Project Manual

REPLACE EMERGENCY GENERATOR AND MDP
PROJECT NO. 2648209

TRANSPORTATION / MAINTENANCE - DELTONA
2101 EUSTACE AVE.
DELTONA FL, 32725

THE SCHOOL BOARD OF VOLUSIA COUNTY FLORIDA
200 NORTH CLARA AVENUE
DELAND, FLORIDA

CIVIL

Kimley-Horn and Associates, Inc.
200 S. Orange Ave, Suite 600
Orlando, FL 32801

STRUCTURAL

Kimley-Horn and Associates, Inc.
200 S. Orange Ave, Suite 600
Orlando, FL 32801
Project Administration Location:
Kew Gardens Ave., Suite 200
Palm Beach Gardens, FL 33410
(561) 463-0665

MECHANICAL / ELECTRICAL

Kimley-Horn and Associates, Inc.
200 S. Orange Ave, Suite 600
Orlando, FL 32801
Project Administration Location:
201 N. Franklin St., Suite 1400
Tampa, FL 33602
(813) 620-1460

DATE: 03/19/2026

REVISED:

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All references herein that conflict with processes, procedures, or other terms outlined in the Owner contracts, as associated with this Project, the Owner contracts shall take precedence.

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Note:
Project $200,000 or more, utilize the A101-2017 Standard Form of Agreement, A101-2017 Exhibit A and the A201-2017 General Conditions of the Contract (Standard Bid); project is less than $200,000 utilize the 625 Standard Form of Agreement (Proposals).

Specific documents listed above may not apply to this project. Select "N/A" for document(s) which do not apply to this project. ***Required: consult the Owner's Construction Project Manager in charge to make this determination.***

Facility Name: TRANSPORTATION / MAINTENANCE - DELTONA
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SCHOOL BOARD OF VOLUSIA COUNTY FLORIDA

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ADVERTISEMENT FOR BID

SCHOOL BOARD OF VOLUSIA COUNTY FLORIDA
FAC DOCUMENT 630

NOTICE is hereby given that sealed bids for: *(Facility Name)* Transportation / Maintenance - Deltona, *(Project Name)* Replace Emergency Generator and MDP , VCS Project Number 2648209, will be received by the School Board of Volusia County Florida, until *(date)* 07/15/2026 at *(time)* 1:00 pm**,** in the Volusia County Schools Facilities Services Building, at which time all bids will be publicly opened and read aloud. Bids received after this time will not be accepted. Bids may be mailed or hand delivered to Volusia County Schools, Facilities Services, 3750 Olson Drive, Daytona Beach Florida 32124.

A MANDATORY PRE-BID CONFERENCE is scheduled for *(date)* 06/25/2026, *(time)* 10:00 am at *(location)* Transportation / Maintenance - Deltona, 2101 Eustace Ave, Deltona Florida 32725**. All bidders must attend**. The representative of each bidder shall be an authorized employee of the bidder and shall sign in accordingly.

Documents, including complete specifications, may be examined by appointment at the office of the Construction Project Manager of record at Facilities Services, 3750 Olson Drive, Daytona Beach Florida (386) 947-8786.

BID DOCUMENTS ARE AVAILABLE VIA THE VOLUSIA COUNTY SCHOOLS WEBSITE AT: https://www.vcsedu.org/facilities-design The documents are in PDF format and may be viewed, printed or saved to your computer.

A310 Bid Bond Included
(The following sentence applies if the A310 Bid Bond is included for this project) Bids must be accompanied by a bid bond, certified check or cashier's check in an amount equal to five (5) percent of the total bid.

Bidders for this project are required to hold a current Certificate of Prequalification issued by the School Board of Volusia County Florida at the time of bid opening. To pre-qualify contact Purchasing, 200 North Clara Avenue, DeLand Florida 32720; telephone (386)734-7190.

All bids shall be binding for a period of 60 calendar days from the date of bid opening or until School Board approval of the bid, whichever occurs first. The bid amount of the successful bidder, once approved by the School Board, shall not be subject to change or withdrawal.

All bids shall be subject to the provisions of the Solicitation, as defined in FAC Document 631, Instructions to Bidders. It is the sole responsibility of all bidders to fully comply with the provisions of the Solicitation during this bidding process.

The School Board reserves the right to reject any one or more bids as provided by law.

The School Board of Volusia County Florida

Ruben Colon, Board Chair

INSTRUCTIONS TO BIDDERS

SCHOOL BOARD OF VOLUSIA COUNTY FLORIDA
FAC DOCUMENT 631

TO BIDDERS: You are hereby invited to submit a sealed bid for the following project. Bids will be publicly opened and read aloud at the time and place designated. Bids received after this time will not be accepted.

1. PROJECT INFORMATION

FACILITY NAME:	TRANSPORTATION / MAINTENANCE - DELTONA
PROJECT NAME:	REPLACE EMERGENCY GENERATOR AND MDP
PROJECT NUMBER:	2648209
OWNER:	THE SCHOOL BOARD OF VOLUSIA COUNTY FLORIDA
ENGINEER:	KIMLEY-HORN AND ASSOCIATES, INC.
BID DATE AND TIME:	07/15/2026 1:00pm
LOCATION:	Volusia County Schools Facilities Services Bid Conference Room 3750 Olson Drive Daytona Beach, Florida 32124 Phone: 386-947-8786

MANDATORY PRE-BID CONFERENCE

DATE AND TIME:	06/25/2026 10:00am
LOCATION:	TRANSPORTATION / MAINTENANCE - DELTONA 2101 EUSTACE AVE. DELTONA FL, 32725

All Bidders must attend the pre-bid conference. The representative of each Bidder shall be an authorized employee of the Bidder and shall sign in accordingly.

CONSTRUCTION TIME:
SIXTY (60) consecutive calendar days after written “Notice to Proceed”.

BID DOCUMENTS:

Documents, including drawings and specifications, may be examined at the office of:

Kimley-Horn and Associates, Inc.
201 N. Franklin St., Suite 1400, Tampa Florida 33602

Bid documents are available in digital format. Bidders may view, print or save copies of the bid documents via the Volusia County Schools website at: https://www.vcsedu.org/facilities-design
(Note: documents for proposals not published online.)

BID RESULTS:

The bid results will be available on the district web site at https://www.vcsedu.org/facilities-design
(Note: proposal results not published online.)

DIRECTIONS TO SCHOOLS AND FACILITIES

Directions to School Board of Volusia County schools and facilities are available via the district website at: https://www.vcsedu.org/community-information-services/maps-and-directions.

2. DEFINITIONS

2.1 **Contract**: *(select contract applicable to Project)*
☒ Standard Form Agreement between Owner and Contractor, AIA Document A101-2017, as modified by the Owner and General Conditions of the Contract for Construction, AIA Document A201-2017, as modified by the Owner.
☐ Standard Form of Agreement Between Owner and Contractor for a Small Project, FAC Document 625.

2.2 **Contractor**: The term Contractor as used in this Solicitation shall be defined as provided in Section 489.105(3), Florida Statutes (2003) and shall be licensed to perform that work and in direct contractual relationship with Owner.

2.3 **Bidder**: Contractor which has received a certificate of prequalification by the School Board in conformance with State Board of Education Rules and School Board Policy 604. Certificate of prequalification shall only entitle a Contractor to submit a bid and shall not constitute proof of Bidder's ability to perform a contract or serve as a substitute for any of the qualifications imposed on Contractor in the Solicitation.

2.4 **Lowest Responsible Bidder**: A Contractor who has the skills, qualifications, ability and experience to perform the contract, in all respects, as required by the Solicitation and who has submitted the lowest responsible bid.

2.5 **Non-responsive bid**: Shall include, but not be limited to, submission of a subcontractor without required licensing, submission of incomplete forms or documentation, failure to demonstrate the skills, qualifications, ability and experience to perform the contract as required by the Solicitation of both the Bidder and its subcontractor(s), or any other reason provided by law.

2.6 **Self-performance**: Performance of work by the Bidder in one or more of the types of work as disclosed under FAC Document 633, List of Subcontractors, which is undertaken and completed entirely by his own forces through the use of skilled and unskilled labor, supervision and equipment owned, operated and controlled by the Bidder without the assistance, employ, contract or reliance on any third parties, individual or corporate, except that a total of not more than 10% of the cost of performing the work, that is to be self-performed, may be expended to utilize outside sources to perform the work and then only when the third party assistance is so specialized as to be commonly employed in the industry as it is otherwise not economically reasonable to maintain it internally.

2.7 **School Board**: The School Board of Volusia County Florida. The term "Owner" may be used interchangeably.

2.8 **Solicitation**: Consists of the following documents: Project Manual, Advertisement for Bid, Drawings, Addenda. The term includes what is generally defined as "Invitation to Bid" and "Request for Proposals" in Section 287.012, Fla. Stat. (2003).

2.9 **Subcontractor**: Any person or entity under contract with a Contractor to provide services or labor for the construction, installation, or repair of an improvement of real property. For purposes of this Solicitation, this term does not include suppliers who provide only materials, equipment or supplies to a Contractor.

3. PREQUALIFICATION OF BIDDERS

The prequalification process and terms and conditions of certificates of prequalification shall be governed by Volusia County School Board Policy 604.

A Bidder's failure to hold a certificate of prequalification at the time of bid submittal shall result in the automatic rejection of that bid.

4. BID SUBMITTAL

Each Bidder, on or before the bid date and time specified above, shall sign and submit, to Volusia County Schools, Facilities Services, 3750 Olson Drive, Daytona Beach Florida 32124, one (1) original and one (1) copy of the FAC Document 632, Bid Form, of the Solicitation in the format provided herein, with all bid information completed and two (2) copies of all other required bid documentation. If bids are delivered by U.S. mail, or some other form of delivery other than hand-delivery, a return receipt may be requested. Submittals containing any condition, omissions, unexplained erasures, alterations, items not called for or irregularities of any kind may be rejected by the School Board. Any additions or deletions made before bid opening shall be made solely on FAC Document 632, Bid Form. Verbal or digital bid submittals will not be considered.

Each Bidder's submittal shall be placed in an envelope and sealed and marked with the name of the project. Required bid documents included with the Bid Form shall be assembled as follows: FAC Document 632 Bid Form, AIA Document A310 Bid Bond (if required for this project), Power of Attorney (if required for this project), FAC Document 633 List of Subcontractors and then any other documents required. Bid documents (original set and copy set) shall be stapled or paperclipped, binders of any kind as well as separation pages should not be used. Failure to submit any bid document or bid information with the bid, as specified, shall result in the bid being rejected as non-responsive.

The School Board expressly reserves the right to waive minor technicalities, and to use sufficient time to investigate the bids and the skills, qualifications, experience and ability of the Bidders and its subcontractor(s) to fully perform the contract requirements. Any refusal by a Bidder or subcontractor(s) to respond to the School Board's request for information shall deem a bid non-responsive and serve as grounds for rejection of the bid by the School Board. Any documentation requested by School Board during this investigation process shall not be deemed a supplement to a bid, but as part of its good faith investigation process. Any withdrawal of a subcontractor by a Bidder without good cause shown shall deem a bid non-responsive and serve as grounds for rejection of the bid by the School Board; however, in no event shall any substitution of a subcontractor result in an increase in the bid amount.

A Bidder's failure to file a protest within the time prescribed in Section 120.57(3), Florida Statutes, shall constitute a waiver of the right to protest under Chapter 120, Florida Statutes, or by any other means.

Award of the contract will be made to the lowest responsible Bidder for the actual amount bid; however, the School Board reserves the right to reject all bids as provided by law.

All bids shall be binding for a period of 60 calendar days from the date of bid opening or until School Board approval of the bid, whichever occurs first. The bid amount of the successful Bidder, once approved by the School Board, shall not be subject to change or withdrawal.

5. AIA DOCUMENT A310, BID BOND - REQUIRED

If a Bid Bond is required, the Bid and Bid Bond must be accompanied by a certified check or cashier's check in an amount equal to five (5) percent of the total bid and shall be made payable to the "School Board of Volusia County Florida." The bond or check shall be irrevocable for 60 calendar days from the date of bid opening or until School Board approval of the bid, whichever occurs first.

All Bidders shall submit one (1) copy of the Bid Bond on form AIA Document A310 Bid Bond. Surety companies providing Bidders' bonds shall be licensed to operate in the State of Florida and shall be rated "excellent" or better by Best Insurance Rating Guide. The bond shall be signed or countersigned by a

Florida Resident Agent. You must provide a signed Power of Attorney for each copy of the bond. A Bidder may, at its option, submit a certified check from a Florida bank or a cashier's check as bid security, original and one photostat copy required.

6. SUBCONTRACTOR DISCLOSURE

Bidders shall furnish, on the FAC Document 633, List of Subcontractors form, a full disclosure of subcontractors to be utilized on the project or a clear representation of the Bidder's intent to self-perform the work, as defined, as an attachment to FAC Document 632, Bid Form.

7. EXAMINATION OF SITE

Bidders are required to visit the construction site, prior to bidding, compare the Drawings and Specifications with any work in place and inform themselves of all conditions thereof. Failure to visit site will in no way relieve the successful Bidder from furnishing materials or performing any work necessary to complete the project in accordance with the contract documents, and specifications.

8. ADDENDA

Only those Contractors who attend the mandatory pre-bid meeting will be notified via email of the issuance of Addenda for this project. All addenda will be published on the Owner's website.
(Note: addenda for proposal projects not published online.)

9. PUBLIC ENTITY CRIME INFORMATION STATEMENT

All invitations to bid as defined by Section 287.012(11), Florida Statutes, requests for proposals as defined by Section 287.012(16), Florida Statutes, and any contract document described by Section 287.058, Florida Statutes, shall contain a statement informing persons of the provisions of paragraph (2)(a) of Section 287.133, Florida Statutes, which reads as follows:

> "A person or affiliate who has been placed on the convicted vendor list following a conviction for a public entity crime may not submit a bid on a contract to provide any goods or services to a public entity, may not submit a bid on a contract with a public entity for the construction or repair of a public building or public work, may not submit bids on leases or real property to a public entity, may not be awarded or perform work as a contractor, supplier, subcontractor, or consultant under a contract with any public entity, and may not transact business with any public entity in excess of the threshold amount provided in Section 287.017, for CATEGORY TWO for a period of 36 months from the date of being placed on the convicted vendor list."

10. BID PROTEST BOND

As a condition precedent to filing a bid protest pursuant to Section 120.57(3)(f), Florida Statutes, a protestor shall post a bid protest bond consistent with Section 255.0516, Florida Statutes Any failure by a protestor to file a bid protest bond with the School Board at the time of filing a bid protest shall result in a dismissal with prejudice of the protest for failure to comply with Section 255.0516, Florida Statutes All bid protests must be accompanied by a bid protest bond in the form provided herein and a certified check or cashier's check in an amount consistent with that identified in Section 255.0516(1) or (2), Florida Statutes for this project.

11. CONTRACTOR ACKNOWLEDGMENT FORM

The successful Contractor shall submit an executed Contractor Acknowledgment Form (included in these specifications) to Facilities Services before work begins. On this form the Contractor acknowledges that it has been given access to and has read the asbestos survey, management plan, re-inspection report (if applicable) and/or the certificate of final inspection (if applicable) for the school it will be working in. Further, it acknowledges that the Contractor must cease work and notify the project manager and asbestos program manager in the event of encountering materials not previously identified by the aforementioned reports.

This document must be submitted with the executed contract documents.

12. CONTRACT

The successful Bidder shall execute the Contract for the amount as submitted by the Bidder and approved by the School Board, within ten (10) working days after written notification of acceptance. A binding contract exists upon the issuance of the School Board's Notice of Acceptance of Bid.

The terms and conditions of this Solicitation shall prevail over any other conflicting language until the award of the contract to the lowest responsible Bidder and issuance of the School Board's Notice of Acceptance of Bid.

13. FAC DOCUMENT 640, PERFORMANCE AND PAYMENT BOND - REQUIRED

If a Performance and Payment is required, the successful Bidder shall submit four (4) signed copies of a Performance and Payment Bond from a surety insurer authorized to do business in the State of Florida equal to one hundred percent (100%) of the total contract amount. The School Board's standard Bond Form, included herein, shall be used to submit the information. The Performance and Payment Bond shall be submitted simultaneously with the execution of the Contract. The Performance and Payment Bond shall be subject to the provisions of Section 255.05, Florida Statutes, and shall not expire until one (1) year after the date of the Certificate of Final Payment. The Performance and Payment Bond shall be executed on the same day as the Contract and shall include a Power of Attorney for each copy of the Bond.

14. LIQUIDATED DAMAGES

The parties acknowledge the School Board will suffer damages if the project has not reached Substantial Completion and Final Completion on the dates set forth in the Contract. The damages suffered by the School Board, in the event of a delay, are not readily ascertainable. Due to the difficulty in ascertaining the damages, the Contractor and the Contractor's surety shall be liable for and shall pay, as liquidated damages, the sum of five hundred dollars and zero cents ($500.00) per calendar day for each calendar day or part thereof, the delay in the project continues beyond the deadline set by the terms of the Contract for Substantial Completion of the work. The parties acknowledge that these sums are not a penalty, but are the amount agreed upon by the parties as liquidated damages representing the losses to the School Board which would be incurred in the event the project is delayed by the Contractor beyond the date of Substantial Completion and the date of Final Completion as set forth in the Contract.

15. TIME OF THE ESSENCE

Any time periods provided for herein which shall end on a Saturday, Sunday, or a legal holiday shall extend to 5:00 p.m. of the next business day. Time is of the essence in this Contract.

BID FORM

SCHOOL BOARD OF VOLUSIA COUNTY FLORIDA
FAC DOCUMENT 632

TO: School Board of Volusia County Florida
Facilities Services
3750 Olson Drive, Daytona Beach Florida 32124
(386) 947-8786

The undersigned, having become familiarized with the local conditions affecting the cost of the work and with the Drawings and Specifications as prepared by Kimley-Horn and Associates, Inc hereby submits the following bid / proposal:

Facility Name: TRANSPORTATION / MAINTENANCE - DELTONA
Project Name: Replace Emergency Generator and MDP
VCS Project No.: 2648209

COMPANY NAME: _____
ADDRESS: _____
PHONE: _____

I (We) propose to furnish all labor, materials, equipment and services necessary for the completion of the above project, all in accordance with the Drawings and Specifications hereof, including any addenda issued, as indicated below.

BASE BID
Note: modify the format in the box below as needed for this project.

As shown on the drawings and specifications, the sum of:
_____ ($_____).

ALTERNATES - As described below.
(Note: A/E insert description below; add additional Alternates as needed.)

ALTERNATE NO.1: Install site generator located at MDP in lieu of replacing generator at transportation building
If the owner elects to proceed with Alternate No. 1, as described in the Contract Documents:
☐ add / ☐ deduct _____
($_____).

UNIT PRICES - No unit prices for this project.
(Note: A/E insert description below; add additional Unit Prices as needed.)

UNIT PRICE A: *(insert description here)*
If the owner elects to proceed with Unit Price A, as described in the Contract Documents:
☐ add / ☐ deduct _____
($_____) per _____.

BID SECURITY - REQUIRED
If required, bid security in an amount equal to 5% of the total bid proposal is enclosed with the understanding that this proposal shall remain in full effect for a period of 60 days starting at the bid opening date and time.

The undersigned agrees to commence work under the Contract on or before a date to be specified in the written FAC Document 650 Notice to Proceed, and to substantially complete the project within sixty (60) consecutive calendar days thereafter, as specified in Article 3 of AIA Document A101-2017 Agreement, or Article 2 of FAC Document 625 Agreement, which ever is applicable to this project.

The Bidder acknowledges the following addendum (addenda) is made an integral part of the bid documents:

Addendum No.	Date Issued	Addendum No.	Date Issued

In submitting this bid / proposal, the Bidder acknowledges this bid / proposal is based on all construction documents and addenda as posted on the Owner's website or otherwise provided by the Owner's representative. The Owner reserves the right to accept or reject any or all bids / proposals and is not obligated to accept the lowest responsible bid / proposal.

OFFICIAL COMPANY NAME AND ADDRESS:

_____ By: _____
(Signature)

_____

_____ _____
(Print Name, Title)

_____

AIA® Document A310™ – 2010

Bid Bond

CONTRACTOR:
(Name, legal status and address)

SURETY:
(Name, legal status and principal place of business)

OWNER:
(Name, legal status and address)

BOND AMOUNT: $

PROJECT:
(Name, location or address, and Project number, if any)

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

The Contractor and Surety are bound to the Owner in the amount set forth above, for the payment of which the Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, as provided herein. The conditions of this Bond are such that if the Owner accepts the bid of the Contractor within the time specified in the bid documents, or within such time period as may be agreed to by the Owner and Contractor, and the Contractor either (1) enters into a contract with the Owner in accordance with the terms of such bid, and gives such bond or bonds as may be specified in the bidding or Contract Documents, with a surety admitted in the jurisdiction of the Project and otherwise acceptable to the Owner, for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof; or (2) pays to the Owner the difference, not to exceed the amount of this Bond, between the amount specified in said bid and such larger amount for which the Owner may in good faith contract with another party to perform the work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect. The Surety hereby waives any notice of an agreement between the Owner and Contractor to extend the time in which the Owner may accept the bid. Waiver of notice by the Surety shall not apply to any extension exceeding sixty (60) days in the aggregate beyond the time for acceptance of bids specified in the bid documents, and the Owner and Contractor shall obtain the Surety's consent for an extension beyond sixty (60) days.

If this Bond is issued in connection with a subcontractor's bid to a Contractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

When this Bond has been furnished to comply with a statutory or other legal requirement in the location of the Project, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

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User Notes:

Signed and sealed this day of ,

	(Contractor as Principal) *(Seal)*
(Witness)	*(Title)*
	(Surety) *(Seal)*
(Witness)	*(Title)*

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User Notes:

LIST OF SUBCONTRACTORS

SCHOOL BOARD OF VOLUSIA COUNTY FLORIDA
FAC DOCUMENT 633

Bidder Company Name:	
Facility Name:	Transportation / Maintenance - Deltona
Project Name:	Replace Emergency Generator and MDP
VCS Project Number:	2648209

This form shall be considered an integral part of FAC Document 632, Bid Form, and shall be submitted with the Bid Form.

The term Subcontractor as used herein shall be used as defined in FAC Document 631, Instructions to Bidders.

For each "TYPE OF WORK" listed below, list the name of the subcontractor who will be performing any portion of that work. Use additional sheets, if needed.

Bidder may list itself to self-perform, as defined in FAC Document 631, Instructions to Bidders, a type of work when the Bidder is currently licensed to and shall perform that type of work and provides completed FAC Document 634, Bidder Project Data for Self-Performed Projects, within five (5) days to the date of this bid, for at least two (2) previously self-performed projects of comparable size and scope of this Contract for the last five (5) years.

There shall be no exceptions to a Bidder's obligation to provide the aforementioned documentation in the time frame provided. Failure to provide any of the aforementioned documentation or comply with the requirements of this form shall constitute a material deviation from the requirements of this Solicitation and shall serve as grounds for rejecting the bid as non-responsive.

(Consultant: modify the list of work in the table below as needed for the Project.)

TYPE OF WORK	SUBCONTRACTOR
1. Earthwork	
2. Paving	
3. Site Utilities	
4. Concrete	
5. Electrical	

BIDDER PROJECT DATA
FOR SELF-PERFORMED PORTIONS OF THE WORK

SCHOOL BOARD OF VOLUSIA COUNTY FLORIDA
FAC DOCUMENT 634

Facility Name: TRANSPORTATION / MAINTENANCE - DELTONA
Project Name: Replace Emergency Generator and MDP
VCS Project No.: 2648209

Instructions to Bidder: Work completed in the past 5-years. For each type of work proposed to be self-performed by Bidder in FAC Document 633 of the Solicitation, provide full responses to this form. In the event Bidder requires additional space, Bidder is authorized to reproduce this form.

Submitted by - Firm Name: _____

Firm Address: _____

Self-performed Project No. 1

Project: _____

A. Type of Work: _____

Description: _____ Date Completed: _____

Location: _____

Value of Self-performed Work: _____ Total Project Value: _____

B. Owner: _____

Contact Person(s): _____ Phone: _____

Email: _____

Office Address: _____

C. Arch. or Eng.: _____

Contact Person(s): _____ Phone: _____

Email: _____

Office Address: _____

Self-performed Project No. 2

Project: _____

A. Type of Work: _____

Description: _____ Date Completed: _____

Location: _____

Value of Self-performed Work: _____ Total Project Value: _____

B. Owner: _____

Contact Person(s): _____ Phone: _____

Email: _____

Office Address: _____

C. Arch. or Eng.: _____

Contact Person(s): _____ Phone: _____

Email: _____

Office Address: _____

Self-performed Project No. 3

Project: _____

A. Type of Work: _____

Description: _____ Date Completed: _____

Location: _____

Value of Self-performed Work: _____ Total Project Value: _____

B. Owner: _____

Contact Person(s): _____ Phone: _____

Email: _____

Office Address: _____

C. Arch. or Eng.: _____

Contact Person(s): _____ Phone: _____

Email: _____

Office Address: _____

Self-performed Project No. 4

Project: _____

A. Type of Work: _____

Description: _____ Date Completed: _____

Location: _____

Value of Self-performed Work: _____ Total Project Value: _____

B. Owner: _____

Contact Person(s): _____ Phone: _____

Email: _____

Office Address: _____

C. Arch. or Eng.: _____

Contact Person(s): _____ Phone: _____

Email: _____

Office Address: _____

The foregoing is a statement of fact. Any inaccurate information disclosed in this form shall constitute a major deviation from the Solicitation and result in the rejection of bid as non-responsive to the requirements of the Solicitation.

_____ _____

Print Name *Title*

_____ _____

Signature *Date*

TRENCH SAFETY ACT FORM

SCHOOL BOARD OF VOLUSIA COUNTY FLORIDA
FAC DOCUMENT 635

Facility Name: TRANSPORTATION / MAINTENANCE - DELTONA
Project Name: Replace Emergency Generator and MDP
VCS Project No.: 2648209

This form shall be completed, signed and submitted with FAC Document 632, Bid Form. Failure to submit this form at the time of bid will constitute automatic disqualification and non-acceptance of bid proposal.

The undersigned, herein called "Bidder", has determined to his own complete satisfaction that all portions of the Florida Trench Safety Act (90-96, Laws of Florida) as the OSHA Excavation Safety Standards 29, CFR part 1926.650 Subpart P, will be fully complied with and executed properly on this project.

Bidder acknowledges that included in the various items of the proposal and in the Total Bid Price are costs for complying with the Florida Trench Safety Act (90-96, Laws of Florida) effective October 1, 1990. The bidder further identifies the costs to be summarized below:

	Trench Safety Measure (Description)	Units of Measure (LF, SY)	Unit (Quantity)	Unit Cost	Extended Cost
A.					
B.					
C.					
D.					
				Total	

In Witness whereof, the Bidder as hereunto set his signature and affixed his seal

this _____ day of _____ in the year _____

Firm: _____ *(SEAL)*

By: _____

Name and Title: _____

BID PROTEST BOND

SCHOOL BOARD OF VOLUSIA COUNTY FLORIDA
FAC DOCUMENT 636

Bond Number:
Facility Name:
Project Name:
VCS Project No.:

KNOW ALL PERSONS BY THESE PRESENTS:

That we, _____ a *(select one)* ☐ corporation ☐ joint venture ☐ partnership ☐ proprietorship ☐ limited liability company organized and existing under the laws of the State of _____, and duly authorized to do business in the State of Florida and having its principal place of business at _____ as PRINCIPAL; and _____, a surety company, organized under the laws of the State of _____, and duly authorized to do business in the State of Florida, whose principal place of business is _____ as SURETY, are held and firmly bound unto the School Board of Volusia County Florida as OBLIGEE in the amount of _____ Dollars ($_____) for the payment of which sum we bind ourselves, our heirs, personal representatives, successors and assigns, jointly and severally.

THIS BOND is issued under provisions of Section 255.0516, Florida Statutes. The above-named principal has initiated an administrative protest pursuant to Section 120.57, Florida Statutes, regarding the School Board of Volusia County's (Board) bid solicitation, bid rejection or contract award for the above-referenced project, which protest is conditioned upon the posting of a bond. The bond shall be conditioned upon the payment of all costs and attorneys' fees which may be adjudged against the person filing the protest in the administrative hearing in which the action is brought and any subsequent appellate court proceeding.

NOW, THEREFORE, if the Principal, after conclusion or termination of the administrative hearing process, and/or any appellate court proceedings regarding the protest, shall satisfy all attorneys' fees, costs and interest thereon, rendered by final order and/or judgment, in favor of the Board as the prevailing party, then the obligation shall be null and void; otherwise this bond shall remain in full force and effect.

The Board may bring an action in a proper court on this bond for the amount of such liability, including all additional costs and attorneys' fees associated with a claim against the bond.

PRINCIPAL _____

BY _____

TITLE _____ (CORPORATE SEAL)

ATTEST _____

TITLE _____

SURETY _____

BY _____ (CORPORATE SEAL)

TITLE _____

Florida Licensed Insurance Agent _____

NOTE: Power of attorney showing authority of Surety's agent or Attorney in fact must be attached.

AIA Document A101 – 2017

Standard Form of Agreement Between Owner and Contractor
where the basis of payment is a Stipulated Sum

AGREEMENT made as of the _____ day of _____ in the year _____.
(In words, indicate day, month, and year.)

BETWEEN the Owner:
(Name, legal status, address and other information)

School Board of Volusia County Florida
200 North Clara Avenue, DeLand Florida 32720

Document mailing address: 3750 Olson Drive, Daytona Beach Florida 32124

and the Contractor:
(Name, legal status, address and other information)

_____

for the following Project:
(Name, location and detailed description)

_____

The Architect:
(Name, legal status, address and other information)

_____

The Owner and Contractor agree as follows.

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TABLE OF ARTICLES

1 THE CONTRACT DOCUMENTS

2 THE WORK OF THIS CONTRACT

3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

4 CONTRACT SUM

5 PAYMENTS

6 DISPUTE RESOLUTIONS

7 TEMINATION OR SUSPENSION

8 MISCELLANEOUS PROVISIONS

9 ENUMERATION OF CONTRACT DOCUMENTS

EXHIBIT A INSURANCE AND BONDS

ARTICLE 1 THE CONSTRACT DOCUMENTS

The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, Addenda issued prior to execution of this Agreement, other documents listed in this Agreement, and Modifications issued after execution of this Agreement, all of which form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. An enumeration of the Contract Documents, other than a Modification, appears in Article 9. Contract documents include the Contractor's bid or proposal.

ARTICLE 2 THE WORK OF THIS CONTRACT

The Contractor shall fully execute the Work described in the Contract Documents, except as specifically indicated in the Contract Documents to be the responsibility of others.

ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

§ 3.1. The date of commencement of the Work shall be:

[ ] The date of this Agreement.

[X] A date set forth in a notice to proceed issued by the Owner.

[ ] Established as follows:

(Insert a date or a means to determine the date of commencement of the Work.)

_____

If a date of commencement of the Work is not selected, then the date of commencement shall be the date of this Agreement.

§ 3.2 The Contract Time shall be measured from the date of commencement of the Work.

§ 3.3 Substantial Completion

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§ 3.3.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall achieve Substantial Completion of the entire Work:
(Check one of the following boxes and complete the necessary information.)

[X] Not later than _____ (_____) consecutive calendar days from the date of commencement of the Work.

[ ] By the following date:

§ 3.3.2 Subject to adjustments of the Contract Time as provided in the Contract Documents, if portions of the Work are to be completed prior to Substantial Completion of the entire Work, the Contractor shall achieve Substantial Completion of such portions by the following dates:

Portion of Work	Substantial Completion Date

§ 3.3.3 If the Contractor fails to achieve Substantial Completion as provided in this Section 3.3, liquidated damages, if any, shall be assessed as set forth in Section 4.5.

ARTICLE 4 CONTRACT SUM

§ 4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be _____ ($ _____), subject to additions and deductions as provided in the Contract Documents.

§ 4.2 Alternates

§ 4.2.1 Alternates, if any, included in the Contract Sum:

Item	Price

~~§ 4.2.2 Subject to the conditions noted below, the following alternates may be accepted by the Owner following execution of this Agreement. Upon acceptance, the Owner shall issue a Modification to this Agreement.~~
~~*(Insert below each alternate and the conditions that must be met for the Owner to accept the alternate.)*~~

~~Item~~	~~Price~~	~~Conditions of Acceptance~~

§ 4.3 Allowances, if any, included in the Contract Sum:
(Identify each allowance.)

Item	Price

§ 4.4 Unit prices, if any:
(Identify the item and state the unit price and quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price per Unit ($0.00)

§ 4.5 Liquidated damages, if any:
(Insert terms and conditions for liquidated damages, if any.)

The parties acknowledge the Owner will suffer damages if the project has not reached Substantial Completion and Final Completion on the dates set forth in the Contract. The damages suffered by the Owner, in the event of a delay, are not readily ascertainable. Due to the difficulty in ascertaining the damages, the Contractor and the Contractor's surety shall be liable for and shall pay, as liquidated damages, the sum of _____ dollars _____ cents ($_____) per calendar

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day for each calendar day or part thereof, the delay in the project continues beyond the deadline set by the terms of the Contract for Substantial Completion of the work. The parties acknowledge that these sums are not a penalty, but are the amount agreed upon by the parties as liquidated damages representing the losses to the Owner which would be incurred in the event the project is delayed by the Contractor beyond the date of Substantial Completion as set forth in the Contract. Time is of the essence. Any such liquidated damages may, at the option of the Owner, be withheld and deducted from any unpaid portion of the Contract sum.

§ 4.6 Other:
(Insert provisions for bonus or other incentives, if any, that might result in a change to the Contract Sum.)

_____

ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments

§ 5.1.1 Based upon Applications for Payment submitted to the Architect by the Contractor and Certificates for Payment issued by the Architect, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided below and elsewhere in the Contract Document.

§ 5.1.2 The period covered by each Application for Payment shall be one calendar month ending on the last day of the month, or as follows:

_____

§ 5.1.3 Provided that an Application for Payment is received by the Architect not later than the first day of a month and certified to the Owner by the seventh day of the month, the Owner shall make payment of the amount certified to the Contractor not later than the last day of the same month. If an Application for Payment is received by the Architect and certified to the Owner after the application date fixed above, payment of the amount certified shall be made by the Owner not later than thirty (30) days after the Architect receives the Application for Payment.
(Federal, state or local laws may require payment within a certain period of time.)

§ 5.1.4 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. The schedule of values shall be prepared in such form, and supported by such data to substantiate its accuracy, as the Architect and Owner may require. This schedule of values shall be used as a basis for reviewing the Contractor's Applications for Payment. The Contractor shall not make changes in the Schedule of Values without prior approval of the Architect and Owner.

§ 5.1.5 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment.

§ 5.1.6 In accordance with AIA Document A201™–2017, General Conditions of the Contract for Construction, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.6.1 The amount of each progress payment shall first include:

.1 That portion of the Contract Sum properly allocable to completed Work;

.2 That portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction, or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing.~~; and~~

~~.3 That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified.~~

§ 5.1.6.2 The amount of each progress payment shall then be reduced by:

.1 The aggregate of any amounts previously paid by the Owner;

.2 The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A201–2017;

.3 Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;

.4 For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A201–2017; and

.5 Retainage withheld pursuant to Section 5.1.7.

§ 5.1.7 Retainage

§ 5.1.7.1 For each progress payment made prior to Substantial Completion of the Work, the Owner may withhold the following amount, as retainage, from the payment otherwise due:
(Insert a percentage or amount to be withheld as retainage from each Application for Payment. The amount of retainage may be limited by governing law.)

Retainage, not to exceed five percent (5%), shall be withheld from each progress payment to the Contractor for Projects with a total cost of construction services identified in the contract of more than two hundred thousand dollars ($200,000.00), 218.735 F.S.

§ 5.1.7.1.1 The following items are not subject to retainage:
(Insert any items not subject to the withholding of retainage, such as general conditions, insurance, etc.)

_____

§ 5.1.7.2 Reduction or limitation of retainage, if any, shall be as follows:
(If the retainage established in Section 5.1.7.1 is to be modified prior to Substantial Completion of the entire Work, including modifications for Substantial Completion of portions of the Work as provided in Section 3.3.2, insert provisions for such modifications.)

_____

§ 5.1.7.3 Except as set forth in this Section 5.1.7.3, upon Substantial Completion of the Work, the Contractor may submit an Application for Payment that includes the retainage withheld from prior Applications for Payment pursuant to this Section 5.1.7. The Application for Payment submitted at Substantial Completion shall not include retainage as follows:
(Insert any other conditions for release of retainage upon Substantial Completion.)

_____

§ 5.1.8 If final completion of the Work is materially delayed through no fault of the Contractor, the Owner shall pay the Contractor any additional amounts in accordance with Article 9 of AIA Document A201–2017.

§ 5.1.9 Except with the Owner's prior approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

§ 5.2 Final Payment

§ 5.2.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when

.1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Article 12 of AIA Document A201–2017, and to satisfy other requirements, if any, which extend beyond final payment; and

.2 applicable for Final Payment along with all warranties, guarantees, close out documents including all as built drawings in paper document and digital combined PDF format, transmitted via FTP or other Owner accepted protocol, and items required under the Contract Documents as submitted to the Architect or Engineer for review and transmittal to the Owner; and

.3 Board acceptance of the Certificate of Final Inspection (CFI); and

.4 a final Certificate for Payment has been issued by the Architect.

§ 5.2.2 The Owner's final payment to the Contractor shall be made ~~no later than~~ 30 days after the issuance of the Architect's final Certificate for Payment, or as follows:

_____

~~§ 5.2 Interest~~
~~Payments due and unpaid under the Contract shall bear interest from the date payment is due at the rate stated below, or in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.~~
~~*(Insert rate of interest agreed upon, if any.)*~~

ARTICLE 6 DISPUTE RESOLUTION
§ 6.1 Initial Decision Maker
The Architect will serve as the Initial Decision Maker pursuant to Article 15 of AIA Document A201–2017~~, unless the parties appoint below another individual, not party to this Agreement, to serve as the Initial Decision Maker~~.
(If the parties mutually agree, insert the name, address and other contact information of the Initial Decision Maker, if other than the Architect.)

_____

§ 6.2 Binding Dispute Resolution
For any Claim subject to, but not resolved by, mediation pursuant to Article 15 of AIA Document A201–2017, the method of binding dispute resolution shall be as follows:
(Check the appropriate box.)

[ ] Arbitration pursuant to Section 15.4 of AIA Document A201–2017

[X] Litigation in a court of competent jurisdiction

[ ] Other *(Specify)*

_____

If the Owner and Contractor do not select a method of binding dispute resolution, or do not subsequently agree in writing to a binding dispute resolution method other than litigation, Claims will be resolved by litigation in a court of competent jurisdiction.

ARTICLE 7 TERMINATION OR SUSPENSION
§ 7.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A201–2017.

~~§ 7.1.1 If the Contract is terminated for the Owner's convenience in accordance with Article 14 of AIA Document A201–2017, then the Owner shall pay the Contractor a termination fee as follows:~~
~~*(Insert the amount of, or method for determining, the fee, if any, payable to the Contractor following a termination for the Owner's convenience.)*~~

_____

§ 7.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A201–2017.

ARTICLE 8 MISCELLANEOUS PROVISIONS
§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A201–2017 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

§ 8.2 The Owner's representative:
(Name, address, email address, and other information)

_____

§ 8.3 The Contractor's representative:
(Name, address, email address, and other information)

_____

§ 8.4 ~~Neither the Owner's nor the Contractor's representative shall be changed without ten days prior notice to the other party.~~ The Contractor's representative shall not be changed without prior written approval by the Owner.

§ 8.5 Insurance and Bonds
§ 8.5.1 The Owner and the Contractor shall purchase and maintain insurance as set forth in AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum, Exhibit A, Insurance and Bonds, and elsewhere in the Contract Documents.

§ 8.5.2 The Contractor shall provide bonds as set forth in AIA Document A101™–2017 Exhibit A, and elsewhere in the Contract Documents.

§ 8.6 Other provisions:

_____

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS
§ 9.1 This Agreement is comprised of the following documents:

.1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor
.2 AIA Document A101™–2017, Exhibit A, Insurance and Bonds
.3 AIA Document A201™–2017, General Conditions of the Contract for Construction

.4 Drawings

Exhibit	Title	Date
B	List of Drawings	

.5 Specifications

Exhibit	Title	Date
C	List of Specifications	

.6 Addenda, if any:

Number	Date	Pages

Portions of Addenda relating to bidding or proposal requirements are not part of the Contract Documents unless the bidding or proposal requirements are also enumerated in this Article 9.

.7 Other Exhibits:
(Check all boxes that apply and include appropriate information identifying the exhibit where required.)

Supplemental and other Conditions of the Contract:

_____

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.8 Other documents, if any, listed below:
(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A201™–2017 provides that the advertisement or invitation to bid, Instructions to Bidders, sample forms, the Contractor's bid or proposal, portions of Addenda relating to bidding or proposal requirements, and other information furnished by the Owner in anticipation of receiving bids or proposals, are not part of the Contract Documents unless enumerated in this Agreement. Any such documents should be listed here only if intended to be part of the Contract Documents.)

_____

This Agreement entered into as of the day and year first written above.

School Board of Volusia County Florida _____

OWNER *(Signature)*	CONTRACTOR *(Signature)*
, Board Chair *(Printed name and title)*	*(Printed name and title)*
WITNESS *(Signature)*	WITNESS *(Signature)*
, Superintendent *(Printed name and title)*	*(Printed name and title)*

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Exhibit A – Insurance and Bonds
to AIA Document A101 – 2017 Agreement

This Insurance and Bonds Exhibit is part of the Agreement, between the Owner and the Contractor, dated the _____ day of _____ in the year _____.
(In words, indicate day, month, and year.)

for the following PROJECT:
(Name and location or address)

_____

THE OWNER:
(Name, legal status and address)

School Board of Volusia County Florida
200 North Clara Avenue, DeLand Florida 32720

Document mailing address: 3750 Olson Drive, Daytona Beach Florida 32124

THE CONTRACTOR:
(Name, legal status and address)

_____

TABLE OF ARTICLES

A.1 GENERAL

A.2 OWNER'S INSURANCE

A.3 CONTRACTOR'S INSURANCE AND BONDS

A.4 SPECIAL TERMS AND CONDITIONS

ARTICLE A.1 GENERAL

The Owner and Contractor shall purchase and maintain insurance, and provide bonds, as set forth in this Exhibit. As used in this Exhibit, the term General Conditions refers to AIA Document A201™–2017, General Conditions of the Contract for Construction. The Owner, at its discretion, may modify this document at any time during the preparation of the Contract to conform to the Project.

ARTICLE A.2 OWNER'S INSURANCE

§ A.2.1 General

Prior to commencement of the Work, the Owner shall secure the insurance, and provide evidence of the coverage, required under ~~this Article~~ Section A.2.2 and, upon the Contractor's request, provide a copy of the ~~property~~ insurance policy or policies required ~~by Section A2.3~~. The copy of the policy or policies provided shall contain all applicable conditions, definitions, exclusions, and endorsements.

§ A.2.2 Liability and Property Insurance

The Owner shall be responsible for purchasing and maintaining the Owner's usual general liability and property insurance.

§ A.2.3 Required Property Insurance

§ A.2.3.1 ~~Unless this obligation is placed on the~~ The Contractor, pursuant to Section A.3.3.2.1, ~~the Owner~~ shall purchase and maintain, from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located, property insurance written on a builder's risk "all-risks" completed value or equivalent policy form and sufficient to cover the total value of the entire Project on a replacement cost basis. The ~~Owner's~~ Contractor's property insurance coverage shall be no less than the amount of the initial Contract Sum, plus the value of subsequent Modifications and labor performed and materials or equipment supplied by others. The property insurance shall be maintained until Substantial Completion and thereafter as provided in Section A.2.3.1.3, unless otherwise provided in the Contract Documents or otherwise agreed in writing by the parties to this Agreement. This insurance shall include the interests of the Owner, Contractor, Subcontractors, and Sub-subcontractors in the Project as insureds. This insurance shall include the interests of mortgagees as loss payees.

§ A.2.3.1.1 Causes of Loss. The insurance required by this Section A.2.3.1 shall provide coverage for direct physical loss or damage, and shall not exclude the risks of fire, explosion, theft, vandalism, malicious mischief, collapse, earthquake, flood, or windstorm. The insurance shall also provide coverage for ensuing loss or resulting damage from error, omission, or deficiency in construction methods, design, specifications, workmanship, or materials. Sub-limits, if any, are as follows:
(Indicate below the cause of loss and any applicable sub-limit.)

Causes of Loss	Sub-Limit

§ A.2.3.1.2 Specific Required Coverages. The insurance required by this Section A.2.3.1 shall provide coverage for loss or damage to falsework and other temporary structures, and to building systems from testing and startup. The insurance shall also cover debris removal, including demolition occasioned by enforcement of any applicable legal requirements, and reasonable compensation for the Architect's and Contractor's services and expenses required as a result of such insured loss, including claim preparation expenses. Sub-limits, if any, are as follows:
(Indicate below type of coverage and any applicable sub-limit for specific required coverages.)

Coverage	Sub-Limit

§ A.2.3.1.3 Unless the parties agree otherwise, upon Substantial Completion, the ~~Owner~~ Contractor shall continue the insurance required by Section A.2.3.1 or, if necessary, replace the insurance policy required under Section A.2.3.1 with property insurance written for the total value of the Project that shall remain in effect until expiration of the period for correction of the Work set forth in Section 12.2.2 of the General Conditions.

§ A.2.3.1.4 Deductibles and Self-Insured Retentions. If the insurance required by this Section A.2.3 is subject to deductibles or self-insured retentions, the ~~Owner~~ Contractor shall be responsible for all loss not covered because of such deductibles or retentions. Deductibles in excess of $50,000 shall not be permitted.

§ A.2.3.2 Occupancy or Use Prior to Substantial Completion. The Owner's occupancy or use of any completed or partially completed portion of the Work prior to Substantial Completion shall not commence until the insurance company or companies providing the insurance under Section A.2.3.1 have consented in writing to the continuance of coverage. The Owner and the Contractor shall take no action with respect to partial occupancy or use that would cause cancellation, lapse, or reduction of insurance, unless they agree otherwise in writing.

§ A.2.3.3 Insurance for Existing Structures

If the Work involves remodeling an existing structure or constructing an addition to an existing structure, the ~~Owner~~ Contractor shall purchase and maintain, until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, "all-risks" property insurance, on a replacement cost basis, protecting the existing structure against direct physical loss or damage from the causes of loss identified in Section A.2.3.1, notwithstanding the undertaking of the Work. The Contractor shall be responsible for all co-insurance penalties.

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§ A.2.4 Optional Extended Property Insurance.
The ~~Owner~~ Contractor shall purchase and maintain the insurance selected and described below.
(Select the types of insurance the ~~Owner~~ Contractor is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance. For each type of insurance selected, indicate applicable limits of coverage or other conditions in the fill point below the selected item.)

[ ] § 2.4.1 Loss of Use, Business Interruption, and Delay in Completion Insurance, to reimburse the Owner for loss of use of the Owner's property, or the inability to conduct normal operations due to a covered cause of loss.

[X] § 2.4.2 Ordinance or Law Insurance, for the reasonable and necessary costs to satisfy the minimum requirements of the enforcement of any law or ordinance regulating the demolition, construction, repair, replacement or use of the Project.

[ ] § 2.4.3 Expediting Cost Insurance, for the reasonable and necessary costs for the temporary repair of damage to insured property, and to expedite the permanent repair or replacement of the damaged property.

[ ] § 2.4.4 Extra Expense Insurance, to provide reimbursement of the reasonable and necessary excess costs incurred during the period of restoration or repair of the damaged property that are over and above the total costs that would normally have been incurred during the same period of time had no loss or damage occurred.

[ ] § 2.4.5 Civil Authority Insurance, for losses or costs arising from an order of a civil authority prohibiting access to the Project, provided such order is the direct result of physical damage covered under the required property insurance.

[ ] § 2.4.6 Ingress/Egress Insurance, for loss due to the necessary interruption of the insured's business due to physical prevention of ingress to, or egress from, the Project as a direct result of physical damage.

[ ] § 2.4.7 Soft Costs Insurance, to reimburse the Owner for costs due to the delay of completion of the Work, arising out of physical loss or damage covered by the required property insurance: including construction loan fees; leasing and marketing expenses; additional fees, including those of architects, engineers, consultants, attorneys and accountants, needed for the completion of the construction, repairs, or reconstruction; and carrying costs such as property taxes, building permits, additional interest on loans, realty taxes, and insurance premiums over and above normal expenses.

§ A.2.5 Other Optional Insurance.
The Owner shall purchase and maintain the insurance selected below.

(Select the types of insurance the Owner is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance.)

[X] § 2.5.1 Cyber Security Insurance for loss to the Owner due to data security and privacy breach, including costs of investigating a potential or actual breach of confidential or private information. *(Indicate applicable limits of coverage or other conditions in the fill point below.)*

[ ] § 2.5.2 Other Insurance
(List below any other insurance coverage to be provided by the Owner and any applicable limits.)

Coverage **Limits**

ARTICLE A.3 CONTRACTOR'S INSURANCE AND BONDS

§ A.3.1 General

§ A.3.1.1 Certificates of Insurance. The Contractor shall provide certificates of insurance acceptable to the Owner evidencing compliance with the requirements in this Article A.3 at the following times: (1) prior to commencement of the Work; (2) upon renewal or replacement of each required policy of insurance; and (3) upon the Owner's written request. The Contractor shall furnish to the Owner copies of any endorsements that are subsequently issued amending coverage or limits. Failure of the contractor to obtain and maintain required insurance shall be grounds for termination of the Contract by the Owner. An additional certificate evidencing continuation of commercial liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment and thereafter upon renewal or replacement of such coverage until the expiration of the periods required by Section A.3.2.1 and Section A.3.3.1. The certificates will show the Owner as an additional insured, including a copy of the additional insured form attached to the certificate of insurance, on the Contractor's Commercial General Liability and excess or umbrella liability policy or policies. Umbrella excess liability shall be provided for Projects with a contract sum in excess of one million dollars ($1,000,000); not less than one million dollars ($1,000,000) over primary insurance; and retention for self-insured hazards for one million dollars ($1,000,000).

§ A.3.1.2 Deductibles and Self-Insured Retentions. The Contractor shall disclose to the Owner any deductible or self-insured retentions applicable to any insurance required to be provided by the Contractor.

§ A.3.1.3 Additional Insured Obligations. To the fullest extent permitted by law, the Contractor shall cause the commercial general liability coverage to include (1) the Owner, the Architect, and the Architect's consultants as additional insureds for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations; and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions for which loss occurs during completed operations. The additional insured coverage shall be primary and non-contributory to any of the Owner's general liability insurance policies and shall apply to both ongoing and completed operations. The Contractor, for your Work, shall maintain completed operations coverage for itself and each additionally insured for at least five (5) years or the Florida Statute of Repose whichever is greater. To the extent commercially available, the additional insured coverage shall be no less than that provided by Insurance Services Office, Inc. (ISO) forms CG 20 10 07 04, CG 20 37 07 04, and, with respect to the Architect and the Architect's consultants, CG 20 32 07 04.

§ A.3.2 Contractor's Required Insurance Coverage

§ A.3.2.1 The Contractor shall purchase and maintain the following types and limits of insurance from an insurance company or insurance companies, rated by A.M. Best "A-" or better, lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Contractor shall maintain the required insurance until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, unless a different duration is stated below:

(If the Contractor is required to maintain insurance for a duration other than the expiration of the period for correction of Work, state the duration.)

