AND ANNEX C. MULTIWIRE BRANCH CIRCUITS AS DEFINED IN NEC 100 / 210.4 (CIRCUITS SHARING A COMMON NEUTRAL CONDUCTOR) SHALL NOT BE PERMITTED.
- C. IDENTIFY THE PANEL AND CIRCUIT NUMBER FOR ALL RECEPTACLES, SWITCHES, ETC. IN AREA OF CONSTRUCTION. PROVIDE CLEAR ADHESIVE LABELS WITH BLACK LETTERING. IN HEALTHCARE FACILITIES, ENGRAVE EMERGENCY DEVICE COVERPLATES IN PATIENT CARE AREAS. MARK INSIDES OF ALL DEVICE BOXES WITH PANEL AND CIRCUIT NUMBER.
- D. RECEPTACLES THAT ARE CONTROLLED BY AN AUTOMATIC MEANS SUCH AS OCCUPANCY SENSOR OR ENERGY MANAGEMENT SYSTEM SHALL BE MARKED IN ACCORDANCE WITH NEC 406.3(E).
- E. LOCATIONS OF ELECTRICAL CONNECTIONS AND LOCAL DISCONNECTS SHALL BE COORDINATED WITH MECHANICAL AND PLUMBING CONTRACTORS TO ENSURE ACCESS AND WORKING CLEARANCE IS MAINTAINED PER NEC. NOTIFY OTHER TRADES OF REQUIRED CLEARANCE AREAS TO AVOID ROUTING OF OTHER SYSTEMS IN THESE AREAS. DO NOT INSTALL ELECTRICAL EQUIPMENT OVER EQUIPMENT NAMEPLATES OR ACCESS PANELS OR THROUGH ACCESS/MAINTENANCE CLEARANCES OF EQUIPMENT BY OTHER TRADES.
- F. REFER TO "SYSTEM INSTALLATION MATRIX" (ON SYSTEMS LEGEND SHEET) AND SPECIFICATIONS FOR CONTRACTOR REQUIREMENTS OF EACH SYSTEM.
- G. THE CONTRACTOR SHALL ROUTE ALL "SYSTEM CONDUIT STUB-UPS" TO THE NEAREST CORRIDOR CABLING PATH (SEE "STUB-UP" DETAILS). REFER TO CABLING PATH INSTALLATION DETAIL FOR ADDITIONAL REQUIREMENTS.
- H. CONTRACTOR SHALL PAINT ALL SYSTEMS CONDUIT STUB-UPS LIGHT BLUE FOR SYSTEMS CABLING INTO THE CORRIDOR CABLING PATH. PROVIDE PULL STRINGS IN ALL NEW CONDUIT RUNS FOR SYSTEM CABLING INSTALLATION.
- I. ELECTRICAL CONTRACTOR SHALL UTILIZE EXISTING PATHWAYS IN EXISTING WOOD WALLS TO MINIMIZE REPAIRING WALL. COORDINATE EXACT REQUIREMENTS WITH EXISTING CONDITIONS PRIOR CONSTRUCTION.

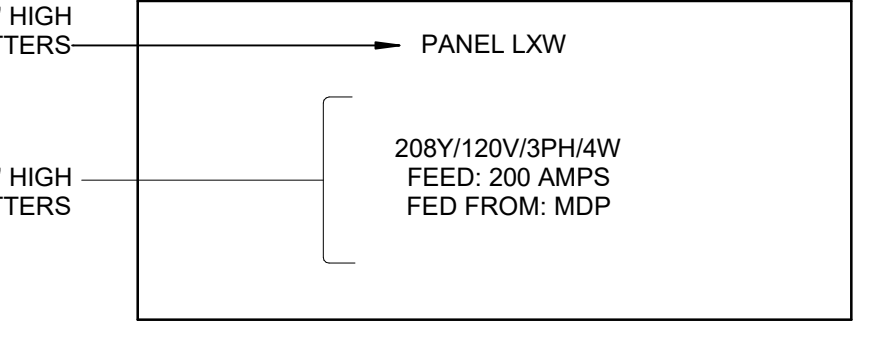
**ACCT# 540CBANFF2500**

	DRAWING INFORMATION		FUTURE FARMERS OF AMERICA - RECREATION HALL		DRAWING NO. <b>E-200</b>
	A & E FILE NO.	VKYS23	111 FFA Camp Road, Hardinsburg, KY 40143		
	DRAWING DATE	10.09.2024	<b>FIRST FLOOR PLAN - ELECTRICAL</b>		
	DRAWN BY	ALG	ENGR. FILE NO. # 540CBANFF2500		
COMMONWEALTH OF KENTUCKY FINANCE AND ADMINISTRATION CABINET DEPARTMENT FOR FACILITIES AND SUPPORT SERVICES DIVISION OF ENGINEERING AND CONTRACT ADMINISTRATION FRANKFORT, KENTUCKY		AS BUILT DATE		DECA LOG #	
CMTA A LEIBERFEE COMPANY		10411 Meeting Street Prospect, KY 40059 T: 502.326.3085 F: 502.326.2691		REVISION HISTORY OF THIS DRAWING	
DESCRIPTION OF REVISIONS		DATE	DESCRIPTION OF REVISIONS		DATE
1			5		
2			6		
3			7		
4			8		



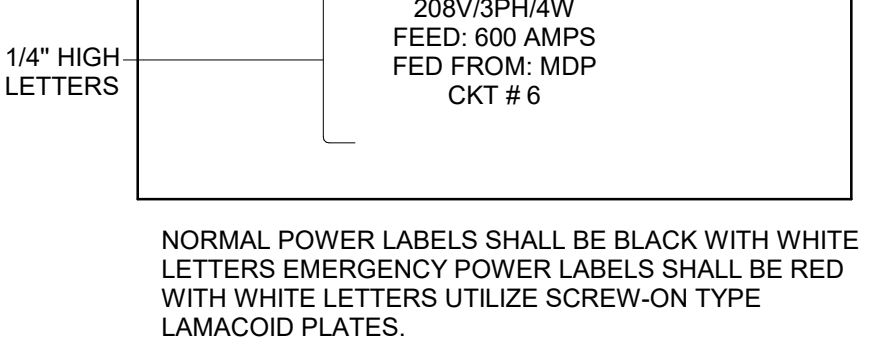
NORMAL POWER LABELS SHALL BE BLACK WITH WHITE LETTERS EMERGENCY POWER LABELS SHALL BE RED WITH WHITE LETTERS UTILIZE SCREW-ON TYPE LAMACOID PLATES.

TYPICAL SWITCHBOARD AND DISTRIBUTION PANELBOARD CIRCUIT LABEL NAMEPLATE DETAIL NO SCALE



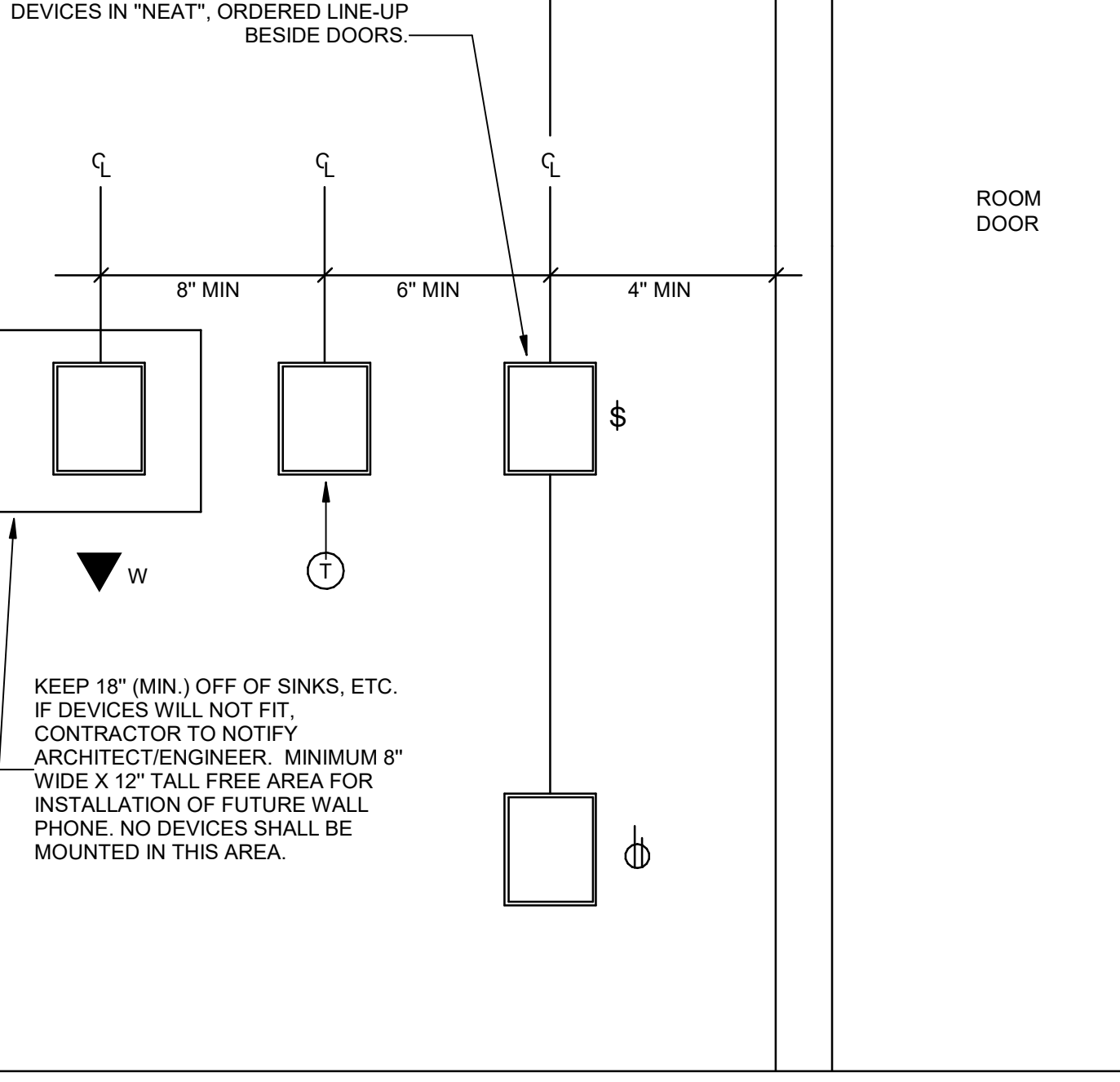
NORMAL POWER LABELS SHALL BE BLACK WITH WHITE LETTERS EMERGENCY POWER LABELS SHALL BE RED WITH WHITE LETTERS UTILIZE SCREW-ON TYPE LAMACOID PLATES.

TYPICAL POWER PANEL NAMEPLATE DETAIL NO SCALE



NORMAL POWER LABELS SHALL BE BLACK WITH WHITE LETTERS EMERGENCY POWER LABELS SHALL BE RED WITH WHITE LETTERS UTILIZE SCREW-ON TYPE LAMACOID PLATES.

TYPICAL DISCONNECT AND COMBINATION STARTER/CONNECT NAMEPLATE DETAIL NO SCALE

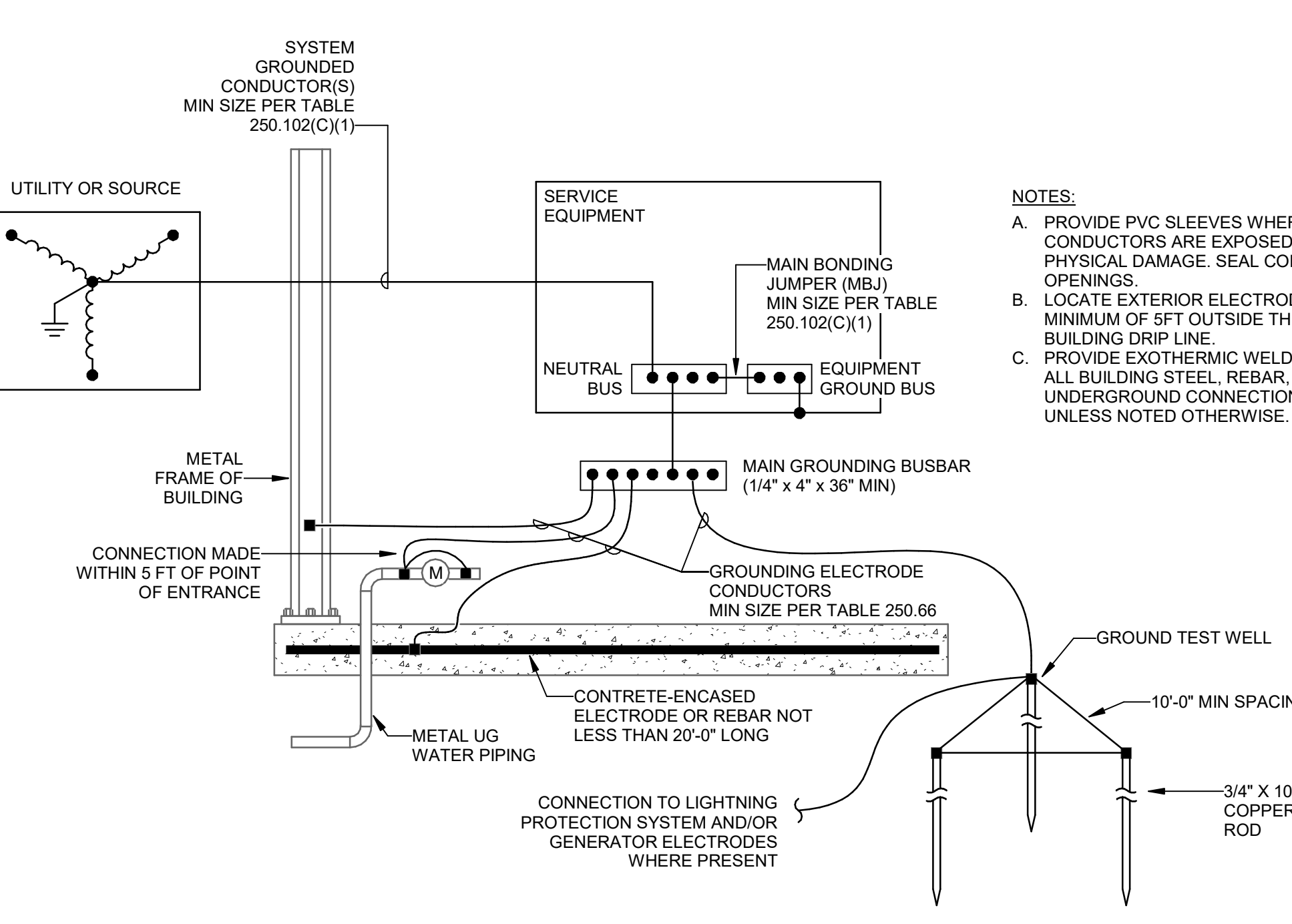


KEEP 18" (MIN.) OFF OF SINKS, ETC. IF DEVICES WILL NOT FIT, CONTRACTOR TO NOTIFY ARCHITECT/ENGINEER. MINIMUM 8" WIDE X 12" TALL FREE AREA FOR INSTALLATION OF FUTURE WALL PHONE. NO DEVICES SHALL BE MOUNTED IN THIS AREA.