§ A.3.2.2 Commercial General Liability

§ 3.2.2.1 Commercial General Liability insurance for the Project written on an occurrence form with policy limits of not less than one million dollars ($1,000,000) each occurrence, one million dollars ($1,000,000) per claimant, two million dollars ($2,000,000) general aggregate, and two million dollars ($2,000,000) aggregate for products-completed operations hazard, providing coverage for claims including

.1 damages because of bodily injury, sickness or disease, including occupational sickness or disease, and death of any person;

.2 personal injury and advertising injury;

.3 damages because of physical damage to or destruction of tangible property, including the loss of use of such property;

.4 bodily injury or property damage arising out of completed operations; ~~and~~

.5 the Contractor's indemnity obligations under Section 3.18 of the General Conditions;

.6 contractual liability for bodily injury and property damage not less than one million dollars ($1,000,000) per claimant and each occurrence; and for property damage two million dollars ($2,000,000) general aggregate; and

.7 property damage liability shall provide X, C and U coverage.

§ A.3.2.2.2 The Contractor's Commercial General Liability policy under this Section A.3.2.2 shall not contain an exclusion or restriction of coverage for the following:

.1 Claims by one insured against another insured, if the exclusion or restriction is based solely on the fact that the claimant is an insured, and there would otherwise be coverage for the claim.

.2 Claims for property damage to the Contractor's Work arising out of the products-completed operations hazard where the damaged Work or the Work out of which the damage arises was performed by a Subcontractor.

.3 Claims for bodily injury other than to employees of the insured.

.4 Claims for indemnity under Section 3.18 of the General Conditions arising out of injury to employees of the insured.

.5 Claims or loss excluded under a prior work endorsement or other similar exclusionary language.

.6 Claims or loss due to physical damage under a prior injury endorsement or similar exclusionary language.

.7 Claims related to residential, multi-family, or other habitational projects, if the Work is to be performed on such a project.

.8 Claims related to roofing, if the Work involves roofing.

.9 Claims related to exterior insulation finish systems (EIFS), synthetic stucco or similar exterior coatings or surfaces, if the Work involves such coatings or surfaces.

.10 Claims related to earth subsidence or movement, where the Work involves such hazards.

.11 Claims related to explosion, collapse and underground hazards, where the Work involves such hazards.

§ 3.2.3 Automobile Liability covering vehicles owned, hired, leased and non-owned vehicles used, by the Construction Manager, with policy limits of not less than one million dollars ($1,000,000) per accident, for bodily injury, death of any person, and property damage arising out of the ownership, maintenance and use of those motor vehicles along with any other statutorily required automobile coverage. The Owner is to be named as additionally insured. The State of Florida has no-fault automobile insurance requirements; the Contractor shall be certain coverage is provided which conforms to any specific stipulation in this law.

§ A.3.2.4 The Contractor may achieve the required limits and coverage for Commercial General Liability and Automobile Liability through a combination of primary and excess or umbrella liability insurance, provided such primary and excess or umbrella insurance policies result in the same or greater coverage as the coverages required under Section A.3.2.2 and A.3.2.3, and in no event shall any excess or umbrella liability insurance provide narrower coverage than the primary policy. The excess policy shall not require the exhaustion of the underlying limits only through the actual payment by the underlying insurers.

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§ A.3.2.5 Workers' Compensation at State, Chapter 440 Florida Statutes, and Federal, e.g. Longshoremen's Statute, statutory limits with policy limits not less than one million dollars ($1,000,000.00) each accident, each employee and policy limit.

§ A.3.2.5.1 In the event the Contractor is using leased employees (PEO arrangement), provide the same workers' compensation policy limits as Section 3.2.5; and a waiver of subrogation in favor of alternate employers' endorsement showing the subcontractor as the alternate employer.

§ 3.2.6 Employers' Liability with policy limits not less than one million dollars ($1,000,000) each accident, one million dollars ($1,000,000) each employee, and one million dollars ($1,000,000) policy limit.

§ A.3.2.7 Jones Act, and the Longshore & Harbor Workers' Compensation Act, as required, if the Work involves hazards arising from work on or near navigable waterways, including vessels and docks.

§ 3.2.8 If the Construction Manager is required to furnish professional services as part of the Work, the Construction Manager shall procure Professional Liability insurance covering performance of the professional services, with policy limits of not less than one million dollars ($1,000,000) per claim and one million dollars ($1,000,000) in the aggregate.

§ 3.2.9 If the Work involves the transport, dissemination, use, or release of pollutants, the Construction Manager shall procure Pollution Liability insurance, with policy limits of not less than one million dollars ($1,000,000) per claim and one million dollars ($1,000,000) in the aggregate.

§ 3.2.10 Coverage under Sections 3.2.8 and 3.2.9 may be procured through a Combined Professional Liability and Pollution Liability insurance policy, with combined policy limits of not less than _____ ($ _____) per claim and _____ ($ _____) in the aggregate.

§ 3.2.11 Insurance for maritime liability risks associated with the operation of a vessel, if the Work requires such activities, with policy limits of not less than _____ ($ _____) per claim and _____ ($ _____) in the aggregate.

§ 3.2.12 Insurance for the use or operation of manned or unmanned aircraft, if the Work requires such activities, with policy limits of not less than _____ ($ _____) per claim and _____ ($ _____) in the aggregate.

§ A.3.3 Contractor's Other Insurance Coverage

§ A.3.3.1 Insurance selected and described in this Section A.3.3 shall be purchased from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Contractor shall maintain the required insurance until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, unless a different duration is stated below:
(If the Contractor is required to maintain any of the types of insurance selected below for a duration other than the expiration of the period for correction of Work, state the duration.)

§ 3.3.2 The Contractor shall purchase and maintain the following types and limits of insurance in accordance with Section 3.3.1.
(Select the types of insurance the Contractor is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance. Where policy limits are provided, include the policy limit in the appropriate fill point.)

[X] § 3.3.2.1 Property insurance of the same type and scope satisfying the requirements identified in Section A.2.3, which, if selected in this section A.3.3.2.1, relieves the Owner of the responsibility to purchase and maintain such insurance ~~except insurance required by Section A.2.3.1.3 and Section A.2.3.3~~. The Contractor shall comply with all obligations of the Owner under Section A.2.3 except to the extent provided below. The Contractor shall disclose to the Owner the amount of any deductible, and the Owner shall be responsible for losses within the deductible. Upon request, the Contractor shall provide the Owner with a copy of the property insurance policy or policies required. The Owner shall adjust and settle

the loss with the insurer and be the trustee of the proceeds of the property insurance in accordance with Article 11 of the General Conditions unless otherwise set forth below.
(Where the Contractor's obligation to provide property insurance differs from the Owner's obligations as described under Section A.2.3, indicate such differences in the space below. Additionally, if a party other than the Owner will be responsible for adjusting and settling a loss with the insurer and acting as the trustee of the proceeds of property insurance in accordance with Article 11 of the General Conditions, indicate the responsible party below.)

[ ] § 3.3.2.2 Railroad Protective Liability Insurance, with policy limits of not less than _____ ($ _____) per claim and _____ ($ _____) in the aggregate, for Work within fifty (50) feet of railroad property.

[ ] § 3.3.2.3 Asbestos Abatement Liability Insurance, with policy limits of not less than _____ ($ _____) per claim and _____ ($ _____) in the aggregate, for liability arising from the encapsulation, removal, handling, storage, transportation, and disposal of asbestos-containing materials.

[X] § 3.3.2.4 Insurance for physical damage to property while it is in storage and in transit to the construction site, including scaffolding and other equipment used on the Project, on an "all-risks" completed value form.

[ ] § 3.3.2.5 Property insurance on an "all-risks" completed value form, covering property owned by the Construction Manager and used on the Project, including scaffolding and other equipment.

[ ] § 3.3.2.6 Other Insurance
(List below any other insurance coverage to be provided by the Construction Manager and any applicable limits.)

Coverage **Limits**

§ A.3.4 Performance Bond and Payment Bond
§ A.3.4.1 The Contractor shall provide surety bonds, from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located~~, as follows:~~.
~~*(Specify type and penal sum of bonds.)*~~

~~Payment and Performance Bonds shall be AIA Document A312, Payment Bond and Performance Bond, or contain provisions identical to AIA Document A312, current as of the date of this Agreement.~~

§ A.3.4.2 Unless otherwise agreed in writing prior to beginning Work, the Contractor shall furnish and pay for a Performance and Payment Bond on the Project in the amount of one-hundred percent (100%) of the Contract Price. The liability under said Bond shall be coextensive with the Contractor for all damages arising out of Contractor's breach of this agreement or failure to perform, including, but not limited to, delay damages, liquidated damages (if any), completion of punch lists and the Contractors responsibilities under Section 12.2.2.1 of the General Conditions. "Conditional" Payment Bonds under Florida Statutes, Section 713.245, shall not be acceptable. Proper Power of Attorney shall accompany said bonds.

§ A.3.4.3 The Contractor shall provide a Public Construction Bond as required by 255.05 F.S.; the Performance and Payment Bonds shall be on forms provided and approved by the Owner.

§ A.3.4.4 Bonds shall be secured through sources acceptable to the Owner. To be acceptable to the Owner as Surety for Performance and Payment Bonds, a Surety Company shall comply with the following provisions:

.1 the Surety Company must be authorized to do business in the State of Florida; and
.2 the Surety Company shall have been in business and have a record of successful continuous operations for at least five years; and

.3 the Surety Company shall have at least A.M. Best Company Policyholder's Rating of "A-" and "Financial Size Category" of class XI or an equivalent rating from the Insurance Commissioner if not rated by A.M. Best.

ARTICLE A.4 SPECIAL TERMS AND CONDITIONS

Special terms and conditions that modify this Insurance and Bonds Exhibit, if any, are as follows:

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AIA Document A201 – 2017

General Conditions of the Contract for Construction

for the following PROJECT:
(Name and location or address)

_____

THE OWNER:
(Name, legal status and address)

School Board of Volusia County Florida
200 North Clara Avenue, DeLand Florida 32720

Document mailing address: 3750 Olson Drive, Daytona Beach Florida 32124

THE ARCHITECT:
(Name, legal status and address

_____

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ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

All references herein to "Contractor" shall mean "Construction Manager" for Construction Management contract Projects in lieu thereof. The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (A201-2017 General Conditions of the Contract as modified by Owner hereinafter "A201-2017", Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement, and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, ~~(3) a Construction Change Directive,~~ or (3) a written order for a minor change in the Work issued by the Architect. ~~Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of Addenda relating to bidding or proposal requirements.~~

§ 1.1.2.1 Three (3) original Contract documents shall be signed by both parties with one (1) signed document delivered to Contractor after Owner approval.

§ 1.1.3 The Work

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment, and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

§ 1.1.4 The Project

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 and by Separate Contractors.

§ 1.1.5 The Drawings

The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.

§ 1.1.6 The Specifications

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.7 Instruments of Service

Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.8 Initial Decision Maker

The Architect ~~Initial Decision Maker~~ is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith.

§ 1.1.9 Third Party Beneficiary

Nothing contained in the Contract Documents shall create a contractual relationship between the Owner and any third party; however, it is understood and agreed that the Owner is an intended third-party beneficiary of all contracts for design or engineering services, all subcontracts, purchase orders as well as all agreements between the Contractor and third parties. The Contractor shall incorporate the obligations of this Contract into its respective subcontracts, supply agreements and purchase orders.

§ 1.2 Correlation and Intent of the Contract Documents

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the intended ~~indicated~~ results.

§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.2.4 The term "Provide", as used in the Contract Documents, includes furnishing all labor, supervision, tools, materials, supplies, equipment, shop drawings, product data and samples, together with all services, accessories and costs associated with performance of the work, for production of an item or system usable in the completed project.

§ 1.2.5 Where conflict or discrepancies exists within or between the Contract Documents or between the Contract Documents and applicable industry standards or applicable codes, ordinances, or other legal requirements, the more stringent requirements shall apply; otherwise, the following order of precedence shall be used.

.1 The Agreement
.2 Supplementary Conditions, if any
.3 These General Conditions
.4 Addenda, if any, with those of later date having precedence over those of earlier date
.5 Specifications
.6 Drawings

§ 1.2.6 Any organization's document referred to, unless otherwise specified in the Specifications, shall mean the latest edition of such document adopted and published prior to the date of the Specifications, and such documents shall be a part of the Specifications with the same effect as if written therein in full.

§ 1.2.7 Dimensions indicated on any Drawings are required dimensions, regardless of measurement per given scale. The Contractor shall verify at the Site necessary levels, measurements, etc., for proper and complete fabrication, assembly and installation of Work. Where dimensions are not indicated, and exact location is not apparent, the Contractor shall notify the Owner and Architect. Inadvertent discrepancies or omissions of details, figures or notes on one drawing, where another drawing correctly sets forth such information, shall not be cause for additional charges or claims.

§ 1.2.8 The interrelation of the Specifications, the Drawings and the Schedules is as follows: The Specifications determine the nature of the setting of the various materials; the Drawings establish the quantities, dimension and details; and the Schedules give the locations. Should the Drawings disagree in themselves, or with the Specifications, the better quality or greater quantity of work or materials shall be estimated upon and, unless otherwise ordered by the Architect in writing, shall be performed or furnished. Explanatory notes on Drawings take precedence over Specifications. Figures given on Drawings take precedence over scaled measurements, and large-scale details take precedence over small Drawings.

§ 1.3 Capitalization

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles, or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 Interpretation

In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 Ownership and Use of Drawings, Specifications, and Other Instruments of Service

§ 1.5.1 Unless otherwise provided in the Owner's Agreement with the Architect, the Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and retain all common law, statutory, and other reserved rights in their Instruments of Service, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7 and 1.8, solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants.

§ 1.6 Notice

§ 1.6.1 Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to whom the notice is addressed and shall be deemed to have been duly served if delivered in person, by mail, by courier, or by electronic transmission if a method for electronic transmission is set forth in the Agreement.

§ 1.6.2 Notice of Claims as provided in Section 15.1.3 shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery.

§ 1.6.3 Written notice requirements of this Contract imposed upon the Contractor shall be strictly construed and such requirements are a condition precedent to Contractor pursuing any rights or remedies hereunder. Contractor expressly waives its rights to claim any waiver by the Owner of such notice requirements based upon the Owner having actual knowledge, implied, verbal or constructive notice, suffering lack of prejudice or any other grounds as substitute for the failure of the Contractor to comply with the express written notice requirements herein.

§ 1.7 Digital Data Use and Transmission

§ 1.7.1 The parties shall agree upon protocols governing the transmission and use of Instruments of Service or any other information or documentation in digital form. ~~The parties will use AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, to establish the protocols for the development, use, transmission, and exchange of digital data.~~

§ 1.7.2 The Owner, at its discretion and direction, intends to utilize Procore Construction Management software platform which is licensed to the Owner. Access to the platform shall be provided to the Contractor at no cost to the Contractor.

- .1 The Procore Certification Program, as applicable to the Contractor's software access, shall be provided to those deemed necessary by the Contractor and Owner for the Project. The program is a self-paced webinar format intended to familiarize the user with the software. Time will be allotted to the Contractor for this purpose.
- .2 The Contractor shall perform the following:
  - .1 upload pertinent documents and files within the Procore software as established by the Owner; and
  - .2 utilize Procore Tools to manage specific data based documents and information; and
  - .3 collaborate and communicate with the Owner and Consultants within the Procore software; and
  - .4 modify the drawings within the Procore software throughout the Project in order to create as built drawings; and

.5 other Owner assigned and/or required Procore software processes necessary for the successful completion of the Project.

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model ~~and without having those protocols set forth in AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document G202™–2013, Project Building Information Modeling Protocol Form,~~ shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

§ 1.9 Public Records Compliance

§ 1.9.1 If the Contractor has questions regarding the application of Chapter 119, Florida Statutes, to the Contractor's duty to provide public records relating to this contract, contact the Custodian of Public Records at (386) 734-7190 extension 20119, custserv@volusia.k12.fl.us or 200 North Clara Avenue, DeLand Florida 32720. The Contractor shall:

.1 Keep and maintain public records required by the school district to perform the service; and

.2 Upon request from the school district's custodian of public records, provide the school district with a copy of the requested records or allow the records to be inspected or copied within a reasonable time at a cost that does not exceed the cost provided in this chapter or as otherwise provided by law; and

.3 Ensure that public records that are exempt or confidential and exempt from public records disclosure requirements are not disclosed except as authorized by law for the duration of the contract term and following completion of the contract if the Contractor does not transfer the records to the school district; and

.4 Upon completion of the contract, transfer, at no cost, to the school district all public records in possession of the Contractor or keep and maintain public records required by the school district to perform the service. If the Contractor transfers all public records to the school district upon completion of the contract, the Contractor shall destroy any duplicate public records that are exempt or confidential and exempt from public records disclosure requirements. If the Contractor keeps and maintains public records upon completion of the contract, the Contractor shall meet all applicable requirements for retaining public records. All records stored electronically must be provided to the school district, upon request from the school district's custodian of public records, in a format that is compatible with the information technology systems of the school district.

§ 1.9.2 Failure of the Contractor to abide by the terms of this provision shall be deemed a material breach of this agreement and the School District of Volusia County may enforce the terms of this provision in the form of a court proceeding and shall, as a prevailing party, be entitled to reimbursement of all attorney's fees and costs associated with that proceeding. This provision shall survive termination or expiration of the contract.

ARTICLE 2 OWNER

§ 2.1 General

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The term "Owner" means the Owner or the Owner's authorized representative, who shall be the Superintendent or designee. The Owner's Representative is authorized to act on the Owner's behalf as provided herein and in applicable law, regulation or ordinance. The Owner's Representative has the authority to reject unsatisfactory work and to stop the work if necessary to ensure its proper execution. Failure of the Owner's Representative, in any one or more instances, to insist on strict performance of any of the terms of the Contract or to exercise any option herein conferred shall not be construed as a waiver or relinquishment of future insistence of any such terms or options. ~~Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.~~

§ 2.1.2 The Owner shall furnish to the Contractor, within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of, or enforce mechanic's lien rights. Such information

shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein.

§ 2.2 Evidence of the Owner's Financial Arrangements

§ 2.2.1 Where the Owner has designated information furnished under this Section 2.2 as "confidential," the Contractor shall keep the information confidential and shall not disclose it to any other person. However, the Contractor may disclose "confidential" information, after seven (7) days' notice to the Owner, where disclosure is required by law, including a subpoena or other form of compulsory legal process issued by a court or governmental entity, or by court or arbitrator(s) order. The Contractor may also disclose "confidential" information to its employees, consultants, sureties, Subcontractors and their employees, Sub-subcontractors, and others who need to know the content of such information solely and exclusively for the Project and who agree to maintain the confidentiality of such information. ~~Prior to commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. The Contractor shall have no obligation to commence the Work until the Owner provides such evidence. If commencement of the Work is delayed under this Section 2.2.1, the Contract Time shall be extended appropriately.~~

~~§ 2.2.2 Following commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract only if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due; or (3) a change in the Work materially changes the Contract Sum. If the Owner fails to provide such evidence, as required, within fourteen days of the Contractor's request, the Contractor may immediately stop the Work and, in that event, shall notify the Owner that the Work has stopped. However, if the request is made because a change in the Work materially changes the Contract Sum under (3) above, the Contractor may immediately stop only that portion of the Work affected by the change until reasonable evidence is provided. If the Work is stopped under this Section 2.2.2, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided in the Contract Documents.~~

~~§ 2.2.3 After the Owner furnishes evidence of financial arrangements under this Section 2.2, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.~~

~~§ 2.2.4 Where the Owner has designated information furnished under this Section 2.2 as "confidential," the Contractor shall keep the information confidential and shall not disclose it to any other person. However, the Contractor may disclose "confidential" information, after seven (7) days' notice to the Owner, where disclosure is required by law, including a subpoena or other form of compulsory legal process issued by a court or governmental entity, or by court or arbitrator(s) order. The Contractor may also disclose "confidential" information to its employees, consultants, sureties, Subcontractors and their employees, Sub-subcontractors, and others who need to know the content of such information solely and exclusively for the Project and who agree to maintain the confidentiality of such information.~~

§ 2.3 Information and Services Required of the Owner

§ 2.3.1 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

§ 2.3.2 The Owner ~~shall~~ may, at Owner's sole discretion, retain an architect lawfully licensed to practice architecture, or an entity lawfully practicing architecture, in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 2.3.3 If the employment of the Architect terminates, the Owner ~~shall~~ may employ a successor ~~to whom the Contractor has no reasonable objection and~~ whose status under the Contract Documents shall be that of the Architect.

§ 2.3.4 The Owner shall furnish surveys to the extent available to the Owner, without being responsible for the accuracy of completeness of same, describing physical characteristics, legal limitations and utility locations for the site of the

Project, and a legal description of the site. ~~The Contractor shall be entitled to rely on the accuracy of such survey information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.~~

§ 2.3.5 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

§ 2.3.6 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.

§ 2.4 Owner's Right to Stop the Work

§ 2.4.1 If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3. The Owner shall incur no liability for delays occasioned by any stop-work order issued in accordance with this paragraph.

§ 2.4.2 If, after consultation with the Architect, suspension of the Work is warranted by reason of unforeseen conditions which may adversely affect the quality of the Work if such Work were continued, the Owner may suspend the Work by written notice to the Contractor. In such event, the Contract Time shall be adjusted accordingly, and the Contract Sum shall be adjusted to the extent, if any, that additional costs are incurred by reason of such suspension. If the Contractor, in its reasonable judgment, believes that a suspension is warranted by reason of unforeseen circumstances which may adversely affect the quality of the Work if the Work were continued, the Contractor shall immediately notify the Owner and the Architect of such belief and describe with particularity the reasons therefor.

§ 2.5 Owner's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ~~five~~ ten-day period after receipt of notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, ~~correct such default or neglect. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect and the Architect~~ commence and continue to carry out the Work. The Architect may, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. ~~If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.~~ The right of Owner to stop the Work pursuant to this Section 2.5 shall not give rise to any duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity.

ARTICLE 3 CONTRACTOR

§ 3.1. General

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 3.1.3 The Contractor shall not be relieved of its obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become ~~generally~~ familiar with local conditions under which the Work is to be performed, and correlated personal observations with requirements of the Contract Documents. Familiarity with local conditions shall include, without limitation, (1) the condition and layout of the Project site and surrounding locale, (2) available labor supply and costs, (3) available subcontractors and suppliers, (4) the prevailing climate, including the impact of rain and saltwater environment, (5) available material and equipment and costs, and (6) other similar issues. Extra payments will not be authorized for Work that could have been foreseen by careful examination of the Site. Execution of the Contract shall constitute acceptance, by the Contractor, of existing Site conditions as a part of the requirements for this Work, except as to concealed and unknown conditions as provided in Section 3.7.4. Contractor shall make no claim for additional time or money based upon its failure to comply with this Paragraph.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.4, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall submit Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner, subject to Section 15.1.7, as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.3 Supervision and Construction Procedures

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention and in accordance with all local and Florida licensing requirements and Florida Building Code. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely notice to the Owner and Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. Unless the Architect objects to the Contractor's proposed alternative, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences, or procedures.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors. The Contractor agrees to remove from the Project any employee, Subcontractor, or Subcontractor employee that commits any breach of the Contract Documents or any breach of the Owner's written rules and regulations regarding jobsite conduct.

§ 3.3.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them. The Contractor shall require all construction personnel to maintain a neat general appearance at all times. Shirts, trousers and proper shoes are required apparel. The display of vulgar words, signs or figures is prohibited. Sandals and flip-flops are prohibited on the Project site. The use of radios, sound producing devices and the like are prohibited on the Project site. The Contractor shall not be permitted to use restrooms or other sanitary facilities within the Owner's existing buildings or on-site facilities.

§ 3.3.4 The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work. Neither the presence or absence of the Owner or Architect shall relieve the Contractor from any requirements of the Contract Documents.

§ 3.3.5 The Contractor will be responsible for all building grades, lines, levels, etc., required for layout of the Work.

§ 3.3.6 If required by Owner on a Project where applicable, at the earliest possible time after the commencement of the Work on the Project site, the Contractor shall have all property corners and benchmarks verified or established by a state-licensed land surveyor, shall locate the Project on the Project site, establishing necessary reference marks and axes from which the Work accurately can progress, shall furnish Architect evidence of such verification and shall report at once any errors discovered during the process of such verification.

§ 3.3.7 If any of the Work is required to be inspected or approved by any public authority, the Contractor shall cause such inspection or approval to be performed. No inspection performed or failed to be performed by the Owner hereunder shall be a waiver of any of the Contractor's obligations hereunder or be construed as an approval or acceptance of the Work or any part thereof.

§ 3.3.8 The Contractor acknowledges that it is the Contractor's responsibility to hire all personnel for the proper and diligent prosecution of the Work and the Contractor shall use its best efforts to maintain labor peace for the duration of the Project. In the event of a labor dispute of the Contractor, its subcontractors or suppliers, the Contractor shall not be entitled to any increase in the Contract Sum.

§ 3.4 Labor and Materials

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

§ 3.4.2 Equal Opportunity

§ 3.4.2.1 ~~Except in the case of minor changes in the Work approved by the Architect in accordance with Section 3.12.8 or ordered by the Architect in accordance with Section 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive.~~ The Contractor shall maintain policies of employment as follows: (1) the Contractor and the Contractor's Subcontractors shall not discriminate against any employee or applicant for employment because of race, gender, religion, national origin, ethnicity, sexual orientation, age or disability; (2) the Contractor and the Contractor's Subcontractors shall, in all solicitations or advertisements for employees placed by them or on their behalf, state that all qualified applicants will receive consideration for employment without regard to race, gender, religion, national origin, ethnicity, sexual orientation, age or disability.

§ 3.4.3 The Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order of other appropriate written directive by the Owner ~~shall enforce strict discipline and~~

~~good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them~~.

§ 3.4.4 Value Engineering Incentive

§ 3.4.4.1 Any proposal initiated and developed by the Contractor for variation from contractual requirements, which to be acceptable under the Contract would necessitate issuance of a contractual change and which reduces the cost of performing the Contract, without degrading operational functions: e.g., performance, reliability or maintainability of the item. Such proposals would be submitted by the Contractor to the Architect in the same form as prescribed for any other proposal, which would likewise necessitate a change in the contractual requirements but would include a statement that they are a proposed Value Engineering Change subject to the operation of this clause.

§ 3.4.4.2 The Architect will be the sole judge of acceptability, and no substitute will be ordered, installed, used or initiated without the Architect's prior written acceptance which will be evidenced by Change Order. However, any Value Engineering Change accepted by the Architect shall not result in any increase in the Contract Price or Contract Time. By making a request for a Value Engineering Change, the Contractor agrees to pay directly to the Architect all Architect's fees and charges related to the Architect's review of the request for Value Engineering Change, whether or not the Architect accepts the request. The Owner may require the Contractor to furnish at the Contractor's expense a special performance guarantee or other surety with respect to any substitute approved after award of the Contract.

§ 3.4.5 Owner Direct Purchase

§ 3.4.5.1 The Owner is tax exempt and may wish to exercise its right to purchase directly various construction materials, supplies and equipment that may be part of the Contract. The Owner will, via its purchase orders, purchase that material and the Contractor shall assist the Owner in the preparation of purchase orders. The Owner may direct the Contractor to prepare the purchase order on the Owner's form and make ready for verification and execution by the Owner. The materials shall be purchased from the vendors and or suppliers originally selected by the Contractor, for the price originally negotiated by the Contractor. Within thirty (30) days of the Notice to Proceed (NTP) the Contractor shall prepare a complete list of materials, supplies and equipment, including the cost of each item, for the Project and the Owner will advise the Contractor in writing which items from the list the Owner wishes to purchase directly.

§ 3.4.5.2 At a time deemed acceptable to the Owner, the Contract amount shall be reduced by the net, undiscounted amount of the purchase order, plus all sales taxes and surtax as levied. Issuance of the purchase orders by the Owner does not change any of the Contractor's responsibilities regarding material purchases, or installations, with the exception of the payments for the materials purchased. The Contractor remains responsible for coordination, correct quantities ordered, submittals, protection, storage, scheduling, shipping, security, expedition, receiving and unloading, certifying the accuracy of shipping tickets and invoices, installation, cleaning, all applicable warranties and that all materials purchased meet the requirements of the Contract Documents. The Contractor shall certify all invoices as accurate and acceptable and forward to the Owner the certified invoices for payment by the Owner.

§ 3.4.5.3 In the event that materials, supplies or equipment purchased under this option are defective or rejected for any reason whatsoever, and it becomes necessary in the opinion of the Contractor to initiate legal action against the responsible party, the Owner agrees to assign and subordinate to the Contractor any claims the Owner has against the responsible party resulting from the purchase order and to execute any legal documents necessary to accomplish the assignment, subordination or subrogation of such claims, and to cooperate with the Contractor in such legal action.

§ 3.4.5.4 The Contractor agrees to execute the Owner's document "Contractor's Direct Material Purchase Affidavit" and to submit the affidavit to the Owner along with the above described list of materials, supplies and equipment, as agreed to between the Owner and Contractor. Tax savings will be returned to the Owner via Change Order.

§ 3.5 Warranty

§ 3.5.1 The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not

executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect or Owner, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.5.2 All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 9.8.4.

§ 3.6 Taxes

The Contractor shall pay sales, consumer, use and similar taxes for the Work in accordance with the laws of the state and other taxing authorities in the jurisdiction where the Project is located ~~provided by the Contractor~~ that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

§ 3.7 Permits, Fees, Notices and Compliance with Laws

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded. The Contractor shall procure all certificates of inspection, use, occupancy, permits and licenses, pay all charges and fees and give all notices necessary and incidental to the due and lawful prosecution of the Work. Certificates of inspection, use and occupancy shall be delivered to the Owner upon completion of the Work in sufficient time for occupation of the Project in accordance with the approved schedule for the Work. The costs of such procurement, payment and delivery are included within the Contract Sum.

§ 3.7.1.1 Certain permits, regulations and fees may apply to work involved in this Project when such work takes place beyond the limits of the school site. This may include but not be limited to hauling and disposal of materials and debris resulting from demolition. The Contractor shall obtain any such permits, comply with all applicable regulations and pay the cost of any and all fees required by such offsite work.

§ 3.7.1.2 The Owner's building department is the authority having jurisdiction for building code compliance unless otherwise provided in the Contract Documents. The Owner's building permit is required to be issued before construction may commence and will be furnished to the Contractor at no cost upon compliance with permit application requirements.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work. The Contractor shall comply with all applicable federal, state and county, and city statutes, safety regulations, codes, ordinances and orders, including the Occupational Safety and Health Administration Act of 1970 (OSHA) as amended from time to time.

§ 3.7.3 If the Contractor performs Work ~~knowing it to be~~ contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.7.4 Concealed or Unknown Conditions (Excluding Claims for Unsuitable Soils)

If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 14 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor, stating the reasons. No adjustment in Contract Sum or Contract Time shall be allowed pursuant to this Article to the extent the concealed or unknown condition should have been reasonably discovered by the Contractor during pre-bid site inspections, review, or preconstruction services. If either party disputes the Architect's determination or recommendation, that party may submit a Claim as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.7.6 Claims for Unsuitable Soils "Unsuitable soil" does not include soil with high or low moisture content or soil adversely affected by weather conditions and no claim for additional cost will be accepted based solely on the moisture content of excavated material. If the excavated material is unsatisfactory for the specified use on the project solely because of either high or low moisture content or the soil is adversely affected by weather conditions, the Contractor may, in its discretion, either (1) process the material to adjust the moisture content to the specified condition or an acceptable condition if not specified, or (2) remove the material and replace it with satisfactory material. Contractor's election of either option will be at Contractor's expense with no additional cost to the Owner.

§ 3.7.7 E-Verify

§ 3.7.7.1 State of Florida, Office of the Governor, Executive Order 11-116 (superseding Executive Order 11-02) requires all agencies under the direction of the Governor to verify the employment eligibility of all new employees through the U.S. Department of Homeland Security's E-Verify system. Further, in conjunction with Section 448.095 F.S., the Contractor is directed to include as a condition of all contracts for the provision of goods or services to the School Board of Volusia County in excess of nominal value, an express requirement that the Contractor utilizes the U.S. Department of Homeland Security's E-Verify system to verify the employment eligibility of all new employees hired by the Contractor during the contract term, and an express requirement that the Contractor include in such subcontracts the requirement that subcontractors performing work or providing services pursuant to the state contract utilize the E-Verify system to verify the employment eligibility of all new employees hired by the subcontractor during the contract term. To enroll in the E-Verify system employers should visit www.e-verify.gov.

§ 3.7.7.2 Failure to comply shall be cause for termination of contract by the Owner, at its sole discretion. The Contractor is liable for any additional costs incurred as a result of the termination of Contract, Section 448.095(2) F.S.

§ 3.7.7.3 The Contractor is required to submit to the Owner FAC Document 639, Contractor E-Verify Affidavit, upon contract execution.

§ 3.7.8 Use of Coercion for Labor and Services

§ 3.7.8.1 Section 787.06(13) F.S., requires all nongovernmental entities executing, renewing or extending a contract with a governmental entity to provide an affidavit signed by an officer or representative of the nongovernmental entity under penalty of perjury that the nongovernmental entity does not use coercion for labor or services as defined in that statute. The School Board of Volusia County Florida is a governmental entity for purposes of this statute. Unless otherwise directed by the Owner, said affidavit shall be submitted as part of the Contractor's Pre-qualification via the School District's Purchasing Department.

§ 3.8 Allowances

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents,

.1 allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;

.2 Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and

.3 whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

§ 3.9 Superintendent

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during all performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor. Important communications shall be confirmed in writing. Other communications shall be similarly confirmed on written request in each case. The superintendent shall be satisfactory to the Owner in all respects, and Owner shall have the right to require Contractor to dismiss from the Project any superintendent whose performance is not satisfactory to Owner, and to replace such superintendent with a superintendent satisfactory to Owner. The Contractor shall not replace the superintendent without the written consent of the Owner.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Architect may notify the Contractor, stating whether the Owner or the Architect (1) has reasonable objection to the proposed superintendent or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed.

§ 3.9.4 If required by Owner, a list of all supervisory personnel, including the project manager and superintendent, that the Contractor intends to use on the Project and a chain-of-command organizational chart shall be submitted to the Owner for approval. The Contractor shall not engage supervisory personnel or utilize an organization and chain-of-command other than as approved by Owner in writing and shall not change such personnel or form of organization without the written approval of the Owner.

§ 3.10 Contractor's Construction and Submittal Schedules

§ 3.10.1 The Contractor, ~~promptly~~ within thirty (30) days after ~~being awarded~~ execution of the Contract, shall submit for the Owner's and Architect's ~~information~~ written approval a Contractor's construction schedule for the Work. The construction schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to completion and shall not exceed time limits current under the Contract Documents. The schedule shall be revised at appropriate intervals as required by the Owner and conditions of the Work and Project.

§ 3.10.2 Within thirty (30) days of Notice to Proceed (NTP), the Contractor shall prepare, for the Architect's approval, and thereafter keep current, a schedule of submittals which is coordinated with the Contractor's construction schedule and allows the Architect reasonable time to review submittals. No payment shall be due until this schedule is submitted and approved. ~~The Contractor, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, shall submit a submittal schedule for the Architect's approval. The Architect's approval shall not be unreasonably delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, or fails to provide submittals in accordance with the approved submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.~~

§ 3.10.3 The Contractor shall perform the Work in ~~general accordance~~ conformity with the most recent schedules submitted to the Owner and Architect.

§ 3.10.4 If the Contractor submits a schedule indicating an intention to achieve completion of the Work prior to contractually required dates, including milestones, no liability of the Owner to the Contractor for any failure of the Contractor to complete early shall be created, whether or not the Owner approve such schedule.

§ 3.10.5 At the Owner's option, the Contractor shall provide a schedule utilizing critical path techniques to measure the progress of the Work. Such schedules shall be subject to the Owner's and Architect's written approval.

§ 3.10.6 Float or slack is not for the exclusive use or benefit of either the Owner or the Contractor. Extensions of time for performance will be granted only to the extent that the equitable time adjustments for the activity or activities affected exceed the total float along the activity chain involved at the time the change was ordered or the delay occurred. Notwithstanding the above, the Contractor shall only be entitled to an extension of the time for an excusable delay to the critical path of the Work that delays completion of the Project beyond the completion date stated in the Agreement.

§ 3.10.7 The Contractor acknowledges that the Owner may retain the services of a scheduling consultant at the Owner's expense. The Contractor shall cooperate with any such scheduling consultant at the Owner's direction, including, without limitation, with regard to the preparation of the Project schedule.

§ 3.11 As Built Drawings, Documents and Samples at the Site

§ 3.11.1 As Built drawings shall be updated monthly, which shall be a condition precedent to all Progress Payments, and shall provide as much accuracy as possible. As built drawings of the completed Project are precedent to final payment and shall be submitted in paper document and combined PDF, or other Architect and Owner acceptable digital format, on CD, DVD or other approved file transfer protocol (FTP), transmitted from the Contractor to the Architect for review and acceptance ~~as-built drawings to the Owner shall be a condition precedent to Final Payment. Completed as-built drawings shall be submitted as paper documents and on CD or DVD in combined PDF format~~.

§ 3.11.2 The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, ~~Construction Change Directives,~~ and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form ~~or~~ and paper copy, available to the Architect and Owner, and delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.11.3 The Contractor shall maintain all approved permit drawings in a manner so as to make them accessible to governmental inspectors and other authorized agencies. All approved drawings shall be appropriately identified and delivered to the Owner within sixty (60) days of final completion of the Work.

§ 3.12 Shop Drawings, Product Data and Samples

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules, and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier, or distributor to illustrate some portion of the Work.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment, or workmanship, and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples, and similar submittals are not Contract Documents. Their purpose is to demonstrate how the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents ~~may~~ shall be returned by the Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Architect, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, in accordance with

the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of Separate Contractors. Submittals which are not marked as reviewed for compliance with the Contract Documents and approved by the Contractor shall be returned by the Architect without action.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples, or similar submittals, until the respective submittal has been approved by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from the requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples, or similar submittals, unless the Contractor has specifically notified the Architect of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order ~~or Construction Change Directive~~ has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals, by the Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples, or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such notice, the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures. The Contractor shall not be required to provide professional services in violation of applicable law.

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall be entitled to rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional in Florida, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop Drawings, and other submittals related to the Work, designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy and accuracy of the services, certifications, and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor the performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review and approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.

§ 3.12.10.2 If the Contract Documents require the Contractor's design professional to certify that the Work has been performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Architect at the time and in the form specified by the Architect.

§ 3.12.11 The Contractor shall assemble for the Architect's approval two (2) complete binders of all operating and maintenance data from all manufacturers whose equipment is or will be installed in the Work.

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§ 3.12.12 The Contractor shall submit to Owner one copy of all submissions made to the Architect pursuant to this Section 3.12.

§ 3.13 Use of Site

The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, lawful orders of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment. The Contractor shall be responsible for the permitting, erection, maintaining and removal of all construction signage. The Contractor must submit all sign copy for approval prior to erecting or displaying. The Contractor and Owner shall meet promptly after execution of the Agreement to determine reasonable requirements for ingress and egress from the site. Reasonable locations for staging, parking and a single construction entrance shall be designated by the Contractor, subject to the Owner's approval.

§ 3.13.2 The Contractor shall assure free, convenient, unencumbered and direct access to properties neighboring the Project site for the owners of such properties and their respective tenants, agents, invitees and guests.

§ 3.14 Cutting and Patching

§ 3.14.1 The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting, or patching shall be restored to the condition existing prior to the cutting, fitting, or patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or Separate Contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter construction by the Owner or a Separate Contractor except with written consent of the Owner and of the Separate Contractor. Consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold, from the Owner or a Separate Contractor, its consent to cutting or otherwise altering the Work.

§ 3.15 Cleaning Up

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials and rubbish caused by operations under the Contract. The Contractor shall prevent paint, mortar and concrete splatter on concrete sidewalks and stair tower floors. Any such splatter shall be immediately removed so no evidence of splatter remains. All construction debris shall be removed in a timely manner. Surrounding graded and grassed areas shall be regularly magnetically scanned to collect miscellaneous nails and other sharp objects; the Contractor shall remove such objects from the construction site. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials from and about the Project.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the Owner shall be entitled to reimbursement from the Contractor.

§ 3.15.3 Immediately prior to the Architect's inspection for Substantial Completion, the Contractor shall completely clean the premises utilizing a licensed cleaning service. Concrete and ceramic surfaces shall be cleaned and washed. Woodwork and resilient shall be dusted and cleaned. Sash, fixtures and equipment shall be thoroughly cleaned. Stains, spots, dust, marks and smears shall be removed from all surfaces. Hardware and metal surfaces shall be cleaned and polished. Glass and plastic surfaces shall be thoroughly cleaned by professional window cleaners. All damaged, broken or scratched glass or plastic shall be replaced by the Contractor at the Contractor's expense.

§ 3.16 Access to Work

The Contractor shall provide the Owner and Architect at all times with access to the Work in preparation and progress wherever located.

§ 3.17 Royalties, Patents and Copyrights

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for defense or loss when a particular design, process, or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings,

Specifications, or ~~other documents~~ Instruments of Service prepared by the Owner or Architect. However, if an infringement of a copyright or patent is discovered by, or made known to, the Contractor, the Contractor shall be responsible for the loss unless the information is promptly furnished to the Architect.

§ 3.18 Indemnification

§ 3.18.1 For one hundred dollars ($100.00), which is included in the contract price, the other good and valuable considerations, receipt of which is hereby acknowledged by the Contractor as consideration for the indemnity herein; said Contractor hereby agrees to defend and indemnify the Owner and the Architect/Engineer and their Agents and employees, from and against all claims, damages, losses and expenses, including but not limited to attorney's fees, arising out of or resulting from the performance of Work, provided that any such claim, damage, loss or expense is (1) attributed to bodily injury, sickness, disease or death, or to injury to, or destruction of tangible property, other than the work itself, including the loss of use resulting therefrom, and (2) caused in whole or in part by any act or omission of the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, regardless of whether or not it is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge or otherwise reduce any other right or obligation of indemnity which otherwise exist as to any party or person described in this Article. ~~To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.~~

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation, or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

§ 3.18.3 The Contractor acknowledges that for one hundred dollars ($100.00) of the Contract Price, as recited in Paragraph 3.18.1 above, and other good and valuable consideration from the Owner and Architect/Engineer, constitutes consideration for giving the Owner and the Architect/Engineer, respectively, the indemnifications required in this Agreement and the Contract Documents. The limit of dollar amount of Contractor's indemnity obligations required by the Agreement and the Contract Documents specifically for those claims caused in whole or in part by the Owner and Architect/Engineer shall be $1,000,000 or the Contract Sum of the Project, whichever is more. The parties agree that the indemnity provided herein bears a reasonable commercial relationship to the Agreement and is incorporated by this reference into the Project specifications and bid documents, if any.

§ 3.18.4 Notwithstanding the above and without monetary limitation, the Contractor hereby indemnifies and holds harmless the Owner, their officers and employees, from liabilities, damages, losses and costs, including, but not limited to, reasonable attorney's fees, to the extent caused by the negligence, recklessness, or intentional wrongful misconduct of the Contractor and persons employed or utilized by the Contractor in the performance of the construction Contract.

ARTICLE 4 ARCHITECT

§ 4.1 General

§ 4.1.1 The Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement.

§ 4.1.2 Duties, responsibilities, and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified, or extended without written consent of the Owner, Contractor, and Architect. Consent shall not be unreasonably withheld.

§ 4.2 Administration of the Contract

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until final payment is due and with the Owner's authorization, from time to time during the one-year period for correction of Work described in Section 12.2. ~~the date the Architect issues the final Certificate for Payment~~. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents, unless otherwise modified in writing in accordance with other provisions of the Contract.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents.

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner ~~reasonably~~ informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner (1) ~~known~~ deviations from the Contract Documents, (2) known deviations from the most recent construction schedule submitted by the Contractor, and (3) defects and deficiencies ~~observed~~ in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of, and will not be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 Communications

The Owner and Contractor shall include the Architect, if any, in all communications that relate to or affect the Architect's services or professional responsibilities. The Owner and Contractor shall promptly notify the Architect of the substance of any direct communications between the Owner and the Contractor otherwise relating to the Project. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

§ 4.2.5 Based on the Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, whether or not the Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness to cause no delay in the Work or in the activities of the Owner, Contractor or separate contractors, while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.8 The Architect will prepare Change Orders ~~and Construction Change Directives~~, or other appropriate written directives, and may order minor changes in the Work as provided in Section 7.4. The Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10.

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more Project representatives to assist in carrying out the Architect's responsibilities at the site. The Owner shall notify the Contractor of any change in the duties, responsibilities and limitations of authority of the Project representatives.

§ 4.2.11 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made in writing no later than fifteen (15) days after receipt of the request ~~within any time limits agreed upon or otherwise with reasonable promptness~~.

§ 4.2.12 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either, and will not be liable for results of interpretations or decisions rendered in good faith.

§ 4.2.13 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

§ 4.2.15 Upon request of the Owner, claims, disputes and other matters in question relating to the execution or progress of the Work or the interpretation of the Contract Documents may be referred to the Architect for initial decision, which the Architect shall render in writing within a reasonable time, not to exceed fifteen (15) days after the date on which such request is made.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a Separate Contractor or the subcontractors of a Separate Contractor.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 Award of Subcontracts and Other Contracts for Portions of the Work

§ 5.2.1 Subcontractors must be properly licensed in accordance with Florida law. ~~Unless otherwise stated in the Contract Documents, the Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the persons or entities proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design. Within 14 days of receipt of the information, the Architect may notify the Contractor whether the Owner or the Architect (1) has reasonable objection to any such proposed person or entity or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.~~

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable ~~and timely~~ objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person, or entity for one previously selected ~~if~~ without due cause ~~unless the Owner or Architect makes reasonable objection to such substitution~~. The Owner may require the Contractor to change any Subcontractor, person, or entity in situations where the Owner determines that their Work is inadequate and adversely affects the Project.

§ 5.2.5 The Contractor shall disclose the existence and extent of any financial interest, whether direct or indirect, it has in any subcontractors or material suppliers which it proposes for the Project.

§ 5.3 Subcontractual Relations

By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work that the Contractor, by these Contract Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies, and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.4 Contingent Assignment of Subcontracts

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

.1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 or Termination for Convenience by the Owner pursuant to Paragraph 14.4 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and

.2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

§ 5.4.1.3 When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract subsequent to the date of acceptance of the assignment; however, in no event shall the Owner's acceptance of such an assignment release the Contractor from its obligations under the subcontract agreement or this Agreement. Subcontracts between the Contractor and its Subcontractors shall provide for the assignment of those subcontracts from the Contractor to the Owner at election of the Owner upon termination of the Contractor.

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be ~~equitably~~ adjusted for increases in direct cost resulting from the suspension beyond the thirty (30) days.

~~§ 5.4.3 Upon assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the~~

~~Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.~~

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 Owner's Right to Perform Construction and to Award Separate Contracts

§ 6.1.1 The term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate agreements. The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance and waiver of subrogation.

§ 6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

§ 6.1.3 The Owner, at its option, shall either (1) provide for coordination of the activities of the Owner's own forces and of each Separate Contractor with the Work of the Contractor, who shall cooperate with them or (2) shall require that the Contractor provide for such coordination, which the Contractor shall perform when directed by Owner to do so. The Contractor shall participate with any Separate Contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to its construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, Separate Contractors, and the Owner until subsequently revised.

§ 6.1.4 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces or with Separate Contractors, the Owner or its Separate Contractors shall have the same obligations and rights that the Contractor has under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6, and Articles 10, 11, and 12.

§ 6.2 Mutual Responsibility

§ 6.2.1 The Contractor shall afford the Owner and Separate Contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a Separate Contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Architect of apparent discrepancies or defects prior to proceeding with the Work shall constitute an acknowledgment that the Owner's or Separate Contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractor that are not apparent.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a Separate Contractor because of the Contractor's delays, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of a Separate Contractor's delays, improperly timed activities, damage to the Work or defective construction.

§ 6.2.4 The Contractor shall promptly remedy damage that the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or Separate Contractor as provided in Section 10.2.5.

§ 6.2.5 The Owner and each Separate Contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.2.6 If any Subcontractor initiates legal or any other proceedings against the Owner on account of any damage alleged to have been caused by the Contractor, the Owner shall notify the Contractor, who shall defend such proceedings at its own expense, and if any settlement, judgment or award against the Owner arises therefrom, the Contractor shall pay or

satisfy it and shall indemnify and reimburse the Owner for all monies paid or to be paid including attorneys' fees and court or other costs which the Owner has incurred.

§ 6.3 Owner's Right to Clean Up

If a dispute arises among the Contractor, Separate Contractors, and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Architect will allocate the cost among those responsible.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, ~~Construction Change Directive~~ or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents. Agreement on and execution of any Change Order shall constitute a final settlement and a full accord and satisfaction of all matters relating to the change and to the impact of the change on unchanged Work, including all direct and indirect costs of whatever nature, and all adjustments to the Contract Schedule.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor, and Architect. ~~A Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor.~~ An order for a minor change in the Work may be issued by the Architect alone.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents. The Contractor shall proceed promptly with changes in the Work, unless otherwise provided in the Change Order, ~~Construction Change Directive,~~ or order for a minor change in the Work. A change in Contract Sum or Contract Time shall be accomplished only by Change Order. No course of conduct, verbal discussions or dealings between the parties shall be the basis of claims by the Contractor to any change in the Contract Sum or Contract Time.

§ 7.1.4 If the Architect determines that a change or changes in the Work might be or are necessary or desirable, the Architect shall issue a proposal request to the Contractor in which the Architect describes the proposed change or changes in the Work. The Contractor shall respond to each such proposal request in writing within a reasonable time, but in no event more the fourteen (14) days after receipt, such response to contain (1) the amount of any increase or decrease in the Contract Price or Guaranteed Maximum Price for effecting the proposed change or changes in the Work (2) a written comprehensive and itemized cost breakdown of the estimated reasonable additional or reduced costs to the Contractor of all labor, materials and equipment required by such proposal requests and (3) the length of any extension or reduction of the Contract Time for effecting the proposed change or changes in the Work.

§ 7.1.5 If any Change Order, signed by the Owner and the Contractor, results in or contains an adjustment to the Contract Price, the amount of such adjustment shall be conclusively deemed and held to include the Contractor's applicable profit, Fee and costs of and for all applicable taxes, bond premiums, insurance premiums, supervision, overhead, profit, labor, labor impact and materials related to the Change Order and the additional Work required and/or contemplated thereby, and the Contractor shall be conclusively deemed and held to have waived any claim for any additional sum or time extension for delays, disruption, acceleration, loss of productivity, ripple effect, inefficiency or any other matter arising out of or in any way related to such Change Order and the additional Work contemplated thereby.

§ 7.2 Change Orders

§ 7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor, and Architect stating their agreement upon all of the following:

.1 The change in the Work, if any;
.2 The amount of the adjustment, if any, in the Contract Sum; and
.3 The extent of the adjustment, if any, in the Contract Time.

§ 7.2.2 If the Change Order provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

.1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;

.2 Unit prices stated in the Contract Documents or subsequently agreed upon;
.3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
.4 As provided in Section 7.2.3.

§ 7.2.3 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.2.2, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.2.3 shall be limited to the following:

.1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect;
.2 Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;
.3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;
.4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and
.5 Costs of supervision and field office personnel directly attributable to the change.

§ 7.2.4 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15.

§ 7.2.5 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.2.6 In subparagraph 7.2.3 above, the reasonable allowance for overhead and profit, including the Contractor's Fee, if any, included in the total cost to the Owner, shall be based on the following schedule, which shall be full compensation for all overhead and profit of whatever nature associated with the Change:

.1 For the Contractor, for any Work performed by the Contractor's own forces, ten percent (10%) of the cost.
.2 For the Contractor, for Work performed by its Subcontractor, five percent (5%) of the amount due the Subcontractor.
.3 For each Subcontractor or Sub-subcontractor, for any Work performed by that Subcontractor's or Sub-subcontractor's own forces, ten percent (10%) of the cost.
.4 For each Subcontractor, for Work performed by its Sub-subcontractor, five percent (5%) of the amount due the Sub-subcontractor.
.5 Costs to which overhead and profit are to be applied shall be determined in accordance with subparagraphs 7.2.3.1 through 7.2.3.5.
.6 In order to facilitate checking of quotations for extras or credits, all proposals, except those so minor that their propriety can be seen by inspection, shall be accompanied by a complete itemization of all increased and decreased costs to both Contractor and its Subcontractors as follows:
    .1 Material quantities and unit costs.
    .2 Labor costs identified with the specific item of material to be placed or operation to be performed.
    .3 Construction equipment
    .4 Workmen's Compensation and Public Liability Insurance.
    .5 Overhead and Profit.
    .6 Employment taxes under FICA and FUTA.
    .7 In no case will a change over $500.00 be approved without such itemization.