### 5 DEVICE ALIGNMENT AND COORDINATION

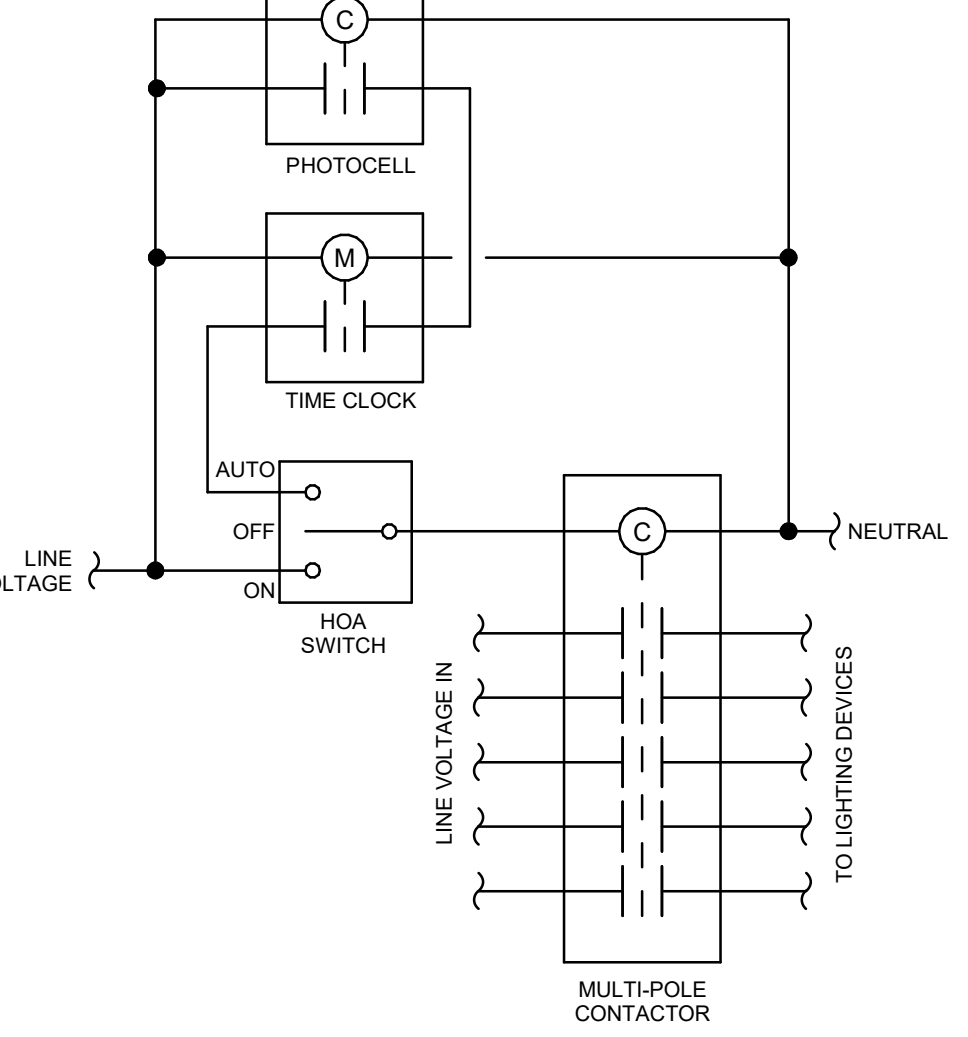
NO SCALE

PANELBOARD AND WIRING SCHEDULE															
PANEL: P1			MAINS TYPE: SPD: SURFACE					SCCR (KA): SUPPLY FROM:							
VOLTAGE: 120/240V 1P/3W			MOUNTING: SURFACE					AVAIL FAULT CURRENT (KA):							
AMPERES: 300 A			MOUNTING: SURFACE					SUPPLY FROM:							
CIRCUIT DESCRIPTION	WIRE	COND	C	OC	P	CKT	A	B	CKT	OC	C	COND	WIRE	CIRCUIT DESCRIPTION	
LTNG - RECREATION HALL 6			20	1	1	0.9	1.8		2	1	20			LTNG - CLASSRM 1,2,3,4	
LTNG - EXTERIOR			20	1	3			0.2	0.7	4	1	20		REC - CLASSROOM 1	
REC - CLASSROOM 1			20	1	5	0.4	0.4		0.7	6	1	20		REC - VESTIBULE 5	
REC - CLASSROOM 2			20	1	7					8	1	20		REC - CLASSROOM 2	
REC - CLASSROOM 3			20	1	9	0.2	0.7			10	1	20		REC - CLASSROOM 3	
REC - CLASSROOM 4			20	1	11			0.4	0.9	12	1	20		REC - CLASSROOM 4	
REC - CLASSROOM 4			20	1	13	0.4	1.1			14	1	20		REC - RECREATION HALL 6	
REC - RECREATION HALL 6			20	1	15			0.4	0.4	16	1	20		REC - RECREATION HALL 6	
HVAC EQUIP. - CLASSROOM 3			20	2	17	0.4	0.5			18	2	20		HVAC EQUIP. - CLASSROOM 1	
HVAC EQUIP. - CLASSROOM 4			20	2	19			0.4	0.5	20	2	20		HVAC EQUIP. - CLASSROOM 1	
FACP			20	2	21	0.5	0.5			22	2	20		EQUIP	
FCU-1			20	2	23			0.8	0.8	24	2	20		FCU-1	
FCU-1			20	2	25	0.5	0.8			26	2	15		FCU-1	
FCU-1			15	2	27			0.8	0.8	28	2	20		HVAC CONTROLLER	
CU-1			8	10	40	2	31			32	2	40	10	8	CU-1
CU-1			8	10	40	2	33	2.6	2.6	34	2	40	10	8	CU-1
CU-1			8	10	40	2	35			36	2	40	10	8	CU-1
CU-1			8	10	40	2	37	2.6	2.6	38	2	40	10	8	CU-1
CU-2			8	10	40	2	39			40	2	40	10	8	CU-2
CU-2			8	10	40	2	41	2.6	2.6	42	2	40	10	8	CU-2
CU-2			8	10	40	2	43			44	2	20		FCU-1	
CU-2			8	10	40	2	45	2.6	0.8	46	2	20		FCU-1	
SPARE			--	--	20	1	47			48	1	20		REC - EXTERIOR	
SPARE			--	--	20	1	49	0.0	0.2	50	1	20		REC - EXTERIOR	
SPARE			--	--	20	1	51			52	1	20	--	SPARE	
SPARE			--	--	20	1	53	0.0	0.0	54	1	20	--	SPARE	
TOTAL LOAD (KVA):			29.5 KVA			26.7 KVA			30						
TOTAL CURRENT (A):			246 A			223 A			30						
LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	ESTIMATED DEMAND	PANEL TOTALS											
EQUIP	4720 VA	100.00%	4720 VA	TOTAL CONNECTED LOAD: 36 KVA											
LTNG	289 VA	100.00%	289 VA	TOTAL ESTIMATED DEMAND: 36 KVA											
REC	6120 VA	100.00%	6120 VA	TOTAL CONNECTED CURRENT: 234 A											
				TOTAL ESTIMATED DEMAND CURRENT: 234 A											



### 4 GROUNDING ELECTRODE SYSTEM DETAIL

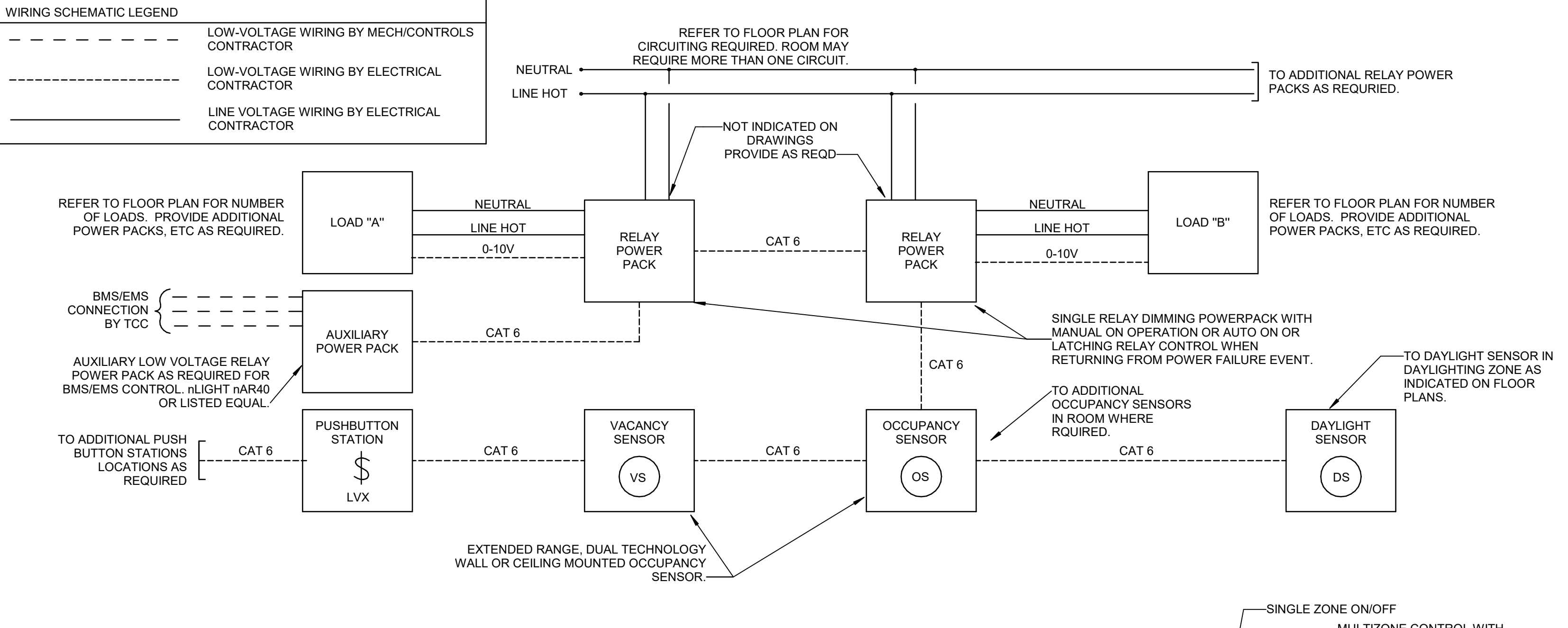
NO SCALE



NOTES:  
 A. PROVIDE QUANTITY OF CONTACTORS AS REQUIRED.  
 B. INSTALL TIME CLOCK AND CONTACTORS IN RINGED ENCLOSURE RATED FOR ENVIRONMENT INSTALLED.  
 C. HOA TO BE OPERABLE WITHOUT OPENING ENCLOSURE.  
 D. INSTALL PHOTOCELL ON ROOF FACING NORTH UNLESS OTHERWISE NOTED ON PLANS.

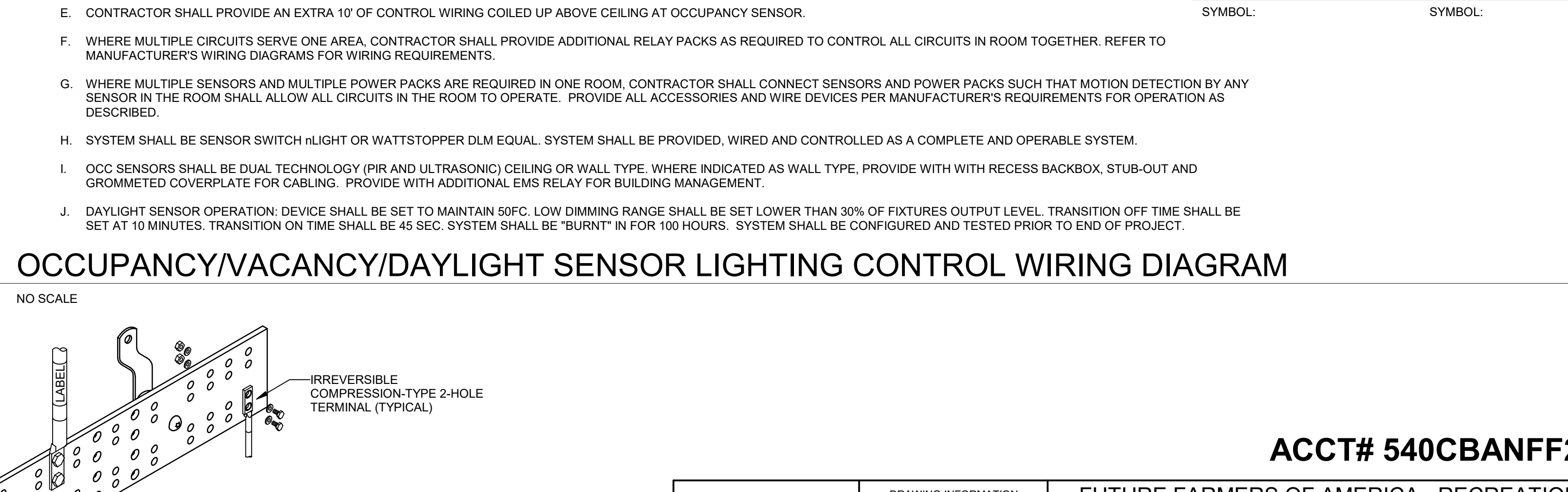
### 7 EXTERIOR LIGHTING CONTROL WIRING

NO SCALE



### 1 OCCUPANCY/VACANCY/DAYLIGHT SENSOR LIGHTING CONTROL WIRING DIAGRAM

NO SCALE

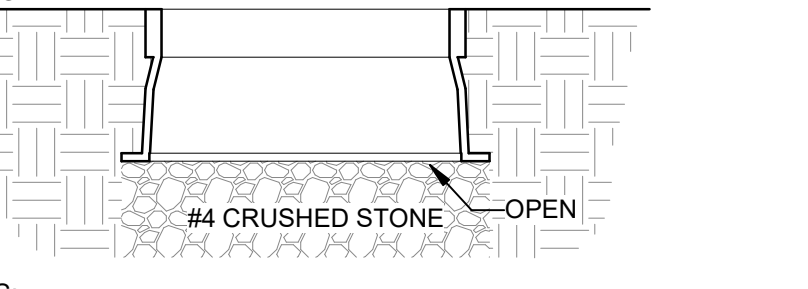
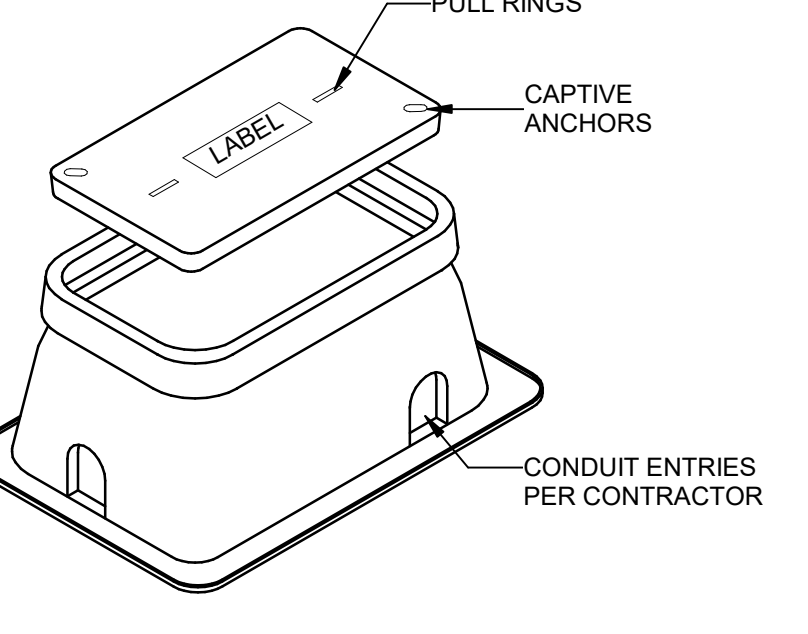


TELECOMMUNICATIONS PRIMARY BONDING BUSBAR (PBB)  
 NOTES:  
 A. PRE-DRILLED ELECTRO-TIN PLATED COPPER GROUND BAR 1/4\"/>

### 3 TELECOMM BUSBAR - PBB

NO SCALE

LUMINAIRE SCHEDULE							
TYPE	DESCRIPTION	BASIS OF DESIGN	EQUAL MANUFACTURERS	MOUNTING	VOLTAGE	REMARKS	
A1	SURFACE MOUNTED 4' LINEAR	AXIS #TB4SLED 1000 80 35 BW 4' XX UNV DP 1 SC	COOPER, PHILIPS	SURFACE	120		
L1	8' LINEAR DIRECT/INDIRECT FIXTURES	AXIS #TB4WDILED 400 1200 80 35 SO ASO 8 XX UNV DP 1	COOPER, PHILIPS	SUSPENDED	120		
W	DECORATIVE WALL SCONCE	LITHONIA #WDGE3-PS-50K-80CRI-R3-MVOLT-SPD10K/PIR	COOPER, PHILIPS	WALL	120		
X1	SINGLE FACE EXIT SIGN	LITHONIA #LE-S-W-1-R	COOPER, PHILIPS	UNIVERSAL	120		



NOTES:  
 A. BOXES TO BE SIZED PER NEC 314.28 BASED UPON FIELD CONFIGURATION OF CONDUIT ENTRIES. PROVIDE EXTENSIONS WHERE REQUIRED.  
 B. BOX AND LID TO BE CONSTRUCTED OF POLYMER CONCRETE. LIST RATING PER INSTALLED LOCATION.  
 C. REFER TO SPECIFICATIONS FOR RELATED INFORMATION.

### 6 PULL BOX DETAIL

NO SCALE

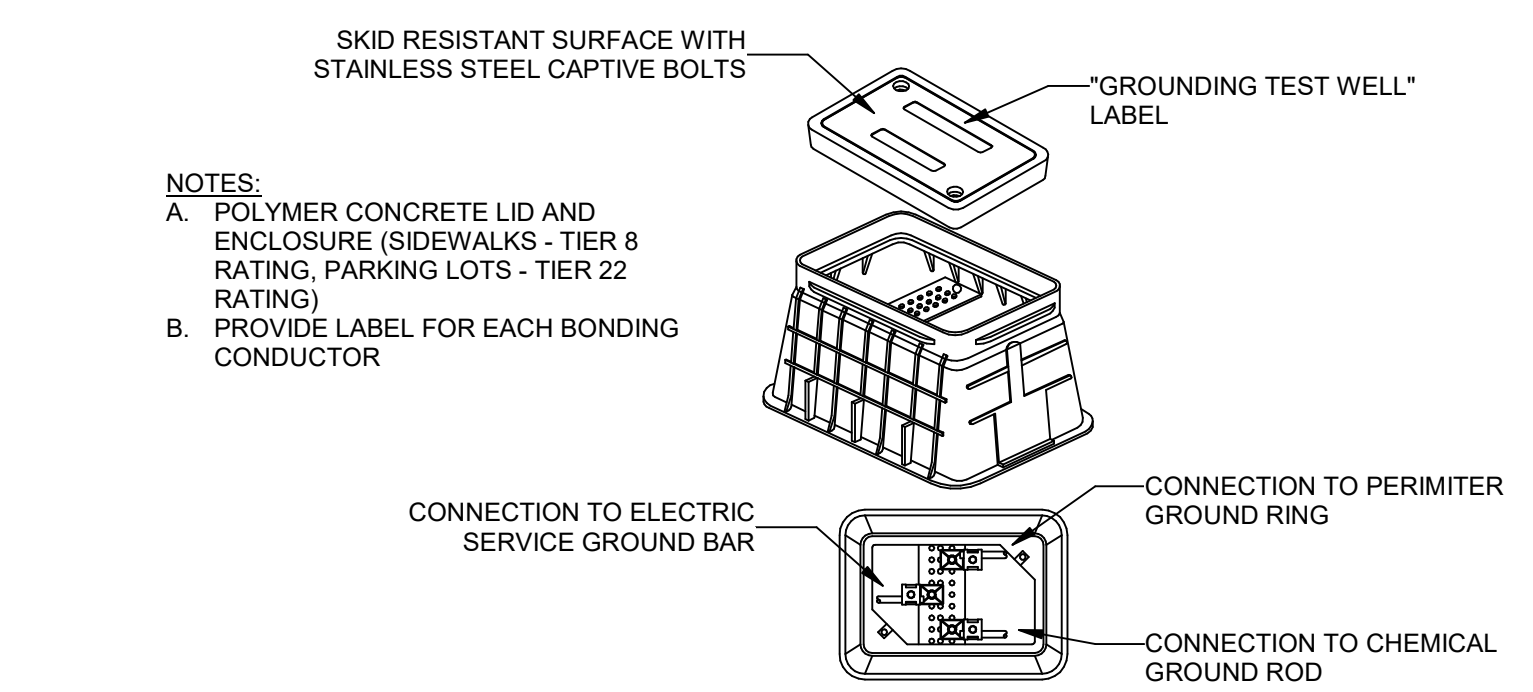
### GENERAL NOTES (LUMINAIRE SCHEDULE):

- ALL LUMINAIRES AND COMPONENTS SHALL BE UL LISTED.
- WHERE LUMINAIRES ARE SHOWN SPLIT-WIRED (HALF EMERGENCY POWER/HALF NORMAL POWER) ON FLOOR PLANS, LUMINAIRES SHALL BE PROVIDED WITH MULTIPLE ELECTRONIC BALLASTS FOR MULTIPLE POWER CIRCUITS AS INDICATED ON FLOOR PLANS.
- PROVIDE BALLASTS FOR FIXTURE LAMP SWITCHING AS INDICATED ON LIGHTING FLOOR PLANS. WHERE A SINGLE FIXTURE IS POWERED FROM NORMAL AND EMERGENCY POWER, HALF OF THE LAMPS WITH A MINIMUM OF TWO LAMPS SHALL BE ON EMERGENCY POWER.
- CONTRACTOR SHALL FOCUS, AIM AND ADJUST LUMINAIRES UNDER THE SUPERVISION AND DIRECTION OF THE ENGINEER AND ARCHITECT. ALLOW LABOR FOR FINAL FOCUS AND ADJUSTMENTS AFTER DARK. LIFTS AND SCAFFOLDING SHALL BE AVAILABLE.
- ALL LAY-IN FIXTURES SHALL BE PROVIDED WITH SCREW ON HOLD DOWN CLIPS AND MAXIMUM 6'-0" LONG FLEXIBLE CONDUIT WHIPS.
- EXIT SIGNS AND FIXTURES THAT ARE HATCHED OR WHERE THE FIXTURE TYPE CONTAINS THE SUFFIX "E" FOR EMERGENCY OPERATION SHALL HAVE AN INTEGRAL 90 MINUTE BATTERY INVERTER IF NOT POWERED FROM AN EMERGENCY GENERATOR.
- ALL BATTERY POWERED FIXTURES SHALL HAVE TEST SWITCHES FACTORY INSTALLED INTEGRAL TO THE REFLECTOR. REMOTE TEST SWITCHES WILL NOT BE ACCEPTED.