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§ 7.3 ~~Construction Change Directives~~

~~§ 7.3.1 A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, the Contract Sum and Contract Time being adjusted accordingly.~~

~~§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.~~

~~§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:~~

- ~~.1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;~~
- ~~.2 Unit prices stated in the Contract Documents or subsequently agreed upon;~~
- ~~.3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or~~
- ~~.4 As provided in Section 7.3.4.~~

~~§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to the following:~~

- ~~.1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect;~~
- ~~.2 Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;~~
- ~~.3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;~~
- ~~.4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and~~
- ~~.5 Costs of supervision and field office personnel directly attributable to the change.~~

~~§ 7.3.5 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15.~~

~~§ 7.3.6 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.~~

~~§ 7.3.7 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.~~

~~§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.~~

~~§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably~~

~~justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.~~

~~§ 7.3.10 When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.~~

§ 7.4 Minor Changes in the Work

The Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing and approved by the Owner. ~~If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Architect and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Architect that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.~~ The Contractor shall not receive any additional compensation, nor shall there be any adjustment to the Contract Time as a result thereof.

ARTICLE 8 TIME

§ 8.1 Definitions

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day including weekends and legal holidays unless otherwise specifically defined.

§ 8.2 Progress and Completion

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, commence the Work prior to the effective date of insurance required to be furnished by the Contractor ~~and Owner~~.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time. To ensure that Substantial Completion of the Work is achieved within the Contract Time, the Contractor will, before commencing the Work, submit to Owner a progress schedule showing milestone dates for completion of major portions of the Work which, if the milestone dates are met, will achieve Substantial Completion of the Work within the Contract Time. In the event any milestone date is missed, the Contractor will immediately accelerate the progress of the Work by taking those steps necessary to ensure that the next milestone date is achieved as originally planned, including without limitation, working seven days a week and overtime and employing additional employees or subcontractors. Unless the failure to meet a milestone date is caused by act of the Owner, the additional cost resulting from such acceleration shall not increase the Contract Sum.

§ 8.3 Delays and Extensions of Time

§ 8.3.1 Except as provided in Subparagraph 8.3.2, no adjustment in Contract Sum shall be made for any delays hereunder and no damages shall be paid by the Owner for such delay. The Contractor shall delay or suspend the progress of the Work, or of any part thereof, whenever he shall be so required by written order of the Owner, and for such periods of time as the Owner may order, providing that in the event of such delay or delays or of such suspension or suspensions of the progress of the Work, or any part thereof, the Contract Time for the Work so suspended or of Work delayed by such suspension shall be extended for a period equivalent to the time lost by reason of the suspension(s), except when the Contractor is notified to suspend Work on account of faulty construction or construction methods that endanger the

Work. Such order of the Owner shall not otherwise modify or invalidate in any way any of the provisions of this Contract, and the Contractor shall not be entitled to any damages or compensation from the Owner on account of such delay or delays, suspension or suspensions, except as provided below. ~~If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner or Architect, of an employee of either, or of a Separate Contractor; (2) by changes ordered in the Work; (3) by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner pending mediation and binding dispute resolution; or (5) by other causes that the Contractor asserts, and the Architect determines, justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine.~~

§ 8.3.2 When alterations or additions on the critical path are made to the Work, and such alterations or additions increase the overall completion date, the Contractor shall submit to the Architect in writing any resultant claim for an extension in the Contract Time, and shall deliver such claims to the Architect within ten (10) days after the occurrence of the event giving rise to the claim. The recommendation of the Architect regarding extension of Contract Time shall be submitted to the Owner for approval. ~~Claims relating to time shall be made in accordance with applicable provisions of Article 15.~~

§ 8.3.2.1 Any approved changes in Contract Time shall be incorporated in a Change Order. No changes in Contract Time shall be made for any alterations or additions to the Work which are not demonstrated to affect the overall completion of the job. The provision of this Article 8 shall in no way alter, change or invalidate the provisions of the Contract Documents with respect to liquidated damages. The Contractor shall not be entitled to any delay damages or other compensation solely on account of an increase in Contract Time except in accordance with Section 8.3.4 below.

§ 8.3.3 Notwithstanding Subparagraph 8.3.1, if the Work is delayed due to the fault or neglect of the Owner, and such delays have a cumulative total impact of more than fifteen (15) calendar days to the critical path, the Contractor may make claim pursuant to Article 4 for its actual and direct costs arising out of the delay. The Contract Sum shall be adjusted for such actual and direct costs, but in no event shall indirect, impact, inefficiency, offsite or home office overhead, loss of productivity, consequential damages, legal or consulting costs be paid on account of such delays. The Contractor hereby expressly waives its right to such delay or time-related costs or damages.

§ 8.3.4 In the event the Contractor accelerates its Work, without written authorization of the Owner, the Owner shall pay no overtime inefficiencies to the Contractor for such acceleration and the Contractor hereby expressly waives its right to recover such overtime inefficiencies. ~~This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.~~

§ 8.3.5 The Contractor's written claims for extension of Contract Time shall be accompanied by detailed dates, correspondence, notices and any other data which provides proof of the events which are the basis for the claim, including a network analysis justifying the time extension. Said network analysis shall specifically detail the extension of the critical path of the Project caused by the events, which underlie the time extension request. Any claim not including said data and network analysis shall be deemed waived.

§ 8.3.6 Should the Contractor be obstructed or delayed in the commencement, prosecution or completion of any part of the Work by any act or delay of the Owner; or by any acts or neglect by any separate contractor employed by the Owner; material or appurtenances for the Work; or by riot, insurrection, war (excluding wars involving the United States in the Mid-Eastern portion of the World), pestilence, fire, earthquakes, cyclones, floods, epidemics; or through any act, default or delay of other parties under contract with the Owner; then the Contract Time for the Work so delayed shall be extended for a period equivalent to the time lost. Such allowance shall not be made unless a claim for extension of time is made by the Contractor to the Owner and Architect in writing within ten (10) days from the time when the alleged cause for delay occurs.

§ 8.3.7 It is further expressly agreed that the Contractor shall not be entitled to any damages or compensation from the Owner on account of any delays resulting from any of the causes specified above except those circumstances where delays are caused by the Owner or by parties under contract with the Owner, in which circumstances the Contractor shall be entitled to compensation (1) for Contractor's actual costs of increased direct jobsite wages resulting from the extended completion date caused by Owner; and (2) for extra premiums on bonds actually paid by the Contractor on account of the

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additional time required to complete all Work hereunder. Any change in the Contract Time resulting from any claims for delays shall be incorporated in a signed Change Order upon approval of the change by the Owner.

§ 8.3.8 Except for weather events listed in Section 8.3.6 above, Contractor expressly assumes the risk for all weather delays of every kind and nature.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

§ 9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.1.2 ~~If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed so that application of such unit prices to the actual quantities causes substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.~~

§ 9.2 Schedule of Values

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit a schedule of values to the Architect before the first Application for Payment, allocating the entire Contract Sum to the various portions of the Work. The schedule of values shall be prepared in the form, and supported by the data to substantiate its accuracy, required by the Architect. The schedule of values shall be prepared in such manner that each major item of the Work and each subcontracted item of the Work is shown as a separate line item on AIA Document G703, Application and Certificate for Payment, Continuation Sheet, or other form acceptable to the Owner. This schedule, unless objected to by the Architect or Owner, shall be used as a basis for reviewing the Contractor's Applications for Payment. Any changes to the schedule of values shall be submitted to the Architect and supported by such data to substantiate its accuracy as the Architect may require, and unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment. The Contractor shall not make changes in the Schedule of Values without prior approval of the Architect and Owner. The form for the Application for Payment shall be AIA Document G702, supported by AIA Document G703, or other Owner approved form. The Schedule of Values shall be prepared in such a manner that each major item of Work and each subcontracted item of Work is shown as a single item on AIA Document G703 Application and Certificate for Payment Continuation Sheet, or other Owner approved form.

§ 9.3 Applications for Payment

§ 9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner or Architect require, such as copies of requisitions, and releases and waivers of liens from Subcontractors and suppliers, and shall reflect retainage if provided for in the Contract Documents.

§ 9.3.1.1 ~~As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.~~

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing and bonded or insured as required by the Owner. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage, and transportation to the site, for such materials and equipment stored off the site. The Contractor shall submit, within 30 days after the date of commencement of the Work and thereafter as the Owner

requires, schedules of materials and equipment for each category or subcontract for which application for payment under this Section 9.3.2 will be made, which schedules shall include items, quantities, value of unit prices with extensions. Schedules shall be updated on a monthly basis and submitted as an attachment to the Contractor's Application for Payment.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information, and belief, be free and clear of liens, claims, security interests, or encumbrances, in favor of the Contractor, Subcontractors, suppliers, or other persons or entities that provided labor, materials, and equipment relating to the Work.

§ 9.4 Certificates for Payment

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data in the Application for Payment, that, to the best of the Architect's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is entitled to payment in the amount certified. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion, and to specific qualifications expressed by the Architect. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work; (2) reviewed construction means, methods, techniques, sequences, or procedures; (3) reviewed copies of requisitions received from Subcontractors and suppliers and other data requested by the Owner to substantiate the Contractor's right to payment; or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 Decisions to Withhold Certification

§ 9.5.1 The Architect may withhold a Certificate for Payment, in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of

- .1 defective Work not remedied;
- .2 third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;
- .3 failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;
- .4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- .5 damage to the Owner or a Separate Contractor;
- .6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
- .7 repeated failure to carry out the Work in accordance with the Contract Documents.

§ 9.5.2 When ~~either party disputes the Architect's decision regarding a Certificate for Payment under Section 9.5.1, in whole or in part, that party may submit a Claim in accordance with Article 15~~ the reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.3 When the reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.4 If the Contractor disputes any determination by the Architect and/or Owner with respect to any Certificate of Payment, the Contractor nevertheless expeditiously shall continue to complete the Work. ~~If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or supplier to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Contractor shall reflect such payment on its next Application for Payment.~~

§ 9.6 Progress Payments

§ 9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents and shall so notify the Architect.

§ 9.6.2 The Contractor shall pay each Subcontractor, no later than seven days after receipt of payment from the Owner, the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

§ 9.6.3 The Architect will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors and suppliers to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay, or to see to the payment of money to, a Subcontractor or supplier, except as may otherwise be required by law.

§ 9.6.5 The Contractor's payments to suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors or provided by suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. ~~Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, create any fiduciary liability or tort liability on the part of the Contractor for breach of trust, or entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.~~

§ 9.6.8 Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend and indemnify the Owner from all loss, liability, damage or expense, including reasonable attorney's fees and litigation expenses, arising out of any lien claim or other claim for payment by any Subcontractor or supplier of any tier. Upon receipt of notice of a lien claim or other claim for payment, the Owner shall notify the Contractor. If approved by the applicable court, when required, the Contractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.

§ 9.7 Failure of Payment

If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within ~~seven~~ fourteen days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within ~~seven~~ fourteen days after the date established in the Contract Documents, the amount certified by the Architect ~~or awarded by binding dispute resolution~~, then the Contractor may, upon seven additional days' notice to the Owner and Architect, stop the Work until payment of the amount ~~owing~~ not in dispute has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable direct costs of shutdown, ~~delay~~ and start-up~~, plus interest~~ as provided for in the Contract Documents. Notwithstanding the preceding sentence, the Contractor shall not stop the Work during the pendency of a bona fide dispute between the Owner and the Contractor, provided all sums not in dispute claimed by the Contractor are paid.

§ 9.8 Substantial Completion

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use. For the Work or any designated portion thereof to be "Substantially Complete", the Work must also satisfy all of the following conditions, except to the extent the same shall be specifically waived or modified in writing by the Owner:

.1 the Work has been completed in accordance with the Contract Documents, except for Punch List Work, to the extent required for the Owner to obtain an occupancy permit and such permit(s) shall have been granted by the appropriate authorities for all of the Work; and

.2 all HVAC, plumbing and electrical systems included in the Work are functioning substantially in accordance with the Contract Documents; and

.3 all life safety systems included in the Work are functioning in accordance with the Contract Documents; and

.4 a Certificate of Substantial Completion has been issued by the Architect as required under Paragraph 9.8; and

.5 all elevators, if any, included in the Work are functioning in accordance with the Contract Documents; and

.6 all offices, rooms and public areas are ready to receive, or have received if required for issuance of a Certificate of Occupancy, furniture, fixtures and equipment supplied by the Owner.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect and Owner a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the Contractor's list, the Architect and Owner will ~~make~~ perform an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's and or the Owner's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect and Owner to determine Substantial Completion.

§ 9.8.4 When the Work or designated portion thereof is determined to be substantially complete, the Architect will prepare a Certificate of Substantial Completion, utilizing the Owner's Procore platform, that shall establish the date of Substantial Completion; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and fix the time of thirty (30) days within which the Contractor shall finish all items on the list. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 ~~When the Work or designated portion thereof is substantially complete,~~ The Architect, as the Owner's representative, including all Project Consultants, shall prepare a single list of items (Punch List) to be completed by the Contractor. The Punch List shall include close out requirements, not limited to, Operations and Maintenance Manual, warrantees, and as built drawings, contingent on Project completion, which will be submitted to the Contractor. The

Contractor will assign a cost estimate for each item then submit the Punch List to the Architect and Owner for review and acceptance. Estimated costs to render the Project complete, satisfactory and acceptable are to be agreeable to the Contractor, Owner and Architect. The development and review of the Punch List shall be completed within 30 calendar days, or 45 calendar days by applicable law and mutual agreement of Contractor and Owner, of the substantial completion date and shall be issued by the Architect to the Contractor and Owner within five (5) days of acceptance by all parties. Within twenty (20) business days after the final Punch List is issued, the Owner must pay the Contractor the remaining contract balance that includes all retainage previously withheld less an amount equal to one hundred fifty percent (150%) of the estimated cost to complete the Punch List items. ~~will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.~~

§ 9.8.6 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate. ~~Upon such acceptance, and consent of surety if any, the Owner shall make payment of retainage applying to the Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.~~

§ 9.8.7 The Owner shall have the right to take possession of and use any completed or partially completed portions of the Work, notwithstanding that the time for completing the entire Work or such portions of the Work may not yet have expired. However, such action on the part of the Owner shall not be deemed to be an acceptance of any Work not completed in accordance with the Contract Documents. Likewise, absent the issuance of a Certificate of Substantial Completion by the Project Architect, no portion of the Work shall be subject to the running of the Contractor's bonded one (1) year guarantee on workmanship and materials, despite the fact that the building may be partially utilized. Where mechanical equipment is used prior to final inspection, the Owner shall perform routine maintenance and furnish those supplies that normally wear out in use, such as seals, packings, lubricants, etc. However, any major failure or breakdown of equipment not attributable to lack of maintenance or improper use or abuse of the equipment by the Owner shall be made good by the Contractor under terms of its contract warranty, guarantee, bonds, etc.

§ 9.9 Partial Occupancy or Use

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2, 9.8.3, 9.8.4 and 9.8.5. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Contractor, and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 9.10 Final Completion and Final Payment

§ 9.10.1 Upon receipt of the Contractor's notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with the Contract

Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment, (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6) if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees. As a condition precedent to Final Payment, and as part of the Application for Payment, the Contractor shall deliver to the Owner all warranties, guarantees and other close out documents required under the Contract Documents.

§ 9.10.2.1 Final Payment is also contingent upon Building Official final inspection and Owner acceptance of the Department of Education (DOE) document OEF 209, Certificate of Final Inspection (CFI).

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed, corrected, and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of the surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from

.1 liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled;
.2 failure of the Work to comply with the requirements of the Contract Documents;
.3 terms of special warranties required by the Contract Documents; or
.4 audits performed by the Owner, if permitted by the Contract Documents, after final payment.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor, or a supplier, shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

§ 9.10.6 After execution of the Certificate of Substantial Completion and the Certificate of Final Inspection (CFI), and prior to the submittal of the Final Certificate and Application for Payment, the Contractor shall submit to the Architect, along with the affidavits and other documents set forth in Section 9.10.2 above:

.1 Validated warranties and notarized copies of all guarantees for equipment and materials as required by the Construction Documents, and, if applicable, as referred to in the Supplementary Conditions;
.2 Copies of all approved Shop Drawings or installation diagrams and three (3) copies of all brochures, manuals, etc. of all equipment as offered by the manufacturers;
.3 List of subcontractors and major material suppliers (shall include address, telephone number and name of individual to contact regarding this Project); and

.4 As built drawings of the completed Project in paper document and combined PDF or other Architect and Owner acceptable digital format, on CD, DVD or other approved file transfer protocol (FTP), transmitted from the Contractor to the Architect for review and acceptance; Architect shall review for inclusion in the record drawings then transmit to the Owner.

§ 9.10.7 Prior to submission of the Final Certificate and Application for Payment, Contractor and manufacturer's representatives shall provide free instruction in the proper use of installed equipment to representatives of the Owner as designated by the Architect. Instruction shall be given in presence of the Architect.

§ 9.10.7.1 Instruction of the Owner's designated Maintenance Supervisor in the proper methods of cleaning and maintaining all of the finished surfaces and the proper methods of replacement of the consumable items such as filters, light bulbs, washers, etc. shall be the responsibility of the Contractor.

§ 9.10.8 Prior to submission of the Final Certificate and Application for Payment, the Contractor shall start up, test, adjust, balance and otherwise place in a satisfactory working condition all items of mechanical and electrical systems and shall fully instruct representatives of the Owner in the care and operation of such systems.

§ 9.10.8.1 Contractor shall submit to the Architect, along with final requisition for payment, two (2) copies of a manual for the Project, assembled and bound, presenting for the Owner's guidance full details for care and maintenance of equipment included in the Contract.

§ 9.10.8.2 Contractor shall, for this manual, obtain from subcontractors literature of manufacturers relating to equipment, including motors; also furnish cuts, wiring diagrams, instruction sheets and other information pertaining to same in overall operation and maintenance.

§ 9.10.9 During a valid warranty period, if the Contractor is unable or unwilling to respond immediately to make emergency repairs under conditions which the Owner may determine to be an emergency situation, the Owner reserves the right to make such emergency repairs and then to bill the Contractor for a fair and reasonable amount in the reimbursement for such repair.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 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 Contract.

§ 10.2 Safety of Persons and Property

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury, or loss to

.1 employees on the Work and other persons who may be affected thereby;

.2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor; and

.3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

§ 10.2.2 The Contractor shall comply with, and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities, bearing on safety of persons or property or their protection from damage, injury, or loss. Contractor shall comply with all applicable federal, state and county, and city statutes, safety regulations, codes, ordinances and orders, including the Occupational Safety and Health Administration Act of 1970 (OSHA).

§ 10.2.3 The Contractor shall implement, erect, and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards; promulgating safety regulations; and notifying the owners and users of adjacent sites and utilities of the safeguards.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment, or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3. The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 Injury or Damage to Person or Property
If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, written notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.2.9 Contractor shall protect adjoining private or municipal property and shall provide barricades, temporary fences, and covered walkways required to protect the safety of passers-by, as required by prudent construction practices, local building codes, ordinances or other laws, or the Contract Documents.

§ 10.2.10 Contractor shall maintain Work, materials and apparatus free from injury or damage from rain, wind, storms, frost or heat. If adverse weather makes it impossible to continue operations safely in spite of weather precautions, the Contractor shall cease Work and notify the Owner and the Architect of such cessation. The Contractor shall not permit open fires on the Project site.

§ 10.2.11 In addition to its other obligations pursuant to this Article 10, the Contractor shall, at its sole cost and expense, promptly repair any damage or disturbance to walls, utilities, sidewalks, curbs and the property of third parties (including municipalities) resulting from the performance of the Work, whether by it or by its Subcontractors at any tier. The Contractor shall maintain streets in good repair and traversable condition.

§ 10.3 Hazardous Materials and Substances
§ 10.3.1 The Owner has on file at each school and the department of Facilities Services, the following information: (1) Asbestos Management Plan, and (2) Asbestos Survey Report. These documents are available for the Contractor's review at the above locations. The Contractor shall determine if the information contained therein is relevant to the Project. The Contractor shall execute the Owner's "Contractor Acknowledgement Form" of these documents. ~~The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and notify the Owner and Architect of the condition.~~

§ 10.3.1.1 If during the construction of the Project any known hazardous material, or friable asbestos is suspected or encountered, Work in that area shall be suspended and the Owner's Representative shall be notified immediately.

§ 10.3.1.2 The Owner shall be responsible for investigation, removal and disposition of any such material in accordance with applicable laws and regulations. The Contractor will be directed by the Owner on further procedures concerning the project as a result of investigation, removal and disposition of such material.

§ 10.3.2 In the event the Contractor encounters on the site material reasonably believed to be asbestos or polychlorinated biphenyl (PCB) which has not been rendered harmless, the Contractor shall immediately stop Work in the area affected and report the condition to the Owner's Representative 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 or polychlorinated biphenyl (PCB) and has not been rendered harmless. The Work in the affected area shall be resumed in the absence of asbestos or polychlorinated biphenyl (PCB), or when it has been rendered harmless, by written agreement of the Owner and Contractor, or in accordance with final determination by the Architect. ~~Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.~~

§ 10.3.3 The Contractor shall not be required, pursuant to Article 13, perform without consent any Work relating to asbestos or polychlorinated biphenyl (PCB). ~~To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss, or expense is due to the fault or negligence of the party seeking indemnity.~~

§ 10.3.4 To the fullest extent permitted by law, the Owner shall defend, indemnify and hold harmless the Contractor and its agents and employees from and against claims, losses and expenses, including but not limited to attorney's fees, arising out of or resulting from performance of the Work in the affected area if in fact the material is asbestos or polychlorinated biphenyl (PCB) and has not been rendered harmless, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property, other than the Work itself, including loss of use resulting therefrom, but only to the extent caused in whole or in part by negligent acts or omissions of the Owner, anyone directly or indirectly employed by the Owner, or anyone for whose acts the Owner may be liable. ~~The Owner shall not be responsible under this Section 10.3 for hazardous materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for hazardous materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.~~

§ 10.3.5 The Contractor shall reimburse the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.3.6 ~~If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall reimburse the Contractor for all cost and expense thereby incurred.~~

§ 10.4 Emergencies

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury, or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

§ 11.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Owner, Architect, and Architect's consultants shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents.

§ 11.1.2 The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 11.1.3 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance

§ 11.2.1 The Owner shall purchase and maintain insurance ~~of the types and limits of liability, containing the endorsements, and subject to the terms and conditions,~~ as described in the Agreement or elsewhere in the Contract Documents. ~~The Owner shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located.~~

§ 11.2.2 ~~Failure to Purchase Required Property Insurance. If the Owner fails to purchase and maintain the required property insurance, with all of the coverages and in the amounts described in the Agreement or elsewhere in the Contract Documents, the Owner shall inform the Contractor in writing prior to commencement of the Work. Upon receipt of notice from the Owner, the Contractor may delay commencement of the Work and may obtain insurance that will protect the interests of the Contractor, Subcontractors, and Sub-Subcontractors in the Work. When the failure to provide coverage has been cured or resolved, the Contract Sum and Contract Time shall be equitably adjusted. In the event the Owner fails to procure coverage, the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent the loss to the Owner would have been covered by the insurance to have been procured by the Owner. The cost of the insurance shall be charged to the Owner by a Change Order. If the Owner does not provide written notice, and the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain the required insurance, the Owner shall reimburse the Contractor for all reasonable costs and damages attributable thereto.~~

§ 11.2.3 ~~Notice of Cancellation or Expiration of Owner's Required Property Insurance. Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any property insurance required by the Contract Documents, the Owner shall provide notice to the Contractor of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Contractor: (1) the Contractor, upon receipt of notice from the Owner, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Owner or the Contractor; (2) the Contract Time and Contract Sum shall be equitably adjusted; and (3) the Owner waives all rights against the Contractor, Subcontractors, and Sub-~~

~~subcontractors to the extent any loss to the Owner would have been covered by the insurance had it not expired or been cancelled. If the Contractor purchases replacement coverage, the cost of the insurance shall be charged to the Owner by an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.~~

§ 11.3 Waivers of Subrogation

§ 11.3.1 The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents, and employees, each of the other; (2) the Architect and Architect's consultants; and (3) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance. The Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Architect, Architect's consultants, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this Section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

§ 11.3.2 If required in writing by a party in interest, the Owner as fiduciary shall, upon occurrence of an insured loss, give bond for proper performance of the Owner's duties. The cost of required bonds shall be charged against proceeds received as fiduciary. The Owner shall deposit in a separate account proceeds so received, which the Owner shall distribute in accordance with such agreement as the parties in interest may reach. If after such loss no other special agreement is made and unless the Owner terminates the Contract for convenience, replacement of damaged property shall be performed by the Contractor after notification of a Change in the Work in accordance with Article 7. ~~If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, to the extent permissible by such policies, the Owner waives all rights in accordance with the terms of Section 11.3.1 for damages caused by fire or other causes of loss covered by this separate property insurance.~~

§ 11.3.3 The Owner as fiduciary shall have power to adjust and settle a loss with insurers unless one of the parties in interest shall object in writing within five days after occurrence of loss to the Owner's exercise of this power. If such objection be made, the Owner shall not make any settlement with respect to such loss until a resolution has been reached by agreement between such parties in interest and the insurers or by a court of competent jurisdiction.

§ 11.4 Loss of Use, Business Interruption, and Delay in Completion Insurance

The Owner, at the Owner's option, may require the Contractor to purchase and maintain insurance that will protect the Owner against loss of use of the Owner's property, or the inability to conduct normal operations, due to fire or other causes of loss. ~~The Owner waives all rights of action against the Contractor and Architect for loss of use of the Owner's property, due to fire or other hazards however caused.~~

§11.5 Adjustment and Settlement of Insured Loss

§ 11.5.1 A loss insured under the property insurance required by the Agreement shall be adjusted by the ~~Owner~~ Contractor as fiduciary and made payable to the ~~Owner~~ Contractor as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.5.2. The ~~Owner~~ Contractor shall pay the Architect and ~~Contractor~~ Owner their just shares of insurance proceeds received by the ~~Owner~~ Contractor, and by appropriate agreements the Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner.

§ 11.5.2 Prior to settlement of an insured loss, the ~~Owner~~ Contractor shall notify the ~~Contractor~~ Owner of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The ~~Contractor~~ Owner shall have 14 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. If the ~~Contractor~~ Owner does not object, the ~~Owner~~ Contractor shall settle the loss and the ~~Contractor~~ Owner shall be bound by the settlement and allocation. Upon receipt, the ~~Owner~~ Contractor shall deposit the insurance proceeds in a separate account and make the

appropriate distributions. Thereafter, if no other agreement is made or the Owner does not terminate the Contract for convenience, the Owner and Contractor shall execute a Change Order for reconstruction of the damaged or destroyed Work in the amount allocated for that purpose. If the Contractor timely objects to either the terms of the proposed settlement or the allocation of the proceeds, the Owner may proceed to settle the insured loss, and any dispute between the Owner and Contractor arising out of the settlement or allocation of the proceeds shall be resolved pursuant to Article 15. ~~Pending resolution of any dispute, the Owner may issue a Construction Change Directive for the reconstruction of the damaged or destroyed Work.~~

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

§ 12.1.1 If a portion of the Work is covered contrary to the Architect's or Owner's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect or Owner, be uncovered for the Architect's or Owner's examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

The Contractor shall promptly correct Work rejected by the Architect ~~or~~ for failing to conform to the requirements of the Contract Documents, whether discovered before or after Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of any 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 it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. ~~During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty.~~ If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.5.

§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.2.3 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction of the Owner or Separate Contractors, whether completed or partially completed, caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

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§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work nor to Owner's right to make claim with respect to latent defects.

§ 12.3 Acceptance of Nonconforming Work

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate ~~and equitable~~. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the law of the place where the Project is located ~~excluding that jurisdiction's choice of law rules. If the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4~~.

§ 13.1.2 Historical lack of enforcement of any local law shall not constitute a waiver of Contractor's responsibility for compliance with such law in a manner consistent with the Contract Documents unless and until the Contractor has received written consent for the waiver of such compliance from the Owner and the agency responsible for the local law enforcement.

§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. ~~Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make an assignment without such consent, that party~~ Contractor may not assign its rights or obligation under this Contract. If Contractor attempts to make such an assignment, it shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 ~~The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate the assignment.~~

§ 13.3 Rights and Remedies

§ 13.3.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

§ 13.3.2 No action or failure to act by the Owner, Architect, or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed upon in writing.

§ 13.3.3 The invalidity of any part or provision of the Contract Documents shall not impair or affect in any manner the validity, enforceability or effect of the remaining parts and provisions of the Contract Documents.

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations

concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

§ 13.4.1.1 During construction, periodic building code compliance inspections are required and will be performed by the Owner's building department inspectors when requested by the Contractor. It is the responsibility of the Contractor to properly request such code inspections and no Work shall be covered until such Work has been inspected for code compliance.

§ 13.4.2 If the Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity assigned by the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Architect's services and expenses, shall be at the Contractor's expense, including the cost of retesting for verification of compliance if necessary, until the Architect certifies that the Work in question does comply with the requirements of the Contract Documents, and all such costs shall not be included in computing the Contract Sum.

§ 13.4.4 Required certificates of testing, inspection, or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.

§ 13.4.5 If the Architect is to observe tests, inspections, or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.4.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.5 Interest

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at the rate the parties agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

§ 13.6 Time Limits on Claims

The Owner and Contractor shall commence all claims and causes of action, whether in contract, tort, breach of warranty or otherwise, against the other arising out of or related to the Contract in accordance with the requirements of the final dispute resolution method selected in the Agreement within the time period specified by applicable law.

§ 13.7 Financial Disclosures

§ 13.7.1 During the term of this Contract, Contractor covenants and agrees that it will keep adequate books and records of accounts in accordance with Generally Accepted Accounting Principles (GAAP). Contractor further covenants and agrees that, upon request from Owner, Contractor shall provide to Owner financial statements of Contractor, including current income and expense statements of Contractor, consolidated balance sheets signed by a financial officer of Contractor, and audited reports provided to Contractor's Surety, audited financial statements certified by a Certified Public Accountant concerning the financial affairs of Contractor and all affiliates of Contractor, and such other financial information requested by Owner. All such financial information shall comply with GAAP.

§ 13.7.2 In the event the Contractor becomes insolvent and/or fails to pay its current obligations when they become due, Contractor shall so advise Owner of such situation. Contractor hereby authorizes its sureties, lenders, financial institutions and other third parties to release to Owner financial information requested by Owner, including, but not limited to, the financial information described in the preceding Section 13.7.1.

§ 13.8 Waiver of Jury Trial

All parties hereby waive any and all right to any trial by jury in any action or proceeding arising directly or indirectly hereunder.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, for any of the following reasons:

.1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;

.2 An act of government, such as a declaration of national emergency, that requires all Work to be stopped; or

.3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents.~~; or~~

~~.4 The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2.~~

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, repeated suspensions, delays, or interruptions of the entire Work by the Owner as described in Section 14.3, constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, ~~as well as reasonable overhead and profit on Work not executed,~~ and costs incurred by reason of such termination excluding profit on unexecuted Work.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees or any other persons or entities performing portions of the Work because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to material matters important to the progress of the Work, the Contractor may, upon seven additional days' written notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

.1 repeatedly refuses or fails to supply enough properly skilled workers or proper materials;

.2 fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;

.3 repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; ~~or~~

.4 otherwise is guilty of substantial breach of a provision of the Contract Documents; or

.5 is adjudged a bankrupt or insolvent, or if it makes a general assignment for the benefit of its creditors, or if a trustee or receiver is appointed for the Contractor or for any of its property, or if it files a petition to take advantage of any debtor's loss, or to reorganize under the bankruptcy or similar laws.

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, ~~and upon certification by the Architect that sufficient cause exists to justify such action,~~ the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

.1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;

.2 Accept assignment of subcontracts pursuant to Section 5.4; and

.3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the ~~Initial Decision Maker~~ Architect, upon application, and this obligation for payment shall survive termination of the Contract.

§ 14.3 Suspension by the Owner for Convenience

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work, in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and Contract Time shall be adjusted for increases in the direct cost and time caused by suspension, delay, or interruption under Section 14.3.1. Adjustment of the Contract Sum shall not include profit. No adjustment shall be made to the extent

.1 that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or

.2 that an adjustment is made or denied under another provision of the Contract.

§ 14.4 Termination by the Owner for Convenience

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 14.4.2 Upon receipt of notice from the Owner of such termination for the Owner's convenience, the Contractor shall

.1 cease operations as directed by the Owner in the notice;

.2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and

.3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work properly executed; costs incurred by reason of the termination, including costs attributable to termination of Subcontracts; ~~and the termination fee, if any, set forth in the Agreement~~ along with reasonable overhead and profit on the Work performed to date, but in no event shall the Contractor be entitled to anticipated profits on unperformed Work.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

§ 15.1.2 Time Limits on Claims

Any statutes of limitations shall commence to run, and all causes of action shall be deemed to have accrued, in accordance with applicable Florida law. ~~The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the~~

~~Work. The Owner and Contractor waive all Claims and causes of action not commenced in accordance with this Section 15.1.2.~~

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by either party must be made within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later. Claims must be made by written notice to the Architect and the other party. Claims must specifically detail all facts and issues substantiating the Claim, including all costs and expenses incurred. Contractor Claims must be made in writing and timely filed in accordance with the specific requirements of the Contract Documents and under no circumstances whatsoever be based upon actual or verbal notice or lack of prejudice to the other party. An additional Contractor Claim after the initial Claim has been implemented by Change Order will not be considered unless submitted in a timely manner. ~~the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party under this Section 15.1.3.1 shall be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.~~

§ 15.1.3.2 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by written notice to the other party. In such event, no decision by the ~~Initial Decision Maker~~ Architect is required.

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

§ 15.1.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the ~~Initial Decision Maker's~~ Architect's decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment accordingly ~~in accordance with the decision of the Initial Decision Maker~~.

§ 15.1.5 Claims for Additional Cost

If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.5.1 If the Contractor believes additional cost is involved for reasons including but not limited to (1) a written interpretation from the Architect, (2) an order by the Owner to stop the Work where the Contractor was not at fault, (3) a written order for a minor change in the Work issued by the Architect, (4) failure of payment by the Owner, (5) termination of the Contract by the Owner, (6) Owner's suspension or (7) other reasonable grounds, Claim shall be filed in accordance with this Section 15.1.

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

§ 15.1.6.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated, and had an adverse effect on the scheduled construction.

§ 15.1.7 Waiver of Claims for Consequential Damages

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

.1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and

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

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 Initial Decision

§ 15.2.1 Decision of the Architect. Claims, including those alleging an error or omission by the Architect but excluding those arising under Section 10.3 shall be referred initially to the Architect for decision. An initial decision by the Architect shall be required as a condition precedent to mediation or litigation of all Claims between the Contractor and Owner arising prior to the date final payment is due, unless 30 days have passed after the Claim has been referred to the Architect with no decision having been rendered by the Architect. The Architect will not decide disputes between the Contractor and persons or entities other than the Owner. ~~Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and binding dispute resolution without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.~~

§ 15.2.2 The ~~Initial Decision Maker~~ Architect will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the ~~Initial Decision Maker~~ Architect is unable to resolve the Claim if the ~~Initial Decision Maker~~ Architect lacks sufficient information to evaluate the merits of the Claim or if the ~~Initial Decision Maker~~ Architect concludes that, in the Architect's sole discretion, it would be inappropriate for the ~~Initial Decision Maker~~ Architect to resolve the Claim.

§ 15.2.3 In evaluating Claims, the ~~Initial Decision Maker~~ Architect may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the ~~Initial Decision Maker~~ Architect in rendering a decision. The ~~Initial Decision Maker~~ Architect may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the ~~Initial Decision Maker~~ Architect requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of the request, and shall either (1) provide a response on the requested supporting data, (2) advise the ~~Initial Decision Maker~~ Architect when the response or supporting data will be furnished, or (3) advise the ~~Initial Decision Maker~~ Architect that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the ~~Initial Decision Maker~~ Architect will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Architect will approve or reject Claims by written decision, which shall state the reasons therefore and which shall notify the parties of any change in the Contract Sum or Contract Time or both. The approval or rejection of a Claim by the Architect shall be final and binding on the parties but subject to mediation and litigation. ~~The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.~~

§ 15.2.6 ~~Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.~~

§ 15.2.6.1 ~~Either party may, within 30 days from the date of receipt of an initial decision, demand in writing that the other party file for mediation. If such a demand is made and the party receiving the demand fails to file for mediation within 30 days after receipt thereof, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.~~

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 15.3 Mediation

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract~~, except those waived as provided for in Sections 9.10.4, 9.10.5 and 15.1.7,~~ shall be subject to mediation as a condition precedent to binding dispute resolution.

§ 15.3.2 Claims, disputes or other matters in question between the parties to this Agreement shall be first subject to pre-suit mediation prior to the filing of any legal claims or litigation. Completion of pre-suit mediation is a condition precedent to litigation. The obligation to mediate is a material and essential provision of the Agreement. ~~The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.~~

§ 15.3.3 Either party may, within 30 days from the date that mediation has been concluded without resolution of the dispute or 60 days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for binding dispute resolution. If such a demand is made and the party receiving the demand fails to file for binding dispute resolution within 60 days after receipt thereof, then both parties waive their rights to binding dispute resolution proceedings with respect to the initial decision.

§ 15.3.4 Unless otherwise agreed in writing, the Contractor shall carry on the Work and maintain its progress during any mediation or litigation, and the Owner shall continue to make payments to the Contractor in accordance with the Contract Documents. ~~The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.~~

§ 15.3.5 Either party may initiate a mediation preceding by a request in writing to the other party within a reasonable time after the claim, dispute or other matter in question has arisen or as provided in subparagraph 15.3.1, but in no event after the expiration of the applicable statute of limitations.

§ 15.3.6 The parties shall endeavor in good faith to mutually agree upon an acceptable mediator. In the event the parties have not agreed upon a mediator within thirty (30) days of the request for mediation, the Orlando office of the American Arbitration Association, upon the written request of either party, shall appoint a mediator from its pool of approved mediators.

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§ 15.3.7 Unless otherwise mutually agreed, the mediation shall be held in accordance with the Construction Industry Mediation Rules of the American Arbitration Association currently in effect, each party to bear its own fees, costs and expenses.

§ 15.3.8 In the event that pre-suit mediation is unsuccessful, all claims, disputes or other matters in question shall be resolved in the Circuit Courts of Volusia County Florida. The Parties, including the Contractor's Surety, waive Venue and Jurisdiction of any Federal Court and expressly waive Trial by Jury.

§ 15.3.9 All references to Arbitration in the Contract Documents are deleted.

~~§ 15.4 Arbitration~~

~~§ 15.4.1 If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. The Arbitration shall be conducted in the place where the Project is located, unless another location is mutually agreed upon. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.~~

~~§ 15.4.1.1 A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.~~

~~§ 15.4.2 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.~~

~~§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement, shall be specifically enforceable under applicable law in any court having jurisdiction thereof.~~

~~§ 15.4.4 Consolidation or Joinder~~

~~§ 15.4.4.1 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).~~

~~§ 15.4.4.2 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.~~

~~§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as those of the Owner and Contractor under this Agreement.~~

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CONTRACTOR E-VERIFY AFFIDAVIT

SCHOOL BOARD OF VOLUSIA COUNTY FLORIDA
FAC DOCUMENT 639

PURSUANT TO STATE OF FLORIDA, OFFICE OF THE GOVERNOR, EXECUTIVE ORDER 11-116 (Superseding Executive Order 11-02) AND SECTION 448.095 F.S.

Executive Order 11-116 requires all agencies under the direction of the Governor to verify the employment eligibility of all new employees through the U.S. Department of Homeland Security's E-Verify system. Further, in conjunction with Section 448.095 F.S., the Contractor is directed to include as a condition of all contracts for the provision of goods or services to the School Board of Volusia County in excess of nominal value, an express requirement that the Contractor utilizes the U.S. Department of Homeland Security's E-Verify system to verify the employment eligibility of all new employees hired by the Contractor during the contract term, and an express requirement that the Contractor include in such subcontracts the requirement that subcontractors performing work or providing services pursuant to the state contract utilize the E-Verify system to verify the employment eligibility of all new employees hired by the subcontractor during the contract term.

In accordance with Executive Order 11-116 and Section 448.095 F.S. the School Board of Volusia County Florida requires all contractors who are awarded state funded contracts to verify newly hired employees using the U.S. Department of Homeland Security's E-Verify system. It is the responsibility of the awarded Contractor to insure compliance. To enroll in the E-Verify system employers should visit www.e-verify.gov.

By affixing your signature below you hereby affirm that you will comply with all applicable E-Verify requirements for the following project:

Facility Name: _____ Project No.: _____

Project Name: _____

The undersigned has hereunto set his/her hand this _____ day of _____ , _____

_____ _____
(Print or Type Name, Title) *(Signature of Affiant)*

_____ _____
(Federal Employer ID Number – FEIN) *(E-Verify Number)*

_____
(Firm Name)

_____ _____ _____ _____
(Firm Address) *(City)* *(State)* *(Zip Code)*

NOTARY PUBLIC

STATE OF FLORIDA, COUNTY OF _____

Before me, the undersigned authority, personally appeared _____
known to me to be the person described herein and who executed the foregoing instrument and acknowledged before me executed the same.
IN WITNESS WHEREOF, I have hereunto set my hand and official seal this
_____ day of _____ , _____

(Notary Seal)

My commission expires: _____
(Notary Signature)

_____ _____
(Date) *(Print, type or stamp name of notary public)*

☐ Personally known to me ☐ Produced ID _____
(Type of ID, if applicable)

PERFORMANCE AND PAYMENT BOND

SCHOOL BOARD OF VOLUSIA COUNTY FLORIDA
FAC DOCUMENT 640

PUBLIC CONSTRUCTION BOND

Bond No. _____

BY THIS BOND, WE *(Contractor Firm)* _____, *(Physical Address)* _____, *(Phone)* _____, a corporation, *(Surety Firm)* _____, *(Physical Address)* _____, *(Phone)* _____, as Surety, are bound to *(Owner)* School Board of Volusia County Florida, *(Address)* 200 North Clara Avenue, DeLand Florida 32720, *(Phone)* (386) 734-7190, herein called Owner, in the sum of _____ ($_____) for payment of which we bind ourselves, our heirs, personal representatives, successors, and assigns, jointly and severally.

THE CONDITION OF THIS BOND is that if Principal:

1. Performs the contract dated _____, between Principal and Owner for construction of *(Facility Name)* _____, *(Address)* _____, *(Project Name)* _____,*(Contract/Project No.)* _____, the contract being made a part of this bond by reference, at the times and in the manner prescribed in the contract; and
2. Promptly makes payments to all claimants, as defined in Section 255.05(1), Florida Statutes, supplying Principal with labor, materials, or supplies, used directly or indirectly by Principal, in the prosecution of the work provided for in the contract; and
3. Pays Owner all losses, damages, expenses, costs, and attorney's fees, including appellate proceedings, that Owner sustains because of a default by Principal under the contract; and
4. Performs the guarantee of all work and materials furnished under the contract for the time specified in the contract, then this bond is void; otherwise it remains in full force.

Any action instituted by a claimant under this bond for payment must be in accordance with the notice and time limitation provisions in Section 255.05(2), Florida Statutes.

Any changes in or under the contract documents and compliance or noncompliance with any formalities connected with the contract or the changes does not affect Surety's obligation under this bond.

DATED ON _____ day of _____, _____ _____

Signed, sealed and delivered in the presence of:

_____	By: _____
As to President / Principal	President / Principal
_____	_____
(Print/Type Name of Witness to Contractor)	*(Print/Type Name of Contractor)*
	By: _____
	Attorney-in-Fact
_____	_____
As to Surety	*(Print/Type Name of Attorney-in-Fact)*
_____	_____
(Print/Type Name of Witness to Surety)	Florida Resident Agent
	_____
	(Print/Type Name of Florida Resident Agent)

NOTE: If both Principal and Surety are corporations, the respective corporate seals should be affixed and attached. Power-of- Attorney to be attached.

APPROVED _____

Signature

_____

Printed Name

_____

Florida Bar Number

Approved as to form only and for reliance only by the School Board of Volusia County.

CONTRACTOR'S DIRECT MATERIAL PURCHASE AFFIDAVIT

SCHOOL BOARD OF VOLUSIA COUNTY FLORIDA
FAC DOCUMENT 641

STATE OF FLORIDA
COUNTY OF VOLUSIA

COMES NOW _____, and after being duly sworn, does depose and state as follows:

1. My name is: _____, I am employed in the position of *(title)* _____ for *(Contractor)* _____.

2. I am over the age of eighteen years and I have personal knowledge of the facts stated herein.

3. All of the materials which the School Board of Volusia County Florida has purchased directly for the project known as *(Facility Name)* _____, *(Project Name)* _____, *(VCS Project No.)* _____, and pursuant to AIA Document A201-2017, Article 3.4.5 have been purchased from subcontractors, suppliers or vendors who provided bids to the Contractor for this Project and whose bids were relied upon by the Contractor in submitting its bid to Volusia County Schools.

4. All materials purchased directly by Volusia County Schools from the Contractor's subcontractors, suppliers and vendors were purchased at or below the price originally negotiated by the Contractor.

FURTHER AFFIANT SAYETH NAUGHT _____

Sworn to and subscribed before me this _____ day of _____ _____ .

_____ _____
Signature of Notary Public, State of Florida Print, Type or Stamp Commissioned Name of Notary Public

Personally Known ☐ or Produced Identification ☐

Type of I. D. Produced _____

CONTRACTOR'S ACKNOWLEDGMENT FORM

SCHOOL BOARD OF VOLUSIA COUNTY FLORIDA
FAC DOCUMENT 642
(Asbestos Survey)

TO: Volusia County Schools
Facilities Design and Construction
3750 Olson Drive
Daytona Beach, Florida 32124

I acknowledge that I have been given access to and have read the Asbestos Survey, Management Plan, Re-inspection Report (if applicable) and/or Certificate of Final Inspection (if applicable).

Facility Name: _____

Address: _____

☐ Not applicable - Reason: _____

I further acknowledge that I must cease work and notify the project manager and environmental specialist, 3750 Olson Drive, Daytona Beach Florida 32124, telephone number (386) 947-8786, in the event of encountering materials not previously identified by the aforementioned reports. In addition, I understand that any questions regarding the aforementioned reports should be directed to the environmental specialist as stated above.

My reason for being in the school is: _____

My signature is acknowledgement of the above.

_____ Date: _____
(Signature)

Printed Name: _____

Firm's Name: _____

Address: _____

Telephone: _____

AIA® Document G702™ – 1992

Application and Certificate for Payment

TO OWNER:

PROJECT: G Series Form

APPLICATION NO: 001
PERIOD TO:
CONTRACT FOR: General Construction
CONTRACT DATE:
PROJECT NOS: / /

Distribution to:
OWNER: ☐
ARCHITECT: ☐
CONTRACTOR: ☐
FIELD: ☐
OTHER: ☐

FROM CONTRACTOR:

VIA ARCHITECT:

CONTRACTOR'S APPLICATION FOR PAYMENT

Application is made for payment, as shown below, in connection with the Contract.
Continuation Sheet, AIA Document G703, is attached.

1. ORIGINAL CONTRACT SUM		$0.00
2. NET CHANGE BY CHANGE ORDERS		$0.00
3. CONTRACT SUM TO DATE (Line 1 ± 2)		$0.00
4. TOTAL COMPLETED & STORED TO DATE (Column G on G703)		$0.00
5. RETAINAGE:		
a. 0 % of Completed Work (Column D + E on G703)	$0.00	
b. 0 % of Stored Material (Column F on G703)	$0.00	
Total Retainage (Lines 5a + 5b or Total in Column I of G703)		$0.00
6. TOTAL EARNED LESS RETAINAGE (Line 4 Less Line 5 Total)		$0.00
7. LESS PREVIOUS CERTIFICATES FOR PAYMENT (Line 6 from prior Certificate)		$0.00
8. CURRENT PAYMENT DUE		$0.00
9. BALANCE TO FINISH, INCLUDING RETAINAGE (Line 3 less Line 6)	$0.00	

CHANGE ORDER SUMMARY	ADDITIONS	DEDUCTIONS
Total changes approved in previous months by Owner	$0.00	$0.00
Total approved this Month	$0.00	$0.00
TOTALS	$0.00	$0.00
NET CHANGES by Change Order		$0.00

The undersigned Contractor certifies that to the best of the Contractor's knowledge, information and belief the Work covered by this Application for Payment has been completed in accordance with the Contract Documents, that all amounts have been paid by the Contractor for Work for which previous Certificates for Payment were issued and payments received from the Owner, and that current payment shown herein is now due.

CONTRACTOR:

By: _____ Date: _____

State of:

County of:

Subscribed and sworn to before me this day of

Notary Public:
My Commission expires:

ARCHITECT'S CERTIFICATE FOR PAYMENT

In accordance with the Contract Documents, based on on-site observations and the data comprising this application, the Architect certifies to the Owner that to the best of the Architect's knowledge, information and belief the Work has progressed as indicated, the quality of the Work is in accordance with the Contract Documents, and the Contractor is entitled to payment of the AMOUNT CERTIFIED.

AMOUNT CERTIFIED $0.00

(Attach explanation if amount certified differs from the amount applied. Initial all figures on this Application and on the Continuation Sheet that are changed to conform with the amount certified.)

ARCHITECT:

By: _____ Date: _____

This Certificate is not negotiable. The AMOUNT CERTIFIED is payable only to the Contractor named herein. Issuance, payment and acceptance of payment are without prejudice to any rights of the Owner or Contractor under this Contract.

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AIA® Document G703™ – 1992

Continuation Sheet

AIA Document, G702™–1992, Application and Certification for Payment, or G736™–2009, Project Application and Project Certificate for Payment, Construction Manager as Adviser Edition, containing Contractor's signed certification is attached.
In tabulations below, amounts are in US dollars.
Use Column I on Contracts where variable retainage for line items may apply.

APPLICATION NO:	001
APPLICATION DATE:	
PERIOD TO:	
ARCHITECT'S PROJECT NO:	

A	B	C	D	E	F	G		H	I
ITEM NO.	DESCRIPTION OF WORK	SCHEDULED VALUE	WORK COMPLETED		MATERIALS PRESENTLY STORED (NOT IN D OR E)	TOTAL COMPLETED AND STORED TO DATE (D + E + F)	% (G ÷C)	BALANCE TO FINISH (C - G)	RETAINAGE (IF VARIABLE RATE)
			FROM PREVIOUS APPLICATION (D + E)	THIS PERIOD					
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
	GRAND TOTAL	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**0.00%**	**$0.00**	**$0.00**

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PARTIAL RECEIPT AND RELEASE
PROGRESS PAYMENT
SCHOOL BOARD OF VOLUSIA COUNTY FLORIDA
FAC DOCUMENT 655

The undersigned _____, of _____ was heretofore on _____ day of _____, _____ awarded a contract by the SCHOOL BOARD OF VOLUSIA COUNTY FLORIDA, to furnish all of the materials and labor in the construction project entitled *(Facility Name)* _____, *(Address)* _____, *(Project Name)* _____, *(VCS Project No.)* _____ , in accordance with the plans and specifications therefore, as prepared by _____, Architect, and the undersigned has completed said work and fully complied with said contract and has heretofore received the sum of _____, ($_____) as progress payment thereon.

That the undersigned has this date received from the SCHOOL BOARD OF VOLUSIA COUNTY FLORIDA, the sum representing the balance due as of this progress payment, under terms of said contract, and certifies that said work has been performed in accordance with terms thereof and that, as Contractor, has received monies due and to become due to thereunder for work performed and materials furnished in connection with said work, and that, as Contractor, has paid in full all persons furnishing labor and/or materials in connection therewith, including all subcontractors and suppliers, and that there are no unpaid bills for labor performed or materials furnished in connection with said Work or improvements to date.

That the undersigned, for value received, does hereby forever release and discharge the said building and premises as described in said contract, from any and all liens, claims or demands whatsoever that, as Contractor, has or may have for work performed or materials furnished in connection therewith, or for work performed or materials furnished thereon by any subcontractor or supplier, and will hold the SCHOOL BOARD OF VOLUSIA COUNTY FLORIDA, safe and harmless from any and all loss and liability arising or to arise by reason of any unpaid bills for labor performed or materials furnished on said building or premises in connection with said work or improvements as of this progress payment.

IN WITNESS WHEREOF,
the undersigned has hereunto set hand and seal this _____ day of _____ , _____
Witnessed by:

_____ _____ *(SEAL)*
(Witness Signature) *(Contractor Signature)*

_____ _____
(Print or Type Name, Title) *(Print or Type Name, Title)*

STATE OF FLORIDA, COUNTY OF
Before me, the undersigned authority, personally appeared _____
to me well-known and known to me to be the person described in and who executed the foregoing instrument, and acknowledged before me executed the same.
IN WITNESS WHEREOF, I have hereunto set my hand and official seal this
_____ day of _____ , _____

(Notary Seal)

My commission expires: _____
Notary Public, State of Florida

_____ _____
(Date) *(Print, type or stamp name of notary public)*

☐ Personally known to me ☐ Produced ID _____
(Type of ID, if applicable)

AIA® Document G707A™ – 1994

Consent of Surety to Reduction in or Partial Release of Retainage

PROJECT: *(Name and address)*	**ARCHITECT'S PROJECT NUMBER:**	OWNER: ☐
	CONTRACT FOR:	ARCHITECT: ☐
		CONTRACTOR: ☐
TO OWNER: *(Name and address)*	**CONTRACT DATED:**	SURETY: ☐
		OTHER: ☐

In accordance with the provisions of the Contract between the Owner and the Contractor as indicated above, the
(Insert name and address of Surety)

, SURETY,

on bond of
(Insert name and address of Contractor)

, CONTRACTOR,

hereby approves the reduction in or partial release of retainage to the Contractor as follows:

The Surety agrees that such reduction in or partial release of retainage to the Contractor shall not relieve the Surety of any of its obligations to
(Insert name and address of Owner)

, OWNER,

as set forth in said Surety's bond.

IN WITNESS WHEREOF, the Surety has hereunto set its hand on this date:
(Insert in writing the month followed by the numeric date and year.)

_____
(Surety)

_____
(Signature of authorized representative)

Attest:
(Seal):

_____
(Printed name and title)

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Consent Of Surety to Final Payment

PROJECT: *(Name and address)*	**ARCHITECT'S PROJECT NUMBER:**	OWNER: ☐
	CONTRACT FOR:	ARCHITECT: ☐
		CONTRACTOR: ☐
TO OWNER: *(Name and address)*	**CONTRACT DATED:**	SURETY: ☐
		OTHER: ☐

In accordance with the provisions of the Contract between the Owner and the Contractor as indicated above, the
(Insert name and address of Surety)

, SURETY,

on bond of
(Insert name and address of Contractor)

, CONTRACTOR,

hereby approves of the final payment to the Contractor, and agrees that final payment to the Contractor shall not relieve the Surety of any of its obligations to
(Insert name and address of Owner)

, OWNER,

as set forth in said Surety's bond.

IN WITNESS WHEREOF, the Surety has hereunto set its hand on this date:
(Insert in writing the month followed by the numeric date and year.)

_____
(Surety)

_____
(Signature of authorized representative)

Attest:
(Seal):

_____
(Printed name and title)

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CONTRACTOR AFFIDAVIT

SCHOOL BOARD OF VOLUSIA COUNTY FLORIDA
FAC DOCUMENT 661

PURSUANT TO SECTION 713.06(3), FLORIDA STATUTES

TO: SCHOOL BOARD OF VOLUSIA COUNTY FLORIDA

The undersigned, as Contractor, has heretofore, on the _____ day of _____, in the year _____, been awarded a contract by you, as Owner, to furnish all of the materials and labor in the construction project entitled *(Facility Name)* _____, *(Address)* _____, *(Project Name)* _____,*(VCS Project No.)* _____, for the final contract price of _____ ($_____) in accordance with plans and specifications therefore, as prepared by _____, Architect.

The said project has been completed and the contract and plans therefore fully complied with, and all of the contract price has been paid by you, except the final payment thereon, which is now due, but is being withheld until a sworn statement is furnished as required by law, showing whether there are any unpaid and outstanding bills in connection with said building.

That the undersigned hereby certified, under oath, that all lienors contracting directly with or directly employed by the undersigned, on said contract, have been paid in full, and further certified, under oath, that there are no outstanding or unpaid bills for labor performed or materials furnished in connections with said work or improvements.

That this sworn statement is furnished by the Contractor to the Owner pursuant to Section 713.06(3), Florida Statutes.

IN WITNESS WHEREOF,
the undersigned has hereunto set his hand and seal this _____ day of _____ , _____
Witnessed by:

_____ _____ *(SEAL)*
(Witness Signature) *(Contractor Signature)*

_____ _____
(Print or Type Name, Title) *(Print or Type Name, Title)*

STATE OF FLORIDA, COUNTY OF VOLUSIA
Before me, the undersigned authority, personally appeared _____
to me well-known and known to me to be the person described in and who executed the foregoing instrument, and he acknowledged before me that he executed the same.
IN WITNESS WHEREOF, I have hereunto set my hand and official seal this
_____ day of _____ , _____

(Notary Seal)

My commission expires: _____
Notary Public, State of Florida

_____ _____
(Date) *(Print, type or stamp name of notary public)*

☐ Personally known to me ☐ Produced ID _____
(Type of ID, if applicable)

RECEIPT AND RELEASE

SCHOOL BOARD OF VOLUSIA COUNTY FLORIDA
FAC DOCUMENT 662

The undersigned _____, of _____ was heretofore on _____ day of _____, _____ awarded a contract by the SCHOOL BOARD OF VOLUSIA COUNTY FLORIDA, for the final contract price of _____, ($_____) to furnish all of the materials and labor in the construction project entitled *(Facility Name)* _____, *(Address)* _____, *(Project Name)* _____, *(VCS Project No.)* _____, in accordance with the plans and specifications therefore, as prepared by _____, Architect, and the undersigned has completed said work and fully complied with said contract and has heretofore received the sum of _____, ($_____) as payment thereon.

That the undersigned has this date received from the SCHOOL BOARD OF VOLUSIA COUNTY FLORIDA, the sum of _____, ($_____) representing the full balance due him as Contractor, under terms of said contract, and certifies that said contract has been fully performed in accordance with terms thereof and that, as Contractor, has received all monies due and to become due thereunder for work performed and materials furnished in connection with said work, and that, as Contractor, has paid in full all persons furnishing labor and/or materials in connection therewith, including all subcontractors and suppliers, and that there are no unpaid bills for labor performed or materials furnished in connection with said work or improvements.

That the undersigned, for value received, does hereby forever release and discharge the said building and premises as described in said contract, from any and all liens, claims or demands whatsoever that, as Contractor, has or may have for work performed or materials furnished in connection therewith, or for work performed or materials furnished thereon by any subcontractor or supplier, and will hold the SCHOOL BOARD OF VOLUSIA COUNTY FLORIDA, safe and harmless from any and all loss and liability arising or to arise by reason of any unpaid bills for labor performed or materials furnished on said building or premises in connection with said work or improvements.

IN WITNESS WHEREOF,
the undersigned has hereunto set hand and seal this _____ day of _____ , _____
Witnessed by:

_____ _____ *(SEAL)*
(Witness Signature) *(Contractor Signature)*

_____ _____
(Print or Type Name, Title) *(Print or Type Name, Title)*

STATE OF FLORIDA, COUNTY OF
Before me, the undersigned authority, personally appeared _____
to me well-known and known to me to be the person described in and who executed the foregoing instrument, and acknowledged before me executed the same.
IN WITNESS WHEREOF, I have hereunto set my hand and official seal this
_____ day of _____ , _____

(Notary Seal)

My commission expires: _____
Notary Public, State of Florida

_____ _____
(Date) *(Print, type or stamp name of notary public)*

☐ Personally known to me ☐ Produced ID _____
(Type of ID, if applicable)

SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for alternates.

1.2 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if the Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternates into the Work. No other adjustments are made to the Contract Sum.

1.3 PROCEDURES

A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

1. Include, as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation, whether or not indicated as part of alternate.

B. Execute accepted alternates under the same conditions as other Work of the Contract.

C. Schedule: A Part 3 "Schedule of Alternates" Article is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Alternate No. 01: **Install site generator located at MDP in lieu of replacing generator at transportation building**

1. Base Bid: Replace existing generator located at transportation building as indicated on Drawings.
2. Alternate: Install new generator for entire site located at MDP in lieu of replacing generator at transportation building as indicated on Drawings.

END OF SECTION 012300

SECTION 03 10 00
CONCRETE FORMING AND ACCESSORIES

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. American Concrete Institute (ACI):
   a. 117/117R, Standard Tolerances for Concrete Construction and Materials.
   b. 318/318R, Building Code Requirements for Structural Concrete and Commentary.
   c. 347, Guide to Formwork for Concrete.

1.02 DESIGN REQUIREMENTS

A. Design formwork in accordance with ACI 347 and ACI 318/318R to provide concrete finishes specified in Section 03 30 00, Cast-in-Place Concrete.

B. High range water reducer (superplasticizer) shall be used in all concrete mixes. Forms shall be designed for full hydrostatic pressure per ACI 347.

C. Make joints in forms watertight.

D. Limit panel deflection to 1/360th of each component span to achieve tolerances specified.

1.03 SUBMITTALS

A. Action Submittals:

1. Shop Drawings:
   a. Layout of panel joints and tie hole pattern.
   b. Form Ties-Tapered Through-Bolts: Proposed method of sealing form tie hole; coordinate with details shown.
   c. Manufacturer’s data for form release agent.
2. Samples: One each as follows:
   a. Form ties.

B. Informational Submittals:

1. Statement of qualification for formwork designer.
2. Manufacturer’s Certificate of Proper Installation.

1.04 QUALIFICATIONS

A. Formwork Designer: Formwork, falsework, and shoring design shall be by a structural engineer licensed by the State of Florida.

PART 2 PRODUCTS

2.01 FORM MATERIALS

A. Slabs and spread footers:

1. Materials: Plywood, hard plastic finished plywood, or steel in "new and undamaged" condition, of sufficient strength and surface smoothness to produce specified finish.

B. Form Release Agent:

1. Material: Release agent shall not bond with, stain, or adversely affect concrete surfaces, and shall not impair subsequent treatments of concrete surfaces when applied to forms. A ready-to-use water based material formulated to reduce or eliminate surface imperfections, containing no mineral oil or organic solvents. Environmentally safe, meeting local, state, and federal regulations and can be used in potable water facilities.
2. Manufacturers and Products:
   a. BASF, Shakopee, MN; MBT, Rheofinish 211.
   b. Cresset Chemical Company; Crete-Lease 20-VOC.
   c. Unitex Chemicals; Farm Fresh.
   d. Atlas Construction Supply, Inc.; Bio-Guard.

C. Form Ties:

1. Material: Steel.
2. Spreader Inserts:
   a. Conical or spherical type.
   b. Design to maintain positive contact with forming material.
   c. Furnish units that will leave no metal closer than 1.5 inches to concrete surface when forms, inserts, and tie ends are removed.
3. Wire ties not permitted.
4. Flat bar ties for panel forms; furnish plastic or rubber inserts with minimum 1.5-inch depth and sufficient dimensions to permit patching of tie hole.
5. Water Stop Ties:
   a. Neoprene water stop 3/16 inch thick and 15/16 inch diameter whose center hole is one half diameter of tie, or molded plastic water stop of comparable size.
   b. Orient water stop perpendicular to tie and symmetrical about center of tie.
   c. Design ties to prevent rotation or disturbance of center portion of tie during removal of ends and to prevent water leaking along tie.

PART 3 EXECUTION

3.01 FORM SURFACE PREPARATION

A. Thoroughly clean form surfaces that will be in contact with concrete or that have been in contact with previously cast concrete, dirt, and other surface contaminants prior to coating surface.

B. Exposed Wood Forms in Contact with Concrete: Apply form release agent as recommended by the manufacturer.

C. Steel Forms: Apply form release agent to steel forms as soon as they are cleaned to prevent discoloration of concrete from rust.

3.02 ERECTION

A. General: Unless specified otherwise, follow applicable recommendations of ACI 347.

B. Beveled Edges (Chamfer):

1. Form 1-inch bevels at concrete edges, unless otherwise shown.
2. Where beveled edges on existing adjacent structures are other than 1-inch, obtain Engineer's approval of size prior to placement of beveled edge.

C. Forms:

1. Do not reuse forms with damaged surfaces.
2. Locate form ties and joints in an uninterrupted uniform pattern.
3. Inspect form surfaces prior to installation to assure conformance with specified tolerances.

D. Form Tolerances: Provide forms in accordance with ACI 117/117R, ACI 347, and ACI 318/318R and the following tolerances for finishes specified:

1. Tolerances:
   a. Exposed Straight Horizontal and Vertical Surfaces: Flat planes within tolerances specified.
   b. Lateral Alignment:
      1) Centerlines must be within plus or minus 1/2 inch from dimensions shown.
      2) At intersections, centerlines shall intersect within plus or minus 1/2 inch of dimensions shown.
   c. Tolerances:
      1) Physical Dimensions: Maximum 1/4 inch minus or 1/2 inch plus from dimension shown.
      2) Elevations: Within plus or minus 1/2 inch.

3.03 FORM REMOVAL

A. Nonsupporting forms may be removed after cumulatively curing at not less than 50 degF for 48 hours from time of concrete placement if:

1. Concrete is sufficiently hard so as not to sustain damage by form removal operations.
2. Curing and protection operations are maintained.

B. In accordance with ACI 318/318R, Chapter 6, and at such time as concrete has reached compressive strength equal to 80 percent of specified 28-day compressive strength as determined by test cylinders.

END OF SECTION

SECTION 03 21 00 - REINFORCING STEEL

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. American Concrete Institute (ACI):
   a. 318/318R, Building Code Requirements for Structural Concrete and Commentary.
   b. SP-66, Detailing Manual.
2. American Welding Society (AWS): D1.4, Structural Welding Code - Reinforcing Steel.
3. ASTM International (ASTM):
   a. A82, Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
   b. A185, Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.
   c. A497, Standard Specification for Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement.
   d. A615/A615M, Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
   e. A706/A706M, Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
4. Concrete Reinforcing Steel Institute (CRSI):
   a. Placing Reinforcing Bars.
   b. Manual of Standard Practice.
5. International Conference of Building Officials (ICBO): ICBO Research Report.
6. Wire Reinforcement Institute(WRI): Manual of Standard Practice, Welded Wire Fabric.

1.02 SUBMITTALS

A. Action Submittals:

1. Shop Drawings prepared in accordance with CRSI Manual of Standard Practice and ACI SP-66 Detailing Manual:

   a. Bending lists.
   b. Placing drawings.

2. Welded, metallic sleeve splice, and mechanical threaded connection details and product data.

3. Welding Qualification: Prior to welding, submit welder qualifications, AWS certifications, and nondestructive testing procedures.

B. Informational Submittals:

1. Lab test reports for reinforcing steel showing stress-strain curves and ultimate strengths.
2. Mechanical Threaded Connections:
   a. Current International Conference of Building Officials (ICBO) Research Report or equivalent code agency report listing findings to include acceptance, special inspection requirements, and restrictions.
   b. Manufacturer's instructions.
   c. Verification that device threads have been tested and meet requirements for thread quality, in accordance with manufacturer's published methods.
3. Test results of field testing.

1.03 QUALITY ASSURANCE

A. Welder Qualifications: Certified in accordance with AWS D1.4, within the last 6 months.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Unload, store, and handle bars in accordance with CRSI publication "Placing Reinforcing Bars."

PART 2 PRODUCTS

2.01 MATERIALS

A. Deformed Billet-Steel Reinforcing Bars:

1. Includes primary reinforcing bars, stirrups, ties, and spirals.
2. ASTM A615/A615M, Grade 60, where welding is not required.
3. ASTM A706/A706M, Grade 60, for reinforcing to be welded and for reinforcement where tight radius bends are required, such as closed ties and stirrups.

B. Mechanical Splices and Connections:

1. Metal Sleeve Splice: Furnish with cast filler metal, capable of developing, in tension or compression, 125 percent of minimum tensile strength of bar.
   a. Manufacturer and Product: Erico Products, Inc., Cleveland, OH; Cadweld T-Series.

2. Mechanical Threaded Connections: Furnish metal coupling sleeve with internal threads engaging threaded ends of bars developing in tension or compression 125 percent of yield strength of bar.
   a. Manufacturers and Products:
      1) Erico Products, Inc., Cleveland, OH; Lenton Reinforcing Steel Couplers.
      2) Richmond Screw Anchor Co., Inc., Fort Worth, TX; Richmond DB-SAE Dowel Bar Splicers.

C. Welded Wire Fabric:

1. ASTM A185 or ASTM A497 and ACI 318/318R, using ASTM A82 wire of 75 ksi minimum tensile strength.
2. Furnish flat sheets only, rolled sheets not permitted.

2.02 ACCESSORIES

A. Tie Wire:

1. Black, soft-annealed 16-gauge wire.
2. Nylon-, epoxy-, or plastic-coated wire.

B. Bar Supports and Spacers:

1. Use precast concrete bar supports or all-plastic bar supports and side form spacers meeting the requirements of CRSI “Manual of Standard Practice”. Do not use other types of supports or spacers.
2. Bar supports shall have sufficient strength and stiffness to carry loads without failure, displacement, or significant deformation. Space bar supports so minimum concrete cover is maintained for reinforcing between supports.
3. Use only precast concrete bar supports where concrete surfaces are exposed to weather, earth, water, chloride intrusion, or corrosive chemicals. Bar supports shall be nonconductive and have geometry and bond characteristics that deter movement of moisture from the surface to the reinforcement.
4. Precast concrete supports shall have the same color and minimum compressive strength and shall be made from same materials as that of the concrete in which they are to be embedded. Precast concrete supports shall be cast and properly cured for at least 7 days before use and shall have a wire or other device cast into each block for the purpose of attaching them securely to the reinforcing steel.
5. In Concrete Exposed to View After Form Removal: Use small precast concrete blocks made of same color and minimum compression strength as concrete in which they are embedded. All-plastic bar supports and side form spacers may be used, except where surface is exposed as described above.

6. Plastic Bar Supports: Manufactured by Aztec Concrete Accessories, Bloomington, CA.
7. Precast Concrete Supports: Total bond precast high performance concrete bar supports as supplied by Con Sys Inc., Pinawa, MB, Canada.

2.03 FABRICATION

A. Follow CRSI Manual of Standard Practice.

B. Bend bars cold.

PART 3 EXECUTION

3.01 PREPARATION

A. Notify Engineer when reinforcing is ready for inspection and allow sufficient time for inspection prior to placing concrete.

B. Clean reinforcing bars of loose mill scale, oil, earth, and other contaminants.

C. Coat wire projecting from precast concrete bar supports with dielectric material, epoxy, or plastic.

3.02 REINFORCING BAR INSTALLATION

A. Bundle or space bars, instead of field bending where construction access through reinforcing is necessary.

B. Spacing and Positioning: Conform to ACI 318/318R.

C. Location Tolerances: In accordance with CRSI publication, “Placing Reinforcing Bars”.

D. Splicing:

1. Follow ACI 318/318R.
2. Use Class B tension lap splices, unless otherwise shown or permitted in writing by Engineer.
3. Stagger splices in adjacent bars such that no more than 50 percent of the bars are spliced at one location. Space lap splices such that there is at least the equivalent of one Class B tension splice length of unspliced bar between splices.
4. Welded Splices: Obtain Engineer’s approval. Accomplish by full penetration groove welds and develop a minimum of 125 percent of yield strength of bar.

E. Mechanical Splices and Connections:

1. Use only in areas specifically approved in writing by Engineer.
2. Install threaded rods as recommended by manufacturer with threads totally engaged into coupling sleeve and in accordance with ICBO Research Report.
3. For metal sleeve splice, follow manufacturer's installation recommendations.
4. Maintain minimum edge distance and concrete cover.

F. Tying Reinforcing Bars:

1. Tie every other intersection on mats made up of Nos. 3, 4, 5, and 6 bars to hold them firmly at required spacing.
2. Bend tie wire away from concrete surface to provide clearance of 2 inches from surface of concrete to tie wire.

G. Reinforcement Around Openings: On each side and above and below pipe or opening, place an equivalent area of steel bars to replace steel bars cut for opening. Extend steel reinforcing a standard Class B tension lap splice length beyond opening at each end.

H. Welding Reinforcement:

1. Do not perform welding until Engineer's written approval is granted for welding reinforcement.
2. Only ASTM A706/A706M bars shall be welded.
3. Do not perform welding until welder qualifications and current (within 12 months) AWS Welder Certificates are approved.

I. Straightening and Rebending: Straightening and rebending of reinforcing steel bars is not permitted.

J. Unless permitted by Engineer, do not cut reinforcing bars in field.

3.03 WELDED WIRE FABRIC INSTALLATION

A. Use only where specifically shown.

B. Extend fabric to within 3 inches of edges of slab, and lap splices at least 1-1/2 courses of fabric or minimum 8 inches.

C. Tie laps and splices securely at ends and at least every 24 inches with tie wire.

D. Place welded wire fabric on concrete blocks and rigidly support equal to that provided for reinforced bars. Do not use broken concrete, brick, or stone.

E. Follow ACI 318/318R and current Manual of Standard Practice, Welded Wire Fabric.

F. Do not use fabric that has been rolled. Install flat sheets only.

3.04 TESTS AND INSPECTION

A. An independent testing agency shall be retained by Contractor and approved by the Engineer to visually inspect, 100 percent of all welds shall be visually inspected by an AWS CWI, and test reinforcing steel welds in accordance with AWS D1.4.

B. An independent testing agency shall be retained by Contractor and approved by the Engineer to inspect each mechanical splice and verify each component is installed in accordance with manufacturer's instructions and ICBO Research Report.

END OF SECTION

SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 Used for equipment support slabs and spread footer foundations

1.02 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. American Concrete Institute (ACI):
   a. 211.1, Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete.
   b. 223R, Guide for the Use of Shrinkage – Compensating Concrete.
   c. 301, Specifications for Structural Concrete.
   d. 302.1R, Guide For Concrete Floor and Slab Construction.
   e. 304R, Guide for Measuring, Mixing, Transporting, and Placing Concrete.
   f. 305R, Hot Weather Concreting.
   g. 306.1, Standard Specification for Cold Weather Concreting.
   h. 309R, Guide for Consolidation of Concrete.
   i. 318, Building Code Requirements for Structural Concrete and Commentary.
2. ASTM International (ASTM):
   a. C31/C31M, Standard Practice for Making and Curing Concrete Test Specimens in the Field.
   b. C33, Standard Specification for Concrete Aggregates.
   c. C39/C39M, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
   d. C88, Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate.
   e. C94/C94M, Standard Specification for Ready-Mixed Concrete.
   f. C143/C143M, Standard Test Method for Slump of Hydraulic Cement Concrete.
   g. C150, Standard Specification for Portland Cement.
   h. C157/C157M, Standard Test Method for Length Change of Hardened Hydraulic-Cement Mortar and Concrete.
   i. C192/C192M, Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory.
   j. C231, Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
   k. C260, Standard Specification for Air-Entraining Admixtures for Concrete.
   l. C311, Standard Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use in Portland-Cement Concrete.

m. C452, Standard Test Method for Potential Expansion of Portland-Cement Mortars Exposed to Sulfate.
n. C494/C494M, Standard Specification for Chemical Admixtures for Concrete.
o. C618, Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
p. C881, Epoxy-Resin-Base Bonding Systems for Concrete.
q. C1012, Standard Test Method for Length Change of Hydraulic-Cement Mortars Exposed to a Sulfate Solution.
r. C1218/C1218M, Standard Test Method for Water-Soluble Chloride in Mortar and Concrete.
s. D4580, Standard Practice for Measuring Delaminations in Concrete Bridge Decks by Sounding.

3. National Institute of Standards and Technology (NIST): Handbook 44, Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices.
4. National Ready Mixed Concrete Association (NRMCA).

1.03 DEFINITIONS

A. Defective Areas: Surface defects that include honeycomb, rock pockets, indentations greater than 3/16 inch, cracks 0.010 inch wide, chips, air bubbles greater than 3/4 inch in diameter, pinholes, bug holes, embedded debris, lift lines, sand lines, bleed lines, leakage from form joints, fins and other projections, form popouts, texture irregularities, and stains and other color variations that cannot be removed by cleaning.

B. Exposed Concrete: Concrete surfaces that can be seen inside or outside of structures.

C. New Concrete: Less than 60 days old.

D. SRA: Shrinkage Reducing Admixture.

E. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, and other pozzolans materials subject to compliance with requirements.

F. Water/Cement Ratio (w/cm): The ratio by weight of water to cementitious materials.

1.04 SUBMITTALS

A. Action Submittals:

1. Concrete Mix Proportions
   a. Proportions by weight of ingredients in mix.
2. Manufacturer’s Technical Data Sheet:
   a. Concrete admixtures.

b. Evaporation retardant.

3. Shop Drawings:
   a. Product Data: Admixtures and patching materials.
   b. Design Data: Concrete mix designs signed by qualified mix designer.
   c. Placement Drawings:
      1) Concrete, identifying location of each type of construction joint.
   d. Gradation for coarse and fine aggregates, and combined together. List gradings, percent passing through each sieve size.
   e. Detailed plan for hot weather placements including curing and protection for concrete placed in ambient temperatures over 80 degrees F.
   f. Concrete repair methods and materials.

B. Informational Submittals:

1. Preinstallation Conference Minutes.
2. Manufacturer's application instructions for bonding agent and bond breaker.
3. Manufacturers' Certificate of Compliance (Current within last 6 months):
   a. Portland cement.
   b. Fly ash.
   c. Admixtures:
      1) Air Entrainment.
      2) Water Reducing.
      3) High-Range Water-Reducing (Superplaticizer).
      4) Shrinkage Reducing Admixture.
      5) Anti-washout.
      6) Viscosity Modifying.
      7) Manufacturers' Certificate of Proper Installation.
   d. Aggregates.
   e. Bonding agent.
   f. Bond breaker.
   g. Patching materials.
   h. Evaporation retardant
   i. Admixtures: Manufacturers' Certificate of Proper Installation.
4. Statements of Qualification (Current within last 6 months):
   a. Mix Designer.
   b. Batch plant.
   c. Contractor's resident superintendant for concrete installation.
5. Test Reports: (Certified and Current within 6 months):
   a. Admixtures, test reports showing chemical ingredients and percentage of chloride in each admixture.
   b. Source test analysis reports for cement and fly ash, including percentage of chloride content in each.
   c. Statement identifying aggregates reactivity. Determine water soluble chloride in each component of aggregates in accordance with ASTM C1218/C1218M.

d. Each trial concrete mix design, signed by a Qualified Mix Designer.
e. Cylinder compressive test results for each of the laboratory concrete mixes.
f. Shrinkage sample test results for each of the laboratory concrete mixes.

6. Concrete Delivery Tickets:
   a. For each batch of concrete before unloading at site.
   b. Record of drum revolution counter, type, brand, test certification, and amount of fly ash used in accordance with ASTM C94/C94M, Section 16.
   c. Amount of water added at the site and resulting w/cm ratio.
   d. Amount of superplasticizer added at the site.

1.05 QUALITY ASSURANCE

A. Qualifications:

1. Mix Designer: Licensed professional engineer registered in the State of Florida or Florida DOT approved mix designer.
2. Batch Plant: Currently certified by the National Ready Mixed Concrete Association.
3. Maintain in the field office, as a minimum, a copy of ACI 301 and AASHTO T 277 – Test for Density, Relative Density (Specific Gravity).

B. Preinstallation Conference:

1. Required Meeting Attendees:
   a. Contractor, including pumping, placing, finishing, and curing subcontractors.
   b. Ready-mix producer.
   c. Admixture representative.
   d. Testing and sampling personnel.
   e. Owner.
   f. Engineer.
2. Schedule and conduct prior to incorporation of respective products into Project. Notify Port Representative and Engineer of location and time, at least 5 working days in advance.
3. Agenda shall include:
   a. Admixture types, dosage, performance, and redosing at site.
   b. Mix designs, test of mixes, and Submittals.
   c. Placement methods, techniques, equipment, consolidation, and form pressures.
   d. Control Joint locations and concrete placement sequencing; as well as Contraction/Construction Joint locations.
   e. Slump and placement time to maintain slump.
   f. Finish, curing, water retention, and evaporation retardant.
   g. Protection procedures for weather conditions.

h. Other specified requirements requiring coordination.

5. Conference Minutes.

PART 2 PRODUCTS

2.01 MATERIALS

A. Cement: Furnish from one source.

1. Portland Cement:
   a. Meet ASTM C150, Type II.
   b. Equivalent Alkalies: Maximum 0.60 percent, in accordance with ASTM C150, Table 2.
   c. Tricalcium Aluminate Content: Maximum 8 percent.
   d. Combine fly ash with cement at batch plant.

B. Aggregates:

1. Natural Aggregates:
   a. Furnish from one source.
   b. Free from deleterious coatings and substances in accordance with ASTM C33, except as modified herein.
   c. Free of materials and aggregate types causing popouts, discoloration, staining, or other defects on surface of concrete.
   d. In compliance with ACI 223R recommendations.
   e. Use job aggregates in the three laboratory trial batch proportioning tests.
2. Nonpotentially Reactive: In accordance with ASTM C33, Appendix XI, Paragraph X1.1.
3. Aggregate Soundness: Test for fine and coarse aggregates in accordance with ASTM C33 and ASTM C88 using sodium sulfate solution.
4. Fine Aggregates:
   a. Clean, sharp, granular, natural sand. Screenings not Allowed.
   b. ASTM C33.
   c. Materials Passing 200 Sieve: 4 percent maximum.
   d. Limit deleterious substances in accordance with ASTM C33, Table 1 with material finer than 200 sieve limited to 3 percent, coal and lignite limited to 0.5 percent.
5. Coarse Aggregate:
   a. Natural gravels, combination of gravels and crushed gravels, crushed stone, or combination of these materials containing no more than 15 percent flat or elongated particles (long dimension more than five times the short dimension).
   b. Materials Passing 200 Sieve: 0.5 percent maximum.
   c. Limit deleterious substances that react with alkalis to cause excessive expansion of concrete exposed to wetting, in accordance with

ASTM C33, Table 3, for concrete exposed to Exposure Classes C1 and C2.

C. Admixtures: Furnish from one manufacturer.

1. Furnish from one manufacturer.
2. Characteristics:
   a. Compatible with each other and free of chlorides or other corrosive chemicals.
   b. Submit manufacturer's current certification that each specific admixture to be used in the mix is compatible with all other admixtures used in the mix.
   c. In compliance with ACI 223R recommendations.
   d. Admixtures shall be tested in trial batches with job materials and mixture proportions. Such tests shall evaluate:
      1) The admixture's influence on expansion;
      2) Water requirement;
      3) Air content;
      4) Consistency;
      5) Rate of slump loss;
      6) Bleeding;
      7) Rate of hardening;
      8) Compressive Strength; and
      9) Drying shrinkage.
3. Air-Entraining Admixture:
   a. ASTM C260, nontoxic after 30 days and contains no chlorides.
   b. Concrete with air-entrainment admixture added shall maintain air percentage as batched, within plus or minus 2 percent for time required for placement into structure.
   c. Manufacturers and Products:
      1) W.R. Grace & Co.: "Darex" or "Daravair" Series.
      2) BASF Admixtures, Inc.: "MB-VR", "MB-AE90" or "Micro-Air".
      3) Sika Chemical Corporation: "Sika AER".
      4) Euclid Chemical Company: "Air Mix" or "AEA-92".
4. Water-Reducing Admixture: ASTM C494/C494M, Type A.
   a. Manufacturers and Products:
      1) BASF Admixtures Inc.: Pozzolith or Polyheed.
      2) Euclid Chemical Co.: Eucon WR-91 or WR-75.
      3) W. R. Grace & Co.: MIRA Series.
      4) Sika Chemical Corp.: Plastocrete 161.
5. High-Range Water-Reducing Admixture (Superplasticizer):
   a. ASTM C494/C494M.
   b. Hold slump of 5 inches or greater for time required for placement.
   c. Furnish type as recommended by manufacturer for allowed temperature ranges.

d. Type F or G.
e. Manufacturers and Products:
1) BASF Admixtures Inc.: Rheobuild 1000 or Glenium Series.
2) Euclid Chemical Co.: Eucon 37/1037 or Plastol Series.
3) W. R. Grace & Co.: ADVA Series.
4) Sika Chemical Corp.: Sikament.

6. Shrinkage Reducing Admixture:
a. ASTM C157/C157M.
b. An admixture that reduces drying shrinkage and the potential for drying skrinkage-induced cracking and curling, by reducing the capillary surface tension of pore water, specified formulated for use in air-entrained concrete.
c. Manufacturers and Products:
1) Euclid Chemical Company: Eucon SRA.
2) W.R. Grace & Co.: Eclipse 4500.

7. Antiwashout Admixture for Tremie Concrete:
a. Specially developed to prevent cement washout of concrete placed under water.
b. Manufacturer and Product: BASF Admixtures Inc., Rheomac UW 450.

8. Viscosity Modifying Admixture: Used to enhance plastic concrete properties such as workability, pumpability, and stability for “self-consolidating” concrete.
a. BASF Admixtures, Inc.: “Rheomac VMA” Series.
b. Euclid Chemical Company: “Eucon SL” or “Visctrol”.
c. Sika Chemical Co.: “VisoCrete” Series.
d. W.R. Grace & Co.: “VMAR” Series,

D. Fly Ash (Pozzolan): Class F fly ash in accordance with ASTM C618, except as modified herein:

1. Shall not be produced from process that has utilized hazardous or potentially hazardous materials.
2. ASTM C618, Table 1, Loss of Ignition: Maximum 3 percent.
3. ASTM C618, Table 2, Water Requirement: Maximum 100 percent of control.
4. ASTM C618, Table 3, Effectiveness in Controlling Alkali-Silica Reaction: Maximum 100 percent expansion of test mixture as a percentage of low-alkali cement control at 14 days.
5. ASTM C618, Table 3, Uniformity Requirements: Apply when loss on ignition of fly ash furnished exceeds 3 percent.
6. ASTM C618, Table 3, Effectiveness in Contributing to Sulfate Resistance: Procedure A after 6-month sulfate exposure, maximum 0.05 percent.
7. ASTM C618, Table 3, Effectiveness in Contributing to Sulfate Resistance: Procedure B, expansion of test mixture as a percentage of sulfate resistance cement control, after at least 6-month exposure, maximum 100 percent.

8. $\frac{CaO(\%) - 5}{FE_2O_3(\%)} : Maximum 1.5.$
9. Fly ash used in concrete containing aggregate classified as potentially reactive for ASR (alkali-silica reactivity) shall be limited to Class F and shall contain low levels of CaO.

E. Water: Clean and potable containing less than 500 ppm of chlorides, complying with the requirements of ASTM C1602.

2.02 ANCILLARY MATERIALS

A. Bonding Agent:

1. Furnish two-component, 100 percent solids, moisture-tolerant, structural epoxy adhesive that conforms to ASTM C881 and AASHTO M235.
2. Consult manufacturer for surface finish, pot life, set time, vertical or horizontal application, and forming restrictions.
3. Manufacturers and Products:
   a. BASF Building Systems Inc.: Concresive.
   b. Euclid Chemical Co.: Euco Epoxy System.
   c. Sika Chemical Corp.: Sikadur 32.

B. Bond Breaker:

1. Nonstaining type, providing positive bond prevention.
2. Manufacturers and Products:
   a. Burke Co.: Burke Clean Lift Bond Breaker.
   b. Nox-Crete Products Group: Silcoseal Select.
   c. Williams Distributors, Inc.: Williams Tilt-Up Compound.

C. Evaporation Retardant

1. Master Builders, Inc.: Confilm.
2. Euclid Chemical Co.: Eucobar.
3. Refer to Section 03 39 00, Concrete Curing.

2.03 CONCRETE MIX DESIGN

A. Design: Select and proportion ingredients using trial batches; sample, cure and test concrete mix through approved independent testing laboratory in accordance with ACI 211.1, ACI 223R, and ASTM C157/C157M.

1. Structural Concrete Mix shall incorporate at least the following:
   a. 4,000 psi at 28 days, classified as ACI 318 Exposure Class C1.
   b. Minimum Cementitious Material Content:
      1) 564 pounds per cubic yard.

2) Increase cementitious materials content as required to obtain strength requirements and maintain water-cement ratio.

c. Fly Ash: Maximum 25 percent, minimum 20 percent, of total weight of fly ash plus cement.

d. Maximum Water-to-Cementitious Materials Ratio (w/cm): 0.45

e. Coarse Aggregate: 1 inch (Size #57 Stone), conforming with ASTM C33.

f. Fine Aggregate : Clean, sharp granular, natural sand, conforming with ASTM C33. No screenings allowed.

g. Air Entrainment Admixture: 6 percent, plus or minus 1.5 percent.

h. High Range Water-Reducing Admixture.

i. Water-Reducing Admixture.

j. Shrinkage Reducing Admixture.

k. Design lab-cured trial mix cylinders, in accordance with ASTM C192/C192M and ASTM C157/C157M.

l. Use additional cement or cement plus fly ash above minimum specified if required to meet average compressive strength, F'cr.

m. Use F'cr and herein specified shrinkage limits as basis for selection of concrete materials and proportions as set forth in ACI 211.1, ACI 301 and ACI 223R.

n. F'cr: Equal to F'c plus 1,400 when data are not available to establish standard deviation.

B. Admixtures:

1. Air Content:
   a. Required air content shall be 4.5 percent to 7.5 percent when tested in accordance with ASTM C231.
   b. Use 4 percent minimum for concrete placed under requirements of cold weather concreting, unless noted otherwise.
2. Water Reducers: Use in all concrete.
3. High Range Water Reducers (Superplastizicers):
   a. Use in all structural concrete.
   b. Control slump and workability to at least 5-inch slump at discharge into forms by adjusting high-range water-reducer at batch plant.
4. Shrinkage Reducing Admixture.
   a. Use in all structural concrete.
   b. Aggregate Shrinkage Effects: Design mix for shrinkage characteristics of aggregate. Test for shrinkage in accordance with ASTM C157/C157M, results at 28 days shall not exceed 0.048 percent. Aggregate will be rejected if test values exceed these limits.

C. Slump Range at Site:

1. 4 inch with a tolerance of +/- 1 inch.

D. Coarse Aggregate Gradation:

1. As shown in the following table.
2. Coarse Gradation Limits shown are for coarse aggregates based on Table 3 of ASTM C33 for Size Number 57 Stone (1-inch).

Sieve Sizes	**ASTM C33 Gradation Percentage Passing**
	1-inch (Size #57)
2"	-
1-1/2"	100
1"	95 to 100
3/4"	-
1/2"	25 – 60
3/8"	-
No. 4	0 – 10
No. 8	0 – 5
No. 16	-
No. 30	-
No. 50	-

2.04 CONCRETE MIXING

A. General: In accordance with ACI 304R.

B. Concrete Mix Temperatures: As shown below for various stages of mixing and placing:

Concrete Temperatures				
	Concrete Member Size, Minimum Dimension			
Ambient Air Temp.	**<12"**	**12"-36"**	**36"-72"**	**>72"**
Minimum concrete temperature as mixed for indicated air temperature:				
Above 30 degF	60 degF	55 degF	50 degF	45 degF
0 to 30 degF	65 degF	60 degF	55 degF	50 degF
Below 0 degF	70 degF	65 degF	60 degF	55 degF
Maximum allowable gradual temperature drop in first 24 hours after curing period and after end of protection:				
	50 degF	40 degF	30 degF	20 degF

C. Truck Mixers:

1. Equip with electrically actuated counters to readily verify number of revolutions of drum or blades.
2. Counter:
   a. Resettable, recording type, mounted in driver's cab.
   b. Actuated at time of starting mixers at mixing speeds.
3. Truck mixer operation shall furnish concrete batch as discharged that is homogeneous with respect to consistency, mix, and grading.
4. If slump tests taken at approximately 1/4 point and 3/4 point of load during discharge give slumps differing by more than 2 inches when specified, slump is more than 4 inches, discontinue use of truck mixer unless causing condition is corrected and satisfactory performance is verified by additional slump tests.
5. Before attempting to reuse unit, check mechanical details of mixer, such as water measuring, and discharge apparatus, condition of blades, speed of rotation, general mechanical condition of unit, admixture dispensing equipment, and clearance of drum.
6. Do not use nonagitating or combination truck and trailer equipment for transporting ready-mixed concrete.
7. Concrete Volume in Truck:
   a. Limit to 63 percent of total volume capacity in accordance with ASTM C94/C94M when truck mixed.
   b. Limit to 80 percent of total volume capacity when central mixed.
8. Mix each batch of concrete in truck mixer for minimum 70 revolutions of drum or blades at rate of rotation designated by equipment manufacturer.
9. Perform additional mixing, if required, at speed designated by equipment manufacturer as agitating speed.
10. Place materials, including mixing water, in mixer drum before actuating revolution counter for determining number of mixing revolutions.

D. Aggregates: Thoroughly and uniformly wash before use.

E. Admixtures:

1. Air-Entraining Admixture: Add at plant through manufacturer-approved dispensing equipment.
2. Water Reducers: Add prior to addition of high-range water-reducing admixture (superplasticizers).
3. High-range water-reducing admixture (superplasticizers) and Air-Entraining Admixtures:
   a. Add at concrete plant only through equipment furnished or approved by admixture manufacturer.
   b. Accomplish variations in slump, working time, and air content for flowable mixes by increasing or reducing high-range water-reducing admixture (superplasticizers) dose or air-entraining admixture dose at ready-mix plant only.

c. Equipment shall provide for easy and quick visual verification of admixture amount used for each dose.
d. Add discharge amount to each load of concrete into separate dispensing container, verify amount is correct, and add to concrete.
e. Additional dosage of high-range water-reducing admixture (superplasticizers) may be added in field using manufacturer-approved dispensing when unexpected delays cause too great of slump loss.

4. Shrinkage Reduction Admixture: Add at plant through manufacturer approved dispensing equipment.
5. Viscosity Modifying Admixture: Add at plant through manufacturer approved dispensing equipment.

2.05 SOURCE QUALITY CONTROL

A. Cement: Test for total chloride content.

B. Fly Ash: Test in accordance with ASTM C311.

C. Batch Plant Inspection: Engineer shall have access to and have right to inspect batch plants, cement mills, and supply facilities of suppliers, manufacturers, and Subcontractors, providing products included in these Specifications.

1. Weighing Scales: Tested and certified within tolerances set forth in the NIST Handbook No. 44.
2. Batch Plant Equipment: Either semiautomatic or fully automatic in accordance with ASTM C94/C94M.

PART 3 EXECUTION

3.01 PLACING CONCRETE

A. Preparation: Meet requirements and recommendations of ACI 304R and ACI 301, except as modified herein.

B. Inspection: Notify Engineer at least 1 full working day in advance before starting to place concrete, and for each subsequent concrete placement.

C. Discharge Time:

1. As determined by set time, do not exceed 1-1/2 hours after adding cement to water unless special Engineer approved time delay admixtures are used. Coordinate time delay admixture information with manufacturer and Engineer prior to placing concrete.
2. Adjust slump or air content at Site by adding admixtures for particular load when approved by Engineer. Then, adjust plant dosage for remainder of

placement. Additional dosage at Site shall be through approved dispenser supplied by admixture manufacturer.

3. Maintain required slump throughout time of concrete placement and consolidation. Discontinue use of high range water reducing admixture (superplasticizers) and provide new mix design if it fails to maintain specified slump and produce good consolidation for length of time required. Redesign mix adjusting set control admixtures to maintain setting time in range required.

D. Placement into Formwork:

1. Before depositing concrete, remove debris from space to be occupied by concrete.
2. Prior to placement of concrete, dampen fill under slabs on ground, dampen sand where vapor retarder is specified, and dampen wood forms.
3. Reinforcement: Secure in position before placing concrete.
4. Place concrete as soon as possible after leaving mixer, without segregation or loss of ingredients, without splashing forms or steel above, and in layers not over 1.5 feet deep, except for slabs which shall be placed full depth. Place and consolidate successive layers prior to initial set of first layer to prevent cold joints.
5. Use placement devices, for example, chutes, pouring spouts, and pumps.
6. Vertical Free Fall Drop to Final Placement: 5 feet in forms 8 inches or less wide and 8 feet in forms wider than 8 inches, except as specified.
   a. For placements where drops are greater than specified, use placement device such that free fall below placement device conforms to required value.
   b. Limit free fall to prevent segregation caused by aggregates hitting reinforcing steel.
7. Do not use aluminum conveying devices.
8. Provide sufficient illumination in the interior of forms so concrete deposition is visible, permitting confirmation of consolidation quality.
9. Joints in Concrete:
   a. Ensure space beneath plastic waterstop completely fills with concrete.
   b. During concrete placement, make visual inspection of entire waterstop area.
   c. Limit concrete placement to elevation of waterstop in first pass, vibrate concrete under waterstop, lift waterstop to confirm full consolidation without voids, place remaining concrete to full height of slab.
   d. Apply procedure to full length of waterstops.
10. If reinforcement is in direct sunlight or is more than 20 degF higher in temperature than concrete temperature before placement, wet reinforcement with water fog spray before placing concrete to cool reinforcement.

E. Conveyor Belts and Chutes:

1. Design and arrange ends of chutes, hopper gates, and other points of concrete discharge throughout conveying, hoisting, and placing system for concrete to pass without becoming segregated.
2. Do not use chutes longer than 50 feet.
3. Minimum Slopes of Chutes: Angled to allow concrete to readily flow without segregation.
4. Conveyor Belts:
   a. Approved by Engineer.
   b. Wiped clean with device that does not allow mortar to adhere to belt.
   c. Covered conveyor belts and chutes.

F. Retempering: Not permitted for concrete where cement has partially hydrated.

G. Pumping of Concrete:

1. Provide standby pump, conveyor system, crane and concrete bucket, or other system onsite during pumping, for adequate redundancy to assure completion of concrete placement without cold joints in case of primary placing equipment breakdown.
2. Minimum Pump Hose (Conduit) Diameter: 4 inches.
3. Replace pumping equipment and hoses (conduits) that are not functioning properly.
4. Aluminum pipes or conduits not permitted.

H. Maximum Size of Concrete Placements:

1. Limit size of each monolithic concrete placement to allow for strength gain and volume change as a result of shrinkage.
2. Joints:
   a. Locate Control Joints and Contraction/Construction Joints where shown on the Drawings.
   b. Space Control Joints and Contraction/Construction Joints, as shown.

I. Minimum Time between Adjacent Concrete Placements:

1. Control Joints: 7 days water cure.
2. Contraction Joints and/or Construction Joints: 7 days water cure.

J. Removal of Water: Unless tremie method for placing concrete is approved by Engineer, construct watertight forms and remove all water from space to be occupied by concrete. Flush watertight forms and reinforcement, with fresh water, before placing concrete.

K. Consolidation and Visual Observation:

1. Consolidate concrete with internal vibrators with minimum frequency of 8,000 cycles per minute and amplitude as required to consolidate concrete in section being placed.
2. Provide at least one standby vibrator in operable condition at placement Site prior to placing concrete.
3. Consolidation Equipment and Methods: ACI 309R.
4. Provide sufficient windows in forms or limit form height to allow for concrete placement through windows and for visual observation of concrete.
5. Vibration consolidation shall not exceed distance of 3 feet from point of placement.
6. Vibrate concrete in vicinity of joints to obtain impervious concrete.

L. Hot Weather:

1. Prepare ingredients, mix, place, cure, and protect in accordance with ACI 305R.
2. Placement frequency shall be such that lift lines will not be visible in exposed concrete finishes.
3. Maintain concrete temperature below 80 deg F at time of placement, or furnish test data or provide other proof that admixtures and mix ingredients do not produce flash set plastic shrinkage, or cracking as a result of heat of hydration. Cool ingredients before mixing to maintain fresh concrete temperatures as specified or less.
4. Provide for windbreaks, shading, fog spraying, sprinkling, ice, wet cover, or other means as necessary to maintain concrete at or below specified temperature.
5. Prevent differential temperature between reinforcing steel and concrete.
6. Evaporation Retardant: As specified herein and in Section 03 39 00, Concrete Curing.

3.02 CONSTRUCTION JOINTS

A. As specified in Section 03 10 00, Concrete Forming and Accessories; and herein.

3.03 CURING CONCRETE

A. As specified in Section 03 39 00, Concrete Curing, and herein.

1. Fill with nonshrink grout as specified in Section 03 62 00, Nonshrink Grouting.
2. Match color of adjacent concrete and demonstrate on mockup panels first.
3. Compact grout using steel hammer and steel tool to drive grout to high density. Cure grout with water.

3.04 CONCRETE SLAB AND EXPOSED HORIZONTAL SURFACE FINISHES

A. General:

1. Finish concrete per the requirements of ACI 302.1R.
2. Use manual screeds, vibrating screeds, or roller compacting screeds to place concrete level and smooth.
3. Do not use “jitterbugs” or other special tools designed for purpose of forcing coarse aggregate away from surface and allowing layer of mortar, which will be weak and cause surface cracks or delamination, to accumulate.
4. Do not dust surfaces with dry materials.
5. Use evaporation retardant.
6. Round off edges with steel edging tool, except where beveled or chamfered edges are shown. Steel edging tool radius shall be 1/4 inch for slabs subject to wheeled traffic.

B. Formed surfaces shall receive a smooth-form finish in accordance with ACI 301. offset between adjacent pieces of formwork facing material shall not exceed “Class A” tolerance requirements of ACI 117 (i.e. 1/8 inch max. offset).

C. Slab surfaces shall receive a troweled finish in accordance with ACI 301. finish tolerances shall be in accordance with “very flat” classification requirements of ACI 117 (i.e. 1/8 inch max. in 10 feet).

D. Where a nonslip finish is required, give the surface a broom finish or dry-shake application of finely crushed abrasive particles.

3.05 FIELD QUALITY CONTROL

A. General:

1. Provide adequate facilities for safe storage and proper curing of concrete test cylinders onsite for first 24 hours, and for additional time as may be required before transporting to test lab.
2. Provide concrete for testing of slump, air content, and for making cylinders from the point of discharge into forms. When concrete is pumped, Samples used shall be taken from discharge end of pump hose.
3. Evaluation will be in accordance with ACI 301 and Specifications.
4. Specimens shall be made, cured, and tested in accordance with ASTM C31/C31M and ASTM C39/C39M.
5. Frequency of testing shall require that three (3) 6-in by 12-in cylinders be testing for each 50 cubic yards of concrete placed or part thereof, for each weight and strength test, and shall be tested at 3-days, 7-days, and 28-days, with three (3) spare cylinders in the event of cylinder damage. Frequency of testing may be changed at discretion of Engineer.

6. Take concrete samples for slump (ASTM C143/C143M), for strength tests (ASTM C31/C31M and ASTM C39/C39M), and shrinkage tests (ASTM C157/C157M). Take samples at the truck discharge, or for pumped concrete at placement (discharge) end of line**.**
7. Reject concrete represented by cylinders failing to meet strength and air content specified.
8. Testing of concrete will be by Owner provided 3rd party agency.

3.06 MANUFACTURER'S SERVICES

A. Provide the following representative at Site for installation assistance, inspection, and certification of proper installation for concrete ingredients, mix design, mixing, and placement.