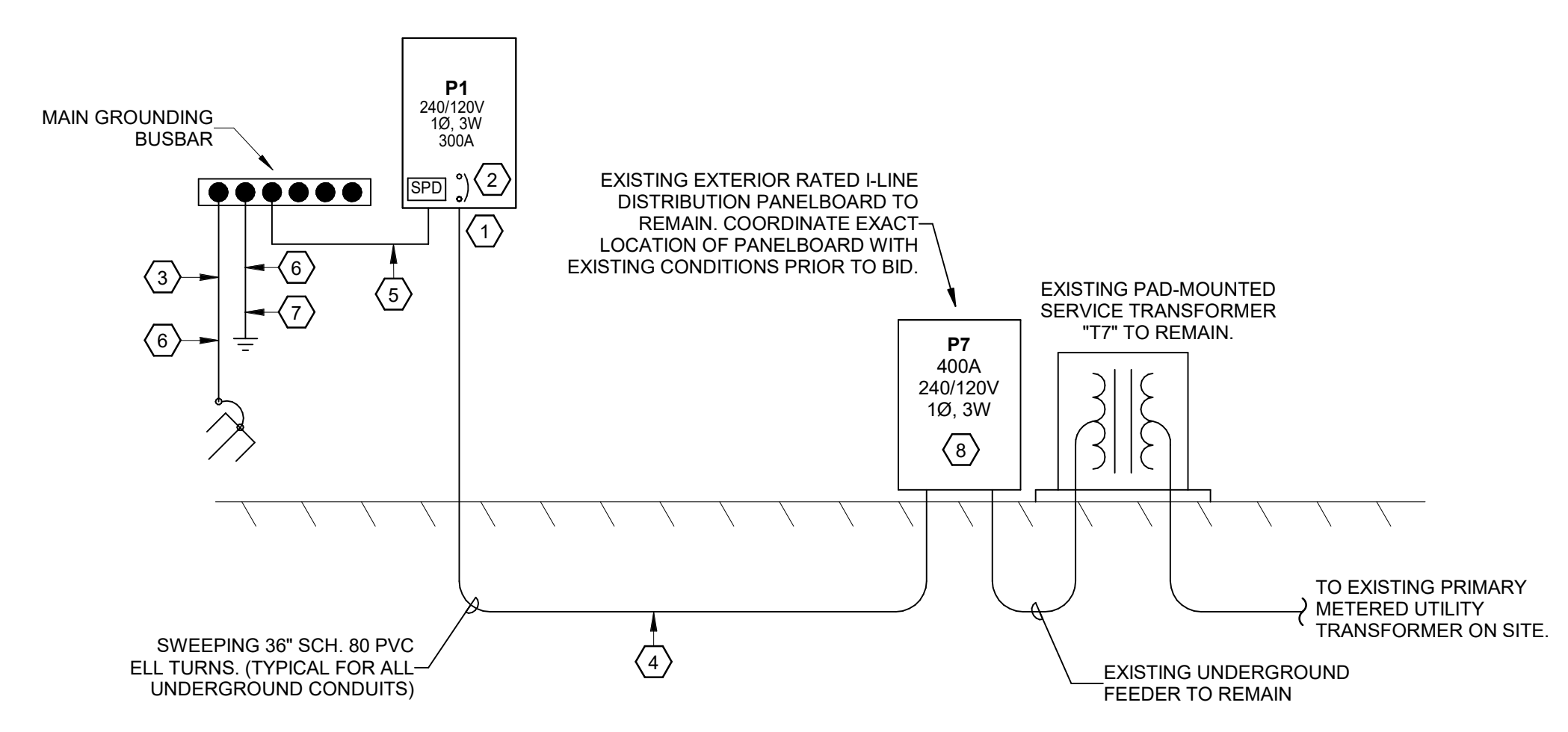
### ACCT# 540CBANFF2500

DRAWING INFORMATION		FUTURE FARMERS OF AMERICA - RECREATION HALL		DRAWING NO.	
A & E FILE NO.	VKYS23	111 FFA Camp Road, Hardinsburg, KY 40143		E-300	
DRAWING DATE	10.09.2024	ELECTRICAL DETAILS		AS BUILT DATE	
DRAWN BY	ALG	ENGR. FILE NO. # 540CBANFF2500		DECA LOG #	
CHECKED BY	ALG	COMMONWEALTH OF KENTUCKY DEPARTMENT FOR FACILITIES AND SUPPORT SERVICES DIVISION OF ENGINEERING AND CONTRACT ADMINISTRATION FRANKFORT, KENTUCKY			
PHASE	RTA	CMTA			
RTA DATE		10411 Meeting Street Prospect, KY 40059 T: 502.326.3085 F: 502.326.2691			
REVISION HISTORY OF THIS DRAWING					
1	DESCRIPTION OF REVISIONS	DATE	DESCRIPTION OF REVISIONS	DATE	
2					
3					
4					





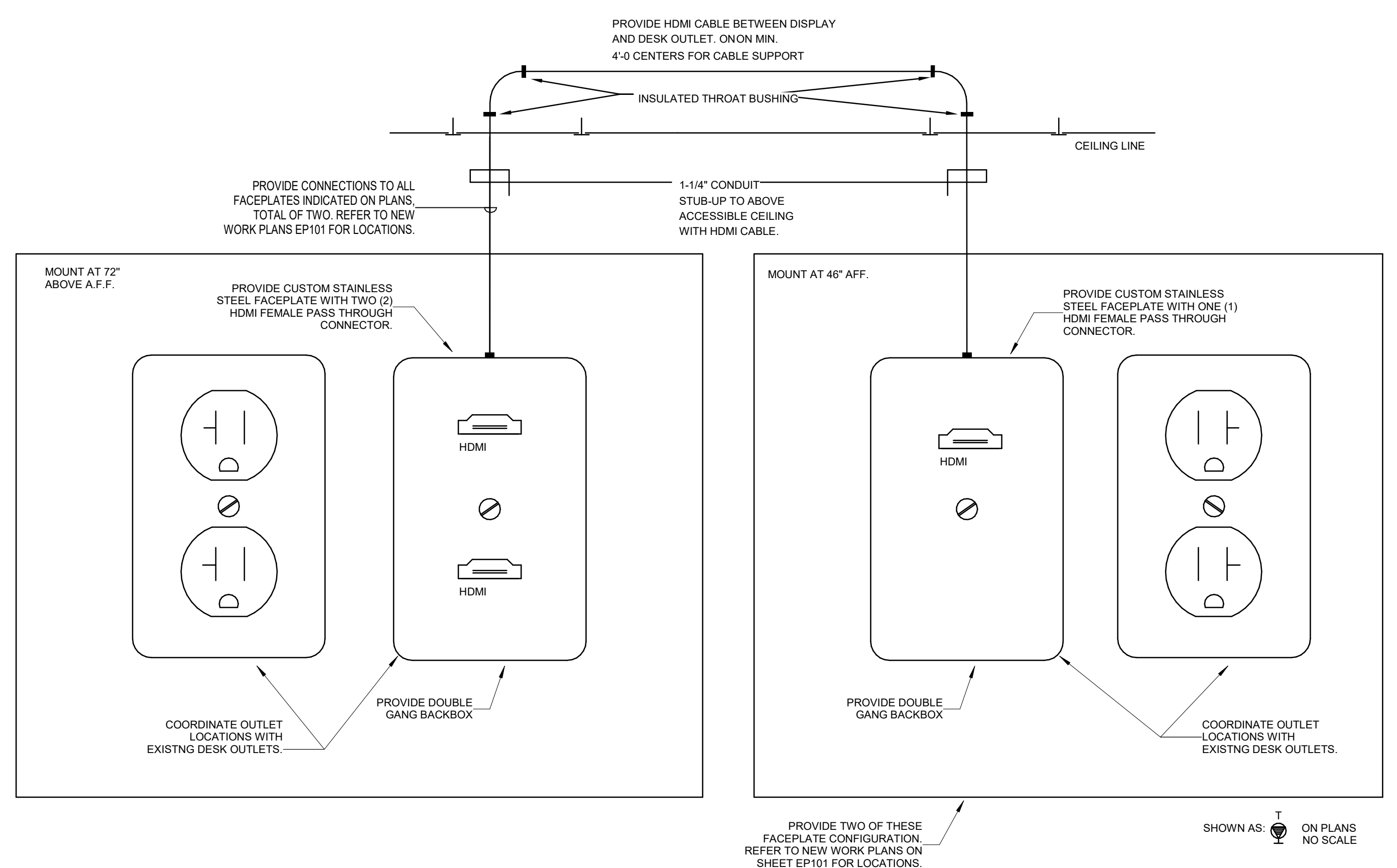
**5 GROUND INSPECTION WELL**  
NO SCALE



**4 POWER DISTRIBUTION RISER DIAGRAM**  
NO SCALE

- POWER RISER GENERAL NOTES:**
- ALL NEW CONDUCTORS SHALL BE COPPER (SEE SPECIFICATIONS FOR TYPE).
  - PROVIDE ENGRAVED LAMACOID LABELS FOR ALL POWER DISTRIBUTION EQUIPMENT FURNISHED OR MODIFIED IN THE PROJECT. LABELS PER DETAILS AND SPECIFICATIONS.
  - SERVICE EQUIPMENT SHALL BE MARKED WITH THE MAXIMUM AVAILABLE FAULT-CURRENT AT THE EQUIPMENT AND THE DATE THE CALCULATION WAS PERFORMED. APPLY A TYPE-WRITTEN ADHESIVE LABEL WITH THE BACKGROUND, 1/2" HIGH BLACK LETTERING.
  - ALL SPARE BREAKERS SHALL BE SO LABELED IN CIRCUIT DIRECTORIES AND SHALL BE LEFT IN THE OFF POSITION.
  - MINIMUM PANEL MOUNTING SPACE IS NOTED ON DRAWINGS AND SCHEDULES. ALL MOUNTING SPACE SHALL BE PREPARED TO ACCEPT FUTURE BREAKERS.
  - SEE SPECIFICATIONS FOR POWER STUDY REQUIREMENTS.