1. Batch Plant Representative:
   a. Observe how concrete mixes are performing.
   b. Be present during first placement of each type of concrete mix.
   c. Assist with concrete mix design, performance, placement, weather problems, and problems as may occur with concrete mix throughout Project.
   d. Establish control limits on concrete mix designs.
2. Admixture Manufacturer's Representative:
   a. Demonstrate special features, product performance, product mixing, testing, and placement or installation for each type of admixture.
   b. Observe how concrete mixes are performing.
   c. Be present during first placement of each type of concrete mix.
   d. Assist with concrete mix design, performance, placement, weather problems, and problems as may occur with concrete mix throughout Project, including instructions for redosing.
   e. Provide equipment for control of concrete redosing for air entrainment or high range water reducing admixture (superplasticizers) at Site to maintain proper slump and air content if so needed.

3.07 PROTECTION OF INSTALLED WORK

A. After curing as specified in Section 03 39 00, Concrete Curing, protect concrete from damage as a result of other construction work.

B. Repair defective areas and areas damaged by construction.

C. Do not load concrete until the 28-day design compressive strength has been achieved.

END OF SECTION

SECTION 03 39 00
CONCRETE CURING

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. American Association of State Highway and Transportation Officials (AASTHO):
   a. AASHTO M182, Standard Specification for Burlap Cloth Made from Jute or Kenaf and Cotton Mats.
2. ASTM International (ASTM):
   a. ASTM C171, Standard Specification for Sheet Materials for Curing Concrete.
   b. C309, Standard Specification for Liquid Membrane-Forming Compounds for Curing concrete.
   c. C1315, Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.

1.02 SUBMITTALS

A. Action Submittals:

1. Manufacturers' data for the following products:
   a. Evaporation retardant.
   b. Curing Materials.
2. Curing methods proposed.

B. Informational Submittals:

1. Curing Materials: Manufacturer's Certificate of Compliance showing moisture retention requirements.
2. Retardants for Exposed Aggregate Finish: Manufacturer's Certification of Compliance.

PART 2 PRODUCTS

2.01 MATERIALS

A. Materials for Curing Concrete:

1. Impervious Sheeting: ASTM C171; waterproof paper, clear or white polyethylene sheeting, or polyethylene-coated burlap.
2. Pervious Sheeting: AASHTO M182.

3. Liquid Membrane-Forming Curing Compound: ASTM C309, white-pigmented, Type 2, Class B, and ASTM C1315: water-based, high-solids content:
   a. Moisture Loss: 0.40 kg/square m/72 hours maximum.
   b. Capable of meeting moisture retention at manufacturer's specified application rate.
4. Manufacturers and Products:
   a. Chemrex, Inc.; Masterkure.
   b. Euclid Chemical Co.; Super Diamond Clear VOX.
   c. WR Meadows, Inc.;VOCOMP-30.
   d. Vexcon Chemical, Inc.; Starseal 1315.
   e. Dayton Superior; Safe Cure and Seal 30%.

B. Evaporation Retardant:

1. Optional: Fluorescent color tint that disappears completely upon drying.
2. Manufacturers and Products:
   a. Master Builders Co.; Confilm.
   b. Euclid Chemical Co.; Eucobar.

C. Water: Clean and potable, containing less than 500 ppm of chlorides.

PART 3 EXECUTION

3.01 CURING OF CONCRETE

A. Use one of the following methods as approved by Engineer:

1. Equipment support pads:
   a. Method 1: Protect and soak surface by water ponding for 7 days, then apply liquid membrane-forming curing compound (type 2) immediately after removal of forms.
   b. Method 2: Cover with burlap or cotton mats and keep continuously soaked for 7 days, then apply liquid membrane-forming curing compound immediately after removal of forms.
   c. Where water curing for concrete during cold weather (below freezing) is not possible, use Engineer-approved liquid membrane-forming curing compound at manufacturer's recommended coverage per gallon.

3.02 EVAPORATION RETARDANT APPLICATION

A. Spray onto surface of fresh concrete immediately after wet curing duration in 3.01 above to allow it to react with surface moisture.

B. Reapply as needed to ensure a continuous moist surface until final finishing is completed up to 14 days after initial pour and 7 days after wet cure.

3.03 MANUFACTURER'S SERVICES

A. Provide manufacturer's representative at Site for installation assistance, inspection, and certification of proper installation for products specified.

END OF SECTION

SECTION 05120

STRUCTURAL STEEL

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Structural shapes.
2. Angles.
3. Structural plates.
4. Bolts, connectors, and anchors.

1.02 REFERENCE STANDARDS

A. American Institute of Steel Construction:

1. AISC 360 - Specification for Structural Steel Buildings.

B. ASTM International:

1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.

2. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.

3. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.

4. ASTM A490 - Standard Specification for Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength.

C. American Welding Society:

1. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.

2. AWS D1.1 - Structural Welding Code - Steel.

D. SSPC: The Society for Protective Coatings:

1. SSPC - Steel Structures Painting Manual.

1.03 SUBMITTALS

E. Shop Drawings:

1. Indicate sizes, spacing, locations of structural members, openings, attachments, and bolts.

2. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths. 4.2.

3. Include erection drawings, elevations, and details where applicable.

4. Indicate welded connections using standard AWS welding symbols. indicate net weld lengths.

5. Prepare shop drawings under seal of a professional structural engineer registered in the state of florida.

F. Manufacturer's Mill Certificate: Certify products meet or exceed specified requirements.

G. Mill Test Reports: Submit indicating structural strength, destructive and non-destructive test analysis.

H. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within previous 12 months.

1.04 QUALIFICATIONS

A. Fabricator: Company specializing in performing Work of this section with minimum five years documented experience.

B. Erector: Company specializing in performing Work of this section with minimum five years documented experience.

PART 2 PRODUCTS

2.01 STRUCTURAL STEEL

A. Structural W-Shapes: ASTM A992; Grade 50

B. Channels and Angles: ASTM A36; Grade 36

C. Structural Plates and Bars: ASTM A36; Grade 36

D. HSS-Shapes: ASTM A500, Grade C
1. Round – F_y = 46 ksi

2. Rectangular – F_y = 50 ksi

2.02 BOLTS, CONNECTORS, AND ANCHORS

A. Bolts: Heavy hex, structural type.
   1. ASTM A325; Type 1, galvanized, or Type 3, plain.

B. Nuts: ASTM A563 Grade A; heavy hex type.

   1. Finish: Hot dipped galvanized

C. Washers: ASTM F436 (ASTM F436M); Type 1, circular

   1. Finish: Hot dipped galvanized

D. Anchor Rods: ASTM F1554, Grade 55.

   1. Shape: Straight.

2.03 WELDING MATERIALS

A. Welding Materials: AWS D1.1; type required for materials being welded.

B. Unless noted otherwise, weld electrodes shall be 70 ksi. unless noted otherwise, provide continuous fillet welds with minimum size of 3/16" or of a size equal to the thickness of the thinner material. Weld leg size shall be adjusted as required to maintain the effective throat of a 3/16" fillet weld in a 90° joint. All weld sizes shown in inches.

2.04 FINISHES

A. Prepare structural component surfaces in accordance with SSPC SP 3.

B. Shop prime structural steel members. Do not prime surfaces that will be field welded in contact with concrete.

C. Areas not shop primed, areas that have been field welded, and all painted areas that have been damaged during erection shall be cleaned, primed, and touch-up painted. Erection marks shall be cleaned.

D. Galvanizing: ASTM A123/A123M; hot dip galvanize after fabrication.

E. Galvanizing for Bolts, Connectors, and Anchors:

   1. Hot-Dipped Galvanizing:

      a. Bolts, Nuts, and Washers: ASTM F2329.
      b. Connectors and Anchors: ASTM A153/A153M.

2. Mechanical Galvanizing: ASTM B695; Class 50 minimum.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

A. Furnish templates for installation of anchor rods and embedment in concrete and masonry work.

3.2 FABRICATION

A. Verify dimensions on-site prior to shop fabrications.

B. Fabricate items with joints tightly fitted and secured.

C. Fit and shop assemble sections in largest practical sizes, for handling through building openings.

D. Frind exposed welds flush and smooth with adjacent finished surface. ease exposed edges to small uniform radius. at exposed to view locations, place plastic filter between welds; sand flush.

E. Make exposed joints butt tight, flush, and hairline.

F. Accurately form components required for anchorage of stairs, landings and railings to each other and to building structure.

G. Fabrication and erection tolerances to be in conformance with AISC 303-22 code of standard practice for steel buildings and bridges.

H. Fabricator, painter, and galvanizer shall communicate and coordinate prior to fabrication to facilitate the galvanization and painting process.

3.03 ERECTION

A. Field weld components as indicated on Delegated Design Drawings.

B. Do not field cut or alter structural members without approval of Delegated Engineer.

C. The Contractor will not construct missing or out-of-position bolt holes by torch cut method. Bolt holes that are needed after fabrication will be constructed by punching or drilling only.

D. Removal of welds will be by air arc methods only. Contractor shall practice standard of care to avoid damage to parent metal during weld removal.

3.04 TOLERANCES

A. Maximum Offset from Alignment: 1/8 inch.

END OF SECTION

SECTION 260010 - SUPPLEMENTAL REQUIREMENTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Requirements generally applicable to all electrical Work on the Project, including but not limited to Work specified in Divisions 26, 27, and 28.

1.2 REFERENCES

A. Abbreviations and Acronyms for Electrical Terms and Units of Measure:
1. 8P8C: An 8-position 8-contact modular jack.
2. A: Ampere, unit of electrical current.
3. AC or ac: Alternating current.
4. AFCI: Arc-fault circuit interrupter.
5. AIC: Ampere interrupting capacity.
6. AL, Al, or ALUM: Aluminum.
7. ASD: Adjustable-speed drive.
8. ATS: Automatic transfer switch.
9. AWG: American wire gauge; see ASTM B258.
10. BAS: Building automation system.
11. BIL: Basic impulse insulation level.
12. BIM: Building information modeling.
13. BMS: Building management system.
14. CAD: Computer-aided design or drafting.
15. CATV: Community antenna television.
16. CB: Circuit breaker
17. cd: Candela, the SI fundamental unit of luminous intensity.
18. CO/ALR: Copper-aluminum, revised.
19. COPS: Critical operations power system.
20. CU or Cu: Copper.
21. CU-AL or AL-CU: Copper-aluminum.
22. dB: Decibel, a unitless logarithmic ratio of two electrical, acoustical, or optical power values.
23. dB(A-weighted) or dB(A): Decibel acoustical sound pressure level with A-weighting applied in accordance with IEC 61672-1.
24. dB(adjusted) or dBa: Decibel weighted absolute noise power with respect to 3.16 pW (minus 85 dBm).
25. dBm: Decibel absolute power with respect to 1 mW.
26. DC or dc: Direct current.
27. DCOA: Designated critical operations area.
28. DDC: Direct digital control (HVAC).
29. EGC: Equipment grounding conductor.
30. ELV: Extra-low voltage.
31. EMF: Electromotive force.
32. EMI: Electromagnetic interference.
33. EMP: Electrical maintenance program (operation and maintenance);

electromagnetic pulse (transient analysis).

34. EPS: Emergency power supply.
35. EPSS: Emergency power supply system.
36. ESS: Energy storage system.
37. EV: Electric vehicle.
38. EVPE: Electric vehicle power export equipment.
39. EVSE: Electric vehicle supply equipment.
40. FACU: Fire-alarm control unit.
41. fc: Footcandle, an internationally recognized unit of illuminance equal to one lumen per square foot or 10.76 lx. The simplified conversion 1 fc = 10 lx in the Specifications is common practice and considered adequate precision for building construction activities. When there are conflicts, lux is the primary unit; footcandle is specified for convenience.
42. FLC: Full-load current.
43. ft: Foot.
44. ft-cd: Foot-candle, the antiquated U.S. standard unit of illuminance, equal to one international candle measured at a distance of one foot, that was superseded in 1948 by the unit "footcandle" when the SI unit candela (cd) replaced the international candle; see "fc."
45. FTP: File transfer protocol.
46. GEC: Grounding electrode conductor.
47. GFCI: Ground-fault circuit interrupter.
48. GFPE: Ground-fault protection of equipment.
49. GND: Ground.
50. HACR: Heating, air conditioning, and refrigeration.
51. HDPE: High-density polyethylene.
52. HID: High-intensity discharge.
53. HP or hp: Horsepower.
54. HVAC: Heating, ventilating, and air conditioning.
55. Hz: Hertz.
56. IBT: Intersystem bonding termination.
57. ICT: Information and communications technology.
58. inch: Inch. To avoid confusion, the abbreviation "in." is not used.
59. I/O: Input/output.
60. IP: Ingress protection rating (enclosures); Internet protocol (communications).
61. IR: Infrared.
62. IS: Intrinsically safe.
63. IT&R: Inspecting, testing, and repair.
64. ITE: Information technology equipment.
65. kAIC: Kiloampere interrupting capacity.
66. kcmil or MCM: One thousand circular mils.
67. kV: Kilovolt.
68. kVA: Kilovolt-ampere.
69. kvar: Kilovolt-ampere reactive.
70. kW: Kilowatt.
71. kWh: Kilowatt-hour.
72. LAN: Local area network.
73. lb: Pound (weight).
74. lbf: Pound (force).
75. LCD: Liquid-crystal display.

76. LCDI: Leakage-current detector-interrupter.
77. LED: Light-emitting diode.
78. Li-ion: Lithium-ion.
79. lm: Lumen, the SI-derived unit of luminous flux.
80. LNG: Liquefied natural gas.
81. LP-Gas: Liquefied petroleum gas.
82. LRC: Locked-rotor current.
83. LV: Low voltage.
84. lx: Lux, the SI-derived unit of illuminance equal to one lumen per square meter.
85. m: Meter.
86. MCC: Motor-control center.
87. MDC: Modular data center.
88. MG set: Motor-generator set.
89. MIDI: Musical instrument digital interface.
90. MLO: Main lugs only.
91. MPEG-2: Abbreviation for the ISO/IEC Moving Picture Experts Group's standard for generic coding of moving pictures and associated audio information (ISO/IEC 13818) released in 1995 and used for most over-the-air and satellite broadcast digital television.
92. MPEG-4: Abbreviation for the ISO/IEC Moving Picture Experts Group's standard framework for coding of audio-visual objects (ISO/IEC 14496) released in 1999, with digital rights management and more advanced compression algorithms than MPEG-2.
93. MOV: Metal-oxide varistor.
94. MV: Medium voltage.
95. MVA: Megavolt-ampere.
96. mW: Milliwatt.
97. MW: Megawatt.
98. MWh: Megawatt-hour.
99. N.C.: Normally closed.
100. Ni-Cd: Nickel-cadmium.
101. Ni-MH: Nickel-metal hydride.
102. NIU: Network interface unit.
103. N.O.: Normally open.
104. NPT: National (American) standard pipe taper.
105. OCPD: Overcurrent protective device.
106. ONT: Optical network terminal.
107. PC: Personal computer.
108. PCS: Power conversion system.
109. PCU: Power-conditioning unit.
110. PF or pf: Power factor.
111. PHEV: Plug-in hybrid electric vehicle.
112. PLC: Programmable logic controller.
113. PLFA: Power-limited fire alarm.
114. PoE: Power over Ethernet.
115. POTS: Plain old telephone service. See "public switched telephone network" definition.
116. PSTN: Public switched telephone network.
117. PV: Photovoltaic.
118. PVC: Polyvinyl chloride.

119. pW: Picowatt.
120. RFI: (electrical) Radio-frequency interference; (contract) Request for interpretation.
121. RMS or rms: Root-mean-square.
122. RPM or rpm: Revolutions per minute.
123. SCADA: Supervisory control and data acquisition.
124. SCCR: Short-circuit current rating.
125. SCR: Silicon-controlled rectifier.
126. SPD: Surge protective device.
127. sq.: Square.
128. SWD: Switching duty.
129. TCP/IP: Transmission Control Protocol/Internet Protocol.
130. TEFC: Totally enclosed fan-cooled.
131. TR: Tamper resistant.
132. TVSS: Transient voltage surge suppressor.
133. UL: (standards) UL Standards & Engagement Inc.; (product categories) UL, LLC.
134. UL CCN: UL Category Control Number.
135. UPS: Uninterruptible power supply.
136. USB: Universal serial bus.
137. UV: Ultraviolet.
138. V: Volt, unit of electromotive force.
139. V(ac): Volt, alternating current.
140. V(dc): Volt, direct current.
141. VA: Volt-ampere, unit of complex electrical power.
142. VAR: Volt-ampere reactive, unit of reactive electrical power.
143. VFC: Variable-frequency controller.
144. VOM: Volt-ohm-multimeter.
145. VoIP: Voice over Internet Protocol.
146. VPN: Virtual private network.
147. VRLA: Valve regulated lead acid; also called "sealed lead acid (SLA)" or "valve regulated sealed lead acid."
148. W: Watt, unit of real electrical power.
149. WAN: Wide area network.
150. Wh: Watt-hour, unit of electrical energy usage.
151. WPT: Wireless power transfer.
152. WPTE: Wireless power transfer equipment.
153. WR: Weather resistant.

B. Abbreviations and Acronyms for Electrical Raceway Types:
1. EMT: Electrical metallic tubing.
2. EMT-A: Aluminum electrical metallic tubing.
3. EMT-S: Steel electrical metallic tubing.
4. EMT-SS: Stainless steel electrical metallic tubing.
5. ENT: Electrical nonmetallic tubing.
6. EPEC: Electrical HDPE underground conduit (thin wall).
7. EPEC-A: Type A electrical HDPE underground conduit.
8. EPEC-B: Type B electrical HDPE underground conduit.
9. ERMC: Electrical rigid metal conduit.
10. ERMC-A: Aluminum electrical rigid metal conduit.
11. ERMC-S: Steel electrical rigid metal conduit.

12. ERMC-S-G: Galvanized-steel electrical rigid metal conduit.
13. ERMC-S-PVC: PVC-coated-steel electrical rigid metal conduit.
14. ERMC-SS: Stainless steel electrical rigid metal conduit.
15. FMC: Flexible metal conduit.
16. FMC-A: Aluminum flexible metal conduit.
17. FMC-S: Steel flexible metal conduit.
18. FMT: Steel flexible metallic tubing.
19. FNMC: Flexible nonmetallic conduit. See "LFNC."
20. HDPE: HDPE underground conduit (thick wall).
21. HDPE-40: Schedule 40 HDPE underground conduit.
22. HDPE-80: Schedule 80 HDPE underground conduit.
23. IMC: Steel electrical intermediate metal conduit.
24. LFMC: Liquidtight flexible metal conduit.
25. LFMC-A: Aluminum liquidtight flexible metal conduit.
26. LFMC-S: Steel liquidtight flexible metal conduit.
27. LFMC-SS: Stainless steel liquidtight flexible metal conduit.
28. LFNC: Liquidtight flexible nonmetallic conduit.
29. LFNC-A: Layered (Type A) liquidtight flexible nonmetallic conduit.
30. LFNC-B: Integral (Type B) liquidtight flexible nonmetallic conduit.
31. LFNC-C: Corrugated (Type C) liquidtight flexible nonmetallic conduit.
32. PVC: Rigid PVC conduit.
33. PVC-40: Schedule 40 rigid PVC conduit.
34. PVC-80: Schedule 80 rigid PVC Conduit.
35. PVC-A: Type A rigid PVC concrete-encased conduit.
36. PVC-EB: Type EB rigid PVC concrete-encased underground conduit.
37. RGS: See ERMC-S-G.
38. RMC: See ERMC.
39. RTRC: Reinforced thermosetting resin conduit.
40. RTRC-AG: Low-halogen, aboveground reinforced thermosetting resin conduit.
41. RTRC-AG-HW: Heavy wall, low-halogen, aboveground reinforced thermosetting resin conduit.
42. RTRC-AG-SW: Standard wall, low-halogen, aboveground reinforced thermosetting resin conduit.
43. RTRC-AG-XW: Extra heavy wall, low-halogen, aboveground reinforced thermosetting resin conduit.
44. RTRC-BG: Low-halogen, belowground reinforced thermosetting resin conduit.

C. Abbreviations and Acronyms for Electrical Single-Conductor and Multiple-Conductor Cable Types:
1. AC: Armored cable.
2. CATV: Coaxial general-purpose cable.
3. CATVP: Coaxial plenum cable.
4. CATVR: Coaxial riser cable.
5. CI: Circuit integrity cable.
6. CL2: Class 2 cable.
7. CL2P: Class 2 plenum cable.
8. CL2R: Class 2 riser cable.
9. CL2X: Class 2 cable, limited use.
10. CL3: Class 3 cable.

11. CL3P: Class 3 plenum cable.
12. CL3R: Class 3 riser cable.
13. CL3X: Class 3 cable, limited use.
14. CM: Communications general-purpose cable.
15. CMG: Communications general-purpose cable.
16. CMP: Communications plenum cable.
17. CMR: Communications riser cable.
18. CMUC: Under-carpet communications wire and cable.
19. CMX: Communications cable, limited use.
20. DG: Distributed generation cable.
21. FC: Flat cable.
22. FCC: Flat conductor cable.
23. FPL: Power-limited fire-alarm cable.
24. FPLP: Power-limited fire-alarm plenum cable.
25. FPLR: Power-limited fire-alarm riser cable.
26. IGS: Integrated gas spacer cable.
27. ITC: Instrumentation tray cable.
28. ITC-ER: Instrumentation tray cable, exposed run.
29. MC: Metal-clad cable.
30. MC-HL: Metal-clad cable, hazardous location.
31. MI: Mineral-insulated, metal-sheathed cable.
32. MTW: (machine tool wiring) Moisture-, heat-, and oil-resistant thermoplastic cable.
33. MV: Medium-voltage cable.
34. NM: Nonmetallic sheathed cable.
35. NMC: Nonmetallic sheathed cable with corrosion-resistant nonmetallic jacket.
36. NMS: Nonmetallic sheathed cable with signaling, data, and communications conductors, plus power or control conductors.
37. NPLF: Non-power-limited fire-alarm circuit cable.
38. NPLFP: Non-power-limited fire-alarm circuit cable for environmental air spaces.
39. NPLFR: Non-power-limited fire-alarm circuit riser cable.
40. NUCC: Nonmetallic underground HDPE conduit with conductors.
41. OFC: Conductive optical fiber general-purpose cable.
42. OFCG: Conductive optical fiber general-purpose cable.
43. OFCP: Conductive optical fiber plenum cable.
44. OFCR: Conductive optical fiber riser cable.
45. OFN: Nonconductive optical fiber general-purpose cable.
46. OFNG: Nonconductive optical fiber general-purpose cable.
47. OFNP: Nonconductive optical fiber plenum cable.
48. OFNR: Nonconductive optical fiber riser cable.
49. P: Marine shipboard cable.
50. PLTC: Power-limited tray cable.
51. PLTC-ER: Power-limited tray cable, exposed run.
52. PV: Photovoltaic cable.
53. RHH: (high heat) Thermoset rubber, heat-resistant cable.
54. RHW: Thermoset rubber, moisture-resistant cable.
55. SA: Silicone rubber cable.
56. SE: Service-entrance cable.
57. SER: Service-entrance cable, round.

58. SEU: Service-entrance cable, flat.
59. SIS: Thermoset cable for switchboard and switchgear wiring.
60. TBS: Thermoplastic cable with outer braid.
61. TC: Tray cable.
62. TC-ER: Tray cable, exposed run.
63. TC-ER-HL: Tray cable, exposed run, hazardous location.
64. THW: Thermoplastic, heat- and moisture-resistant cable.
65. THHN: Thermoplastic, heat-resistant cable with nylon jacket outer sheath.
66. THHW: Thermoplastic, heat- and moisture-resistant cable.
67. THWN: Thermoplastic, moisture- and heat-resistant cable with nylon jacket outer sheath.
68. TW: Thermoplastic, moisture-resistant cable.
69. UF: Underground feeder and branch-circuit cable.
70. USE: Underground service-entrance cable.
71. XHH: Cross-linked polyethylene, heat-resistant cable.
72. XHHW: Cross-linked polyethylene, heat- and moisture-resistant cable.

D. Abbreviations and Acronyms for Electrical Flexible Cord Types:
1. SEO: 600 V extra-hard-usage, hard-service cord with thermoplastic elastomer insulation and oil-resistant thermoplastic elastomer outer covering for damp locations.
2. SEOW: 600 V extra-hard-usage, hard-service cord with thermoplastic elastomer insulation and oil-resistant thermoplastic elastomer outer covering for damp or wet locations.
3. SEOO: 600 V extra-hard-usage, hard-service cord with oil-resistant thermoplastic elastomer insulation and oil-resistant thermoplastic elastomer outer covering for damp locations.
4. SEOOW: 600 V extra-hard-usage, hard-service cord with oil-resistant thermoplastic elastomer insulation and oil-resistant thermoplastic elastomer outer covering for damp or wet locations.
5. SJEO: 300 V hard-usage, junior hard-service cord with thermoplastic elastomer insulation and oil-resistant thermoplastic elastomer outer cover for damp locations.
6. SJEOW: 300 V hard-usage, junior hard-service cord with thermoplastic elastomer insulation and oil-resistant thermoplastic elastomer outer cover for damp or wet locations.
7. SJEOO: 300 V hard-usage, junior hard-service cord with oil-resistant thermoplastic elastomer insulation and oil-resistant thermoplastic elastomer outer cover for damp locations.
8. SJEOOW: 300 V hard-usage, junior hard-service cord with oil-resistant thermoplastic elastomer insulation and oil-resistant thermoplastic elastomer outer cover for damp or wet locations.
9. SJO: 300 V hard-usage, junior hard-service cord with thermoset insulation and oil-resistant thermoset outer cover for damp locations.
10. SJOW: 300 V hard-usage, junior hard-service cord with thermoset insulation and oil-resistant thermoset outer cover for damp or wet locations.
11. SJOO: 300 V hard-usage, junior hard-service cord with oil-resistant thermoset insulation and oil-resistant thermoset outer cover for damp locations.
12. SJOOW: 300 V hard-usage, junior hard-service cord with oil-resistant

thermoset insulation and oil-resistant thermoset outer cover for damp or wet locations.

13. SJTO: 300 V hard-usage, junior hard-service cord with thermoplastic insulation and oil-resistant thermoplastic outer cover for damp locations.
14. SJTOW: 300 V hard-usage, junior hard-service cord with thermoplastic insulation and oil-resistant thermoplastic outer cover for damp or wet locations.
15. SJTOO: 300 V hard-usage, junior hard-service cord with oil-resistant thermoplastic insulation and oil-resistant thermoplastic outer cover for damp locations.
16. SJTOOW: 300 V hard-usage, junior hard-service cord with oil-resistant thermoplastic insulation and oil-resistant thermoplastic outer cover for damp or wet locations.
17. SO: 600 V extra-hard-usage, hard-service cord with thermoset insulation and oil-resistant thermoset outer covering for damp locations.
18. SOW: 600 V extra-hard-usage, hard-service cord with thermoset insulation and oil-resistant thermoset outer covering for damp or wet locations.
19. SOO: 600 V extra-hard-usage, hard-service cord with oil-resistant thermoset insulation and oil-resistant thermoset outer covering for damp locations.
20. SOOW: 600 V extra-hard-usage, hard-service cord with oil-resistant thermoset insulation and oil-resistant thermoset outer covering for damp or wet locations.
21. STO: 600 V extra-hard-usage, hard-service cord with thermoplastic insulation and oil-resistant thermoplastic outer covering for damp locations.
22. STOW: 600 V extra-hard-usage, hard-service cord with thermoplastic insulation and oil-resistant thermoplastic outer covering for damp or wet locations.
23. STOO: 600 V extra-hard-usage, hard-service cord with oil-resistant thermoplastic insulation and oil-resistant thermoplastic outer covering for damp locations.
24. STOOW: 600 V extra-hard-usage, hard-service cord with oil-resistant thermoplastic insulation and oil-resistant thermoplastic outer covering for damp or wet locations.

E. Definitions:

1. 8-Position 8-Contact (8P8C) Modular Jack: An unkeyed jack with up to eight contacts commonly used to terminate twisted pair and multiconductor Ethernet cable. Also called a "TIA-1096 miniature 8-position series jack" (8PSJ), or an "IEC 8877 8-pole jack."
   a. Be careful when suppliers use "RJ45" generically. Obsolete RJ45 jacks used for analog telephone cables have rejection keys. 8P8C jacks used for digital telephone cables and Ethernet cables do not have rejection keys.
2. Basic Impulse Insulation Level (BIL): Reference insulation level expressed in impulse crest voltage with a standard wave not longer than 1.5 times 50 microseconds and 1.5 times 40 microseconds.
3. Cable: In accordance with NIST NBS Circular 37 and IEEE standards, in the United States for the purpose of interstate commerce, the definition of

"cable" is (1) a conductor with insulation, or a stranded conductor with or without insulation (single-conductor cable); or (2) a combination of conductors insulated from one another (multiple-conductor cable).

4. Communications Jack: A fixed connecting device designed for insertion of a communications cable plug.
5. Communications Outlet: One or more communications jacks, or cables and plugs, mounted in a box or ring, with a suitable protective cover.
6. Conductor: In accordance with NIST NBS Circular 37 and IEEE standards, in the United States for the purpose of interstate commerce, the definition of "conductor" is (1) a wire or combination of wires not insulated from one another, suitable for carrying an electric current; (2) (National Electrical Safety Code) a material, usually in the form of wire, cable, or bar, suitable for carrying an electric current; or (3) (general) a substance or body that allows a current of electricity to pass continuously along it.
7. Conduit: A structure containing one or more duct raceways.
8. Designated Seismic System: An architectural, electrical, or mechanical system and its components for which the component importance factor is greater than 1.0 when determined in accordance with Section 018123 "Facility Seismic and Wind Criteria."
9. Direct Buried: Installed underground without encasement in concrete or other protective material.
10. Duct Bank: An arrangement of conduit providing one or more continuous duct raceways between two points.
11. Duct Raceway: A single enclosed raceway for conductors or cable.
12. Electrical Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.
13. Enclosure: The case or housing of an apparatus, or the fence or wall(s) surrounding an installation, to prevent personnel from accidentally contacting energized parts or to protect the equipment from physical damage. Types of enclosures and enclosure covers include the following:
    a. Cabinet: An enclosure that is designed for either surface mounting or flush mounting and is provided with a frame, mat, or trim in which a swinging door or doors are or can be hung.
    b. Concrete Box: A box intended for use in poured concrete.
    c. Conduit Body: A means for providing access to the interior of a conduit or tubing system through one or more removable covers at a junction or terminal point. In the United States, conduit bodies are listed in accordance with outlet box requirements.
    d. Conduit Box: A box having threaded openings or knockouts for conduit, EMT, or fittings.
    e. Cover Plate: A cover designed for protecting wiring devices installed in flush-mounted device boxes while permitting their safe operation; also called a faceplate or wallplate.
    f. Cutout Box: An enclosure designed for surface mounting that has swinging doors or covers secured directly to and telescoping with the walls of the enclosure.
    g. Device Box: A box with provisions for mounting a wiring device directly to the box.
    h. Extension Ring: A ring intended to extend the sides of an outlet

box or device box to increase the box depth, volume, or both.

i. Floor Box: A box mounted in the floor intended for use with a floor box cover and other components to complete the floor box enclosure.

j. Floor-Mounted Enclosure: A floor box and floor box cover assembly with means to mount in the floor that is sealed against the entrance of scrub water at the floor level.

k. Floor Nozzle: An enclosure used on a wiring system, intended primarily as a housing for a receptacle, provided with a means, such as a collar, for surface-mounting on a floor, which may or may not include a stem to support it above the floor level, and is sealed against the entrance of scrub water at the floor level.

l. Junction Box: A box with a blank cover that joins different runs of raceway or cable and provides space for connection and branching of the enclosed conductors.

m. Outlet Box: A box that provides access to a wiring system having pryout openings, knockouts, threaded entries, or hubs in either the sides or the back, or both, for the entrance of conduit, conduit or cable fittings, or cables, with provisions for mounting an outlet box cover, but without provisions for mounting a wiring device directly to the box.

n. Pedestal Floor Box Cover: A floor box cover that, when installed as intended, provides a means for typically vertical or near-vertical mounting of receptacle outlets above the floor's finished surface.

o. Pull Box: A box with a blank cover that joins different runs of raceway and provides access for pulling or replacing the enclosed cables or conductors.

p. Raised-Floor Box: A floor box intended for use in raised floors.

q. Recessed Access Floor Box: A floor box with provisions for mounting wiring devices below the floor surface.

r. Recessed Access Floor Box Cover: A floor box cover with provisions for passage of cords to recessed wiring devices mounted within a recessed floor box.

s. Ring: A sleeve, which is not necessarily round, used for positioning a recessed wiring device flush with the plaster, concrete, drywall, or other wall surface.

t. Ring Cover: A box cover, with raised center portion to accommodate a specific wall or ceiling thickness, for mounting wiring devices or luminaires flush with the surface.

u. Termination Box: An enclosure designed for installation of termination base assemblies consisting of bus bars, terminal strips, or terminal blocks with provision for wire connectors to accommodate incoming or outgoing conductors, or both.

14. Emergency Systems: Those systems legally required and classed as emergency by municipal, state, federal, or other codes, or by any governmental agency having jurisdiction that are designed to ensure continuity of lighting, electrical power, or both, to designated areas and equipment in the event of failure of the normal supply for safety to human life.

15. Essential Electrical Systems: (healthcare facilities) 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.

16. Fault Limited: Providing or being served by a source of electrical power that is limited to not more than 100 W when tested in accordance with UL 62368-1.
    a. The term "fault limited" is intended to encompass most Class 1, 2, and 3 power-limited sources complying with Article 725 of NFPA 70; Class ES1 and ES2 electrical energy sources that are Class PS1 electrical power sources (e.g., USB); and Class ES3 electrical energy sources that are Class PS1 and PS2 electrical power sources (e.g., PoE). See UL 62368-1 for discussion of classes of electrical energy sources and classes of electrical power sources.
17. High-Performance Building: A building that integrates and optimizes on a life-cycle basis all major high-performance attributes, including energy conservation, environment, safety, security, durability, accessibility, cost-benefit, productivity, sustainability, functionality, and operational considerations.
18. Jacket: A continuous nonmetallic outer covering for conductors or cables.
19. Luminaire: A complete lighting unit consisting of a light source such as a lamp, together with the parts designed to position the light source and connect it to the power supply. It may also include parts to protect the light source or the ballast or to distribute the light.
20. Mode: The terms "Active Mode," "Off Mode," and "Standby Mode" are used as defined in the Energy Independence and Security Act (EISA) of 2007.
21. Multi-Outlet Assembly: A type of surface, flush, or freestanding raceway designed to hold conductors, receptacles, and switches, assembled in the field or at the factory.
22. 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. Also called "single-line diagram."
23. Plenum: A compartment or chamber to which one or more air ducts are connected and that forms part of the air distribution system.
24. Protective Device: A device that senses when an abnormal current flow, abnormal voltage potential, or other abnormal electrical waveform exists and then disconnects the affected portion of the circuit from the system. Common protective devices include fuses, circuit breakers, relays, ground-fault circuit interrupters, and arc-fault circuit interrupters.
25. Public Switched Telephone Network (PSTN): Analog telephone technology that uses twisted pair cables from a telephone-provider central office for the transmission medium. "PSTN" refers to the telephone network; "POTS" refers to the individual subscriber line.
26. Receptacle: A fixed connecting device arranged for insertion of a power cord plug. Also called a power jack.
27. Receptacle Outlet: One or more receptacles mounted in a box with a suitable protective cover.
28. Sheath: A continuous metallic covering for conductors or cables.
29. UL Category Control Number (CCN): An alphabetic or alphanumeric code used to identify product categories covered by UL's Listing, Classification,

and Recognition Services.

30. Voice over Internet Protocol (VoIP): Digital telephone packet technology that uses the internet for its transmission medium.
31. Voltage Class: For specified circuits and equipment, voltage classes are defined as follows:
    a. Control Voltage: Having electromotive force between any two conductors, or between a single conductor and ground, that is supplied from a battery or other Class 2 or Class 3 power-limited source.
    b. Line Voltage: (1) (controls) Designed to operate using the supplied low-voltage power without transformation. (2) (transmission lines, transformers, SPDs) The line-to-line voltage of the supplying power system.
    c. Extra-Low Voltage (ELV): Not having electromotive force between any two conductors, or between a single conductor and ground, exceeding 30 V(ac rms), 42 V(ac peak), or 60 V(dc).
    d. Low Voltage (LV): Having electromotive force between any two conductors, or between a single conductor and ground, that is rated above 30 V but not exceeding 1000 V.
    e. Medium Voltage (MV): Having electromotive force between any two conductors, or between a single conductor and ground, that is rated about 1 kV but not exceeding 69 kV.
    f. High Voltage: (1) (circuits) Having electromotive force between any two conductors, or between a single conductor and ground, that is rated above 69 kV but not exceeding 230 kV. (2) (safety) Having sufficient electromotive force to inflict bodily harm or injury.
32. Wire: In accordance with NIST NBS Circular 37 and IEEE standards, in the United States for the purpose of interstate commerce, the definition of "wire" is a slender rod or filament of drawn metal. A group of small wires used as a single wire is properly called a "stranded wire." A wire or stranded wire covered with insulation is properly called an "insulated wire" or a "single-conductor cable." Nevertheless, when the context indicates that the wire is insulated, the term "wire" will be understood to include the insulation.

1.3 COORDINATION

A. Interruption of Existing Electrical and Low Voltage Systems Services: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions:
    1. Notify Owner no fewer than **seven** days in advance of proposed interruption of electrical service.
    2. Do not proceed with interruption of electrical service without Owner's written permission.
    3. Coordinate interruption with systems impacted by outage including, but not limited to, the following:
        a. Exercising generators.
        b. Emergency lighting.
        c. Elevators.
        d. Fire-alarm systems.
    4. Arrange to provide temporary emergency and standby electrical **power**

so facility may remain occupied during the outage. Coordinate power requirements with Owner.

1.4 PREINSTALLATION MEETINGS

A. Electrical Preconstruction Conference: Schedule conference with Architect and Owner, not later than **10** days after Notice to Proceed. Agenda topics include, but are not limited to, the following:
   1. Electrical installation schedule.
   2. Status of power system studies.
   3. Value analysis proposals and requests for substitution of electrical equipment.
   4. Utility work coordination and class of service requests.
   5. Installation schedule for security, fire-alarm, and other life-safety systems.
   6. Value analysis proposals and requests for substitution of electronic safety and security equipment.
   7. Monitoring services work coordination and monitoring service requests.
   8. Commissioning activities.

1.5 SEQUENCING

A. Conduct and submit results of power system studies before submitting product data and Shop Drawings for electrical equipment.

1.6 ACTION SUBMITTALS

A. Coordination Drawings for Structural Supports: Show coordination of structural supports for equipment and devices, including restraints and bracing for control of seismic and wind loads, with other systems, equipment, and structural supports in the vicinity.

B. Coordination Drawings for Duct Banks:
   1. Show duct profiles and coordination with other utilities and underground structures.
   2. Include plans and sections, drawn to scale, and show bends and locations of expansion fittings.

1.7 INFORMATIONAL SUBMITTALS

A. Electrical Installation Schedule: At preconstruction meeting, and periodically thereafter as dates change, provide schedule for electrical installation Work to Owner and Engineer including, but not limited to, milestone dates for the following activities:
   1. Submission of power system studies.
   2. Submission of specified coordination drawings.
   3. Submission of action submittals specified in Division 26.
   4. Orders placed for major electrical equipment.
   5. Arrival of major electrical equipment on-site.
   6. Preinstallation meetings specified in Division 26.
   7. Utility service outages.
   8. Utility service inspection and activation.
   9. Closing of walls and ceilings containing electrical Work.

10. System startup, testing, and commissioning activities for major electrical equipment.
11. System startup, testing, and commissioning activities for emergency lighting.
12. System startup, testing, and commissioning activities for automation systems (SCADA, BMS, lighting, HVAC, fire alarm, fire pump, etc.).
13. Pouring of concrete housekeeping pads for electrical equipment and testing of concrete samples.
14. Requests for inspections by authorities having jurisdiction.

B. Installation Schedule for Communications Systems: At preconstruction meeting, and periodically thereafter as dates change, provide schedule for installation of the communications Work to Owner and Architect including, but not limited to, milestone dates for the following activities:
1. Submission of specified coordination drawings.
2. Submission of action submittals specified in Division 27.
3. Orders placed for major equipment.
4. Arrival of major equipment on-site.
5. Preinstallation meetings specified in Division 27.
6. Telephone and internet service outages.
7. Telephone and internet service inspection and activation.
8. Closing of walls and ceilings containing the communications Work.
9. System startup, testing, and commissioning activities for communications equipment.
10. System startup, testing, and commissioning activities for the Work specified in other divisions that depends on the Work specified in Division 27.
11. System startup, testing, and commissioning activities for automation systems (SCADA, BMS, lighting, HVAC, fire alarm, fire pump, etc.).
12. Requests for special inspections.
13. Requests for inspections by authorities having jurisdiction.

C. Installation Schedule for Security, Fire-Alarm, and Other Life-Safety Systems: At preconstruction meeting, and periodically thereafter as dates change, provide schedule for installation of security, fire-alarm, and the other life-safety Work to Owner and Architect including, but not limited to, milestone dates for the following activities:
1. Submission of specified coordination drawings.
2. Submission of action submittals specified in Division 28.
3. Orders placed for major equipment.
4. Arrival of major equipment on-site.
5. Preinstallation meetings specified in Division 28.
6. Security and fire-alarm system outages.
7. Security and fire-alarm system inspection and activation.
8. Closing of walls and ceilings containing the security and fire-alarm Work.
9. System startup, testing, and commissioning activities for security and fire-alarm equipment.
10. System startup, testing, and commissioning activities for fire-alarm interfaces with the Work specified in other divisions.
11. System startup, testing, and commissioning activities for automation systems (SCADA, BMS, lighting, HVAC, fire alarm, fire pump, etc.).

12. Requests for special inspections.
13. Requests for inspections by authorities having jurisdiction.

D. Welding certificates.

E. Wind Performance Certificates: Provide special certification for systems and components designated on the Drawings or in the Specifications to be subject to high wind exposure and impact damage.
1. Include the following information:
    a. Provide equipment manufacturer's written certification for each designated system and component, stating that it will remain in place and operable following the design wind event and comply with requirements of authorities having jurisdiction.
    b. Certification must be based on ICC-ES or similar nationally recognized testing standard procedures acceptable to authorities having jurisdiction.

1.8 CLOSEOUT SUBMITTALS

A. Facility EMP Binders:
   1. Complete Set: On approved online or cloud solution and USB media that is clearly and permanently labeled with attached placard on lanyard to prevent misplacement.
   2. Volumes 2 and 8: Reproducible hardcopy on archival quality, 28 lb, acid-free, bond paper.

B. Operation and Maintenance Data:
   1. Provide emergency operation, normal operation, and preventive maintenance manuals for each system, equipment, and device. Include the following information:
      a. Manufacturer's operating specifications.
      b. User's guides for software and hardware.
      c. Schedule of maintenance material items recommended to be stored at the Project site.
      d. Detailed instructions covering operation under both normal and abnormal conditions.
      e. Time-current curves for overcurrent protective devices and manufacturer's written instructions for testing and adjusting their settings.
      f. List of load-current and overload-relay heaters with related motor nameplate data.
      g. List of lamp types and photoelectric relays used on the Project, with ANSI and manufacturers' codes.
      h. Manufacturer's instructions for setting field-adjustable components.
      i. Manufacturer's instructions for testing, adjusting, and reprogramming microprocessor controls.
      j. EPSS: Manufacturer's system checklists, maintenance schedule, and maintenance log sheets in accordance with NFPA 110.
      k. Exterior pole inspection and repair procedures.

C. Software and Firmware Operational Documentation: Provide software and firmware operational documentation in Facility EPM Binders, including the following:
   1. Software operating and upgrade manuals.
   2. Names, versions, and website addresses for locations of installed software.
   3. Device address list.
   4. Printout of software application and graphic screens.
   5. Testing and adjusting of panic and emergency power features.
   6. For lighting controls, include the following:
      a. Adjustments of scene preset controls, adjustable fade rates, and fade overrides.
      b. Operation of adjustable zone controls.

D. Software:
   1. Program Software Backup: Provide username and password for approved online or cloud solution and USB media that is clearly and permanently labeled with attached placard on lanyard to prevent misplacement.

2. Provide to Owner upgrades and unrestricted licenses for installed and backup software, including operating systems and programming tools required for operation and maintenance.

PART 2 - PRODUCTS

2.1 SUBSTITUTION LIMITATIONS FOR ELECTRICAL EQUIPMENT

A. Substitution requests for electrical equipment will be entertained under the following conditions:
   1. Substitution requests may be submitted for consideration prior to the Electrical Preconstruction Conference if accompanied by value analysis data indicating that substitution will comply with the Project performance requirements while significantly increasing value for Owner throughout life of facility.
   2. Substitution requests may be submitted for consideration concurrently with submission of power system study reports when those reports indicate that substitution is necessary for safety of maintenance personnel and facility occupants.
   3. Contractor is responsible for sequencing and scheduling power system studies and electrical equipment procurement. After the Electrical Preconstruction Conference, insufficient lead time for electrical equipment delivery will not be considered a valid reason for substitution.

2.2 FACILITY ELECTRICAL MAINTENANCE PROGRAM (EMP) BINDERS

A. Description: Set of binders containing operation and maintenance data for facility's electrical equipment that was compiled during analysis of installed electrical Work for Facility EMP development.
B. Applicable Standards:
   1. Regulatory Requirements: Comply with requirements in NFPA 70B.
   2. General Characteristics:
      a. Volume 1 - Introduction:
         1) Summarize how Facility EMP analysis was performed, how data were collected, and how volumes are organized.
         2) Describe Facility EMP and provide recommended policies and procedures for implementing the program and keeping it current.
         3) Provide place for Owner to identify contact information for employees responsible for implementing and maintaining Facility EMP.
      b. Volume 2 - Facility Safety, Hazards Awareness, and Emergency Procedures:
         1) Include training requirements for employees and contractors.
         2) Include list of known facility hazards impacting IT&R activities.
         3) Include approval and permitting procedures for IT&R activities.
         4) Include incident emergency response procedures.
         5) Include emergency shutdown procedures.

6) Include electrical disaster recovery procedures.
7) Include procedures for investigating the following incidents:
   a) Electrical safety incidents.
   b) Equipment malfunctions.
   c) Unintended operations or alarms.
   d) Operation of protective devices.

c. Volume 3 - Operating Procedures for Electrical Equipment and Controls:

d. Volume 4 - Facility Diagrams and Schedules:
1) Include single-line diagrams.
2) Include grounding and bonding diagrams.
3) Include essential wiring diagrams.
4) Include system automation diagrams (SCADA, BMS, lighting, HVAC, etc.).
5) Include records of switchgear, switchboard, and panelboard schedules.
6) Include time-current curves for overcurrent protective devices.
7) Include list of load-current and overload-relay heaters with related motor nameplate data.

e. Volume 5 - Inventory of Facility Equipment Using Electrical Power:
1) Include simplified floor plans showing equipment locations.
2) Identify critical equipment (electrical or otherwise).
3) Include identifying designations and nameplate data.
4) Include warranty and maintenance contract information.

f. Volume 6 - Inventory of Facility Tools, Supplies, and Personnel Protective Equipment:
1) Include schedules of maintenance material items recommended to be stored at facility.
2) Include list of lamp types and photoelectric relays used in facility with ANSI and manufacturers' codes.
3) Include calibration and servicing data for each item.

g. Volume 7 - Inspection, Testing, and Repair (IT&R) Plan:
1) Include tables showing frequency of activities for each item.
2) Include annual schedule with activities mapped to specific days of the year.
3) Include exterior pole inspection and repair procedures.

h. Volume 8 - Inspection, Testing, and Repair (IT&R) Forms:

i. Volume 9 - Inspection, Testing, and Repair (IT&R) Procedures:

j. Volume 10 - Spare Parts List:
1) Include list of all parts required to perform IT&R procedures.
2) Identify quantities of which parts are recommended to be stored on-site.
3) Include source contact information and budget cost for each item.

k. Volume 11 - Construction Project Closeout Record Documentation:
1) Include records of power system studies and photometric studies.

2) Include records of risk assessment studies.
3) Include records of electrical system startup and commissioning activities.
4) Include records of baseline inspections and tests.
5) Include records of baseline infrared photographs with normal light photographs showing the location, direction, angle, and conditions necessary for reproducing each infrared photograph.
6) Include records of baseline settings for adjustable equipment and devices.

PART 3 - EXECUTION

3.1 DEVELOPMENT OF FACILITY ELECTRICAL MAINTENANCE PROGRAM (EMP)

A. Facility EMP must be developed by qualified EMP specialist.

B. Conduct Facility EMP analysis in accordance with NFPA 70B requirements.
1. Renovation Projects:
a. Facility diagrams must include connected existing equipment for entire facility where known. Areas of uncertainty should be clearly indicated.
b. Obtain copies of existing operation and maintenance data and existing Facility EMP information from Owner.
c. Facility EMP analysis should identify existing equipment that does not have available operation and maintenance data, and should explain Owner's risks because this equipment is not included in Facility EMP.
d. Data for existing equipment outside scope of the Project may be inserted in Facility EMP Binders without analysis.
e. Data for existing equipment impacted by scope of the Project should be analyzed and documented similar to the Project's new equipment data as much as possible.

C. Compile operation and maintenance data from Facility EMP analysis and submit Facility EMP Binders.

3.2 INSTALLATION OF ELECTRICAL WORK

A. Unless more stringent requirements are specified in the Contract Documents or manufacturers' written instructions, comply with NFPA 70 and NECA NEIS 1 for installation of electrical Work on the Project. Consult Architect for resolution of conflicting requirements.

3.3 CLOSEOUT ACTIVITIES

A. Training:
1. Train Owner's maintenance personnel on the following topics:
a. How to implement Facility EMP.
2. Allow Owner to record training sessions.

END OF SECTION 260010

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Copper building wire.
2. Aluminum building wire.
3. Fire-alarm wire and cable.
4. Connectors and splices.

B. Related Requirements:

1. Section 018116 "Facility Environmental Requirements" specifies basis-of-design environmental conditions and performance criteria that are applicable to product selection and installation of the Work on the Project.
2. Section 018123 "Facility Seismic and Wind Criteria" specifies basis-of-design seismic and wind criteria for nonstructural components on the Project.
3. Section 260010 "Supplemental Requirements for Electrical" specifies additional requirements applicable to coordinating, scheduling, and sequencing of the Work specified in this Section.

4. Section 260523 "Control-Voltage Electrical Power Cables" for control systems communications cables and Classes 1, 2, and 3 control cables.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Product Schedule: Indicate type, use, location, and termination locations.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 COPPER BUILDING WIRE

A. Manufacturers: Subject to compliance with requirements, provide products by the following**:**

1. Alpha Wire; brand of Belden, Inc.
2. Belden Inc.
3. Cerro Wire LLC
4. Encore Wire Corporation
5. General Cable; Prysmian Group North America
6. Okonite Company (The)
7. Service Wire Co.
8. Southwire Company, LLC
9. WESCO

B. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.

C. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

2. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

D. Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors.

E. Conductor Insulation:

1. Type THHN and Type THWN-2. Comply with UL 83.
2. [Type THW and Type THW-2. Comply with NEMA WC-70/ICEA S-95-658 and UL 83.
3. Type XHHW-2. Comply with UL 44.

2.2 ALUMINUM BUILDING WIRE

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Alpha Wire; brand of Belden, Inc.
2. Belden Inc.
3. Encore Wire Corporation
4. General Cable; Prysmian Group North America
5. Okonite Company (The)
6. Southwire Company, LLC
7. WESCO

B. Description: Flexible, insulated and uninsulated, drawn aluminum current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.

C. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

2. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

D. Conductors: Aluminum, complying with ASTM B800 and ASTM B801.

E. Conductor Insulation:

1. Type THHN and Type THWN-2. Comply with UL 83.
2. Type THW and Type THW-2. Comply with NEMA WC-70/ICEA S-95-658 and UL 83.
3. Type XHHW-2. Comply with UL 44.

2.3 FIRE-ALARM WIRE AND CABLE

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Allied Wire & Cable Inc.
2. CommScope, Inc
3. Comtran Corporation
4. Genesis; Resideo Technologies, Inc.
5. Prysmian Cables and Systems; Prysmian Group North America
6. PYROTENAX; brand of nVent Electrical plc
7. Radix Wire
8. Rockbestos-Suprenant Cable Corp.
9. Superior Essex Inc.; subsidiary of LS Corp.
10. West Penn Wire; brand of Belden, Inc.

B. General Wire and Cable Requirements: NRTL listed and labeled as complying with NFPA 70, Article 760.

1. Lead Content: Less than 300 ppm.

C. Signaling Line Circuits: Twisted, shielded pair, not less than size as recommended by system manufacturer.

1. Circuit Integrity Cable: Twisted shielded pair, NFPA 70, Article 760, Classification CI, for power-limited fire-alarm signal service Type FPL. NRTL listed and labeled as complying with UL 1424 and UL 2196 for a two-hour rating.

D. Non-Power-Limited Circuits: Solid-copper conductors with 600 V rated, 75 deg C, color-coded insulation, and complying with requirements in UL 2196 for a two-hour rating.

1. Low-Voltage Circuits: No. 16 AWG, minimum, in pathway.

2. Line-Voltage Circuits: No. 12 AWG, minimum, in pathway.

2.4 CONNECTORS AND SPLICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following

1. 3M Electrical Products
2. ABB, Electrification Business
3. AFC Cable Systems; Atkore International
4. Burndy; brand of Hubbell Electrical Solutions; Hubbell Incorporated
5. Gardner Bender
6. Hubbell Utility Solutions; Hubbell Incorporated
7. Ideal Industries, Inc.
8. ILSCO
9. NSi Industries LLC
10. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group
11. Service Wire Co.
12. TE Connectivity Ltd.

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. Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.

D. Lugs: One piece, seamless, designed to terminate conductors specified in this Section.

1. Material: Copper,Aluminum.
2. Type: One or Two] holes with standard barrels.
3. Termination: Compression, Crimp.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders:

1. Copper for feeders smaller than No. 2 AWG; copper or aluminum for feeders No. 2 AWG and larger. Conductors must be solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits:

1. Copper:

a. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

C. ASD Output Circuits Cable: Extra-flexible stranded for all sizes.

D. Power-Limited Fire Alarm and Control: Solid for No. 12 AWG and smaller.

3.2 CONDUCTOR INSULATION AND WIRING METHODS

A. Service Entrance: Type THHN/THWN-2, single conductors in raceway and Type XHHW-2, single conductors in raceway.

B. Exposed Feeders: Type THHN/THWN-2, single conductors in raceway and Type XHHW-2, single conductors in raceway.

C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN/THWN-2, single conductors in raceway.

D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway and Type XHHW-2, single conductors in raceway.

E. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway.

F. Branch Circuits below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway and Type XHHW-2, single conductors in raceway.

G. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless steel, wire-mesh, strain relief device at terminations to suit application.

H. ASD Output Circuits: Type XHHW-2 in metal conduit.

3.3 INSTALLATION, GENERAL

A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

B. Complete raceway installation between conductor and cable termination points in accordance with Section 260533.13 "Conduits for Electrical Systems" prior to pulling conductors and cables.

C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

F. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

G. Complete cable tray systems installation according to Section 260536 "Cable Trays for Electrical Systems" prior to installing conductors and cables.

3.4 INSTALLATION OF FIRE-ALARM WIRE AND CABLE

A. Comply with NFPA 72.

B. Wiring Method: Install wiring in metal pathway according to Section 270528.29 "Hangers and Supports for Communications Systems."

1. Install plenum cable in environmental airspaces, including plenum ceilings.
2. Fire-alarm circuits and equipment control wiring associated with fire-alarm system must be installed in a dedicated pathway system.

   a. Cables and pathways used for fire-alarm circuits, and equipment control wiring associated with fire-alarm system, may not contain any other wire or cable.

3. Fire-Rated Cables: Use of two-hour, fire-rated fire-alarm cables, NFPA 70, Types MI and CI, is not permitted.
4. Signaling Line Circuits: Power-limited fire-alarm cables must not be installed in the same cable or pathway as signaling line circuits.

C. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with fire-alarm system to terminal blocks. Mark each terminal according to system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

D. Cable Taps: Use numbered terminal strips in junction, pull, and outlet boxes; cabinets; or equipment enclosures where circuit connections are made.

E. Color-Coding: Color-code fire-alarm conductors differently from the normal building power wiring. Use one color-code for alarm circuit wiring and another for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Paint fire-alarm system junction boxes and covers red.

F. Risers: Install at least two vertical cable risers to serve the fire-alarm system. Separate risers in close proximity to each other with a minimum one-hour-rated wall, so the loss of one riser does not prevent receipt or transmission of signals from other floors or zones.

G. Wiring to Remote Alarm Transmitting Device: 1 inch conduit between the fire-alarm control panel and the transmitter. Install number of conductors and electrical

supervision for connecting wiring as needed to suit monitoring function.

3.5 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.

B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

   1. Use oxide inhibitor in each splice, termination, and tap for aluminum conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inch of slack.

D. Comply with requirements in Section 284600 "Fire Detection and Alarm" for connecting, terminating, and identifying wires and cables.

3.6 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."

B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.7 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.8 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping."

3.9 FIELD QUALITY CONTROL

A. Tests and Inspections:

   1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.

2. Perform each of the following visual and electrical tests:

    a. Inspect exposed sections of conductor and cable for physical damage and correct connection according to the single-line diagram.
    b. Test bolted connections for high resistance using one of the following:

        1) A low-resistance ohmmeter.
        2) Calibrated torque wrench.
        3) Thermographic survey.

    c. Inspect compression-applied connectors for correct cable match and indentation.
    d. Inspect for correct identification.
    e. Inspect cable jacket and condition.
    f. Insulation-resistance test on each conductor for ground and adjacent conductors. Apply a potential of 500 V(dc) for 300 V rated cable and 1000 V(dc) for 600 V rated cable for a one-minute duration.
    g. Continuity test on each conductor and cable.
    h. Uniform resistance of parallel conductors.

3. Initial Infrared Scanning: After Substantial Completion, but before Final Acceptance, perform an infrared scan of each splice in conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner. Correct deficiencies determined during the scan.

    a. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
    b. Record of Infrared Scanning: Prepare a certified report that identifies switches checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

4. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each switch 11 months after date of Substantial Completion.

B. Cables will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports to record the following:

    1. 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.

END OF SECTION 260519

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Grounding and bonding conductors.
2. Grounding and bonding clamps.
3. Grounding and bonding bushings.
4. Grounding and bonding hubs.
5. Grounding and bonding connectors.
6. Grounding and bonding busbars.
7. Grounding (earthing) electrodes.
8. Grounding electrode enclosures.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" specifies additional requirements applicable to coordinating, scheduling, and sequencing of the Work specified in this Section.

2. Section 264113 "Lightning Protection for Structures" specifies bonding of lightning protection grounding electrodes to facility grounding electrodes.
3. Section 260553 "Identification for Electrical Systems" specifies electrical equipment labels and warning signs installed by this Section.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Product Listing: Include copy of unexpired approval letter, on letterhead of qualified electrical testing agency, certifying product's compliance with specified listing criteria.

   a. If listed manufacturer differs from selling manufacturer, indicate relationship between entities on submittal. Clearly indicate which entity warrants product performance and fitness for purpose.
   b. Listing criteria identified in approval letter must match specified listing criteria. UL label indicating approval of equipment's enclosure is not considered approval of equipment for intended application.
   c. Product identification in approval letter must match product branding and model numbers in submittal. Approval letters for discontinued or superseded products are unacceptable for submitted product.

B. Shop Drawings: Prepare and submit the following:

1. Plans showing dimensioned locations of grounding features described in "Field Quality Control for Grounding and Bonding" Article, including the following:

   a. Grounding electrode access enclosures.
   b. Grounding electrodes.
   c. Grounding arrangements and connections for separately derived systems.

C. Sustainable Design Submittals:

1. Product data for sustainable design features for each type of product.

D. Field quality-control reports.

1.3 INFORMATIONAL SUBMITTALS

A. Manufacturer's published instructions.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data:

1. In addition to items specified in Section 260010 "Supplemental Requirements for Electrical," include the following:

   a. Plans showing locations of grounding features described in "Field Quality Control for Grounding and Bonding" Article, including the following:

      1) Grounding electrode access enclosures.
      2) Grounding electrodes.
      3) Grounding arrangements and connections for separately derived systems.

   b. Instructions for periodic testing and inspection of grounding features at test wells and grounding connections for separately derived systems based on NETA MTS

      1) Tests must determine if ground-resistance or impedance values remain within specified maximums, and instructions must recommend corrective action if values do not.
      2) Include recommended testing intervals.

1.5 QUALIFICATIONS

A. Electrical Power Testing (EPT) Technician III: Possessing active NICET EPT Level III certification. Able to manage switching procedures, conduct tests of complex equipment, analyze test and equipment data, plan a job, and lead a team. Has experience performing NFPA 70B, IEEE, and NETA electrical tests.

B. Electrical Power Testing (EPT) Technician IV: Possessing active NICET EPT Level IV

certification. Able to conduct tests of complex metering and relay systems, evaluate tests, test equipment, test results, and power system performance, recommend actions to maintain or improve system performance, and lead multi-team projects.

C. Electrical Power Testing and Inspecting Agency: Entities possessing active credentials from a qualified electrical testing laboratory recognized by authorities having jurisdiction.

1. On-site electrical testing supervisors must possess active NICET EPT Technician III certification.

1.6 SERVICE CONDITIONS FOR ELECTRICAL EQUIPMENT

A. Electrical and ICT Equipment Grounding (Earthing): Do not exceed 25 Ωresistance to ground (earth).

1. Contact Engineer for resolution if 25 Ω specified resistance to ground (earth) is not attained after complying with prescriptive requirements in Article 250 of NFPA 70.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Products or components listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

2.2 GROUNDING AND BONDING CONDUCTORS

A. Equipment Grounding Conductor:

1. Standard Features: 600 V, THHN/THWN-2, copper wire or cable, green color, in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. Isolated Equipment Grounding Conductor:

1. Standard Features: 600 V, THHN/THWN-2copper] wire or cable, green color with one or more yellow stripes, in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

C. ASTM - Bare Copper Grounding and Bonding Conductor:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following]:

a. ERICO; brand of nVent Electrical plc
b. Southwire

2. Standard Features: Complying with one or more of the following:

a. Soft or Annealed Copper Wire: ASTM B3.
b. Concentric-Lay Stranded Copper Conductor: ASTM B8.
c. Tin-Coated Soft or Annealed Copper Wire: ASTM B33.
d. 19-Wire Combination Unilay-Stranded Copper Conductor: ASTM B787/B787M.

2.3 GROUNDING AND BONDING CLAMPS

A. Description: Clamps suitable for attachment of grounding and bonding conductors to grounding electrodes, pipes, tubing, and rebar. Grounding and bonding clamps specified in this article are also suitable for use with communications applications.

B. UL KDER - Exothermically Welded Connection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following

a. Continental Industries; brand of Hubbell Utility Solutions; Hubbell Incorporated
b. Crouse-Hinds; brand of Eaton, Electrical Sector
c. ERICO; brand of nVent Electrical plc

2. Source Limitations: Obtain products from single manufacturer.
3. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.
b. Grounding and Bonding Equipment for Communications: UL CCN KDSH; including UL 467.

4. Standard Features: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.4 GROUNDING AND BONDING BUSHINGS

A. Description: Bonding bushings connect conduit fittings, tubing fittings, threaded metal conduit, and unthreaded metal conduit to metal boxes and equipment enclosures, and have one or more bonding screws intended to provide electrical continuity between bushing and enclosure. Grounding bushings have provision for connection of bonding or grounding conductor and may or may not also have bonding screws.

B. UL KDER - Bonding Bushing:

1. Manufacturers: Subject to compliance with requirements, provide products by

one of the following

a. Crouse-Hinds; brand of Eaton, Electrical Sector
b. Killark; brand of Hubbell Electrical Solutions; Hubbell Incorporated
c. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group
d. Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated

2. Source Limitations: Obtain products from single manufacturer.
3. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.

4. Standard Features: Threaded bushing with insulated throat.

C. UL KDER - Grounding Bushing:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crouse-Hinds; brand of Eaton, Electrical Sector
b. Killark; brand of Hubbell Electrical Solutions; Hubbell Incorporated
c. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group
d. Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated

2. Source Limitations: Obtain products from single manufacturer.
3. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.

4. Standard Features: Threaded bushing with insulated throat and mechanical-type wire terminal.

2.5 GROUNDING AND BONDING HUBS

A. UL KDER - Grounding and Bonding Hub:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following

a. Burndy; brand of Hubbell Electrical Solutions; Hubbell Incorporated
b. Crouse-Hinds; brand of Eaton, Electrical Sector
c. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions,

Appleton Group

2. Source Limitations: Obtain products from single manufacturer.
3. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

   a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.

4. Standard Features: Insulated, gasketed, watertight hub with mechanical-type wire terminal.

2.6 GROUNDING AND BONDING CONNECTORS

A. UL KDER - Crimped Lug Pressure-Type Grounding and Bonding Busbar Terminal:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following

   a. ABB, Electrification Business
   b. ILSCO

2. Source Limitations: Obtain products from single manufacturer.
3. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

   a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.
   b. Grounding and Bonding Equipment for Communications: UL CCN KDSH; including UL 467.

4. Standard Features: Cast silicon bronze, solderless compression-type wire terminals; with long barrel and two holes spaced on 5/8 or 1 inch centers for two-bolt connection to busbar.

B. UL KDER - Crimped Pressure-Type Grounding and Bonding Cable Connector:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following

   a. Burndy; brand of Hubbell Electrical Solutions; Hubbell Incorporated
   b. ILSCO

2. Source Limitations: Obtain products from single manufacturer.
3. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

   a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.

b. Grounding and Bonding Equipment for Communications: UL CCN KDSH; including UL 467.

4. Standard Features: Crimp-and-compress connectors that bond to conductor when connector is compressed around conductor.

a. Copper alloy, C and H shaped.

2.7 GROUNDING AND BONDING BUSBARS

A. Description: Miscellaneous grounding and bonding devices that serve as common connection for multiple grounding and bonding conductors.

B. UL KDER - Equipment Room Grounding and Bonding Busbar:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following

a. Chatsworth Products, Inc.
b. Continental Industries; brand of Hubbell Utility Solutions; Hubbell Incorporated
c. Cooper B-line; brand of Eaton, Electrical Sector
d. ERICO; brand of nVent Electrical plc
e. Hoffman; brand of nVent Electrical plc
f. ILSCO
g. Panduit Corp

2. Source Limitations: Obtain products from single manufacturer.
3. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.

4. Standard Features:

a. Bus: Rectangular bar of annealed copper.
b. Mounting Stand-Off Insulators: Lexan or PVC.

1) Comply with UL 891 for use in 600 V switchboards, impulse tested at 5000 V.

2.8 GROUNDING (EARTHING) ELECTRODES

A. UL KDER - Rod Electrode:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following

a. Continental Industries; brand of Hubbell Utility Solutions; Hubbell Incorporated
b. ERICO; brand of nVent Electrical plc
c. Galvan Industries, Inc.; Electrical Products Division, LLC

2. Source Limitations: Obtain products from single manufacturer.
3. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

   a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.

4. Standard Features: Copper-clad steel 3/4 inch by 10 ft.

5. Retain "Sustainable Design Features" Subparagraph below if required to attain sustainability rating or to track sustainability submittals.

2.9 GROUNDING ELECTRODE ENCLOSURES

A. Description: Enclosures designed to protect grounding electrodes from damage while providing access for inspection and testing of the grounding system.

B. Grounding Electrode Access Well Enclosure:

1. Manufacturers: Subject to compliance with requirements, products by one of the following

   a. ERICO; brand of nVent Electrical plc
   b. Quazite; brand of Hubbell Utility Solutions; Hubbell Incorporated

2. Source Limitations: Obtain products from single manufacturer.

3. Standard Features:

   a. Well Material: Concrete
   b. Cover Material: Cast iron
   c. Cover Strength: Sidewalk or turf use or Driveway use

   d. scope, in accordance with ISO 14040 and ISO 14044, is publicly available for product.

4. Other Available Features Required by the Project:

   a. Round:

      1) Nominal Diameter: 8 inch or 12 inch
      2) Nominal Height: 36 inch
      3) Slotted sides for installation after grounding connections made.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine facility's grounding electrode system and equipment grounding for compliance with requirements for maximum ground-resistance level and other conditions affecting performance of grounding and bonding of electrical system.

B. Inspect test results of grounding system measured at point of electrical service equipment connection.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with connection of electrical service equipment only after unsatisfactory conditions have been corrected.

3.2 SELECTION OF GROUNDING AND BONDING PRODUCTS

A. Grounding and Bonding Conductors:

1. Provide solid conductor for 8 AWG and smaller, and stranded conductors for 6 AWG and larger unless otherwise indicated.
2. Custom-Length Insulated Equipment Bonding Jumpers: 6 AWG, 19-strand, Type THHN.
3. Bonding Cable: 28 kcmil, 14 strands of 17 AWG conductor, 1/4 inch in diameter.
4. Bonding Conductor: 4 AWG or 6 AWG, stranded conductor.
5. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inch wide and 1/16 inch thick.
6. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inch wide and 1/16 inch thick.
7. Underground Grounding Conductors: Install bare tinned-copper conductor, 2/0 AWG minimum.

B. Grounding and Bonding Connectors:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

C. Grounding and Bonding Busbars: Provide in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated on the Drawings.

3.3 INSTALLATION OF GROUNDING AND BONDING

A. Comply with manufacturer's published instructions.

B. Reference Standards:

1. Electrical Construction: ICC IBC, ICC IFC, NFPA 1, NFPA 70, and NECA NEIS 1.
2. Electrical Maintenance: NFPA 70B.
3. Electrical Safety: NFPA 70E.
4. Grounding and Bonding: NECA NEIS 331 and Article 250 of NFPA 70.
5. Communications Work: BICSI N1.
6. Work in ITE Rooms: NFPA 75.
7. Work in Health Care Facilities: NFPA 99 and Article 517 of NFPA 70.
8. Emergency and Standby Power Work: NFPA 110, NFPA 111, and NECA NEIS 416.
9. Work in Confined Spaces: NFPA 350.

10. Work in Basements and Other Developed Subterranean Spaces: NFPA 520.
11. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.
12. Consult Architect for resolution of conflicting requirements.

C. Special Techniques:

1. Grounding and Bonding Conductors:

a. Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

b. Underground Grounding Conductors:

1) Bury at least 30 inches below grade.

2) Duct-Bank Grounding Conductor: Bury 12 inch above duct bank when indicated as part of duct-bank installation.

2. Grounding and Bonding Connectors: 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.

a. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer in order of galvanic series.
b. Make connections with clean, bare metal at points of contact.
c. Make aluminum-to-steel connections with stainless steel separators and mechanical clamps.
d. Make aluminum-to-galvanized-steel connections with tin-plated copper jumpers and mechanical clamps.
e. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
f. 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 adjacent parts.
2) Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
3) Use exothermic-welded connectors for outdoor locations; if disconnect-type connection is required, use bolted clamp.

g. Grounding and Bonding for Piping:

1) Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use bolted clamp connector or bolt lug-type connector to pipe flange by using one of lug bolts of flange. Where dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
2) Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with bolted connector.
3) Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

h. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install [tinned]bonding jumper to bond across flexible duct connections to achieve continuity.
i. Grounding for Steel Building Structure: Install driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 ft apart.

3. Grounding and Bonding Busbars:

a. Install busbar horizontally, on insulated spacers 2 inch minimum from wall, 6 inch above finished floor unless otherwise indicated.
b. Where busbars are indicated on both sides of doorways, route bonding conductor up to top of door frame, across top of doorway, and down; connect to continuation of horizontal busbar.

4. Electrodes:

a. Ground Rods: Drive rods until tops are 2 inch below finished floor or final grade unless otherwise indicated.

1) Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
2) Use exothermic welds for below-grade connections.

b. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least same distance from other grounding electrodes, and connect to service grounding electrode conductor.

c. Test Wells: Ground rod driven through drilled hole in bottom of handhole. Handholes are specified in Section 260543 "Underground Ducts and Raceways for Electrical Systems," and must be at least 12 inch deep, with cover.

1) Install at least one test well for each service unless otherwise

indicated. Install at ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.

d. Ring Electrode: Install grounding conductor, electrically connected to each building structure ground rod and to each steel column, extending around perimeter of building

1) Install tinned-copper conductor not less than 2/0 AWG for ring electrode and for taps to building steel.
2) Bury ring electrode not less than 24 inch from building's foundation.

e. Concrete-Encased Electrode (Ufer Ground):

1) Fabricate in accordance with NFPA 70; use minimum of 20 ft of bare copper conductor not smaller than 4 AWG.

a) If concrete foundation is less than 20 ft long, provide and bond to additional ground electrodes.
b) Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building's grounding grid or to grounding electrode external to concrete.

2) Fabricate in accordance with NFPA 70; using electrically conductive coated steel reinforcing bars or rods, at least 20 ft long. If reinforcing is in multiple pieces, connect together by usual steel tie wires or exothermic welding to create required length.

5. Grounding at Service:

a. Equipment grounding conductors and grounding electrode conductors must be connected to ground busbar. Install main bonding jumper between neutral and ground buses.

6. Grounding Separately Derived Systems:

a. Permanent Generators: Install grounding electrode(s) at location of permanent generators having switched neutral connections. Electrode must be connected to equipment grounding conductor and to frame of generator.

7. Grounding Underground Distribution System Components:

a. Duct-Bank Grounding Conductor: Bury 12 inch above duct bank when indicated as part of duct-bank installation.
b. Comply with IEEE C2 grounding requirements.

c. Grounding Manholes and Handholes: Install driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inch will extend above finished floor. If necessary, install ground rod before manhole is placed and provide 1/0 AWG bare, tinned-copper conductor from ground

rod into manhole through waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inch above to 6 inches below concrete. Seal floor opening with waterproof, nonshrink grout.

d. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with 4 AWG minimum, stranded, hard-drawn copper bonding conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields in accordance with manufacturer's published instructions with splicing and termination kits.

e. Pad-Mounted Transformers and Switches: Install two ground rods and ring electrode around pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Install tinned-copper conductor not less than 2 AWG for ring electrode and for taps to equipment grounding terminals. Bury ring electrode not less than 6 inches from foundation.

8. Equipment Grounding and Bonding:

a. Install insulated equipment grounding conductors with feeders and branch circuits.

b. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

1) Feeders and branch circuits.
2) Lighting circuits.
3) Receptacle circuits.
4) Single-phase motor and appliance branch circuits.
5) Three-phase motor and appliance branch circuits.
6) Flexible raceway runs.
7) Armored and metal-clad cable runs.
8) Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.
9) X-Ray Equipment Circuits: Install insulated equipment grounding conductor in circuits supplying x-ray equipment.

c. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

d. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

e. Isolated Grounding Receptacle Circuits: Install insulated equipment grounding conductor connected to receptacle grounding terminal. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of applicable derived system or service unless otherwise indicated.

f. Isolated Equipment Enclosure Circuits: For designated equipment supplied by branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install separate insulated equipment grounding conductor. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of applicable derived system or service unless otherwise indicated.

g. Poles Supporting Outdoor Lighting Fixtures: Bond insulated equipment grounding conductor to equipment grounding terminal inside pole base.

h. Metallic Fences: Comply with requirements of IEEE C2.

1) Grounding Conductor: Barecopper, not less than 8 AWG
2) Gates: Must be bonded to grounding conductor with flexible bonding jumper.
3) Barbed Wire: Strands must be bonded to grounding conductor.

9. Fence Grounding:

a. Grounding Method: At each grounding location, drive grounding rod vertically until top is 6 inches below finished grade. Connect rod to fence with 6 AWG conductor. Connect conductor to each fence component at grounding location.

b. Fences greater than 100 ft of Buildings, Structures, Walkways, and Roadways: Ground fence at maximum intervals of 1500 ft.

c. Fences within 100 ft of Buildings, Structures, Walkways, and Roadways: Ground fence at maximum intervals of 750 ft.

1) Gates and Other Fence Openings: Ground fence on each side of opening.

a) Bond metal gates to gate posts by connecting bonding jumper between gate post and gate frame.

b) Bond across openings, with and without gates, except at openings indicated as intentional fence discontinuities. Use 2 AWG wire and bury it at least 18 inches below finished grade.

d. Protection at Crossings of Overhead Electrical Power Lines: Ground fence at location of power line crossing and at maximum distance of 150 ft on each side of crossing.

e. Bonding to Lightning-Protection System: If fence terminates at lightning-protected building or structure, ground fence and bond fence grounding conductor to lightning-protection down conductor or lightning-protection grounding conductor, complying with NFPA 780.

3.4 FIELD QUALITY CONTROL FOR GROUNDING AND BONDING

A. Administration for Electrical Power Tests and Inspections:

1. Contractor will engage qualified electrical testing and inspecting agency to administer and perform tests and inspections.
2. Engage qualified electrical testing and inspecting agency to administer and perform tests and inspections.
3. Engage factory-authorized service representative to administer and perform tests and inspections on components, assemblies, and equipment installations, including connections.
4. Administer and perform tests and inspections

B. Field tests and inspections must be witnessed by Engineer.

C. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with calibrated torque wrench in accordance with manufacturer's published instructions.
3. Test completed grounding system at each location where maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells and at individual ground rods. Make tests at ground rods before conductors are connected.

    a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
    b. Perform tests by fall-of-potential method in accordance with IEEE Std 81.
    c. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

4. 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 record of tests and observations. Include number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

D. Nonconforming Work:

1. Grounding system will be considered defective if it does not pass tests and inspections.
2. Remove and replace defective components and retest.

E. Collect, assemble, and submit test and inspection reports.

1. Report measured ground resistances that exceed the following values:

    a. Power and Lighting Equipment or System 25 Ω

3.5 PROTECTION

A. After installation, protect grounding and bonding cables and equipment from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

END OF SECTION 260526

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Support systems.
2. Mounting, anchoring, and attachment components.
3. Installation of fabricated metal supports.
4. Installation of concrete bases.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" specifies additional requirements applicable to coordinating, scheduling, and sequencing of the Work specified in this Section.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:

a. Slotted support systems, hardware, and accessories.
b. Clamps.
c. Hangers.
d. Sockets.
e. Eye nuts.
f. Fasteners.
g. Anchors.
h. Saddles.
i. Brackets.

2. Include rated capacities and furnished specialties and accessories.

B. Shop Drawings: For fabrication and installation details for electrical hangers and support systems.

1. Hangers. Include product data for components.
2. Slotted support systems.
3. Equipment supports.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Prepare design calculations in accordance with criteria specified in Section 260010 "Supplemental Requirements for Electrical."

B. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame Rating: Class 1.
2. Self-extinguishing according to ASTM D635.

2.2 SUPPORT SYSTEMS

A. Steel Slotted Support Systems:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. ABB, Electrification Business
b. Allied Tube & Conduit; Atkore International
c. Atkore Unistrut
d. CADDY; brand of nVent Electrical plc
e. Cooper B-line; brand of Eaton, Electrical Sector
f. Flex-Strut Inc.
g. G-Strut
h. Gripple Inc.
i. Haydon Corporation
j. Rocket Rack; Robroy Industries

2. Standard Features: Preformed steel channels and angles with minimum **13/32 inch** diameter holes at a maximum of **8 inch** on center in at least one surface.

a. Referenced Standard: MFMA-4 factory-fabricated components for field assembly.
b. Material for Channel, Fittings, and Accessories: Galvanized steel or Stainless steel, Type 304 and Type 316.

c. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
d. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
e. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.

f. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Aluminum Slotted Support Systems:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. ABB, Electrification Business
b. Atkore Unistrut
c. Eaton
d. Flex-Strut Inc.
e. Haydon Corporation
f. MKT Metal Manufacturing

2. Standard Features: Extruded-aluminum channels and angles with minimum **13/32 inch** diameter holes at a maximum of **8 inch** on center in at least one surface.

a. Referenced Standard: MFMA-4 factory-fabricated components for field assembly.
b. Channel Material: 6063-T5 aluminum alloy.
c. Fittings and Accessories Material: 5052-H32 aluminum alloy.

d. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
e. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.

f. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Conduit and Cable Support Devices:

1. Standard Features: **Steel or stainless steel** hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

D. Support for Conductors in Vertical Conduit:

1. Standard Features: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored electrical conductors or cables in riser conduits. Plugs must have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body must be made of malleable iron.

E. Structural Steel for Fabricated Supports and Restraints:

1. Standard Features: ASTM A36/A36M steel plates, shapes, and bars; black and galvanized.

2.3 MOUNTING, ANCHORING, AND ATTACHMENT COMPONENTS

A. Mechanical-Expansion Anchors:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Cooper B-line; brand of Eaton, Electrical Sector
b. Hilti, Inc.
c. ITW Ramset/Red Head; Illinois Tool Works, Inc.
d. MKT Fastening, LLC

2. Standard Features: 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 where used.

B. Concrete Inserts:

1. Standard Features: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.

C. Clamps for Attachment to Steel Structural Elements:

1. Standard Features: MSS SP-58 units are suitable for attached structural element.

D. Through Bolts:

1. Standard Features: Structural type, hex head, and high strength. Comply with ASTM F3125/F3125M, **Grade A325**.

E. Toggle Bolts:

1. Standard Features: **All** steel springhead type.

F. Hanger Rods:

1. Standard Features: Threaded steel.

PART 3 - EXECUTION

3.1 SELECTION OF HANGERS AND SUPPORTS

A. Maximum Support Spacing and Minimum Hanger Rod Size for Raceways: Space supports for EMT, IMC, and ERMC as **required by** NFPA 70. Minimum rod size must be **1/4 inch** in diameter.

B. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least **25** percent in future

without exceeding specified design load limits.

1. Secure raceways and cables to these supports with two-bolt conduit or single-bolt conduit clamps using spring friction action for retention in support channel.

C. Spring-steel clamps designed for supporting single conduits without bolts may be used for **1-1/2 inch** and smaller raceways serving branch circuits and communication systems above suspended ceilings, and for fastening raceways to trapeze supports.

3.2 INSTALLATION OF HANGERS AND SUPPORTS

A. Comply with manufacturer's published instructions.

B. Reference Standards for Installation: Unless more stringent installation requirements are specified in the Contract Documents or manufacturer's published instructions, comply with the following:

1. Electrical Construction: ICC IBC, ICC IFC, NFPA 1, NFPA 70, and NECA NEIS 1.
2. Hot Work: NFPA 51B.
3. Work in Confined Spaces: NFPA 350.
4. Work in Basements and Other Developed Subterranean Spaces: NFPA 520.
5. Installation of Steel Conduit: NECA NEIS 101.
6. Installation of Aluminum Conduit: NECA NEIS 102.
7. Installation of Metal Cable Tray Systems: NECA NEIS 105.
8. Installation of Nonmetallic Cable Tray Systems: NECA NEIS 111.
9. Consult Architect for resolution of conflicting requirements.

C. Special Installation Techniques:

1. Raceway Support Methods: In addition to methods described in NECA NEIS 1, **EMT** and **IMC** may be supported by openings through structure members, in accordance with NFPA 70.
2. 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 must be weight of supported components plus **200 lb**.
3. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

   a. To Wood: Fasten with lag screws or through bolts.
   b. To New Concrete: Bolt to concrete inserts.
   c. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
   d. To Existing Concrete: Expansion anchor fasteners.

   e. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-

weight concrete **4 inch** thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than **4 inch** thick.

f. To Steel: Beam clamps (MSS SP-58, Type 19, 21, 23, 25, or 27), complying with MSS SP-69.

g. To Light Steel: Sheet metal screws.

h. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate

4. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

END OF SECTION 260529

SECTION 260533.13 - CONDUITS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Type EMT duct raceways and elbows.
2. Type HDPE and Type EPEC duct raceways and fittings.
3. Type ERMC duct raceways, elbows, couplings, and nipples.
4. Type IMC duct raceways.
5. Type LFMC duct raceways.
6. Type LFNC duct raceways.
7. Type PVC duct raceways and fittings.
8. Fittings for conduit, tubing, and cable.
9. Solvent cements.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" specifies additional coordination, scheduling, sequencing, submittal, and installation requirements applicable to the Work for electrical, communications, and electronic safety and security systems on the Project, including wiring methods.

2. Section 078413 "Penetration Firestopping" specifies firestopping referenced by this Section.
3. Section 260519 "Low-Voltage for Electrical Power Conductors and Cables" specifies nonmetallic underground conduit with conductors (Type NUCC).
4. Section 260529 "Hangers and Supports for Electrical Systems" specifies conduit hangers and supports referenced by this Section.
5. Section 260553 "Identification for Electrical Systems" specifies electrical equipment labels.

1.2 REFERENCES

A. Abbreviations and Acronyms for Electrical Raceway Types:

1. EMT: Electrical metallic tubing.
2. EMT-A: Aluminum electrical metallic tubing.
3. EMT-S: Steel electrical metallic tubing.
4. EMT-SS: Stainless steel electrical metallic tubing.
5. ENT: Electrical nonmetallic tubing.
6. EPEC: Electrical HDPE underground conduit (thin wall).
7. EPEC-A: Type A electrical HDPE underground conduit.

8. EPEC-B: Type B electrical HDPE underground conduit.
9. ERMC: Electrical rigid metal conduit.
10. ERMC-A: Aluminum electrical rigid metal conduit.
11. ERMC-S: Steel electrical rigid metal conduit.
12. ERMC-S-G: Galvanized-steel electrical rigid metal conduit.
13. ERMC-S-PVC: PVC-coated-steel electrical rigid metal conduit.
14. ERMC-SS: Stainless steel electrical rigid metal conduit.
15. FMC: Flexible metal conduit.
16. FMC-A: Aluminum flexible metal conduit.
17. FMC-S: Steel flexible metal conduit.
18. FMT: Steel flexible metallic tubing.
19. FNMC: Flexible nonmetallic conduit. See "LFNC."
20. HDPE: HDPE underground conduit (thick wall).
21. HDPE-40: Schedule 40 HDPE underground conduit.
22. HDPE-80: Schedule 80 HDPE underground conduit.
23. IMC: Steel electrical intermediate metal conduit.
24. LFMC: Liquidtight flexible metal conduit.
25. LFMC-A: Aluminum liquidtight flexible metal conduit.
26. LFMC-S: Steel liquidtight flexible metal conduit.
27. LFMC-SS: Stainless steel liquidtight flexible metal conduit.
28. LFNC: Liquidtight flexible nonmetallic conduit.
29. LFNC-A: Layered (Type A) liquidtight flexible nonmetallic conduit.
30. LFNC-B: Integral (Type B) liquidtight flexible nonmetallic conduit.
31. LFNC-C: Corrugated (Type C) liquidtight flexible nonmetallic conduit.
32. PVC: Rigid PVC conduit.
33. PVC-40: Schedule 40 rigid PVC conduit.
34. PVC-80: Schedule 80 rigid PVC Conduit.
35. PVC-A: Type A rigid PVC concrete-encased conduit.
36. PVC-EB: Type EB rigid PVC concrete-encased underground conduit.
37. RGS: See ERMC-S-G.
38. RMC: See ERMC.
39. RTRC: Reinforced thermosetting resin conduit.
40. RTRC-AG: Low-halogen, aboveground reinforced thermosetting resin conduit.
41. RTRC-AG-HW: Heavy wall, low-halogen, aboveground reinforced thermosetting resin conduit.
42. RTRC-AG-SW: Standard wall, low-halogen, aboveground reinforced thermosetting resin conduit.
43. RTRC-AG-XW: Extra heavy wall, low-halogen, aboveground reinforced thermosetting resin conduit.
44. RTRC-BG: Low-halogen, belowground reinforced thermosetting resin conduit.

B. Definitions:

1. Conduit: A structure containing one or more duct raceways.
2. Direct Buried: Installed underground without encasement in concrete or other protective material.
3. Duct Bank: An arrangement of conduit providing one or more continuous duct raceways between two points.
4. Duct Raceway: A single enclosed raceway for conductors or cable.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Products or components listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

2.2 TYPE EMT DUCT RACEWAYS AND ELBOWS

A. UL FJMX - Steel Electrical Metal Tubing (EMT-S) and Elbows:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Allied Tube & Conduit; Atkore International
b. Republic Conduit; Nucor Corporation, Nucor Tubular Products
c. Topaz Lighting & Electric
d. Western Tube; Zekelman Industries
e. Wheatland Tube; Zekelman Industries

2. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

a. UL CCN FJMX; including UL 797.

3. Standard Features:

a. Material: Steel.

b. Exterior Coating: Zinc.
c. Interior Coating: Zinc.
d. Minimum Trade Size: trade size 3/4”.

2.3 TYPE HDPE DUCT RACEWAYS AND FITTINGS

A. UL EAZX - Schedule 40 Electrical HDPE Underground Conduit (HDPE-40):

1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the

following UL product categories:

a. UL CCN EAZX; including UL 651A.

2. Standard Features:

a. Dimensional Specifications: Schedule 40.

3. Other Available Features Required by the Project:

a. Minimum Trade Size: trade size 1”.

B. UL EAZX - Schedule 80 Electrical HDPE Underground Conduit (HDPE-80):

1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

a. UL CCN EAZX; including UL 651A.

2. Standard Features:

a. Dimensional Specifications: Schedule 80.

3. Other Available Features Required by the Project:

a. Minimum Trade Size: trade size 1”.

2.4 TYPE ERMC DUCT RACEWAYS, ELBOWS, COUPLINGS, AND NIPPLES

A. UL DYIX - PVC-Coated-Steel Electrical Rigid Metal Conduit (ERMC-S-PVC), Elbows, Couplings, and Nipples:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Bluesteel Services LLC
b. Calbond; Atkore International
c. KorKap; Robroy Industries
d. Plasti-Bond; Robroy Industries

2. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

a. UL CCN DYIX; including UL 6.

3. Standard Features:

a. Exterior Coating: PVC complying with NEMA RN 1.

b. Interior Coating: Zinc with organic top coating.
c. Minimum Trade Size: trade size 3/4”.

4. Other Available Features Required by the Project:

a. Colors: As indicated on the Drawings.
b. Conduit Fittings for Hazardous (Classified) Locations: UL 1203.
c. Expansion and Deflection Fittings: UL 651 with flexible bonding jumper.

2.5 TYPE IMC DUCT RACEWAYS

A. UL DYBY - Steel Intermediate Metal Conduit (IMC):

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Allied Tube & Conduit; Atkore International
b. Calconduit; Atkore International
[Republic Conduit; Nucor Corporation, Nucor Tubular Products
c. Rymco USA brand; manufactured and listed by subsidiary Conduit S.A. de C.V
d. Western Tube; Zekelman Industries
e. Wheatland Tube; Zekelman Industries

2. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

a. UL CCN DYBY; including UL 1242.

3. Standard Features:

a. Exterior Coating: Zinc.
b. Interior Coating: Zinc.
c. Minimum Trade Size: trade size 3/4”.

2.6 TYPE LFMC DUCT RACEWAYS

A. UL DXHR - Steel Liquidtight Flexible Metal Conduit (LFMC-S):

1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

a. UL CCN DXHR; including UL 360.

2. Standard Features:

a. Material: Steel.
b. Minimum Trade Size: trade size 3/4"

2.7 TYPE LFNC DUCT RACEWAYS

A. UL DXOQ - Layered (Type A) Liquidtight Flexible Nonmetallic Conduit (LFNC-A):

1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

a. UL CCN DXOQ; including UL 1660.

2. Standard Features:

a. Type A conduit with smooth seamless inner core and cover bonded together with one or more reinforcement layers between core and cover.
b. Minimum Trade Size: 3/4”

2.8 TYPE PVC DUCT RACEWAYS AND FITTINGS

A. UL DZYR - Schedule 40 Rigid PVC Conduit (PVC-40) and Fittings:

1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

a. UL CCN DZYR; including UL 651.

2. Standard Features:

a. Dimensional Specifications: Schedule 40.
b. Minimum Trade Size: trade size 3/4".

2.9 FITTINGS FOR CONDUIT, TUBING, AND CABLE

A. UL DWTT - Fittings for Type ERMC, Type IMC, Type PVC, Type HDPE, Type EPEC, and Type RTRC Duct Raceways:

1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

a. UL CCN DWTT; including UL 514B.

2. Standard Features:

a. Material: Steel.
b. Coupling Method: Compression coupling, Raintight compression coupling with distinctive color gland nut, Setscrew couplings with only single screw per conduit are unacceptable.
c. Expansion and Deflection Fittings: UL 651 with flexible bonding jumper.

B. UL FKAV - Fittings for Type EMT Duct Raceways:

1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

a. UL CCN FKAV; including UL 514B.

2. Standard Features:

a. Material: Steel.
b. Coupling Method: Compression coupling, Raintight compression coupling with distinctive color gland nut, Setscrew couplings with only single screw per conduit are unacceptable.
c. Expansion and Deflection Fittings: UL 651 with flexible bonding jumper.

C. UL ILNR - Fittings for Type FMC Duct Raceways:

1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

a. UL CCN ILNR; including UL 514B.

D. UL DXAS - Fittings for Type LFMC Duct Raceways:

1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

a. UL CCN DXAS; including UL 514B.

PART 3 - EXECUTION

3.1 SELECTION OF CONDUITS FOR ELECTRICAL SYSTEMS

A. Unless more stringent requirements are specified in the Contract Documents or manufacturer's published instructions, comply with NFPA 70 for selection of duct raceways. Consult Architect for resolution of conflicting requirements.

B. Special Instructions Regarding HDPE Conduits: Although Article 353 of NFPA 70 permits use of HDPE conduits where encased in concrete aboveground, UL CCN EAZX listing requirements state that HDPE conduits are intended only for use where

direct buried with or without being encased in concrete. Specified Type HDPE underground conduits are not permitted to be used aboveground on the Project.

C. Outdoors:

1. Exposed and Subject to Severe Physical Damage: ERMC or IMC.
2. Exposed and Subject to Physical Damage: ERMC or IMC.
3. Exposed and Not Subject to Physical Damage: ERMC, IMC, or PVC-80.
4. Concealed Aboveground: ERMC, IMC, EMT, PVC-80, or PVC-40.
5. Direct Buried: PVC-40 or RTRC-BG.
6. Concrete Encased Not in Trench: PVC-80 or RTRC-BG.
7. Concrete Encased in Trench: PVC-80 or RTRC-BG.

8. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.

D. Indoors:

1. Hazardous Classified Locations: ERMC.
2. Exposed and Subject to Severe Physical Damage: ERMC or IMC.
3. Exposed and Subject to Physical Damage: ERMC or IMC.
4. Exposed and Not Subject to Physical Damage: EMT.
5. Concealed in Ceilings and Interior Walls and Partitions: EMT.
6. Damp or Wet Locations: ERMC or IMC.
7. Retain first or second option in first subparagraph below if duct raceway may be exposed to physical damage. See "Liquidtight Flexible Metal Conduit (LFMC)" and "Liquidtight Flexible Nonmetallic Conduit (LFNC)" articles in the Evaluations for distinction between types.
8. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.

E. Duct Fittings: Select fittings in accordance with NEMA FB 2.10 guidelines.

1. ERMC and IMC: Provide threaded-type fittings unless otherwise indicated.

3.2 INSTALLATION OF CONDUITS FOR ELECTRICAL SYSTEMS

A. Comply with manufacturer's published instructions.

B. Reference Standards for Installation: Unless more stringent installation requirements are specified in the Contract Documents or manufacturer's published instructions, comply with the following:

1. Electrical Construction: ICC IBC, ICC IFC, NFPA 1, NFPA 70, and NECA NEIS 1.
2. Electrical Safety: NFPA 70E.
3. Commissioning of Active and Passive Fire Protection Features: NFPA 3 and NFPA 4.
4. Grounding and Bonding: NECA NEIS 331 and Article 250 of NFPA 70.

5. Communications Work: BICSI N1.
6. Life Safety and Means of Egress Work: NFPA 101.
7. Emergency and Standby Power Work: NFPA 110, NFPA 111, and NECA NEIS 416.
8. Work in Confined Spaces: NFPA 350.
9. Work in Basements and Other Developed Subterranean Spaces: NFPA 520.
10. Type EMT-A: Article 358 of NFPA 70 and NECA NEIS 102.
11. Type EMT-SS: Article 358 of NFPA 70 and NECA NEIS 101.
12. Type EMT-S: Article 358 of NFPA 70 and NECA NEIS 101.
13. Type ENT: Article 362 of NFPA 70 and NECA NEIS 102.
14. Type HDPE and Type EPEC: Article 353 of NFPA 70 and NECA NEIS 111.
15. Type ERMC-A: Article 344 of NFPA 70 and NECA NEIS 102.
16. Type ERMC-SS: Article 344 of NFPA 70 and NECA NEIS 101.
17. Type ERMC-S: Article 344 of NFPA 70 and NECA NEIS 101.
18. Type FMC-S: Article 348 of NFPA 70 and NECA NEIS 101.
19. Type FMC-A: Article 348 of NFPA 70 and NECA NEIS 102.
20. Type FMT: Article 360 of NFPA 70 and NECA NEIS 101.
21. Type IMC: Article 342 of NFPA 70 and NECA NEIS 101.
22. Type LFMC: Article 350 of NFPA 70 and NECA NEIS 101.
23. Type PVC: Article 356 of NFPA 70 and NECA NEIS 111.
24. Type RTRC: Article 355 of NFPA 70 and NECA NEIS 111.
25. Expansion Fittings: NEMA FB 2.40.

C. Special Installation Techniques:

1. General Requirements for Installation of Duct Raceways:

a. Complete duct raceway installation before starting conductor installation.
b. Provide stub-ups through floors with coupling threaded inside for plugs, set flush with finished floor. Plug coupling until conduit is extended above floor to final destination or a minimum of 2 ft above finished floor.

c. Install no more than equivalent of three 90-degree bends in conduit run. Support within 12 inch of changes in direction.
d. Make bends in duct raceway using large-radius preformed ells except for parallel bends. Field bending must be in accordance with NFPA 70 minimum radii requirements. Provide only equipment specifically designed for material and size involved.
e. Conceal conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
f. Support conduit within 12 inch of enclosures to which attached.

g. Install duct sealing fittings at accessible locations in accordance with NFPA 70 and fill them with listed sealing compound. For concealed duct raceways, install fitting in flush steel box with blank cover plate having finish similar to that of adjacent plates or surfaces. Install duct sealing fittings in accordance with NFPA 70.
h. Install devices to seal duct raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal interior of duct raceways at the following

points:

1) Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2) Where an underground service duct raceway enters a building or structure.
3) Conduit extending from interior to exterior of building.
4) Conduit extending into pressurized duct raceway 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.

i. Do not install duct raceways or electrical items on "explosion-relief" walls or rotating equipment.
j. Do not install conduits within 2 inch of the bottom side of a metal deck roof.
k. Keep duct raceways at least 6 inch away from parallel runs of flues and steam or hot-water pipes. Install horizontal duct raceway runs above water and steam piping.
l. Cut conduit perpendicular to the length. For conduits metric designator 53 (trade size 2) and larger, use roll cutter or a guide to make cut straight and perpendicular to the length. Ream inside of conduit to remove burrs.
m. Install pull wires in empty duct raceways. Provide polypropylene or monofilament plastic line with not less than 200 lb tensile strength. Leave at least 12 inch of slack at both ends of pull wire. Cap underground duct raceways designated as spare above grade alongside duct raceways in use.
n. Install duct raceways square to the enclosure and terminate at enclosures without hubs with locknuts on both sides of enclosure wall. Install locknuts hand tight, plus one-quarter turn more.

1) Termination fittings with shoulders do not require two locknuts.

o. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to metric designator 35 (trade size 1-1/4) and insulated throat metal bushings on metric designator 41 (trade size 1-1/2) and larger conduits terminated with locknuts.

2. Types EMT-A, ERMC-A, and FMC-A: Do not install aluminum duct raceways or fittings in contact with concrete or earth.
3. Types ERMC and IMC:

a. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound that maintains electrical conductivity to threads of duct raceway and fittings before making up joints. Follow compound manufacturer's published instructions.

4. Type ERMC-S-PVC:

a. Follow manufacturer's installation instructions for clamping, cutting,

threading, bending, and assembly.

b. Provide PVC-coated sealing locknut for exposed male threads transitioning into female NPT threads that do not have sealing sleeves, including transitions from PVC couplings/female adapters to Type ERMC-S-PVC elbows in direct-burial applications. PVC-coated sealing locknuts must not be used in place of conduit hub. PVC-coated sealing locknut must cover exposed threads on Type ERMC-S-PVC duct raceway.

c. Coat field-cut threads on PVC-coated duct raceway with manufacturer-approved corrosion-preventing conductive compound prior to assembly.

5. Types FMC and LFMC:

   a. Provide a maximum of 72 inch of flexible conduit for recessed and semirecessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

6. Types PVC, HDPE, and EPEC:

   a. Do not install Type PVC, Type HDPE, or Type EPEC conduit where ambient temperature exceeds 122 deg F . Conductor ratings must be limited to 75 deg C except where installed in a trench outside buildings with concrete encasement, where 90 deg C conductors are permitted.

   b. Comply with manufacturer's published instructions for solvent welding and fittings.

   c. Join joints with solvent cement in accordance with manufacturer's published instructions and allowed to cure before handling. Joints to be bent, pushed, or pulled must set for minimum 24 h after joining.

7. Type RTRC: Do not install Type RTRC conduit where ambient temperature exceeds 230 deg F .

8. Duct Raceways Embedded in Slabs:

   a. Run duct raceways larger than metric designator 27 (trade size 1) below concrete slab.

   b. Arrange duct raceways to cross building expansion joints with expansion fittings at right angles to the joint.

   c. Arrange duct raceways to ensure that each is surrounded by minimum of 1 inch of concrete without voids.

   d. Do not embed threadless fittings in concrete unless locations have been specifically approved by Architect.

   e. Change from ENT to ERMC or IMC before rising above floor.

9. Stub-ups to Above Recessed Ceilings:

   a. Provide EMT, IMC, or ERMC for duct raceways.

   b. Provide a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

10. Duct Raceway Terminations at Locations Subject to Moisture or Vibration:

    a. Provide insulating bushings to protect conductors, including conductors smaller than 4 AWG.

11. Duct Fittings: Install fittings in accordance with NEMA FB 2.10 guidelines.

    a. ERMC-S-PVC: Provide only fittings listed for use with this type of conduit. Patch and seal joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Provide sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
    b. EMT: Provide setscrew, steel fittings. Comply with NEMA FB 2.10.
    c. Flexible Conduit: Provide only fittings listed for use with flexible conduit type. Comply with NEMA FB 2.20.

12. Expansion-Joint Fittings:

    a. Install in runs of aboveground PVC that are located where environmental temperature change may exceed 30 deg F and that have straight-run length that exceeds 25 ft. Install in runs of aboveground ERMC conduit that are located where environmental temperature change may exceed 100 deg F and that have straight-run length that exceeds 100 ft.
    b. Install type and quantity of fittings that accommodate temperature change listed for the following locations:

        1) Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
        2) Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
        3) Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
        4) Attics: 135 deg F temperature change.

    c. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.
    d. Install expansion fittings at locations where conduits cross building or structure expansion joints.
    e. Install expansion-joint fitting with position, mounting, and piston setting selected in accordance with manufacturer's published instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

13. Duct Raceways Penetrating Rooms or Walls with Acoustical Requirements: Seal duct raceway openings on both sides of rooms or walls with acoustically rated putty or firestopping.

14. Identification: Provide labels for conduit assemblies, duct raceways, and associated electrical equipment.

    a. Provide warning signs.