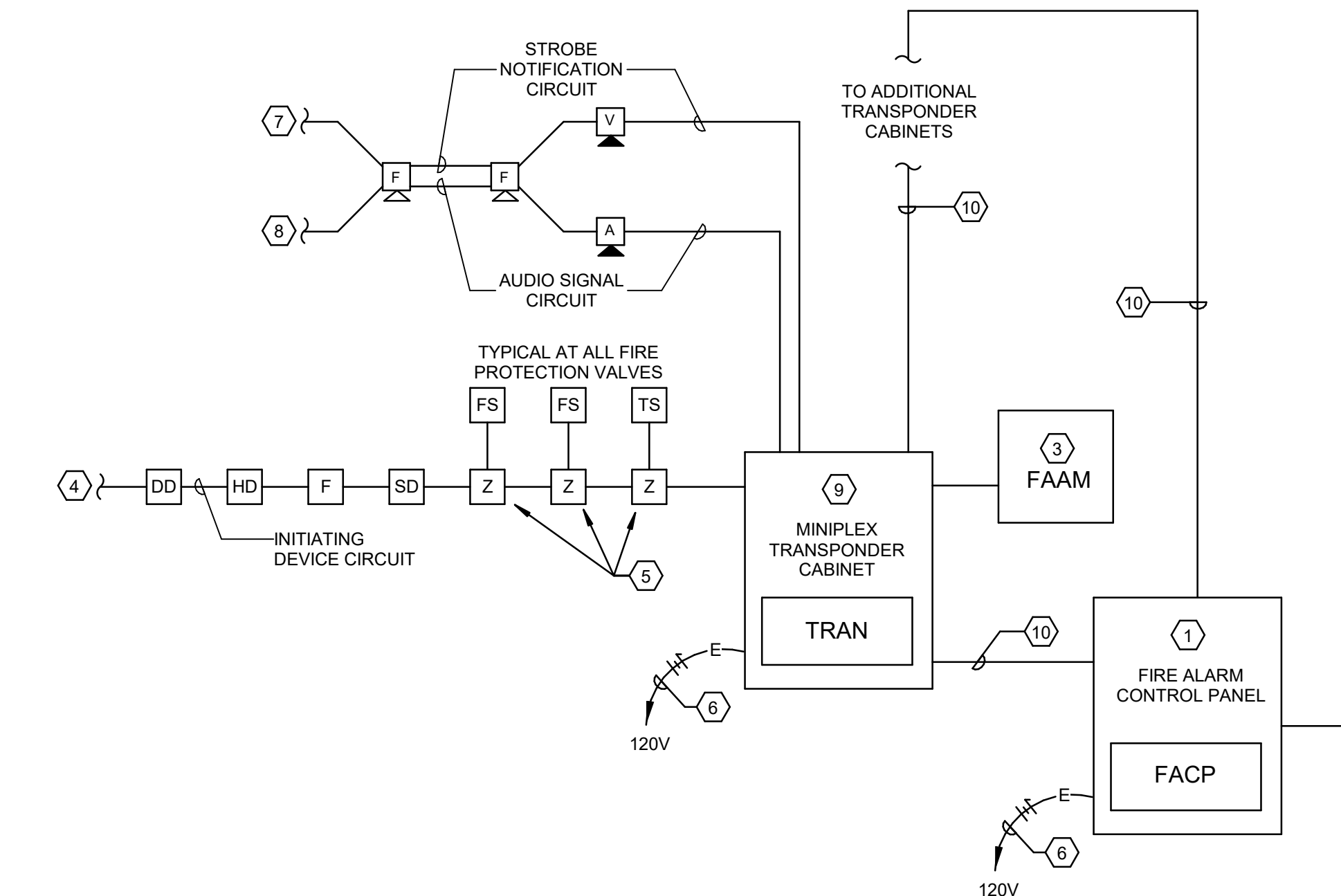
- POWER RISER TAGGED NOTES:**
- PROVIDE A PARALLEL CONNECTED TRANSIENT VOLTAGE SURGE SUPPRESSOR (SPD), CATEGORY #B. UNIT SHALL BE CURRENT TECHNOLOGY IEC#280, 120/240V, 2-PH, 3W OR APPROVED EQUAL. PROVIDE WITH EVENT COUNTER. MOUNT BELOW PANEL BEING PROTECTED AS RECOMMENDED BY EQUIPMENT MANUFACTURER. ALIGN COVERS AND INSTALL WITHOUT GAP BETWEEN TVSS AND PANELBOARD.
  - SERVICE RATED MAIN CIRCUIT BREAKER.
  - PROVIDE ONE (1) #2AWG CONDUCTOR COPPER GROUNDING ELECTRODE FROM NEW GROUND BAR AT PANELBOARD "P1" TO THREE NEW 58"x10" COPPERWELD GROUND RODS AS REQUIRED. CONTRACTOR SHALL TEST GROUNDING SYSTEM IMPEDANCE LEVEL AND IF NOT 5 OHMS, CONTRACTOR SHALL ADD GROUND RODS AS NECESSARY TO MEET THIS REQUIREMENT. GROUND RODS SHALL ALSO BE CONNECTED TO BUILDING STEEL AND COLD WATER PIPING PER NEC.
  - PROVIDE THREE (3) #410 CONDUCTORS AND (1) #4 AWG GROUND IN 2-1/2" SCHEDULE 8 PVC WITH MINIMUM BURY AT 42"
  - (1) #2AWG, BARE COPPER GROUND (ROUTE IN 1-1/4" CONDUIT WHERE EXPOSED).
  - (1) #2AWG, BARE COPPER GROUND (ROUTE IN 1" CONDUIT WHERE EXPOSED).
  - COPPER GROUNDING ELECTRODE CONDUCTOR BONDED TO UNDERGROUND METAL COLD WATER SERVICE AND CADWELD TO BUILDING STEEL.
  - PROVIDE NEW 300A/2P CIRCUIT BREAKER IN H LINE PANELBOARD INDICATED. ELECTRICAL CONTRACTOR SHALL COORDINATE ALL REQUIREMENTS WITH EXISTING CONDITIONS PRIOR TO BID.