D. Interfaces with Other Work:

1. Firestop penetrations of fire-rated floor and wall assemblies.
2. Provide conduit hangers and supports.

E. Tests and Inspections:

1. Perform manufacturer's recommended tests and inspections.
2. Pull solid aluminum or wood test mandrel through duct to prove joint integrity and adequate bend radii, and test for out-of-round duct. Provide minimum 12 inch long mandrel equal to duct size minus 1/4 inch. If obstructions are indicated, remove obstructions and retest.
3. Conduit Placement:

    a. Verify that center-line location and offsets are in accordance with the Drawings.

    b. Verify that hangers and supports for conduits are attached to structure as directed by qualified structural engineer.
    c. Verify that nuts on bolts or hanger rods are secure.
    d. Verify that space between raceways and cored holes are filled with non-shrinking grout or other approved material indicated on the Drawings and the Specifications.
    e. Verify that expansion devices are installed at locations indicated on the Drawings and the Specifications.
    f. Verify that ends are cut square to provide flush-butting surfaces when spliced and inside edges are free of burrs that could impede installation of cables.
    g. Verify minimum separation of utilities, or that approved mechanical protection has been provided to surrounding conduit(s) where minimum separation cannot be achieved.

4. Document all changes on Record Drawings.

F. Nonconforming Work:

1. Conduit will be considered defective if it does not pass tests and inspections.
2. Remove and replace defective units and retest.

3.3 CLEANING

A. Verify that bentonite or other drilling fluids are contained and removed, and site is restored to its original or improved condition.

3.4 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533.13

SECTION 260533.16 – BOXES AND COVERS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metallic outlet boxes, device boxes, rings, and covers.
2. Nonmetallic outlet boxes, device boxes, rings, and covers.
3. Junction boxes and pull boxes.
4. Cover plates for device boxes.

B. Related Requirements:

2. Section 260010 "Supplemental Requirements for Electrical" specifies additional
2. coordination, scheduling, sequencing, submittal, and installation requirements
2. applicable to the Work for electrical, communications, and electronic safety and
2. security systems on the Project, including wiring methods.
3. Section 260526 "Grounding and Bonding for Electrical Systems" specifies grounding and bonding referenced by this Section.
4. Section 260553 "Identification for Electrical Systems" specifies electrical equipment labels and warning signs installed by this Section.
5. Section 260573 "Power System Studies" specifies arc-flash hazard analysis and warning labels referenced by this Section.

1.2 DEFINITIONS

A. Communications Outlet: One or more communications jacks, or cables and plugs, mounted in a box or ring, with a suitable protective cover.

B. Enclosure: The case or housing of an apparatus, or the fence or wall(s) surrounding an installation, to prevent personnel from accidentally contacting energized parts or to protect the equipment from physical damage. Types of enclosures and enclosure covers include the following:

1. Cabinet: An enclosure that is designed for either surface mounting or flush mounting and is provided with a frame, mat, or trim in which a swinging door or doors are or can be hung.
2. Concrete Box: A box intended for use in poured concrete.
3. Conduit Body: A means for providing access to the interior of a conduit or tubing system through one or more removable covers at a junction or terminal point. In the United States, conduit bodies are listed in accordance with outlet box requirements.
4. Conduit Box: A box having threaded openings or knockouts for conduit, EMT, or fittings.
5. Cover Plate: A cover designed for protecting wiring devices installed in flush-mounted device boxes while permitting their safe operation; also called a faceplate or wallplate.

6. Cutout Box: An enclosure designed for surface mounting that has swinging doors or covers secured directly to and telescoping with the walls of the enclosure.
7. Device Box: A box with provisions for mounting a wiring device directly to the box.
8. Extension Ring: A ring intended to extend the sides of an outlet box or device box to increase the box depth, volume, or both.
9. Floor Box: A box mounted in the floor intended for use with a floor box cover and other components to complete the floor box enclosure.
10. Floor-Mounted Enclosure: A floor box and floor box cover assembly with means to mount in the floor that is sealed against the entrance of scrub water at the floor level.
11. Floor Nozzle: An enclosure used on a wiring system, intended primarily as a housing for a receptacle, provided with a means, such as a collar, for surface-mounting on a floor, which may or may not include a stem to support it above the floor level, and is sealed against the entrance of scrub water at the floor level.
12. Junction Box: A box with a blank cover that joins different runs of raceway or cable and provides space for connection and branching of the enclosed conductors.
13. Outlet Box: A box that provides access to a wiring system having pryout openings, knockouts, threaded entries, or hubs in either the sides or the back, or both, for the entrance of conduit, conduit or cable fittings, or cables, with provisions for mounting an outlet box cover, but without provisions for mounting a wiring device directly to the box.
14. Pedestal Floor Box Cover: A floor box cover that, when installed as intended, provides a means for typically vertical or near-vertical mounting of receptacle outlets above the floor's finished surface.
15. Pull Box: A box with a blank cover that joins different runs of raceway and provides access for pulling or replacing the enclosed cables or conductors.
16. Raised-Floor Box: A floor box intended for use in raised floors.
17. Recessed Access Floor Box: A floor box with provisions for mounting wiring devices below the floor surface.
18. Recessed Access Floor Box Cover: A floor box cover with provisions for passage of cords to recessed wiring devices mounted within a recessed floor box.
19. Ring: A sleeve, which is not necessarily round, used for positioning a recessed wiring device flush with the plaster, concrete, drywall, or other wall surface.
20. Ring Cover: A box cover, with raised center portion to accommodate a specific wall or ceiling thickness, for mounting wiring devices or luminaires flush with the surface.
21. Termination Box: An enclosure designed for installation of termination base assemblies consisting of bus bars, terminal strips, or terminal blocks with provision for wire connectors to accommodate incoming or outgoing conductors, or both.

C. Receptacle: A fixed connecting device arranged for insertion of a power cord plug. Also called a power jack.

D. Receptacle Outlet: One or more receptacles mounted in a box with a suitable protective cover.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each type of product requiring samples for source quality control.

C. Shop Drawings: Prepare and submit the following:

1. Shop Drawings for Floor Boxes: Show that floor boxes are located to avoid interferences and are structurally allowable. Indicate floor thickness where boxes are embedded in concrete floors and underfloor clearances where boxes are installed in raised floors.

1.4 INFORMATIONAL SUBMITTALS

A. Manufacturer's published instructions.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Products or components listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

2.2 METALLIC OUTLET BOXES, DEVICE BOXES, RINGS, AND COVERS

A. Source Quality Control:

1. Samples:

a. Floor Box Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors and flooring inserts for each type of floor box.
b. Raised Floor Box Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors and flooring inserts for each type of floor box.
c. Recessed Access-Floor Box Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors and flooring inserts for each type of floor box.
d. Concrete Box Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors and flooring inserts for each type of floor box.

B. UL QCIT - Metallic Outlet Boxes and Covers:

1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing

laboratory in accordance with guide information and standards specified for the following UL product categories:

a. UL CCN QCIT; including UL 514A.

2. Standard Features:

a. Box having pryout openings, knockouts, threaded entries, or hubs in either the sides or the back, or both, for entrance of conduit, conduit or cable fittings, or cables, with provisions for mounting outlet box cover, but without provisions for mounting wiring device directly to box.
b. Material: **Sheet steel** or **Cast metal**.

C. UL QCIT - Metallic Extension Rings:

1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

a. UL CCN QCIT; including UL 514A.

2. Standard Features: Ring intended to extend sides of outlet box or device box to increase box depth, volume, or both.

D. UL QCIT - Metallic Floor Boxes and Floor Box Covers:

1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

a. UL CCN QCIT; including UL 514A.

2. Standard Features: Box mounted in floor with floor box cover and other components to complete floor box enclosure.

2.3 JUNCTION BOXES AND PULL BOXES

A. UL BGUZ - Indoor Sheet Metal Junction and Pull Boxes:

1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

a. UL CCN BGUZ; including UL 50 and UL 50E.

2. Standard Features:

a. Box with a blank cover that serves the purpose of joining different runs of raceway or cable.
b. Degree of Protection: **Type 1**.

B. UL BGUZ - Outdoor Sheet Metal Junction and Pull Boxes:

1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

   a. UL CCN BGUZ; including UL 50 and UL 50E.

2. Standard Features:

   a. Box with a blank cover that serves the purpose of joining different runs of raceway or cable.
   b. Degree of Protection: Type **3R**.

C. UL BGUZ - Outdoor Polymeric Junction and Pull Boxes:

1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

   a. UL CCN BGUZ; including UL 50 and UL 50E.

2. Standard Features:

   a. Box with a blank cover that serves the purpose of joining different runs of raceway or cable.
   b. Degree of Protection: **Type 3R**

2.4 COVER PLATES FOR DEVICE BOXES

A. UL QCIT or QCMZ - Metallic Cover Plates for Device Boxes:

1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

   a. UL CCN QCIT or UL CCN QCMZ; including UL 514D.

2. Standard Features:

   a. Cover plate-Securing Screws: Metal with head color to match cover plate finish.
   b. Damp and Wet Locations: Listed, labeled, and marked for location and use. Provide gaskets and accessories necessary for compliance with listing.

B. UL QCIT or QCMZ - Nonmetallic Cover Plates for Device Boxes:

1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

   a. UL CCN QCIT or UL CCN QCMZ; including UL 514D.

2. Standard Features:

   a. Cover Plate-Securing Screws: Metal with head color to match cover plate finish.
   b. Damp and Wet Locations: Listed, labeled, and marked for location and use. Provide gaskets and accessories necessary for compliance with listing.
   c. Cover Plate Material: **As indicated by Architect**.
   d. Color: **As indicated by Architect**.

PART 3 - EXECUTION

3.1 SELECTION OF BOXES AND COVERS FOR ELECTRICAL SYSTEMS

A. Unless more stringent requirements are specified in Contract Documents or manufacturers' published instructions, comply with NFPA 70 for selection of boxes and enclosures. Consult Architect for resolution of conflicting requirements.

B. Degree of Protection:

1. Outdoors:

   a. **Type 3R** unless otherwise indicated.
   b. Locations Exposed to Hosedown: **Type 4X**.
   c. Locations Subject to Potential Flooding: Type 6P.
   d. Locations Aboveground Where Mechanism Must Operate When Ice Covered: Type 3S.
   e. Locations in-Ground or Exposed to Corrosive Agents: **Type 4X**.
   f. Locations in-Ground or Exposed to Corrosive Agents Where Mechanism Must Operate When Ice Covered: Type 3SX.

2. Indoors:

   a. Type 1 unless otherwise indicated.
   b. Damp or Dusty Locations: **Type 12**.
   c. Surface Mounted in Kitchens and Other Locations Exposed to Oil or Coolants: Type 12.
   d. Flush Mounted in Kitchens and Other Locations Exposed to Oil or Coolants: **Type 12**.
   e. Locations Exposed to Airborne Dust, Lint, Fibers, or Flyings: **Type 4X**.
   f. Locations Exposed to Hosedown: **Type 4**X.
   g. Locations Exposed to Brief Submersion: **Type 6P**.
   h. Locations Exposed to Prolonged Submersion: Type 6P.
   i. Locations Exposed to Corrosive Agents: **Type 4X**.
   j. Locations Exposed to Spraying Oil or Coolants: Type 13.

3.2 INSTALLATION OF BOXES AND COVERS FOR ELECTRICAL SYSTEMS

A. Comply with manufacturer's published instructions.

B. Reference Standards for Installation: Unless more stringent installation requirements are specified in Contract Documents or manufacturers' published instructions, comply with the following:

1. Electrical Construction: ICC IBC, ICC IFC, NFPA 1, NFPA 70, and NECA NEIS 1.
2. Electrical Safety: NFPA 70E.
3. Commissioning of Active and Passive Fire Protection Features: NFPA 3 and NFPA 4.
4. Grounding and Bonding: NECA NEIS 331 and Article 250 of NFPA 70.
5. Communications Work: BICSI N1.
6. Life Safety and Means of Egress Work: NFPA 101.
7. Emergency and Standby Power Work: NFPA 110, NFPA 111, and NECA NEIS 416.
8. Work in Confined Spaces: NFPA 350.
9. Work in Basements and Other Developed Subterranean Spaces: NFPA 520.
10. Outlet, Device, Pull, and Junction Boxes: Article 314 of NFPA 70.
11. Consult Architect for resolution of conflicting requirements.

C. Special Installation Techniques:

1. Provide boxes in wiring and raceway systems wherever required for pulling of wires, making connections, and mounting of devices or fixtures.
2. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to **center** of box unless otherwise indicated.
3. 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, whether installed indoors or outdoors.
4. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
5. Locate boxes so that cover or plate will not span different building finishes.
6. Support boxes in recessed ceilings independent of ceiling tiles and ceiling grid.
7. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for purpose.
8. Fasten junction and pull boxes to, or support from, building structure. Do not support boxes by conduits.
9. Set metal floor boxes level and flush with finished floor surface.
10. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.
11. Do not install aluminum boxes, enclosures, or fittings in contact with concrete or earth.
12. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to

ensure a continuous ground path.

13. Boxes and Enclosures in Areas or Walls with Acoustical Requirements:

    a. Seal openings and knockouts in back and sides of boxes and enclosures with acoustically rated putty.
    b. Provide gaskets for cover plates and covers.

D. Interfaces with Other Work:

1. Identification: Provide labels for boxes and associated electrical equipment.

    a. Identify field-installed conductors, interconnecting wiring, and components.
    b. Label each enclosure with engraved metal or laminated-plastic nameplate.
    c. Provide warning signs and arc-flash hazard warning labels for electrical equipment.

3.3 CLEANING

A. Remove construction dust and debris from boxes before installing cover plates, covers, and hoods.

3.4 PROTECTION

A. After installation, protect boxes from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

END OF SECTION 260533.16

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Labels.
2. Bands.
3. Tapes and stencils.
4. Tags.
5. Signs.
6. Cable ties.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" specifies additional requirements applicable to coordinating, scheduling, and sequencing of the Work specified in this Section.

2. Section 284600 "Fire Detection and Alarm" specifies fire detection and alarm devices referenced in this Section.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each type of label and sign to illustrate composition, size, colors, lettering style, mounting provisions, and graphic features of identification products.

C. Identification Schedule: For each piece of electrical equipment and electrical system components to be index of nomenclature for electrical equipment and system components used in identification signs and labels. Use same designations indicated on Drawings.

PART 2 - PRODUCTS

2.1 LABELS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

2. Listing Criteria: UL CCN PGDQ2 for components; including UL 969.

B. UL PGDQ2 - Vinyl Wraparound Labels: Preprinted, flexible labels laminated with clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.

C. UL PGDQ2 - Self-Adhesive Wraparound Labels: Preprinted, 3 mil thick, polyester flexible label with acrylic pressure-sensitive adhesive.

1. Self-Lamination: Clear; UV-, weather-, and chemical-resistant; self-laminating, with protective shield over legend. Size labels such that clear shield overlaps entire printed legend.
2. Marker for Labels:

a. Permanent, waterproof, black ink marker recommended by tag manufacturer.
b. Machine-printed, permanent, waterproof, black ink recommended by printer manufacturer.

D. UL PGDQ2 - Self-Adhesive Labels: Polyester, thermal, transfer-printed, 3 mil thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.

1. Minimum Nominal Size:

a. 1-1/2 by 6 inch for raceway and conductors.
b. 3-1/2 by 5 inch for equipment.
c. As required by authorities having jurisdiction.

2.2 EXTRUDED INSULATING TUBING

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

2. Listing Criteria: UL CCN YDPU2 for components; including UL 224.

2.3 BANDS

A. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameters sized to suit diameters and that stay in place by gripping action.

2.4 TAPES AND STENCILS

A. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit

identification legend machine printed by thermal transfer or equivalent process.

B. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 mil thick by 1 to 2 inch wide; compounded for outdoor use.

C. Floor Marking Tape: 2 inch wide, 5 mil pressure-sensitive vinyl tape, with yellow and black stripes and clear vinyl overlay.

D. Underground-Line Warning Tape:

1. Tape:

   a. Recommended by manufacturer for method of installation and suitable to identify and locate underground electrical and communications utility lines.
   b. Printing on tape must be permanent and may not be damaged by burial operations.
   c. Tape material and ink must be chemically inert and not be subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.

2. Color and Printing:

   a. Comply with APWA Uniform Color Code using NEMA Z535.1 safety colors.

3. Nonconducting Line-Warning Tape :

   a. Pigmented polyolefin, bright colored, compounded for direct-burial service.
   b. Width: 3 inch.
   c. Thickness: 4 mil.
   d. Weight: 18.5 lb/1000 sq. ft.
   e. Tensile in accordance with ASTM D882: 30 lbf and 2500 psi.

4. Reinforced Nonconducting Line-Warning Tape :

   a. Multilayer laminate, consisting of high-density polyethylene scrim coated with pigmented polyolefin; bright colored, compounded for direct-burial service.
   b. Width: 3 inch.
   c. Thickness: 12 mil.
   d. Weight: 36.1 lb/1000 sq. ft.
   e. Tensile in accordance with ASTM D882: 400 lbf and 11,500 psi.

5. Detectable Line-Warning Tape :

   a. Detectable three-layer laminate, consisting of printed pigmented polyolefin film, solid aluminum-foil core, and clear protective film that allows inspection of continuity of conductive core; bright colored, compounded for direct-burial service.
   b. Width: 3 inch.
   c. Overall Thickness: 5 mil.

d. Foil Core Thickness: 0.35 mil.
e. Weight: 28 lb/1000 sq. ft.
f. Tensile in accordance with ASTM D882: 70 lbf and 4600 psi.

6. Reinforced Detectable Line-Warning Tape :

a. Reinforced, detectable three-layer laminate, consisting of printed pigmented woven scrim, solid aluminum-foil core, and clear protective film that allows inspection of continuity of conductive core; bright-colored, compounded for direct-burial service.
b. Width: 3 inch.
c. Overall Thickness: 8 mil.
d. Foil Core Thickness: 0.35 mil.
e. Weight: 34 lb/1000 sq. ft.
f. Tensile in accordance with ASTM D882: 300 lbf and 12,500 psi.

E. Concrete Cable Route Markers :

1. Description: Concrete markers visually aid tracing the route of electrical cables. Monument markers are typically installed at grade. Protective cover markers are typically installed above the cables at grade or below grade.
2. Product Characteristics:

a. Material: Precast reinforced concrete.
b. Marker Type:

1) Above-Ground Monument Post:

a) Nominal Dimensions (Height, Width, Depth): 30 inch, 6 inch, 3 inch.

2) Above-Ground Monument Block:

a) Nominal Dimensions (Height, Width, Depth): 12 inch, 12 inch, 6 inch

3) In-Ground Protective Cover (Plank or Slab):

a) Nominal Dimensions (Length, Width, Depth): 36 inch, 6 inch, 2 inch

c. Lettering: Approximately 1/8 inch deep, not less than 1 inch high, symmetrically spaced; marked on both sides to allow for reversal.

F. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height must be 1 inch.

2.5 TAGS

A. Nonmetallic Preprinted Tags: Polyethylene tags, 0.015 inch thick, color-coded for phase and voltage level, with factory printed permanent designations; punched for use with self-locking cable tie fastener.

2.6 SIGNS

A. Baked-Enamel Signs:

1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
2. 1/4 inch grommets in corners for mounting.
3. Nominal Size: 7 by 10 inch.

B. Laminated Acrylic or Melamine Plastic Signs:

1. Engraved legend.
2. Thickness:

   a. For signs up to 20 sq. inch, minimum 1/16 inch thick.
   b. For signs larger than 20 sq. inch, 1/8 inch thick.

   c. Engraved legend with black letters on white face.
   d. Punched or drilled for mechanical fasteners with 1/4 inch grommets in corners for mounting.
   e. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.7 CABLE TIES

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

2. Listing Criteria: UL CCN ZODZ; including UL 1565 or UL 62275.

B. UL ZODZ - General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 deg F in accordance with ASTM D638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black, except where used for color-coding.

C. UL ZODZ - UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 deg F in accordance with ASTM D638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black.

D. UL ZODZ - Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, and self-locking.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 deg F in accordance with ASTM D638: 7000 psi.
3. UL 94 Flame Rating: 94V-0.
4. Temperature Range: Minus 50 to plus 284 deg F.
5. Color: Black.

PART 3 - EXECUTION

3.1 PREPARATION

A. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

3.2 SELECTION OF COLORS AND IDENTIFICATION MARKINGS

A. Comply with 29 CFR 1910.144 for color identification of hazards, and the following:

1. Fire-protection and fire-alarm equipment, including raceways, must be finished, painted, or suitably marked safety red.
2. Ceiling-mounted hangers, supports, cable trays, and raceways must be finished, painted, or suitably marked safety yellow where less than 7.7 ft above finished floor.

B. Pipe and Conduit Labeling: Comply with ASME A13.1.

C. Color-Coding for Phase- and Voltage-Level Identification, 1000 V or Less: Use colors listed below for ungrounded service, feeder, and branch-circuit conductors.

1. Color must be factory applied or field applied for sizes larger than 6 AWG when permitted by authorities having jurisdiction.
2. Colors for 208Y/120 V Circuits:

   a. Phase A: Black.
   b. Phase B: Red.
   c. Phase C: Blue.

3. Colors for 240 V Circuits:

   a. Phase A: Black.

b. Phase B: Red.

4. Colors for 480Y/277 V Circuits:

a. Phase A: Brown.
b. Phase B: Orange.
c. Phase C: Yellow.

5. Color for Neutral (Grounded Conductor): White.
6. Color for Equipment Ground: Bare copper, or Green.
7. Color for Isolated Ground: Green with two or more yellow stripes.

D. Color-Coding Raceways, Cable Trays, Junction Boxes, and Conductors for Intrinsically-Safe Circuits: Light blue. When used to identify intrinsically-safe circuits, Article 504 of NFPA 70 requires that the color light blue not be used for any other purpose.

E. Color-Coding Instructional Signs: Self-adhesive labels, including color code for grounded and ungrounded conductors.

F. Accessible Fittings for Raceways: Identify cover of junction and pull box of the following systems with wiring system legend and system voltage. System legends must be as follows:

1. "EMERGENCY POWER."
2. "POWER."
3. "UPS."

G. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.

H. Locations of Underground Lines: Underground-line warning tape for power and lighting.

I. Vaults, Manholes, Handholes, and Pull and Junction Boxes, More Than 1000 V: For conductors in vaults, pull and junction boxes, manholes, and handholes, use nonmetallic preprinted tags colored and marked to indicate phase, and separate tag with circuit designation.

J. Concealed Raceways, Duct Banks, More Than 1000 V, within Buildings: Tape and stencil. Stencil legend "DANGER - CONCEALED HIGH-VOLTAGE WIRING" with 3 inch high, black letters on 20 inch centers.

1. Locate identification at changes in direction, at penetrations of walls and floors, and at 100 ft maximum intervals.
2. Identify system voltage and system or service type with black letters on orange field.
3. Apply floor marking tape to the following finished surfaces:

a. Floor surface directly above conduits running beneath and within 12 inch of floor that is in contact with earth or is framed above unexcavated space.
b. Wall surfaces directly external to raceways concealed within wall.

c. Accessible surfaces of concrete envelope around raceways in vertical shafts, exposed in building, or concealed above suspended ceilings.

K. Accessible Raceways, Armored and Metal-Clad Cables, More Than 1000 V: Vinyl wraparound labels.

1. Locate identification at changes in direction, at penetrations of walls and floors, at 100 ft maximum intervals in straight runs, and at 25 ft maximum intervals in congested areas.
2. Identify system voltage and system or service type with black letters on orange field.

L. Vaults, Manholes, Handholes, and Pull and Junction Boxes, 1000 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use snap-around labels to identify phase.

1. Locate identification at changes in direction, at penetrations of walls and floors, at 100 ft maximum intervals in straight runs, and at 25 ft maximum intervals in congested areas.
2. Identify system voltage and system or service type with black letters on orange field.

M. Accessible Raceways and Metal-Clad Cables, 1000 V or Less, for Service, Feeder, and Branch Circuits, More Than 30 A and 120 V to Ground: Identify with self-adhesive raceway labels.

1. Locate identification at changes in direction, at penetrations of walls and floors, at 100 ft maximum intervals in straight runs, and at 25 ft maximum intervals in congested areas.
2. Identify system voltage and system or service type with black letters on orange field.

N. Conductors to Be Extended in Future: Attach write-on tags to conductors and list source.

O. Cover Plates: Label individual cover plates with self-adhesive labels. Place label at top of cover plate. Label cover plate with the following information, in the order listed:

1. Panelboard designation.
2. Colon or dash.
3. Branch circuit number.

P. Workspace Indication: Apply floor marking tape to finished surfaces. Show working clearances in direction of access to live parts. Workspace must comply with NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

Q. Equipment Identification Labels:

1. Black letters on white field.
2. Indoor Equipment: Laminated acrylic or melamine plastic sign.

3. Outdoor Equipment: Laminated acrylic or melamine sign.
4. Equipment to Be Labeled:

    a. Racks, Frames, and Enclosures: Identify front and rear of each with self-adhesive labels
    b. Panelboards: Typewritten directory of circuits in location provided by panelboard manufacturer. Panelboard identification must be in form of self-adhesive, engraved, laminated acrylic or melamine label.
    c. Enclosures and electrical cabinets.
    d. Access doors and panels for concealed electrical items.
    e. Switchgear.
    f. Switchboards.
    g. Transformers: Label that includes tag designation indicated on Drawings for transformer, feeder, and panelboards or equipment supplied by secondary.
    h. Substations.
    i. Emergency system boxes and enclosures.
    j. Motor-control centers.
    k. Enclosed switches.
    l. Enclosed circuit breakers.
    m. Enclosed controllers.
    n. Variable-speed controllers.
    o. Push-button stations.
    p. Power-transfer equipment.
    q. Contactors.
    r. Remote-controlled switches, dimmer modules, and control devices.
    s. Uninterruptible power supplies.
    t. Battery-inverter units.
    u. Battery racks.
    v. Power-generating units.
    w. Monitoring and control equipment.

R. Cable Ties: General purpose, for attaching tags, except as listed below:

1. Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum rated.

3.3 SELECTION OF SIGNS AND HAZARD MARKINGS

A. Comply with 29 CFR 1910.145 for danger, caution, warning, and safety instruction signs.

B. Signs, labels, and tags required for personnel safety must comply with the following standards:

1. Safety Colors: NEMA Z535.1.
2. Facility Safety Signs: NEMA Z535.2.
3. Safety Symbols: NEMA Z535.3.
4. Product Safety Signs and Labels: NEMA Z535.4.
5. Safety Tags and Barricade Tapes for Temporary Hazards: NEMA Z535.5.

C. Electrical Hazard Warnings:

1. Arc-Flash Hazard Warning: Self-adhesive labels. Comply with NFPA 70E and Section 260573 "Power System Studies" requirements for arc-flash hazard warning labels.
2. Raceways and Cables Carrying Circuits at More Than 1000 V:

   a. Black letters on orange field.
   b. Legend: "DANGER - CONCEALED HIGH VOLTAGE WIRING."

3. Multiple Power Sources Warning Legend: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
4. OSHA Workspace Clearance Warning Legend: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 3 FEET MINIMUM."

D. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive labels.

1. Apply to exterior of door, cover, or other access.
2. For equipment with multiple power or control sources, apply to door or cover of equipment, including, but not limited to, the following:

   a. Power-transfer switches.
   b. Controls with external control power connections.

E. Operating Instruction Signs: Self-adhesive labels.

F. Emergency Operating Instruction Signs: Self-adhesive labels with white legend on red background with minimum 3/8 inch high letters for emergency instructions at equipment used for power transfer or load shedding.

3.4 INSTALLATION

A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes typical for electrical equipment environments specified in Section 260010 "Supplemental Requirements for Electrical."

C. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).

D. Fasteners for Labels and Signs: Self-tapping, stainless steel screws or stainless steel machine screws with nuts and flat and lock washers.

E. 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 operation and maintenance manual. Use consistent designations throughout Project.

F. Install identifying devices before installing acoustical ceilings and similar concealment.

G. Verify identity of item before installing identification products.

H. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.

I. Apply identification devices to surfaces that require finish after completing finish work.

J. Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.

K. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from floor.

L. Vinyl Wraparound Labels:

1. Secure tight to surface of raceway or cable at location with high visibility and accessibility.
2. Attach labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to location and substrate.

M. Snap-Around Labels: Secure tight to surface at location with high visibility and accessibility.

N. Self-Adhesive Wraparound Labels: Secure tight to surface at location with high visibility and accessibility.

O. Snap-Around Color-Coding Bands: Secure tight to surface at location with high visibility and accessibility.

P. Heat-Shrink, Preprinted Tubes: Secure tight to surface at location with high visibility and accessibility.

Q. Marker Tapes: Secure tight to surface at location with high visibility and accessibility.

R. Self-Adhesive Vinyl Tape: Secure tight to surface at location with high visibility and accessibility.

1. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for minimum distance of 6 inch where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding.

S. Tape and Stencil: Comply with requirements in painting Sections for surface preparation and paint application.

T. Floor Marking Tape: Apply stripes to finished surfaces following manufacturer's instructions.

U. Underground Line Warning Tape:

1. During backfilling of trenches, install continuous underground-line warning tape not less than 12 inch directly above cables or raceways buried 18 inch or more below grade. Use multiple tapes where width of multiple lines installed in common trench exceeds 16 inch overall.

2. Limit use of underground-line warning tape to direct-buried cables.
3. Install underground-line warning tape for direct-buried cables and cables in raceways.

V. Metal Tags:

1. Place in location with high visibility and accessibility.
2. Secure using UV-stabilized cable ties.

W. Nonmetallic Preprinted Tags:

1. Place in location with high visibility and accessibility.
2. Secure using UV-stabilized cable ties.

X. Write-on Tags:

1. Place in location with high visibility and accessibility.
2. Secure using general-purpose cable ties.

Y. Baked-Enamel Signs: Attach signs that are not self-adhesive type with mechanical fasteners appropriate to location and substrate.

Z. Metal-Backed Butyrate Signs: Attach signs that are not self-adhesive type with mechanical fasteners appropriate to location and substrate.

AA. Laminated Acrylic or Melamine Plastic Signs: Attach signs that are not self-adhesive type with mechanical fasteners appropriate to location and substrate.

END OF SECTION 260553

SECTION 260800 - COMMISSIONING OF ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Electrical equipment connected to Normal electrical systems, including the following:

   a.
   b. Transformers.
   c. **Secondary** service electrical systems.
   d. Distribution and branch-circuit panelboards.
   e. Lightning protection systems.
   f. Grounding systems.

2. Electrical equipment connected to Essential electrical systems that provide an alternative source of power in the absence of power from the Normal electrical system, including the following:

   a. **Secondary** service electrical systems.
   b. Distribution and branch-circuit panelboards.
   c. Grounding systems.
   d. Generators.
   e. UPS.

3. Controls and instrumentation, including the following:

   a. Equipment monitoring systems.
   b. Energy monitoring and control systems.
   c. Electrical metering and metering system.
   d. Demand response systems.
   e. Lighting control systems.
   f. Security systems.
   g. Fire-alarm systems.

4. Systems testing and verification, including Normal and Essential electrical systems, and transitions from Normal to Essential electrical systems and back.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.

1.2 DEFINITIONS

A. BoD: Basis-of-Design Document

B. Cx: Commissioning

C. CxA: Commissioning Authority

D. OPR: Owner's Project Requirements

E. "Systems," "Assemblies," "Subsystems," "Equipment," and "Components": Where these terms are used together or separately, they mean "as-built" systems, assemblies, subsystems, equipment, and components.

1.3 INFORMATIONAL SUBMITTALS

A. Construction Checklists by CxA: Draft construction checklists will be created by CxA for Contractor review.

B. Construction Checklists by Contractor: Include the following for construction checklists:

1. Instrumentation and control for electrical systems.
2. Instrumentation and control for lighting control systems.
3. Low-voltage power cables.
4. Control voltage power cables.
5. Electrical feeders and branch circuits.
6. Dry-type transformers.
7. Instrument transformers.
8. Switchboard assemblies rated 1200 A or greater.
9. Low-voltage motor starters.
10. Low-voltage insulated case circuit breakers.
11. Low-voltage network protectors.
12. Low-voltage air switches.
13. Low-voltage surge protective devices.

14. Protective relays.
15. Metering devices.
16. Molded-case circuit breakers.
17. Low-voltage power circuit breakers.
18. Grounding systems.
19. Ground-fault protection systems.
20. Panelboards.
21. Receptacles and devices.
22. Engine generators.
23. Automatic transfer switches.
24. Variable-frequency drives.
25. AC synchronous motors and generators.
26. AC induction motors and generators.
27. DC motors and generators.
28. Battery systems.

29. Battery chargers.
30. Flooded lead-acid batteries.
31. Flooded lead-calcium batteries.
32. VRLA batteries.
33. UPS systems.
34. Power factor correction equipment, including capacitors, dry-type reactors (both shunt and current-limiting), and liquid-filled reactors (both shunt and current-limiting).
35. Lighting.
36. Vehicle charging equipment.

1.4 QUALITY ASSURANCE

A. Testing Equipment and Instrumentation Quality and Calibration: For test equipment and instrumentation required to perform electrical Cx work, perform the following:

1. Submit test equipment and instrumentation list. For each equipment or instrument, identify the following:

    a. Equipment/instrument identification number.
    b. Planned Cx application or use.
    c. Manufacturer, make, model, and serial number.
    d. Calibration history, including certificates from agencies that calibrate the equipment and instrumentation.

2. Test equipment and instrumentation must meet the following criteria:

    a. Capable of testing and measuring performance within the specified acceptance criteria.
    b. Be calibrated at manufacturer's recommended intervals with current calibration tags permanently affixed to the instrument being used.
    c. Be maintained in good repair and operating condition throughout duration of use on Project.
    d. Be recalibrated/repaired if dropped or damaged in any way since last calibrated.

B. Proprietary Test Instrumentation and Tools:

1. Equipment Manufacturer's Proprietary Instrumentation and Tools: For installed equipment included in the Cx process, test instrumentation and tools manufactured or prescribed by equipment manufacturer to service, calibrate, adjust, repair, or otherwise work on its equipment or required as a condition of equipment warranty, perform the following:

    a. Submit proprietary instrumentation and tools list. For each instrument or tool, identify the following:

        1) Instrument or tool identification number.
        2) Equipment schedule designation of equipment for which the instrument or tool is required.

3) Manufacturer, make, model, and serial number.
4) Calibration history, including certificates from agencies that calibrate the instrument or tool, where appropriate.

b. Include a separate list of proprietary test instrumentation and tools in operation and maintenance manuals.
c. Electrical proprietary test instrumentation and tools become property of Owner at the time of Substantial Completion.

PART 2 - PRODUCTS (Not Used)
PART 3 - EXECUTION

3.1 CONSTRUCTION CHECKLISTS

A. Prepare detailed construction checklists for electrical systems, subsystems, equipment, and components. Complete and submit construction checklists.

3.2 CONSTRUCTION CHECKLIST REVIEW

A. Review and provide written comments on draft construction checklists. CxA will create required draft construction checklists and provide them to Contractor.

B. Return draft Construction Checklist review comments within **10** days of receipt.

C. When review comments have been resolved, CxA will provide final construction checklists, marked "Approved for Use, (date)."

D. Use only construction checklists, marked "Approved for Use, (date)."

3.3 GENERAL TESTING REQUIREMENTS

A. Certify that electrical systems, subsystems, and equipment have been installed, calibrated, and started and that they are operating according to the Contract Documents and approved Shop Drawings and submittals.

B. Certify that electrical instrumentation and control systems have been completed and calibrated, that they are operating according to the Contract Documents and approved Shop Drawings and submittals, and that pretest set points have been recorded.

C. Set systems, subsystems, and equipment into operating mode to be tested according to approved test procedures (for example, normal shutdown, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions).

D. Measure capacities and effectiveness of systems, assemblies, subsystems, equipment, and components, including operational and control functions to verify compliance with acceptance criteria.

E. Test systems, assemblies, subsystems, equipment, and components operating modes,

interlocks, control responses, and responses to abnormal or emergency conditions, and response according to acceptance criteria.

F. Construction Checklists: Prepare and submit detailed construction checklists for electrical systems, subsystems, equipment, and components.

1. Contributors to development of construction checklists must include, but are not limited to, the following:

a. Electrical systems and equipment installers.
b. Electrical instrumentation and controls installers.

G. Perform tests using design conditions, whenever possible.

1. Simulated conditions may, with approval of Architect, be imposed using an artificial load when it is impractical to test under design conditions. Before simulating conditions, calibrate testing instruments. Provide equipment to simulate loads. Set simulated conditions as directed by CxA, and document simulated conditions and methods of simulation. After tests, return configurations and settings to normal operating conditions.
2. Cx test procedures may direct that set points be altered when simulating conditions is impractical.
3. Cx test procedures may direct that sensor values be altered with a signal generator when design or simulating conditions and altering set points are impractical.

H. If tests cannot be completed because of a deficiency outside the scope of the electrical system, document the deficiency and report it to Owner. After deficiencies are resolved, reschedule tests.

I. If seasonal testing is specified, complete appropriate initial performance tests and documentation and schedule seasonal tests.

J. Coordinate schedule with, and perform Cx activities at the direction of the CxA.

K. Comply with Construction Checklist requirements, including material verification, installation checks, startup, and performance tests requirements specified in Sections specifying electrical systems and equipment.

L. Provide qualified testing and inspecting agency personnel in accordance with Section 260010 "Supplemental Requirements for Electrical," instrumentation, tools, and equipment to complete and document the following:

1. Performance tests.
2. Demonstration of a sample of performance tests.
3. Cx tests.
4. Cx test demonstrations.

3.4 Cx TESTS FOR ELECTRICAL SYSTEMS

A. Verification of Normal Electrical System Operation:

1. Prerequisites: Acceptance of results for construction checklists for Division 26 electrical components associated with Normal electrical system.
2. Equipment and Systems to Be Tested: Division 26 electrical equipment.
3. Test Purpose: Verify operation of Normal electrical system.
4. Test Conditions: Energize components of Normal electrical system, one at a time.
5. Acceptance Criteria: Proper operation of Normal electrical system over a **24**-hour period.

B. Verification of Essential Electrical System Operation:

1. Prerequisites:

   a. Acceptance of results for construction checklists for Division 26 electrical components associated with Essential electrical system.
   b. Completion of "Verification of Normal Electrical System Operation" tests.

2. Equipment and Systems to Be Tested: Division 26 electrical equipment.
3. Test Purpose: Verify operation of Essential electrical system.
4. Test Conditions:

   a. Energize components of Normal electrical system.
   b. Simulate a failure of Normal electrical system.

5. Acceptance Criteria: Transfer of power from Normal to Essential electrical system within OPR.

C. Test Purpose: Verify operation of control and monitoring systems for Normal and Essential electrical systems.

D. Test Conditions:

1. Energize components of Normal electrical system.
2. Test operation of equipment.

E. Acceptance Criteria: Operation of equipment according to OPR.

END OF SECTION 260800

SECTION 260923 - LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Time switches.
2. Outdoor photoelectric switches.
3. Daylight-harvesting controls.
4. Occupancy and vacancy sensors.
5. Emergency lighting controls.
6. Lighting Contactors

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" specifies additional coordination, scheduling, sequencing, submittal, and installation requirements applicable to the Work for electrical, communications, and electronic safety and security systems on the Project, including wiring methods.

2. Section 260526 "Grounding and Bonding for Electrical Systems" specifies grounding and bonding of lighting control devices referenced by this Section.
3. Section 260529 "Hangers and Supports for Electrical Systems" specifies hangers and supports referenced by this Section.
4. Section 260553 "Identification for Electrical Systems" specifies electrical equipment labels and warning signs referenced by this Section.
5. **Section 262726 "Wiring Devices"** for wall-box dimmers and manual light switches.

1.2 DEFINITIONS

A. BCELTS: Branch circuit emergency lighting transfer switch.

B. DPDT: Double pole double throw.

C. DPST: Double pole single throw.

D. N.C.: Normally closed.

E. N.O.: Normally open.

F. PIR: Passive infrared.

G. SPDT: Single pole double throw.

H. SPST: Single pole single throw.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Product Listing: Include copy of unexpired approval letter, on letterhead of qualified electrical testing agency, certifying product's compliance with specified listing criteria.

a. If listed manufacturer differs from selling manufacturer, indicate relationship between entities on submittal. Clearly indicate which entity warrants product performance and fitness for purpose.
b. Listing criteria identified in approval letter must match specified listing criteria. UL label indicating approval of equipment's enclosure is not considered approval of equipment for intended application.
c. Product identification in approval letter must match product branding and model numbers in submittal. Approval letters for discontinued or superseded products are unacceptable for submitted product.

2. Include manufacturer's sample extended warranty language.

B. Shop Drawings: Prepare and submit the following:

1. Show installation details for the following:

a. Occupancy sensors.
b. Vacancy sensors.

2. Interconnection diagrams showing field-installed wiring.
3. Diagrams for power, signal, and control wiring.

C. Sustainable Design Submittals:

1. Lighting Control Documentation: Floor plans indicating the following information:

a. As-installed locations of switches and dimmers.
b. Lighting zones and control strategy for each switch or dimmer, including unoccupied time-delay setting for shut-off and override time-delay setting for shut-off.
c. Multilevel or dimming range capability for each switch or dimmer.
d. Which switches or dimmers are operated by occupancy sensors, vacancy sensors, daylighting sensors, or time clocks.

1.4 INFORMATIONAL SUBMITTALS

A. Manufacturer's published instructions.

B. Field Reports:

1. Manufacturer's field reports for field quality-control support.
2. Field reports for software and firmware upgrades.

1.5 CLOSEOUT SUBMITTALS

A. Warranty documentation.

B. Software and firmware service agreement.

1.6 WARRANTY

A. Special Installer Extended Warranty: Installer warrants that installed lighting control devices perform in accordance with specified requirements and agrees to repair or replace components or products that fail to perform as specified within extended-warranty period. Warranty must convey to Owner upon acceptance of the Work.

1. Extended-Warranty Period: **Two** years from date of Substantial Completion; full coverage for labor, materials, and equipment.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements:

1. Products or components listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
2. Must comply with CCR Title 24.

2.2 TIME SWITCHES

A. UL WGZR - Electronic Time Switch:

1. Source Limitations: Obtain products from single manufacturer.
2. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

a. Clock-Operated Switches: UL CCN WGZR, including UL 917.

2.3 OUTDOOR PHOTOELECTRIC SWITCHES

A. UL WJFX - Solid-State Outdoor Photoelectric Switch, Flexible Mounting:

1. Source Limitations: Obtain products from single manufacturer.
2. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

a. Plug-in, Locking-Type Photocontrols: UL CCN WJFX, including UL 773.

3. Standard Features:

a. Solid state, with dry contacts rated to operate connected relay, contactor coils, or microprocessor input; and compatible with drivers and LED lamps.
b. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
c. Light-Level Monitoring Range: **1.5 to 10 fc**, with an adjustment for turn-on and turn-off levels within that range.
d. Time Delay: Fifteen-second minimum, to prevent false operation.
e. Surge Protection: Metal-oxide varistor.
f. Mounting: Twist lock complies with ANSI C136.10, with base-and-stem mounting or stem-and-swivel mounting accessories as required to direct sensor to the north sky exposure.
g. Failure Mode: Luminaire stays ON.

2.4 DAYLIGHT-HARVESTING CONTROLS

A. UL WJCT - Daylight-Harvesting Control Switch:

1. Source Limitations: Obtain products from single manufacturer.
2. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

a. Photoelectric Switches: UL CCN WJCT, including UL 773A.

3. Standard Features:

a. System operates indoor lighting.
b. Ceiling-Mounted Switching Controls:

1) Solid-state, light-level sensor unit, with power pack, that detects changes in indoor lighting levels that are perceived by the eye.

c. Operating Ambient Conditions: Dry interior conditions, **32 to 120 deg F**.
d. Sensor Output:

1) Contacts rated to operate the associated power pack, complying with UL 773A. Sensor must be powered by the power pack.
2) Digital signal compatible with power pack.

e. Sensor Type: **Closed loop**.
f. Zone: **Multi**.
g. Power Pack:

1) Dry contacts rated for **20 A** load at 120 and 277 V(ac), for **13 A** tungsten at 120 V(ac), and for **1 hp** at 120 V(ac). Sensor has 24

V(dc), 150 mA, Class 2 power source.

a) LED status lights to indicate load status.
b) Plenum rated.

2) Digital controller capable of accepting **three** 8PSJ inputs with **two** outputs rated for **20 A** load at 120 and 277 V(ac), for 16 **A driver** at 120 and 277 V(ac), and for **1 hp** at 120 V(ac). Sensor has 24 V(dc) Class 2 power source.

a) With integral current monitoring
b) Compatible with digital addressable lighting interface.
c) Plenum rated.

h. General Space Sensors Light-Level Monitoring Range: **10 to 200 fc**, with an adjustment for turn-on and turn-off levels within that range.
i. Atrium Space Sensors Light-Level Monitoring Range: **100 to 1000 fc**, with an adjustment for turn-on and turn-off levels within that range.
j. Skylight Sensors Light-Level Monitoring Range: **1000 to 10 000 fc**, with an adjustment for turn-on and turn-off levels within that range.
k. Time Delay: Adjustable from 5 to 300 seconds to prevent cycling.
l. Set-Point Adjustment: Equip with deadband adjustment of 25, 50, and 75 percent above the "on" set point, or provide with separate adjustable "on" and "off" set points.
m. Test Mode: User selectable, overriding programmed time delay to allow settings check.
n. Control Load Status: User selectable to confirm that load wiring is correct.
o. Indicator: Two digital displays to indicate the beginning of on-off cycles.

4. Sequence of Operation: As daylight increases, the lights are turned off at a predetermined level. As daylight decreases, the lights are turned on at a predetermined level.

a. Lighting control set point is based on two lighting conditions:

1) When no daylight is present.
2) When significant daylight is present (target level).

b. System programming is done with two handheld, remote-control tools.

B. UL WJCT - Daylight-Harvesting Digital Control Dimmer:

1. Source Limitations: Obtain products from single manufacturer.
2. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

a. Photoelectric Switches: UL CCN WJCT, including UL 773A.

3. Standard Features:

a. Sensing daylight and electrical lighting levels, the system adjusts the indoor electrical lighting levels. As daylight increases, lights are dimmed.
b. System programming is done with two handheld, remote-control tools.

1) Initial setup tool.
2) Tool for occupants to adjust the target levels by increasing the set point up to 25 percent, or by minimizing the electric lighting level.

c. Ceiling-Mounted Dimming Controls: Solid-state, light-level sensor unit, with **separate** power pack, to detect changes in indoor lighting levels that are perceived by the eye.
d. Sensor Output: 0-10 V(dc) to operate luminaires. Sensor is powered by controller unit.
e. Light-Level Sensor Set-Point Adjustment Range: **20 to 60 fc**.
f. Power Pack: Digital controller capable of accepting **three** 8PSJ inputs with **two** output(s) rated for **20 A LED** load at 120 and 277 V(ac), for **13 A** LED Driver load at 120 and 277 V(ac), and for **1 hp** at 120 V(ac). Sensor has 24 V(dc) Class 2 power source.

1) With integral current monitoring.
2) Compatible with digital addressable lighting interface.
3) Plenum rated.

4. Sequence of Operation: Lighting control set point is based on the following two lighting conditions:

a. When no daylight is present (target level).
b. When significant daylight is present.

2.5 OCCUPANCY AND VACANCY SENSORS

A. Dual-Technology, Passive-Infrared (PIR) and Ultrasonic, Occupancy or Vacancy Sensor:

1. Source Limitations: Obtain products from single manufacturer.
2. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for one of the following UL product categories:

a. Energy Management Equipment: UL CCN PAZX, including UL 916 or UL 60730-1.
b. Appliance Controls: UL CCN ATNZ, including UL 60730-1.
c. Intrusion Detection Units: UL CCN ANSR, including UL 639.

3. Standard Features:

a. **Wall-** or **Ceiling**-mounted, solid-state indoor **occupancy and vacancy** sensors.
b. **Separate** power pack.
c. Hardwired or Wireless connection to switch BAS and lighting control

system.

d. Sensitivity Adjustment: Separate for each sensing technology.

e. Detector Sensitivity: Detect occurrences of **6 inch** minimum movement of any portion of a human body that presents a target of not less than **36 sq. inch**, and detect a person of average size and weight moving not less than **12 inch** in either a horizontal or a vertical manner at an approximate speed of **12 inch/s**.

1) Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of **1000 sq. ft** when mounted on a **96 inch** high ceiling.

2) Detection Coverage (Room, Wall Mounted): Detect occupancy anywhere within a 180-degree pattern centered on the sensor over an area of **1000 sq. ft** when mounted **48 inch** above finished floor.

4. Operation:

a. Occupancy Sensor: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.

b. Vacancy Sensor: Unless otherwise indicated, lights are manually turned on and sensor turns lights off when the room is unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.

c. Combination Sensor: Unless otherwise indicated, sensor must be programmed to turn lights on when coverage area is occupied and turn them off when unoccupied, or to turn off lights that have been manually turned on; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.

B. Dual-Technology, Passive-Infrared (PIR) and Passive-Acoustic, Occupancy or Vacancy Sensor:

1. Source Limitations: Obtain products from single manufacturer.

2. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for one of the following UL product categories:

a. Energy Management Equipment: UL CCN PAZX, including UL 916 or UL 60730-1.

b. Appliance Controls: UL CCN ATNZ, including UL 60730-1.

c. Intrusion Detection Units: UL CCN ANSR, including UL 639.

3. Standard Features:

a. **Wall-** or **Ceiling**-mounted, solid-state indoor **occupancy and** m**vacancy** sensors.

b. **Separate** power pack.

c. Hardwired or Wireless connection to switch and BAS and lighting control system.

d. Sensitivity Adjustment: Separate for each sensing technology.

e. Detector Sensitivity: Detect occurrences of **6 inch** minimum movement of any portion of a human body that presents a target of not less than **36 sq. inch**, and detect a person of average size and weight moving not less than **12 inch** in either a horizontal or a vertical manner at an approximate speed of **12 inch/s**.

1) Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of **1000 sq. ft** when mounted on a **96 inch** high ceiling.
2) Detection Coverage (Room, Wall Mounted): Detect occupancy anywhere within a 180-degree pattern centered on the sensor over an area of **1000 sq. ft** when mounted **48 inch** above finished floor.

4. Operation:

a. Occupancy Sensor: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
b. Vacancy Sensor: Unless otherwise indicated, lights are manually turned on and sensor turns lights off when the room is unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
c. Combination Sensor: Unless otherwise indicated, sensor must be programmed to turn lights on when coverage area is occupied and turn them off when unoccupied, or to turn off lights that have been manually turned on; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.

C. Wall-Switch Occupancy Sensor:

1. Source Limitations: Obtain products from single manufacturer.
2. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for one of the following UL product categories:

a. Photoelectric Controls: UL CCN WJCT, including UL 773A.
b. Energy Management Equipment: UL CCN PAZX, including UL 916 or UL 60730-1.
c. Intrusion Detection Units: UL CCN ANSR, including UL 639.

3. Standard Features:

a. Automatic-wall-switch occupancy sensor with manual on-off switch, suitable for mounting in single gang switchbox using hardwired or wireless connection.

1) Occupancy Sensor Operation: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn lights off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
2) Operating Ambient Conditions: Dry interior conditions, **32 to**

120 deg F.

3) Switch Rating: Not less than 800 VA **driver or LED** load at 120 V, 1200 VA **driver or LED** load at 277 V, and 800 W incandescent.

b. Standard Range: 180-degree field of view, field adjustable from 180 to 40 degrees; with a minimum coverage area of **900 sq. ft**.
c. Sensing Technology: **PIR**.
d. Switch Type: Single pole, field-selectable automatic "on," or manual "on," automatic "off."
e. Capable of controlling load in three-way application.
f. Voltage: Match circuit voltage.
g. Ambient-Light Override: Concealed, field-adjustable, light-level sensor from **10 to 150 fc**. Switch prevents lights from turning on when light level is higher than set point of sensor.
h. Time Delay:

1) Concealed, field-adjustable, "off" time-delay selector at up to 30 minutes.
2) Concealed, "off" time-delay selector at 30 seconds and 5, 10, and 20 minutes.

i. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and helps eliminate false "off" switching.
j. Color: White, unless otherwise noted on Architectural drawings.
k. Faceplate: Color matched to switch.

D. High-Bay Occupancy Sensor:

1. Source Limitations: Obtain products from single manufacturer.
2. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

a. Photoelectric Controls: UL CCN WJCT, including UL 773A.