**3 MONITOR INSTALLATION DETAIL**  
NO SCALE

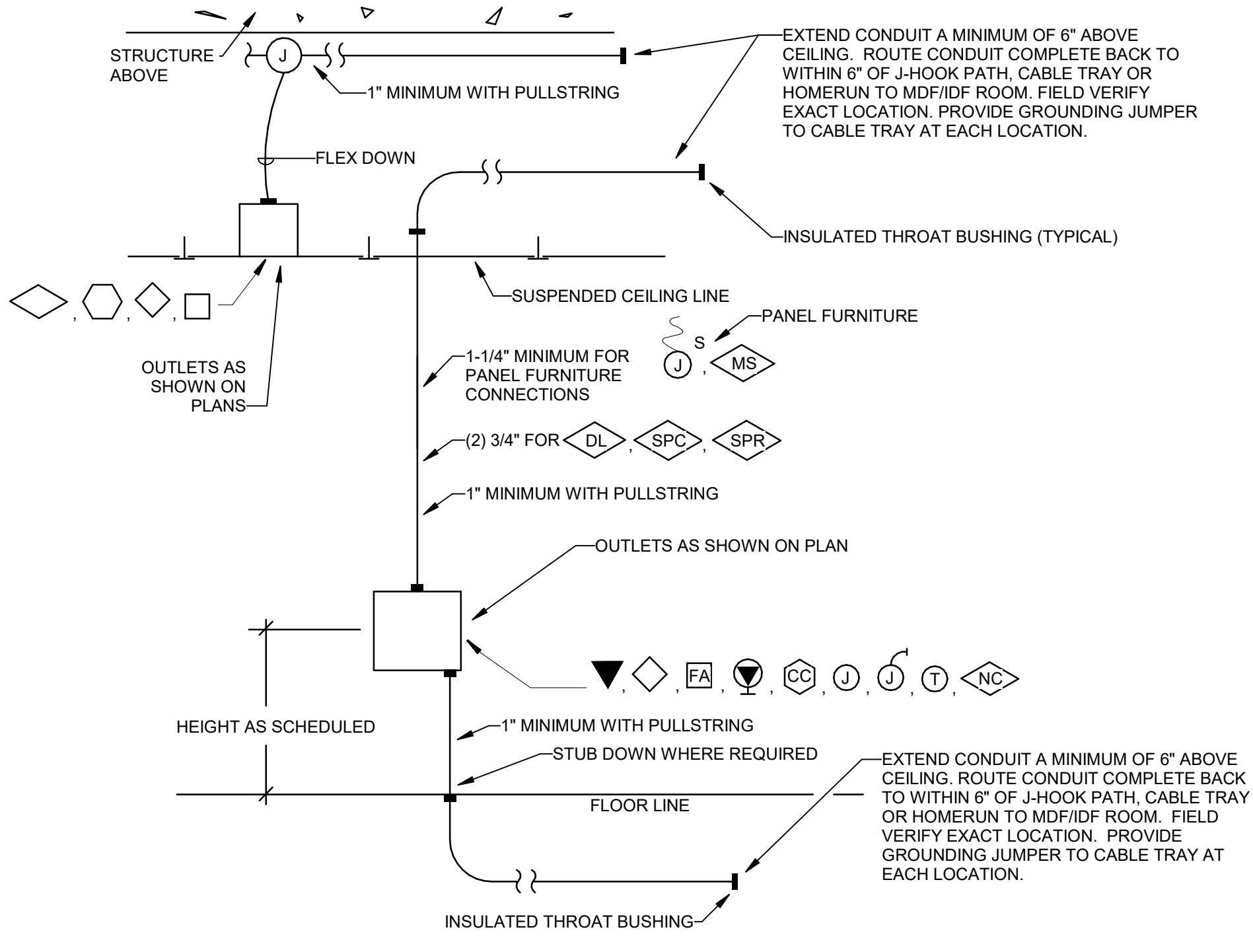
**GENERAL NOTES (FIRE ALARM RISER):**

- THIS RISER IS PARTIAL. ALL THE DEVICES CONNECTED TO THE "FACP" UNITS ARE NOT SHOWN. THE CONTRACTOR SHALL REFER TO THE ELECTRICAL FLOOR PLANS FOR THE COMPLETE FIRE ALARM SYSTEM.
- THE EXTENT OF ALL FIRE ALARM SYSTEM WORK IS INDICATED OR IMPLIED ON THE CONTRACT DRAWINGS.
- FIELD VERIFY THE EXACT NUMBER AND LOCATIONS OF ALL MECHANICALLY RELATED ITEMS (SPRINKLER CONNECTIONS, EXTINGUISHING SYSTEMS, SMOKE DAMPERS, RANGE HOOD SUPPRESSION SYSTEMS, ETC.) AND MAKE CONNECTIONS AS REQUIRED/INDICATED.
- PROVIDE CONNECTIONS TO ALL FIRE PROTECTION TAMPER AND FLOW SWITCHES VIA ZONE ADDRESSABLE MODULES AS REQUIRED. CONTRACTOR SHALL VERIFY ALL LOCATIONS WITH FIRE PROTECTION SYSTEM SHOP DRAWINGS. CONTRACTOR SHALL PROVIDE A UNIT PRICE FOR COMPLETE INSTALLATION OF A CONNECTION TO EXISTING FIRE PROTECTION SWITCHES.
- ALL FIRE ALARM STROBE LIGHTS SHALL BE SYNCHRONIZED TO ACCOMMODATE BUILDING STANDARDS AS REQUIRED.
- FAP SPEAKERS TO PROVIDE SUFFICIENT AUDIBILITY FOR AREA SERVED.
- SMOKE DETECTORS SHALL NOT BE LOCATED CLOSER THAN 36" TO SUPPLY, RETURN OR EXHAUST AIR OPENINGS NOR CLOSER THAN 12" TO WALL/ CEILING INTERSECTIONS.
- ADDITIONAL DUCT DETECTORS MAY BE SHOWN ON MECHANICAL DRAWINGS. PROVIDE AND CONFIGURE DUCT DETECTOR(S) FOR EITHER SHUTDOWN OF EQUIPMENT OR CLOSURE OF SMOKE DAMPER(S) AS REQUIRED BY CODE.
- AIR HANDLING UNITS SHALL ONLY SHUT DOWN WHEN SMOKE IS DETECTED AT THAT PARTICULAR AIR HANDLING UNIT (UON). SMOKE DAMPERS SHALL CLOSE ONLY WHEN SMOKE IS DETECTED AT THAT PARTICULAR SMOKE DAMPER BY ACTIVATION OF THE CONTROLLING SMOKE DETECTOR. REFER TO THE SPECIFICATIONS FOR FURTHER REQUIREMENTS.
- PROVIDE DUCT SMOKE DETECTORS WITH REMOTE TEST SWITCH/INDICATOR LIGHT AT 7'-6" AFF ON WALL IN AREA BELOW DETECTOR.
- RISER DIAGRAM IS FOR BID PURPOSES ONLY. SYSTEM SHALL BE INSTALLED AND CONNECTED IN ACCORDANCE WITH WIRING DIAGRAMS OBTAINED FROM MANUFACTURER, THAT HAVE BEEN APPROVED BY THE STATE FIRE MARSHAL'S OFFICE OR AUTHORITY HAVING JURISDICTION.
- PROVIDE FIRE ALARM MANUFACTURER WITH LOCATION DESCRIPTIONS FOR ALL FIRE ALARM DEVICES AS SOON AS POSSIBLE AFTER AWARD OF CONTRACT FOR PRE-PROGRAMMING OF FIRE ALARM SYSTEM. COORDINATE DESCRIPTIONS WITH BUILDING OWNER. UTILIZE FINAL ROOM NAMES AND NUMBERS, NOT NAMES AND NUMBERS FROM FLOOR PLANS.
- EACH FIRE ALARM DEVICE SHALL BE LABELED WITH SELF ADHESIVE POLYESTER COATED PRINTED LABELS INDICATING DEVICE ADDRESS AND CIRCUIT PER FIRE ALARM SHOP DRAWINGS.
- MODIFY AND/OR EXPAND EXISTING CONTROL PANEL(S) AND ANNUNCIATOR(S) TO ACCOMMODATE AS REQUIRED TO SUPPORT ADDITIONAL DEVICES SHOWN. FURNISH AND INSTALL ANY MODULES OR EQUIPMENT NECESSARY TO EXPAND SYSTEM. EXISTING ANNUNCIATOR(S) AND CONTROL PANEL(S) SHALL BE UPDATED TO DISPLAY TROUBLES AND ALARM LOCATIONS FOR ALL NEW ZONES.
- PROVIDE CONNECTIONS TO NEW ACCESS CONTROL DOORS TO ALLOW POSITIVE LATCHING AND FREE EGRESS UNDER ALARM CONDITIONS. COORDINATE EXACT REQUIREMENTS WITH SUCCESSFUL DOOR HARDWARE MANUFACTURER PRIOR TO CONSTRUCTION.
- PROVIDE ACCESS PANELS AS REQUIRED FOR MAINTENANCE AND TESTING FOR SMOKE DETECTORS LOCATED ABOVE INACCESSIBLE CEILINGS. COORDINATE SIZE AND LOCATIONS WITH ARCHITECT PRIOR TO INSTALLATION.
- PROVIDE APPROVED TESTING AND REQUIRED CERTIFICATION OF SYSTEM COMPONENTS AND PROVE OPERATION OF SYSTEM FOR THE AREA OF WORK WHEN COMPLETE.
- WIRING TO ALL FIRE ALARM DEVICES SHALL BE PER NEC AND MANUFACTURER'S RECOMMENDATIONS. VERIFY ALL WIRING REQUIREMENTS WITH THE OWNER AND FIRE ALARM VENDOR.
- ALL NEW DEVICES INDICATED, SUCH AS SMOKE DETECTORS, NOTIFICATION APPLIANCES, ETC., SHALL MATCH AND BE COMPATIBLE WITH EXISTING BUILDING SYSTEM.
- ALL 120V POWER FOR NEW FIRE ALARM SYSTEM COMPONENTS SHALL BE CONNECTED TO EMERGENCY LIFE-SAFETY BRANCH PANELS AS APPLICABLE. PROVIDE ALL NEW POWER CONNECTIONS AS REQUIRED FOR SYSTEM OPERATION.
- PROVIDE A DEDICATED POWER CIRCUIT TO EACH FIRE ALARM EQUIPMENT PANEL OR POWER SUPPLY.
- FIRE ALARM OCP DEVICES SHALL HAVE NON-REMOVABLE LOCKABLE HANDLE PAINTED RED.
- THIS CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL BUILDING PERMITS, ELECTRICAL APPROVALS, AND APPROVALS FROM THE STATE OFFICE OF FIRE SAFETY OR AUTHORITY HAVING JURISDICTION (AHJ). THIS INCLUDES PREPARING DRAWINGS, CUTSHEETS, AND OTHER DOCUMENTATION REQUIRED BY THE AHJ OR FIRE ALARM EQUIPMENT MANUFACTURER. A COPY OF THESE REQUIREMENTS SHALL BE OBTAINED FROM AHJ. THE DRAWINGS SHALL BE PREPARED AS A FINAL SUBMITTAL AS OUTLINED IN THE SUBMITTAL REQUIREMENTS. ELECTRONIC COPIES OF THESE PLANS REQUIRED FOR THIS PURPOSE MAY BE OBTAINED FROM THE ENGINEER. DRAWINGS THAT ARE REQUIRED FOR APPROVAL SHALL BE FINISHED WITHIN 7 WORKING DAYS OF AWARD OF CONTRACT.
- WRITTEN CERTIFICATION OF ENTIRE FIRE ALARM SYSTEM SHALL BE SUBMITTED TO OWNER & ENGINEER AT CLOSE OF PROJECT.
- A TECHNICAL REPRESENTATIVE OF FIRE ALARM MANUFACTURER SHALL BE PRESENT AT ALL TIMES DURING FIRE ALARM CERTIFICATION.
- CONTRACTOR SHALL MONITOR TROUBLES ON EXISTING PANEL EQUIPMENT ON A DAILY BASIS. WHERE A TROUBLE IS INDICATED, IT SHALL BE REPORTED TO THE OWNER AND CONSTRUCTION SHALL STOP UNTIL TROUBLE IS RESOLVED UNLESS OTHERWISE INDICATED BY OWNER.
- INITIATING DEVICE CIRCUITS AND NOTIFICATION APPLIANCE CIRCUITS SHALL BE IN SEPARATE RACEWAYS. FIRE ALARM SYSTEM JUNCTION BOXES, BACK BOXES, AND PULL BOXES SHALL BE PAINTED RED.
- PROVIDE QUANTITY OF POWER SUPPLIES AND NAC PANELS BASED UPON FINAL SYSTEM DESIGN AND REQUIRED SPARE CAPACITY. LOCATE ADDITIONAL PANELS ADJACENT TO THOSE SHOWN ON PLANS. DO NOT INSTALL ADDITIONAL EQUIPMENT IN OTHER AREAS OF THE PROJECT WITHOUT WRITTEN CONSENT BY THE ENGINEER.

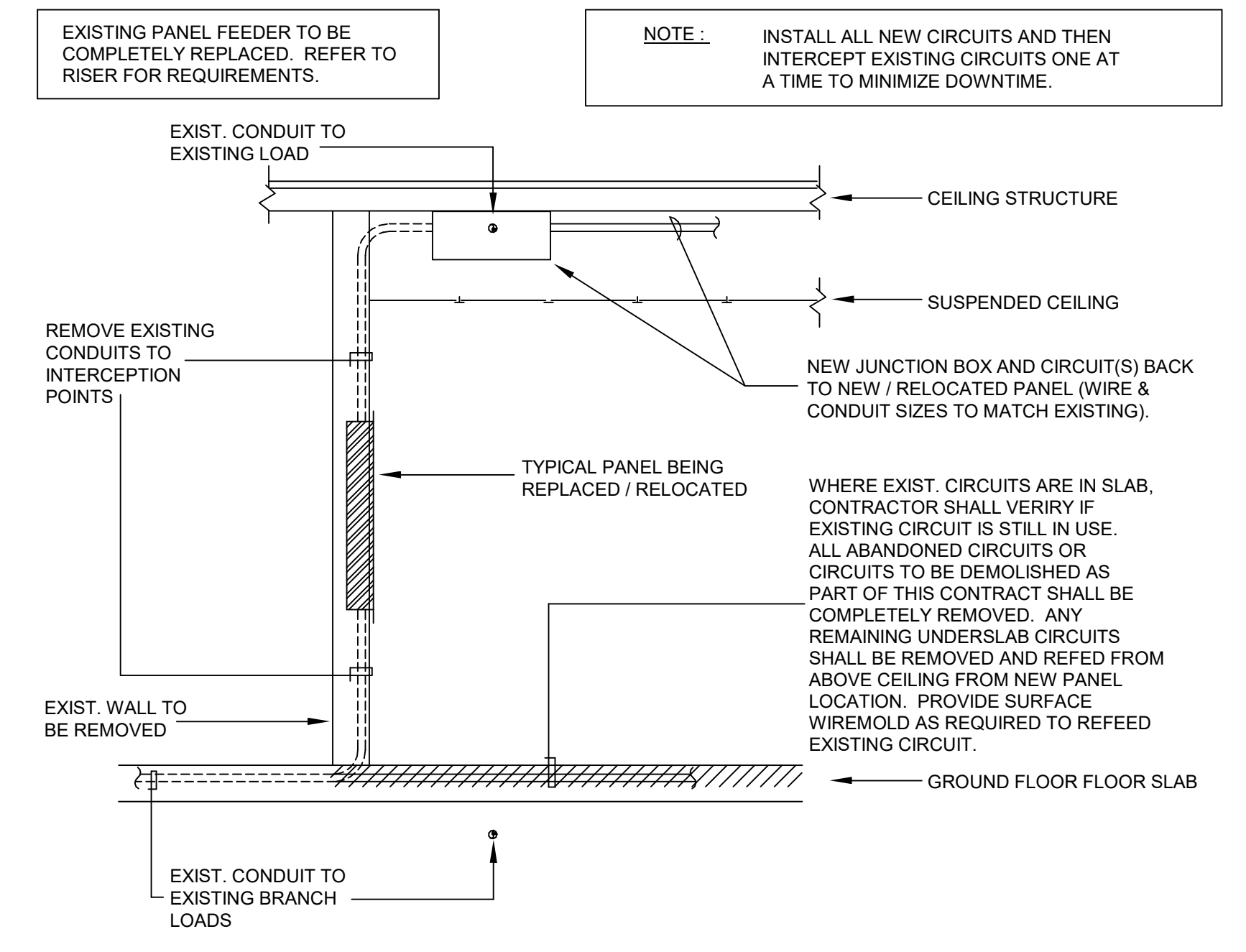


**1 FIRE ALARM RISER DIAGRAM**  
NO SCALE

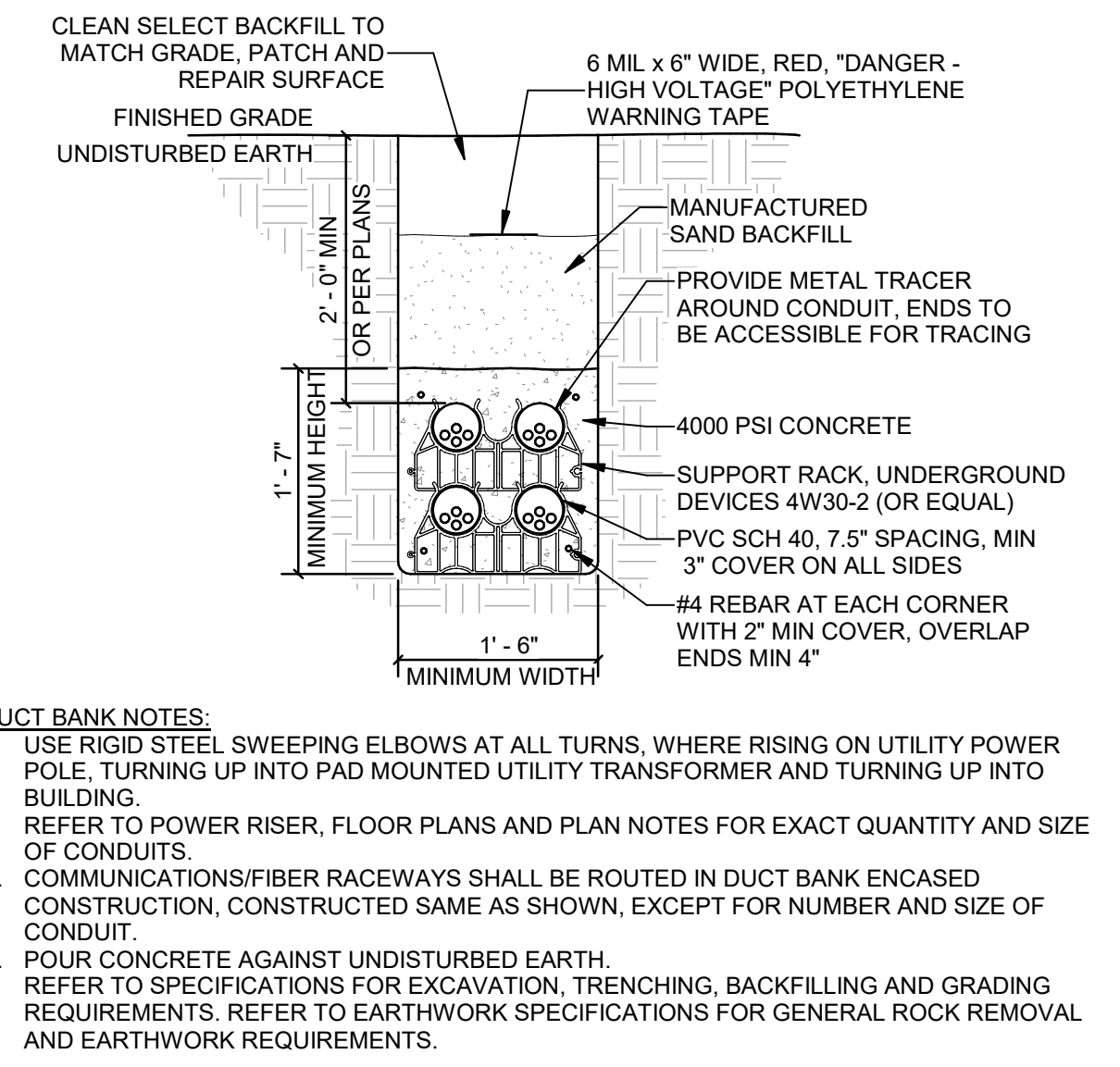
- TAGGED NOTES:**
- FIRE ALARM CONTROL PANEL WITH INTEGRAL MICROPHONE. PROVIDE NEMA ENCLOSURE WITH LOCKABLE COVER.
  - COMMUNICATIONS LINE TO MDF.
  - REMOTE ANNUNCIATOR PANEL WITH INTEGRAL MICROPHONE.
  - TO ADDITIONAL INITIATION DEVICES. REFER TO FLOOR PLANS FOR ALL DEVICE LOCATIONS.
  - PROVIDE A MONITOR "IAM" (INDIVIDUAL ADDRESSABLE MODULE) FOR ADDRESSABLE SUPERVISION OF FIRE PROTECTION VALVES AND FIXED TEMPERATURE HEAT DETECTORS. MONITOR "IAM" SHALL BE SURFACE MOUNTED, IN NEMA-1 ENCLOSURE, ABOVE SUSPENDED CEILING OR ON WALL AS REQUIRED.
  - DEDICATED 120V POWER CIRCUITS FOR FIRE ALARM SYSTEM COMPONENTS AS INDICATED. REFER TO FLOOR PLANS FOR CIRCUIT NUMBERS. PAINT BREAKER SERVING EQUIPMENT RED.
  - TO ADDITIONAL VISUAL NOTIFICATION DEVICES. REFER TO FLOOR PLANS FOR ALL DEVICE LOCATIONS.
  - TO ADDITIONAL AUDIBLE NOTIFICATION DEVICES. REFER TO FLOOR PLANS FOR ALL DEVICE LOCATIONS.
  - PROVIDE MINIPLX TRANSPONDER CABINET WITH LOCAL MODE CONTROLLER COMPATIBLE WITH FIRE ALARM CONTROL PANEL. REFER TO FLOOR PLANS FOR LOCATIONS. PROVIDE QUANTITY AS REQUIRED TO SERVE ALL INITIATING AND NOTIFICATIONS DEVICES WITH 20% SPARE CAPACITY FOR SYSTEM GROWTH.
  - AUDIO RISER WIRING AND DIGITAL COMMUNICATION WIRING, CONDUCTORS PER MANUFACTURER IN "C".



**2 ROUGHING-IN DETAIL FOR STUB-OUTS**  
NO SCALE



**7 PANEL REPLACEMENT / RELOCATION DETAIL**  
NO SCALE



**6 DUCT BANK 4C**  
NO SCALE

- DUCT BANK NOTES:**
- USE RIGID STEEL SWEEPING ELBOWS AT ALL TURNS. WHERE RISING ON UTILITY POWER POLE, TURNING UP INTO PAD MOUNTED UTILITY TRANSFORMER AND TURNING UP INTO BUILDING.
  - REFER TO POWER RISER, FLOOR PLANS AND PLAN NOTES FOR EXACT QUANTITY AND SIZE OF CONDUITS.
  - COMMUNICATIONS/FIBER RACEWAYS SHALL BE ROUTED IN DUCT BANK ENCASED CONSTRUCTION, CONSTRUCTED SAME AS SHOWN, EXCEPT FOR NUMBER AND SIZE OF CONDUIT.
  - POUR CONCRETE AGAINST UNDISTURBED EARTH.
  - REFER TO SPECIFICATIONS FOR EXCAVATION, TRENCHING, BACKFILLING AND GRADING REQUIREMENTS. REFER TO EARTHWORK SPECIFICATIONS FOR GENERAL ROCK REMOVAL AND EARTHWORK REQUIREMENTS.

**ACCT# 540CBANFF2500**

DRAWING INFORMATION		FUTURE FARMERS OF AMERICA - RECREATION HALL		DRAWING NO.	
A & E FILE NO.	VKYSZ23	111 FFA Camp Road, Hardinsburg, KY 40143		E-301	
DRAWING DATE	10.09.2024	ELECTRICAL DETAILS		AS BUILT DATE	
DRAWN BY	ALG	ENGR. FILE NO. # 540CBANFF2500		DECA LOG #	
CHECKED BY	ALG	COMMONWEALTH OF KENTUCKY FINANCE AND ADMINISTRATION CABINET DEPARTMENT FOR FACILITIES AND SUPPORT SERVICES DIVISION OF ENGINEERING AND CONTRACT ADMINISTRATION FRANKFORT, KENTUCKY			
PHASE	RTA	CMTA		10411 Meeting Street Prospect, KY 40059 T: 502.326.3085 F: 502.326.2691	
RTA DATE		REVISION HISTORY OF THIS DRAWING			
		DESCRIPTION OF REVISIONS	DATE	DESCRIPTION OF REVISIONS	DATE
		1		5	
		2		6	
		3		7	
		4		8	