3. Standard Features:

a. Solid-State Unit: Designed to operate with the lamp and ballasts or drivers indicated.
b. Power: Line voltage.

1) Operating Ambient Conditions: **32 to 149 deg F**.
2) Mounting: Threaded pipe.
3) Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
4) Detector Technology: PIR.

c. Detector Coverage: User selectable by interchangeable PIR lenses, suitable for mounting heights from **12 to 50 ft**.

4. Operation: Turn lights on when coverage area is occupied, and to half-power

when unoccupied; with a time delay for turning lights to half-power that is adjustable over a minimum range of 1 to 16 minutes.

5. Accessories: Obtain manufacturer's installation and maintenance kit with laser alignment tool for sensor positioning and power port connectors.

2.6 INDUSTRIAL CONTROL SWITCHES

A. Lighting Contactor:

1. Source Limitations: Obtain products from single manufacturer.
2. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

   a. Industrial Control Switches: UL CCN NRNT, including UL 508.

3. Standard Features:

   a. Electrically operated and **electrically** held, combination-type lighting contactors with **non-fused switch**, complying with NEMA ICS 2.

   b. Current Rating for Switching: Listing or rating consistent with type of load served, including tungsten filament, inductive, and high-inrush driver (driver with 15 percent or less THD of normal load current).
   c. Fault Current Withstand Rating: Equal to or exceeding the available fault current at the point of installation.
   d. Enclosure Rating: Comply with UL 50E.
   e. Provide with control and pilot devices as **indicated on the Drawings**, matching the enclosure rating specified for the enclosure.

   f. Interface with DDC System for HVAC: Provide hardware interface to enable the DDC system for HVAC to monitor and control lighting contactors.

      1) Monitoring: On-off status
      2) Control: On-off operation

2.7 EMERGENCY LIGHTING CONTROLS

A. UL WPWR - Branch Circuit Emergency Lighting Transfer Switch (BCELTS):

1. Source Limitations: Obtain products from single manufacturer.
2. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

   a. Automatic Transfer Switches: UL CCN WPWR, including UL 1008.

3. Standard Features:

a. Automatically transfers emergency lighting load from normal branch circuit to emergency branch circuit in accordance with Article 700 of NFPA 70.
b. Rating: matching branch circuit voltage, not exceeding 20 A.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine lighting control devices before installation. Reject lighting control devices that are wet, moisture damaged, or mold damaged.

B. Examine walls and ceilings for suitable conditions where lighting control devices will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SELECTION OF CONDUCTORS AND CABLES

A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than 12 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than **18 AWG**. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than **14 AWG**. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.3 INSTALLATION OF LIGHTING CONTROL DEVICES

A. Comply with manufacturer's published instructions.

B. Reference Standards for Installation: Unless more stringent installation requirements are specified in the Contract Documents or manufacturer's published instructions, comply with the following:

1. Electrical Construction: ICC IBC, ICC IFC, NFPA 1, NFPA 70, and NECA NEIS 1.
2. Electrical Maintenance: NFPA 70B.
3. Electrical Safety: NFPA 70E.
4. Grounding and Bonding: NECA NEIS 331 and Article 250 of NFPA 70.
5. Communications Work: BICSI N1.
6. Life Safety and Means of Egress Work: NFPA 101.
7. Work in Basements and Other Developed Subterranean Spaces: NFPA 520.
8. Consult Architect for resolution of conflicting requirements.

C. Special Installation Techniques:

1. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.

2. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's instructions.

3. Installation of Industrial Control Switches: Mount electrically held lighting contactors with elastomeric isolator pads to eliminate structure-borne vibration unless contactors are installed in an enclosure with factory-installed vibration isolators.

4. Installation of Wiring:

   a. Conduit: Minimum conduit size is **3/4" inch**.
   b. Wiring within Enclosures: Separate power-limited and nonpower-limited conductors in accordance with conductor manufacturer's published instructions.
   c. Size conductors in accordance with lighting control device manufacturer's published instructions unless otherwise indicated.
   d. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, device, and outlet boxes; terminal cabinets; and equipment enclosures.

D. Interfaces with Other Work:

1. Identification: Provide labels for lighting control devices and associated electrical equipment.

   a. Identify field-installed conductors, interconnecting wiring, and components.
   b. Label each enclosure with engraved metal or laminated-plastic nameplate.
   c. Identify controlled circuits in lighting contactors.
   d. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.
   e. Label time switches and contactors with a unique designation.

3.4 FIELD QUALITY CONTROL

A. Administrant for Electrical Power Tests and Inspections:

1. **Owner** will engage qualified electrical testing and inspecting agency to administer and perform tests and inspections.
2. Engage qualified electrical testing and inspecting agency to administer and perform tests and inspections.
3. Engage factory-authorized service representative to administer and perform tests and inspections on components, assemblies, and equipment installations,

including connections.
4. Administer and perform tests and inspections with assistance of factory-authorized service representative.

B. Administrant for Lighting Tests and Inspections:

1. **Owner** will engage qualified lighting testing and inspecting agency to administer and perform tests and inspections.
2. Engage qualified lighting testing and inspecting agency to administer and perform tests and inspections.
3. Engage factory-authorized service representative to administer and perform tests and inspections on components, assemblies, and equipment installations, including connections.
4. Administer and perform tests and inspections with assistance of factory-authorized service representative.

C. Field tests must be witnessed by Engineer.

D. Tests and Inspections:

1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Nonconforming Work:

1. Lighting control devices will be considered defective if they do not pass tests and inspections.
2. Remove and replace defective units and retest.

F. Field Quality-Control Reports: Collect, assemble, and submit test and inspection reports.

G. Manufacturer Services: Engage factory-authorized service representative to s**upport** field tests and inspections.

1. Manufacturer's Field Reports for Field Quality-Control Support: Prepare and submit report after each visit by factory-authorized service representative, documenting activities performed at the Project site.

3.5 ADJUSTING

A. Occupancy Adjustments: When requested within **12** months from date of Substantial Completion, provide on-site assistance in adjusting lighting control devices to suit actual occupied conditions. Provide up to **two** visits to the Project site during other-than-normal occupancy hours for this purpose. Some of the Work may be required during hours of darkness.

1. For occupancy and motion sensors, verify operation at outer limits of detector

range. Set time delay to suit Owner's operations.
2. For daylighting controls, adjust set points and deadband controls to suit Owner's operations.
3. Align high-bay occupancy sensors using manufacturer's laser aiming tool.

3.6 CLOSEOUT ACTIVITIES

A. Demonstration:

1. **Demonstrate** to Owner's maintenance and clerical personnel how to operate the following systems and equipment:

a. Lighting control devices.

B. Training:

1. **Train** Owner's maintenance personnel on the following topics:

a. How to adjust, operate, and maintain lighting control devices.

3.7 MAINTENANCE

A. Software and Firmware Service Agreement:

1. Technical Support: Beginning at Substantial Completion, verify that software and firmware service agreement includes software support for **two** years.
2. Upgrade Service: At Substantial Completion, update software and firmware to latest version. Install and program software upgrades that become available within **two** years from date of Substantial Completion. Verify upgrading software includes operating system and new or revised licenses for using software.

a. Upgrade Notice: Not less than **30 days**; to allow Owner to schedule and access the system.

3. Field Reports for Software and Firmware Upgrades: Prepare and submit report after each update, documenting upgrades installed.

END OF SECTION 260923

SECTION 262416 - PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Panelboards.
2. Disconnecting and overcurrent protective devices.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" specifies additional abbreviations, definitions, submittals, qualifications, testing agencies, and other requirements applicable to the Work for electrical, communications, and electronic safety and security systems on Project, including wiring methods.

2. Section 260529 "Hangers and Supports for Electrical Systems" specifies concrete bases and supports for panelboards installed by this Section.
3. Section 260553 "Identification for Electrical Systems" specifies electrical equipment labels and warning signs installed by this Section.
4. Section 260573 "Power System Studies" specifies short-circuit current studies, overcurrent protective device coordination studies, and arc-flash hazard analysis studies.
5. Section 262813 "Fuses" specifies fuses and spare-fuse cabinets installed by this Section.
6. Section 264313 "Surge Protective Devices for Low-Voltage Electrical Power Circuits" specifies Type 1 and Type 2 surge protective devices installed by this Section.

1.2 DEFINITIONS

A. MCCB: Molded-case circuit breaker.

B. VPR: Voltage protection rating.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. In addition to information identified in Section 013300 "Submittal Procedures," submit the following:

1. Product Listing: Include copy of unexpired approval letter, on letterhead of qualified electrical testing agency, certifying product's compliance with specified listing criteria.

2. Include manufacturer's sample extended warranty language.

B. Shop Drawings: For each panelboard and related equipment:

1. Include dimensioned plans, elevations, sections, and details.
2. Show tabulations of installed devices with nameplates, conductor termination sizes, equipment features, and ratings.
3. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.
4. Detail bus configuration, current, and voltage ratings.
5. Short-circuit current rating of panelboards and overcurrent protective devices.

6. Include evidence of listing, by qualified electrical testing laboratory recognized by authorities having jurisdiction, for series rating of installed devices.

7. Include evidence of listing, by qualified electrical testing laboratory recognized by authorities having jurisdiction, for SPD as installed in panelboard.
8. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
9. Include wiring diagrams for power, signal, and control wiring.
10. Key interlock scheme drawing and sequence of operations.

11. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device. Include Internet link for electronic access to downloadable PDF of coordination curves.

C. Field quality-control reports.

1.4 INFORMATIONAL SUBMITTALS

A. Panelboard Schedules: For installation in panelboards.

B. Manufacturer's published instructions.

C. Field Reports:

1. Manufacturer's field reports for field quality-control support.
2. Field reports for voltage monitoring and adjusting.
3. Field reports for infrared scanning.

1.5 CLOSEOUT SUBMITTALS

A. Warranty documentation.

1.6 QUALIFICATIONS

A. Low-Voltage Electrical Testing and Inspecting Agency: Entities possessing active credentials from a qualified electrical testing laboratory recognized by authorities

having jurisdiction.

1. On-site electrical testing supervisors must have documented certification and experience with testing electrical equipment in accordance with NETA testing standards.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.

B. Handle and prepare panelboards for installation in accordance with **NEMA PB 1**.

1.8 WARRANTY

A. Special Installer Extended Warranty: Installer warrants that fabricated and installed panelboards perform in accordance with specified requirements and agrees to repair or replace components or products that fail to perform as specified within extended-warranty period.

1. Extended-Warranty Period: **Two** years from date of Substantial Completion; full coverage for labor, materials, and equipment.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Products or components listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

B. Fabricate and test panelboards in accordance with IEEE 344 to withstand seismic forces specified in Section 018123 "Facility Seismic and Wind Criteria."

C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

D. Comply with NEMA PB 1.

E. Enclosures: **Flush and Surface**-mounted, dead-front cabinets.

1. Rated for environmental conditions at installed location.

a. Indoor Dry and Clean Locations: UL 50E, **Type 1**.
b. Outdoor Locations: UL 50E, **Type 3R**.
c. Kitchen and Wash-Down Areas: UL 50E, **Type 4X**, **stainless steel**.

d. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: UL 50E, T**ype 12**.

2. Height: **7 ft** maximum.

3. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box. Trims must cover live parts and may have no exposed hardware.
4. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims must cover live parts and may have no exposed hardware.

5. Skirt for Surface-Mounted Panelboards: Same gage and finish as panelboard front with flanges for attachment to panelboard, wall, and ceiling or floor.
6. Gutter Extension and Barrier: Same gage and finish as panelboard enclosure; integral with enclosure body. Arrange to isolate individual panel sections.

7. Finishes:

a. Panels and Trim: **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. Back Boxes: Same finish as panels and trim.

c. Fungus Proofing: Permanent fungicidal treatment for overcurrent protective devices and other components.

F. Phase, Neutral, and Ground Buses:

1. Material: Tin-plated aluminum.

a. Plating must run entire length of bus.
b. Bus must be fully rated for entire length.

2. Interiors must be factory assembled into unit. Replacing switching and protective devices may not disturb adjacent units or require removing main bus connectors.

3. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.

G. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Tin-plated aluminum.
2. Terminations must 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, with lug on neutral bar for each pole in panelboard.

5. Ground Lugs and Bus-Configured Terminators: **Mechanical** type, with lug on bar for each pole in panelboard.

H. Quality-Control Label: Panelboards or load centers must be labeled, by qualified electrical testing laboratory recognized by authorities having jurisdiction, for use as service equipment with one or more main service disconnecting and overcurrent protective devices. Panelboards or load centers must have meter enclosures, wiring, connections, and other provisions for utility metering. Coordinate with utility company for exact requirements.

I. Future Devices: Panelboards or load centers must have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

1. Percentage of Future Space Capacity: 15 percent or as indicated on drawings, whichever is greater.

J. Panelboard Short-Circuit Current Rating:

1. Rated for series-connected system with integral or remote upstream overcurrent protective devices and labeled by qualified electrical testing laboratory recognized by authorities having jurisdiction. Include label or manual with size and type of allowable upstream and branch devices listed and labeled, by qualified electrical testing laboratory recognized by authorities having jurisdiction, for series-connected short-circuit rating.

a. Panelboards rated 240 V or less must have short-circuit ratings as shown on Drawings, but not less than 10 000 A(rms) symmetrical.
b. Panelboards rated above 240 V and less than 600 V must have short-circuit ratings as shown on Drawings, but not less than 14 000 A(rms) symmetrical.

2. Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed, by qualified electrical testing laboratory recognized by authorities having jurisdiction, for 100 percent interrupting capacity.

a. Panelboards and overcurrent protective devices rated 240 V or less must have short-circuit ratings as shown on Drawings, but not less than 10 000 A(rms) symmetrical.
b. Panelboards and overcurrent protective devices rated above 240 V and less than 600 V must have short-circuit ratings as shown on Drawings, but not less than 14 000 A(rms) symmetrical.

2.2 PANELBOARDS

A. UL QEUY - Distribution Panelboard:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following:**

a. ABB, Electrification Business
b. Eaton
c. Siemens Industry, Inc., Energy Management Division

d. Square D; Schneider Electric USA
e. LS Electric America

2. Source Limitations: Obtain products from single manufacturer.
3. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

   a. Distribution Type Panelboards: UL CCN QEUY; including UL 67 and NEMA PB 1.

4. Standard Features:

   a. Doors: Secured with vault-type latch with tumbler lock; keyed alike.

      1) For doors more than **36 inch** high, provide two latches, keyed alike.

   b. Mains: As indicated on drawings.

      1) Location: As indicated on drawings.
      2) Main Breaker: Main lug interiors up to 400 A must be field convertible to main breaker.

   c. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: **Bolt-on circuit breakers**.
   d. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: **Bolt-on circuit breakers**.
   e. Branch Overcurrent Protective Devices: Fused switches.

5. Other Available Features Required by Project:

   a. Surge Suppression: Factory installed as integral part of indicated panelboards, complying with UL 1449 SPD **Type 2**.

   b. Isolated Ground Bus: Adequate for branch-circuit isolated ground conductors; insulated from box.

   c. Full-Sized Neutral: Equipped with full-capacity bonding strap for service entrance applications. Mount electrically isolated from enclosure.
   d. Extra-Capacity Neutral Bus: Neutral bus rated 200 percent of phase bus and listed and labeled, by qualified electrical testing laboratory recognized by authorities having jurisdiction, as suitable for nonlinear loads in electronic-grade panelboards and others designated on Drawings. Connectors must be sized for double-sized or parallel conductors as indicated on Drawings.
   e. Do not mount neutral bus in gutter.
   f. Feed-Through Lugs: mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.

   g. Subfeed (Double) Lugs: **Mechanical** type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.

h. Gutter-Tap Lugs: **Mechanical** type suitable for use with conductor material and with matching insulating covers. Locate at same end of bus as incoming lugs or main device.
i. Extra-Capacity Neutral Lugs: Rated 200 percent of phase lugs mounted on extra-capacity neutral bus.

j. Split Bus: Vertical buses divided into individual vertical sections.

1) Contactors in Main Bus: NEMA ICS 2, Class A, **electrically** held, general-purpose controller, with same short-circuit interrupting rating as panelboard.

a) Internal Control-Power Source: Control-power transformer, with fused primary and secondary terminals, connected to main bus ahead of contactor connection.
b) External Control-Power Source: **120 V branch circuit**Copy and revise first paragraph below for each configuration indicated on the Drawings.

B.

C. UL QEUY - Lighting and Appliance Branch-Circuit Panelboard:

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following:**

a. ABB, Electrification Business
b. Eaton
c. Siemens Industry, Inc., Energy Management Division
d. Square D; Schneider Electric USA
e. LS Electric America

2. Source Limitations: Obtain products from single manufacturer.
3. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

a. Lighting and Appliance Branch-Circuit Type Panelboards: UL CCN QEUY; including UL 67 and NEMA PB 1.

4. Standard Features:

a. Mains: As indicated on drawings.

1) Location: As indicated on drawings.
2) Main Breaker: Main lug interiors up to 400 A must be field convertible to main breaker.

b. Branch Overcurrent Protective Devices: **Bolt-on** circuit breakers, replaceable without disturbing adjacent units.

5. Other Available Features Required by Project:

   a. Surge Suppression: Factory installed as integral part of indicated panelboards, complying with UL 1449 SPD **Type 2**.

   b. Isolated Ground Bus: Adequate for branch-circuit isolated ground conductors; insulated from box.

   c. Full-Sized Neutral: Equipped with full-capacity bonding strap for service entrance applications. Mount electrically isolated from enclosure.
   d. Extra-Capacity Neutral Bus: Neutral bus rated 200 percent of phase bus and listed and labeled, by qualified electrical testing laboratory recognized by authorities having jurisdiction, as suitable for nonlinear loads in electronic-grade panelboards and others designated on Drawings. Connectors must be sized for double-sized or parallel conductors as indicated on Drawings.
   e. Do not mount neutral bus in gutter.
   f. Feed-Through Lugs: **Mechanical** type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.

   g. Subfeed (Double) Lugs: **Mechanical** type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
   h. Gutter-Tap Lugs: **Mechanical** type suitable for use with conductor material and with matching insulating covers. Locate at same end of bus as incoming lugs or main device.
   i. Extra-Capacity Neutral Lugs: Rated 200 percent of phase lugs mounted on extra-capacity neutral bus.

   j. Split Bus: Vertical buses divided into individual vertical sections.

      1) Contactors in Main Bus: NEMA ICS 2, Class A, **electrically** held, general-purpose controller, with same short-circuit interrupting rating as panelboard.

         a) Internal Control-Power Source: Control-power transformer, with fused primary and secondary terminals, connected to main bus ahead of contactor connection.
         b) External Control-Power Source: **120 V branch circuit**

   k. Doors: Door-in-door construction with concealed hinges; secured with **flush or multipoint** latch with tumbler lock; keyed alike.

2.3 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. 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: Magnetic trip element with front-mounted, field-adjustable trip setting.
3. Electronic Trip Circuit Breakers:

a. RMS sensing.
b. Field-replaceable rating plug or 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 must be recorded with type, phase, and magnitude of fault that caused trip.
f. Integral test jack for connection to portable test set or laptop computer.
g. Field-Adjustable Settings:

1) Instantaneous trip.
2) Long- and short-time pickup levels.
3) Long- and short-time adjustments.
4) Ground-fault pickup level, time delay, and I squared T response.

4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.

5. GFCI Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (6 mA trip).
6. GFPE Circuit Breakers: Class B ground-fault protection (30 mA trip).
7. Arc-Fault Circuit Interrupter Circuit Breakers: Comply with UL 1699; 120/240 V, single-pole configuration.
8. Subfeed Circuit Breakers: Vertically mounted.
9. MCCB Features and Accessories:

a. Standard frame sizes, trip ratings, and number of poles.
b. Breaker handle indicates tripped status.
c. UL listed for reverse connection without restrictive line or load ratings.

d. Lugs: **Mechanical** style, suitable for number, size, trip ratings, and conductor materials.
e. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and HID lighting circuits.

f. Ground-Fault Protection: **Integrally mounted** relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
g. Communication Capability: **Circuit-breaker-mounted** communication module with functions and features compatible with power monitoring and control system.

h. Shunt Trip: **120 V** trip coil energized from separate circuit, set to trip at **55** percent of rated voltage.

i. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in **on or off** position.

j. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.

k. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage **without intentional** time delay.

l. Rating Plugs: Three-pole breakers with ampere ratings greater than **150** A must have interchangeable rating plugs or electronic adjustable trip units.

B. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.

1. Provide fuses and spare fuse cabinet.
2. Fused Switch Features and Accessories:

a. Standard ampere ratings and number of poles.

b. Mechanical cover interlock with manual interlock override, to prevent opening of cover when switch is in on position. Interlock must prevent switch from being turned on with cover open. Operating handle must have lock-off means with provisions for three padlocks.

2.4 MAINTENANCE MATERIAL ITEMS

A. Spare Parts: Furnish to Owner spare parts, for repairing panelboards and related equipment, that are packaged with protective covering for storage on-site and identified with labels describing contents.

1. Keys: **Two** spares for each type of panelboard cabinet lock.
2. Circuit Breakers Including GFCI and GFPE Types: Two spares for each panelboard.
3. Fuses for Fused Switches: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
4. Fuses for Fused Power-Circuit Devices: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.

B. Special Tools: Furnish to Owner proprietary equipment, keys, and software required to operate, maintain, repair, adjust, or implement future changes to panelboards and related equipment, that are packaged with protective covering for storage on-site and identified with labels describing contents.

1. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

2. Portable Test Set: For testing functions of solid-state trip devices without removing from panelboard. Include relay and meter test plugs suitable for testing panelboard meters and switchboard class relays.

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 in accordance with **NEMA PB 1.1**.

C. Examine panelboards before installation. Reject panelboards that are damaged, 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.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's published instructions.

B. Reference Standards:

1. Panelboards: Unless more stringent requirements are specified in Contract Documents or manufacturers' published instructions, comply with **NEMA PB 1.1**.
2. Consult Architect for resolution of conflicting requirements.

C. Special Techniques:

1. Equipment Mounting:

a. Install floor-mounted panelboards on cast-in-place concrete equipment base(s).

b. Attach panelboard to vertical finished or structural surface behind panelboard.

c. Mount surface-mounted panelboards to steel slotted supports **5/8 inch** minimum in depth. Orient steel slotted supports vertically.

d. Provide seismic control devices.

2. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.

3. Provide mounting and anchoring devices.

4. Mount top of trim **7.5 ft** above finished floor unless otherwise indicated.
5. Mount panelboard cabinet plumb and rigid without distortion of box.

6. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
7. Install overcurrent protective devices and controllers not already factory installed.

    a. Set field-adjustable, circuit-breaker trip ranges.
    b. Tighten bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver in accordance with manufacturer's published instructions.

8. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.
9. Install filler plates in unused spaces.

10. Stub four **1 inch** empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in future. Stub four **1 inch** empty conduits into raised floor space or below slab not on grade.

11. Arrange conductors in gutters into groups and bundle and wrap with wire ties **after completing load balancing**.
12. Mount spare fuse cabinet in accessible location.

D. Interfaces with Other Work:

1. 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.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components.

B. Install warning signs.

C. Panelboard Nameplates: Label each panelboard with nameplate.

D. Device Nameplates: Label each branch circuit device in power panelboards with nameplate.

E. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles must be located on interior of panelboard door.

F. Breaker Labels: Faceplate must list current rating, UL and IEC certification standards, and AIC rating.

G. Circuit Directory:

1. Provide directory card inside panelboard door, mounted in **transparent card**

holder.

a. Circuit directory must identify specific purpose with detail sufficient to distinguish it from other circuits.

2. Provide computer-generated circuit directory mounted inside panelboard door with transparent plastic protective cover.

   a. Circuit directory must identify specific purpose with detail sufficient to distinguish it from other circuits.

3. Create directory to indicate installed circuit loads **after balancing panelboard loads**; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.

3.4 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.

C. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes. Prior to making circuit changes to achieve load balancing, inform Architect of effect on phase color coding.

1. Measure loads during period of normal facility operations.
2. Perform circuit changes to achieve load balancing outside normal facility operation schedule or at times directed by Architect. Avoid disrupting services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
3. After changing circuits to achieve load balancing, recheck loads during normal facility operations. Record load readings before and after changing circuits to achieve load balancing.
4. Tolerance: Maximum difference between phase loads, within panelboard, may not exceed 20 percent.

3.5 PROTECTION

A. Temporary Heating: Prior to energizing panelboards, apply temporary heat to maintain temperature in accordance with manufacturer's published instructions.

END OF SECTION 262416

SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. General-use switches, dimmer switches, and fan-speed controller switches.
2. General-grade single straight-blade receptacles.
3. General-grade duplex straight-blade receptacles.
4. Receptacles with arc-fault and ground-fault protective devices.
5. Locking receptacles.
6. Connectors, cords, and plugs.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" specifies additional coordination, scheduling, sequencing, submittal, and installation requirements applicable to the Work for electrical, communications, and electronic safety and security systems on the Project, including wiring methods.

2. Section 260526 "Grounding and Bonding for Electrical Systems" specifies grounding and bonding referenced by this Section.

3. Section 260533.16 "Boxes and Covers for Electrical Systems" specifies covers and cover plates referenced by this Section.
4. Section 260553 "Identification for Electrical Systems" specifies electrical equipment labels and warning signs referenced by this Section.
5. Section 260923 "Lighting Control Devices" for occupancy sensors, timers, control-voltage switches, and control-voltage dimmers.

1.2 DEFINITIONS

A. AFCI: Arc-Fault Circuit Interrupter.

B. Commercial/Industrial-Use Cord Reel: A cord reel subject to severe use in factories, commercial garages, construction sites, and similar locations requiring a harder service-type cord.

C. GFCI: Ground-Fault Circuit Interrupter.

D. UL 1472 Type I Dimmer: Dimmer in which air-gap switch is used to energize preset lighting levels.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Product Listing: Include copy of unexpired approval letter, on letterhead of qualified electrical testing agency, certifying product's compliance with specified listing criteria.

a. If listed manufacturer differs from selling manufacturer, indicate relationship between entities on submittal. Clearly indicate which entity warrants product performance and fitness for purpose.
b. Listing criteria identified in approval letter must match specified listing criteria. UL label indicating approval of equipment's enclosure is not considered approval of equipment for intended application.
c. Product identification in approval letter must match product branding and model numbers in submittal. Approval letters for discontinued or superseded products are not acceptable for submitted product.

2. Include manufacturer's sample extended warranty language.

B. Shop Drawings:

1. Wiring diagrams for duplex straight-blade receptacles with integral switching means.

C. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Warranty documentation.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Extra stock material.

B. Special tools.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Products or components listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

2.2 GENERAL-USE SWITCHES, DIMMER SWITCHES, AND FAN-SPEED CONTROLLER SWITCHES

A. Toggle Switch:

1. Source Limitations: Obtain products from single manufacturer.

2. Listing Criteria: UL CCN WMUZ and UL 20.
3. Standard Features:

a. Device Color: As indicated on architectural Drawings.
b. Configuration:

1) General-duty, 120-277 V, 15 A
2) General-duty, 120-277 V, 20 A
3) Extra-heavy-duty, 120-277 V, 15 A
4) Extra-heavy-duty, 120-277 V, 20 A
5) Extra-heavy-duty, 120-277 V, 30 A

4. Accessories:

a. Cover Plate: **0.060 inch** thick, high-impact thermoplastic (nylon) with smooth finish and color matching wiring device; from same manufacturer as wiring device.
b. Securing Screws for Cover Plate: Metal with head color matching wallplate finish.

B. Type I Dimmer Switch:

1. Source Limitations: Obtain products from single manufacturer.

2. Listing Criteria: UL CCN EOYX and UL 1472.
3. Standard Features:

a. UL 1472 Type I dimmer.

b. Device Color: As indicated on architectural Drawings.
c. Switch Style: **Toggle**.
d. Dimming Control Style: **Slide.**

4. Accessories:

a. Cover Plate: **0.060 inch** thick, high-impact thermoplastic (nylon) with smooth finish and color matching wiring device; from same manufacturer as wiring device.
b. Securing Screws for Cover Plate: Metal with head color matching wallplate finish.

2.3 GENERAL-GRADE SINGLE STRAIGHT-BLADE RECEPTACLES

A. Single Straight-Blade Receptacle:

1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

   a. Receptacles for Plugs and Attachment Plugs: UL CCN RTRT and UL 498.

2. Accessories:

   a. Cover Plate: **0.060 inch** thick, high-impact thermoplastic (nylon) with smooth finish and color matching wiring device; from same manufacturer as wiring device.
   b. Securing Screws for Cover Plate: Metal with head color matching wallplate finish.

2.4 GENERAL-GRADE DUPLEX STRAIGHT-BLADE RECEPTACLES

1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

   a. Receptacles for Plugs and Attachment Plugs: UL CCN RTRT and UL 498.
   b. Surge Protective Devices: UL 1449, Type 3.

2. Standard Features:

   a. Device Color: As indicated on architectural Drawings.
   b. Configuration: Heavy-duty, NEMA 5-20R.

3. Accessories:

   a. Cover Plate: **0.060 inch** thick, high-impact thermoplastic (nylon) with smooth finish and color matching wiring device; from same manufacturer as wiring device.
   b. Securing Screws for Cover Plate: Metal with head color matching wallplate finish.

B. Tamper-Resistant Duplex Straight-Blade Receptacle:

1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

   a. Receptacles for Plugs and Attachment Plugs: UL CCN RTRT and UL 498.
   b. Surge Protective Devices: UL 1449, Type 3.

2. Standard Features:

a. Device Color: As indicated on architectural Drawings.
b. Configuration: Heavy-duty, NEMA 5-20R.

3. Accessories:

a. Cover Plate: **0.060 inch** thick, high-impact thermoplastic (nylon) with smooth finish and color matching wiring device; from same manufacturer as wiring device.
b. Securing Screws for Cover Plate: Metal with head color matching wallplate finish.

2.5 RECEPTACLES WITH ARC-FAULT AND GROUND-FAULT PROTECTIVE DEVICES

A. General-Grade, Tamper-Resistant Duplex Straight-Blade Receptacle with AFCI Device:

1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

a. Outlet Branch-Circuit Type AFCIs: UL CCN AWBZ, UL 498, UL 1699, and UL Subject 1699A.

2. Standard Features:

a. Device Color: As indicated on architectural Drawings.

3. Accessories:

a. Cover Plate: **0.060 inch** thick, high-impact thermoplastic (nylon) with smooth finish and color matching wiring device; from same manufacturer as wiring device.
b. Securing Screws for Cover Plate: Metal with head color matching wallplate finish.

B. General-Grade, Tamper-Resistant Duplex Straight-Blade Receptacle with AFCI and GFCI Device:

1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

a. Outlet Branch-Circuit Type GFCIs and AFCIs: UL CCN KCXX, UL 498, UL 943, UL 1699, and UL Subject 1699A.

2. Standard Features:

a. Device Color: As indicated on architectural Drawings.
b. Configuration: Heavy-duty, NEMA 5-20R.

3. Accessories:

   a. Cover Plate: **0.060 inch** thick, high-impact thermoplastic (nylon) with smooth finish and color matching wiring device; from same manufacturer as wiring device.
   b. Securing Screws for Cover Plate: Metal with head color matching wallplate finish.

C. General-Grade, Weather-Resistant, Tamper-Resistant Duplex Straight-Blade Receptacle with GFCI Device:

1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

   a. Receptacle GFCIs: UL CCN KCXS, UL 498, and UL 943.

2. Standard Features:

   a. Device Color: As indicated on architectural Drawings.
   b. Configuration: Heavy-duty, **NEMA 5-20R**.

3. Accessories:

   a. Cover Plate: **0.060 inch** thick, high-impact thermoplastic (nylon) with smooth finish and color matching wiring device; from same manufacturer as wiring device.
   b. Securing Screws for Cover Plate: Metal with head color matching wallplate finish.

2.6 LOCKING RECEPTACLES

A. UL RTRT - NEMA, 125 V, Locking Receptacle:

1. Source Limitations: Obtain products from single manufacturer.
2. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:

   a. Receptacles for Plugs and Attachment Plugs: UL CCN RTRT and UL 498.

3. Standard Features:

   a. Device Color: Black with yellow voltage indication on face.
   b. Configuration: As shown on drawings.

B. UL RTRT - NEMA, 250 V, Locking Receptacle:

1. Source Limitations: Obtain products from single manufacturer.
2. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing

laboratory in accordance with guide information and standards specified for the following UL product categories:

a. Receptacles for Plugs and Attachment Plugs: UL CCN RTRT and UL 498.

3. Standard Features:

a. Device Color: Black with blue voltage indication on face.
b. Configuration: As shown on drawings.

2.7 SPECIAL-PURPOSE POWER OUTLET ASSEMBLIES

A. Power Outlet Cord Management Assembly

1. Source Limitations: Obtain all components for each power outlet cord management assembly from single manufacturer.
2. General Characteristics: Provide the following specified products with fabricated power outlet cord management assembly:

a. Cord Management System:

1) Spring-driven commercial/industrial-use cord reel, <**Insert wire size**> conductors .
2) Cord reel for use in Class I Group D hazardous location .

b. Termination Fitting:

1) Owner-furnished fitting.

2) Outdoor-use, watertight, sealed cord connector;

c. Mounting: As shown on drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Receptacles:

1. Verify that receptacles to be procured and installed for Owner-furnished equipment are compatible with mating attachment plugs on equipment.

B. Cord Reels:

1. Examine roughing-in for cord reel mounting and power connections to verify actual locations of mounts and power connections before cord reel installation.
2. Examine walls, floors, and ceilings for suitable conditions where cord reel will be installed.
3. Proceed with installation only after unsatisfactory conditions have been

corrected.

3.2 SELECTION OF CONTROLLED AND UNCONTROLLED RECEPTACLES

A. Private and Open Office Spaces:

1. Uncontrolled Receptacles at Workstations: Coordinate final locations of receptacles with furniture plan such that at least one uncontrolled receptacle is selected for installation not greater than 6 ft. (1.8 m) from each workstation.
2. Controlled Receptacles at Workstations: Coordinate final locations of receptacles with furniture plan such that at least one controlled receptacle is selected for installation not greater than 6 ft. (1.8 m) from each workstation.
3. Contact Architect for resolution of discrepancies between these requirements and Drawings.

3.3 SELECTION OF GFCI RECEPTACLES

A. Healthcare Facilities: Unless protection of downstream branch-circuit wiring, cord sets, and power-supply cords is required by NFPA 70 or NFPA 99, provide non-feed-through GFCI receptacles.

3.4 INSTALLATION OF SWITCHES

A. Comply with manufacturer's published instructions.

B. Reference Standards for Installation: Unless more stringent installation requirements are specified in the Contract Documents or manufacturer's published instructions, comply with the following:

1. Electrical Construction: ICC IBC, ICC IFC, NFPA 1, NFPA 70, and NECA NEIS 1.
2. Electrical Safety: NFPA 70E.
3. Life Safety and Means of Egress Work: NFPA 101.
4. Work in Basements and Other Developed Subterranean Spaces: NFPA 520.
5. Wiring Devices: NECA NEIS 130.
6. Mounting Heights: NECA NEIS 1.
7. Consult Architect for resolution of conflicting requirements.

C. Interfaces with Other Work:

1. Identification:

a. Identify cover or cover plate for device with panelboard identification and circuit number.

b. Mark cover or cover plate using hot, stamped, or engraved machine printing with **black**-filled lettering, and provide durable wire markers or tags inside device box or outlet box.
c. Provide warning signs and arc-flash hazard warning labels for electrical

equipment.

d. Healthcare Facilities: Distinctively identify covers or cover plates of device boxes and outlet boxes that are supplied from life safety and critical branch power supplies following facility's standard practice.

3.5 INSTALLATION OF STRAIGHT-BLADE RECEPTACLES

A. Comply with manufacturer's published instructions.

B. Reference Standards for Installation: Unless more stringent installation requirements are specified in the Contract Documents or manufacturer's published instructions, comply with the following:

1. Electrical Construction: ICC IBC, ICC IFC, NFPA 1, NFPA 70, and NECA NEIS 1.
2. Electrical Safety: NFPA 70E.
3. Grounding and Bonding: NECA NEIS 331 and Article 250 of NFPA 70.
4. Work in ITE Rooms: NFPA 75.
5. Work in Health Care Facilities: NFPA 99 and Article 517 of NFPA 70.
6. Work in Confined Spaces: NFPA 350.
7. Work in Basements and Other Developed Subterranean Spaces: NFPA 520.
8. Installing and Maintaining Wiring Devices: NECA NEIS 130.
9. Mounting Heights: Unless otherwise indicated in the Contract Documents, comply with mounting heights recommended in NECA NEIS 1.
10. Receptacle Orientation: Unless otherwise indicated in the Contract Documents, orient receptacle to match configuration diagram in NEMA WD 6.

    a. Hospital-Grade Receptacle Orientation: Orient receptacle with ground pin or neutral pin at top.

11. Consult Architect for resolution of conflicting requirements.

C. Interfaces with Other Work:

1. Identification: Provide labels for receptacles and associated electrical equipment.

    a. Identify field-installed conductors, interconnecting wiring, and components.
    b. Label each enclosure with engraved metal or laminated-plastic nameplate.

        1) Identify cover or cover plate for device with panelboard identification and circuit number.

        2) Mark cover or cover plate using hot, stamped, or engraved machine printing with **black**-filled lettering, and provide durable wire markers or tags inside device box or outlet box.

    c. Provide warning signs and arc-flash hazard warning labels for electrical

equipment.

d. Healthcare Facilities: Distinctively identify covers or cover plates of device boxes and outlet boxes that are supplied from life safety and critical branch power supplies following facility's standard practice.

2. Do not install Type 3 SPD, including surge-protected relocatable taps and power strips, on branch circuit downstream of GFCI device.

3.6 INSTALLATION OF LOCKING RECEPTACLES

A. Comply with manufacturer's published instructions.

B. Reference Standards for Installation: Unless more stringent installation requirements are specified in the Contract Documents or manufacturer's published instructions, comply with the following:

1. Electrical Construction: ICC IBC, ICC IFC, NFPA 1, NFPA 70, and NECA NEIS 1.
2. Electrical Safety: NFPA 70E.
3. Grounding and Bonding: NECA NEIS 331 and Article 250 of NFPA 70.
4. Work in ITE Rooms: NFPA 75.
5. Work in Health Care Facilities: NFPA 99 and Article 517 of NFPA 70.
6. Work in Confined Spaces: NFPA 350.
7. Work in Basements and Other Developed Subterranean Spaces: NFPA 520.
8. Installing and Maintaining Wiring Devices: NECA NEIS 130.
9. Mounting Heights: Unless otherwise indicated in the Contract Documents, comply with mounting heights recommended in NECA NEIS 1.
10. Receptacle Orientation: Unless otherwise indicated in the Contract Documents, orient receptacle to match configuration diagram in NEMA WD 6.
11. Consult Architect for resolution of conflicting requirements.

C. Interfaces with Other Work:

1. Identification: Provide labels for receptacles and associated electrical equipment.

a. Identify field-installed conductors, interconnecting wiring, and components.
b. Label each enclosure with engraved metal or laminated-plastic nameplate.

1) Identify cover or cover plate for device with panelboard identification and circuit number.

2) Mark cover or cover plate using hot, stamped, or engraved machine printing with **black**-filled lettering, and provide durable wire markers or tags inside device box or outlet box.

c. Provide warning signs and arc-flash hazard warning labels for electrical equipment.

d. Healthcare Facilities: Distinctively identify covers or cover plates of device boxes and outlet boxes that are supplied from life safety and critical branch power supplies following facility's standard practice.

3.7 INSTALLATION OF CORD REELS AND FITTINGS

A. Comply with manufacturer's published instructions.

B. Reference Standards for Installation: Unless more stringent installation requirements are specified in the Contract Documents or manufacturer's published instructions, comply with the following:

1. Electrical Construction: ICC IBC, ICC IFC, NFPA 1, NFPA 70, and NECA NEIS 1.
2. Electrical Maintenance: NFPA 70B.
3. Electrical Safety: NFPA 70E.
4. Hot Work: NFPA 51B.
5. Grounding and Bonding: NECA NEIS 331 and Article 250 of NFPA 70.
6. Work in Confined Spaces: NFPA 350.
7. Work in Basements and Other Developed Subterranean Spaces: NFPA 520.

3.8 INSTALLATION OF CONNECTORS, CORDS, AND PLUGS

A. Comply with manufacturer's published instructions.

B. Reference Standards for Installation: Unless more stringent installation requirements are specified in the Contract Documents or manufacturer's published instructions, comply with the following:

1. Electrical Construction: ICC IBC, ICC IFC, NFPA 1, NFPA 70, and NECA NEIS 1.
2. Electrical Maintenance: NFPA 70B.
3. Electrical Safety: NFPA 70E.
4. Grounding and Bonding: NECA NEIS 331 and Article 250 of NFPA 70.
5. Work in ITE Rooms: NFPA 75.
6. Work in Health Care Facilities: NFPA 99 and Article 517 of NFPA 70.
7. Work in Basements and Other Developed Subterranean Spaces: NFPA 520.
8. Consult Architect for resolution of conflicting requirements.

3.9 PROTECTION

A. Devices:

1. Schedule and sequence installation to minimize risk of contamination of wires and cables, devices, device boxes, outlet boxes, covers, and cover plates by plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other materials.

2. After installation, protect wires and cables, devices, device boxes, outlet boxes, covers, and cover plates from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

B. Cord Reels and Fittings:

1. After installation, protect cord reels and fittings from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

C. Connectors, Cords, and Plugs:

1. After installation, protect connectors, cords, and plugs from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

END OF SECTION 262726

SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fusible switches.
2. Nonfusible switches.
3. Shunt trip switches.
4. Molded-case circuit breakers (MCCBs).
5. Enclosures.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.

1.2 DEFINITIONS

A. GFEP: Ground-fault circuit-interrupter for equipment protection.

B. GFLS: Ground-fault circuit-interrupter for life safety.

C. SPDT: Single pole, double throw.

1.3 ACTION SUBMITTALS

A. Product Data:

1. For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include nameplate ratings, dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
2. Enclosure types and details for types other than UL 50E, Type 1.
3. Current and voltage ratings.
4. Short-circuit current ratings (interrupting and withstand, as appropriate).

5. Include evidence of qualified electrical testing laboratory listing for series rating of installed devices.
6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.

7. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of

overcurrent protective device. Provide in PDF electronic format.

B. Shop Drawings: For enclosed switches and circuit breakers.

1. Include plans, elevations, sections, details, and attachments to other work.
2. Include wiring diagrams for power, signal, and control wiring.

C. Field Quality-Control Submittals:

1. Field quality-control reports.

1.4 INFORMATIONAL SUBMITTALS

A. Sample warranties.

1.5 CLOSEOUT SUBMITTALS

A. Warranty documentation.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Spare Parts: Furnish to Owner spare parts, for repairing enclosed switches and circuit breakers, that are packaged with protective covering for storage on-site and identified with labels describing contents. Include the following:

1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
2. Fuse Pullers: Two

1.7 WARRANTY

A. Special Installer Extended Warranty: Installer warrants that fabricated and installed enclosed switches and circuit breakers perform in accordance with specified requirements and agrees to repair or replace components or products that fail to perform as specified within extended-warranty period.

1. Extended-Warranty Period: Two years from date of Substantial Completion; full coverage for labor, materials, and equipment.

B. Special Manufacturer Extended Warranty: Manufacturer warrants that enclosed switches and circuit breakers perform in accordance with specified requirements and agrees to provide repair or replacement of components or products that fail to perform as specified within extended-warranty period.

1. Extended-Warranty Period: Three years from date of Substantial Completion; prorated coverage for labor, materials, and equipment.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Source Limitations: Obtain products from single manufacturer.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. Electrical Components, Devices, and Accessories: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

2.2 FUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. ABB, Electrification Business
2. Eaton
3. Siemens Industry, Inc., Energy Management Division
4. Square D; Schneider Electric USAType HD, Heavy Duty:

1. Single throw.
2. Three pole.
3. 240 and/or 600 V(ac).
4. 1200 A and smaller.
5. UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses.
6. Lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. 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. Isolated Ground Kit: Internally mounted; insulated, labeled for copper and aluminum neutral conductors.
4. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
5. Service-Rated Switches: Labeled for use as service equipment.
6. Hookstick Handle: Allows use of hookstick to operate handle.

7. Lugs: Mechanical type, suitable for number, size, and conductor material.

2.3 NONFUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. ABB, Electrification Business
2. Eaton
3. Siemens Industry, Inc., Energy Management Division
4. Square D; Schneider Electric USA

B. Type GD, General Duty, Three Pole, Single Throw, 240 V(ac), 600 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

C. Type HD, Heavy Duty, Three Pole, 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. 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. Isolated Ground Kit: Internally mounted; insulated, labeled for copper and aluminum neutral conductors.
4. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
5. Service-Rated Switches: Labeled for use as service equipment.
6. Hookstick Handle: Allows use of hookstick to operate handle.

7. Lugs: Mechanical type, suitable for number, size, and conductor material.

2.4 SHUNT TRIP SWITCHES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Bussmann, an Eaton business
2. Littelfuse, Inc.
3. Mersen USA

B. General Requirements: Comply with 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: 600 V(ac), 100 A and less; UL 98 and NEMA KS 1; integral shunt trip mechanism; horsepower rated, with clips or bolt pads to accommodate specified fuses; lockable handle with capability to

accept three padlocks; interlocked with cover in closed position.

D. Type HD, Heavy-Duty, Three Pole, Single-Throw Nonfusible Switch: 600 V(ac), 100 A and less; UL 98 and NEMA KS 1; integral shunt trip mechanism; horsepower rated, lockable handle with capability to accept three padlocks; interlocked with cover in closed position.

E. Control Circuit: 120 V(ac); obtained from integral control power transformer, with primary and secondary fuses with control power transformer of enough capacity to operate shunt trip, pilot, indicating and control devices.

F. Accessories:

1. Oiltight key switch for key-to-test function.
2. Oiltight green ON pilot light.
3. Isolated neutral lug; 100 percent rating.

4. Mechanically interlocked auxiliary contacts that change state when switch is opened and closed.

5. Three-pole, double-throw, fire-safety and alarm relay; 120 V(ac) coil voltage.
6. Three-pole, double-throw, fire-alarm voltage monitoring relay complying with NFPA 72.
7. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
8. Isolated Ground Kit: Internally mounted; insulated, labeled for copper and aluminum neutral conductors.
9. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
10. Service-Rated Switches: Labeled for use as service equipment.
11. Hookstick Handle: Allows use of hookstick to operate handle.
12. Form C alarm contacts that change state when switch is tripped.

13. Lugs: Mechanical type, suitable for number, size, and conductor material.

2.5 MOLDED-CASE CIRCUIT BREAKERS

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. ABB, Electrification Business
2. Eaton
3. Siemens Industry, Inc., Energy Management Division
4. Square D; Schneider Electric USA

B. Circuit breakers must be constructed using glass-reinforced insulating material. Current carrying components must be completely isolated from handle and accessory mounting area.

C. Circuit breakers must have toggle operating mechanism with common tripping of all poles, which provides quick-make, quick-break contact action. Circuit-breaker handle must be over center, be trip free, and reside in tripped position between on and off to provide local trip indication. Circuit-breaker escutcheon must be clearly marked on and off in addition to providing international I/O markings. Equip circuit breaker with push-to-trip button, located on face of circuit breaker to mechanically operate circuit-breaker tripping mechanism for maintenance and testing purposes.

D. Maximum ampere rating and UL, IEC, or other certification standards with applicable voltage systems and corresponding interrupting ratings must be clearly marked on face of circuit breaker. Circuit breakers must be 100 percent rated. Circuit breaker/circuit breaker combinations for series connected interrupting ratings must be listed by UL as recognized component combinations. Series rated combination used must be marked on end-use equipment along with statement "Caution - Series Rated System. _____ Amps Available. Identical Replacement Component Required."

E. MCCBs must be equipped with device for locking in isolated position.

F. Lugs must be suitable for 90 deg C rated wire, sized in accordance with 75 deg C temperature rating in NFPA 70.

G. Standard: Comply with UL 489 with required interrupting capacity for available fault currents.

H. Thermal-Magnetic Circuit Breakers: Inverse time-current thermal 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.

I. Adjustable, Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.

J. Electronic Trip Circuit Breakers: Field-replaceable rating plug, RMS sensing, with the following field-adjustable settings:

1. Instantaneous trip.
2. Long- and short-time pickup levels.
3. Long- and short-time time adjustments.
4. Ground-fault pickup level, time delay, and I-squared t response.

K. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.

L. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker and trip activation on fuse opening or on opening of fuse compartment door.

M. GFLS Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6 mA trip).

N. GFEP Circuit Breakers: With Class B ground-fault protection (30 mA trip).

O. Features and Accessories:

1. Standard frame sizes, trip ratings, and number of poles.
2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.
3. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.
4. Alarm Switch: One NO contact that operates only when circuit breaker has tripped.
5. Auxiliary Contacts: One SPDT switch with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.

6. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.

7. 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.
8. Communication Capability: Circuit-breaker-mounted communication module with functions and features compatible with power monitoring and control system, specified in Section 260913 "Electrical Power Monitoring and Control."

9. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
10. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key must be removable only when circuit breaker is in off position.

11. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function.
12. Electrical Operator: Provide remote control for on, off, and reset operations.

13. Accessory Control Power: Integrally mounted, self-powered.

2.6 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: UL 489, NEMA KS 1, UL 50E, and UL 50, to comply with environmental conditions at installed location.

B. Enclosure Finish: Enclosure must be gray baked enamel paint, electrodeposited on cleaned, phosphatized steel (UL 50E Type 1), a brush finish on Type 304 stainless steel (UL 50E Type 4-4X stainless steel).

C. Conduit Entry: UL 50E Types 4, 4X, and 12 enclosures may not contain knockouts. UL 50E Types 7 and 9 enclosures must be provided with threaded conduit openings in both endwalls.

D. Operating Mechanism: Circuit-breaker operating handle must be directly operable through front cover of enclosure (UL 50E Type 1. Cover interlock mechanism must

have externally operated override. Override may not permanently disable interlock mechanism, which must return to locked position once override is released. Tool used to override cover interlock mechanism must not be required to enter enclosure in order to override interlock.

E. Enclosures designated as UL 50E Type 4, 4X stainless steel, 12, or 12K must have dual cover interlock mechanism to prevent unintentional opening of enclosure cover when circuit breaker is ON and to prevent turning circuit breaker ON when enclosure cover is open.

F. UL 50E Type 7/9 enclosures must be furnished with breather and drain kit to allow their use in outdoor and wet location applications.

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.

1. Commencement of work will indicate Installer's acceptance of areas and conditions as satisfactory.

3.2 SELECTION OF ENCLOSURES

A. Indoor, Dry and Clean Locations: UL 50E, Type 1.

B. Outdoor Locations: UL 50E, Type 4X

3.3 INSTALLATION

A. Comply with manufacturer's published instructions.

B. Special Techniques:

1. 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.

2. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

3. Comply with mounting and anchoring requirements specified in Section 260548.16 "Seismic Controls for Electrical Systems."
4. Temporary Lifting Provisions: Remove temporary lifting of eyes, channels, and

brackets and temporary blocking of moving parts from enclosures and components.

5. Install fuses in fusible devices.

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 engraved metal or laminated-plastic nameplate.

3.5 FIELD QUALITY CONTROL

A. Field tests and inspections must be witnessed by Engineer of Record

B. Tests and Inspections for Switches:

1. Visual and Mechanical Inspection:

a. Inspect physical and mechanical condition.
b. Inspect anchorage, alignment, grounding, and clearances.
c. Verify that unit is clean.
d. Verify blade alignment, blade penetration, travel stops, and mechanical operation.
e. Verify that fuse sizes and types match the Specifications and Drawings.
f. Verify that each fuse has adequate mechanical support and contact integrity.
g. Inspect bolted electrical connections for high resistance using one of the following methods:

1) Use low-resistance ohmmeter.

a) Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.

2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.

a) Bolt-torque levels must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS Table 100.12.

h. Verify that operation and sequencing of interlocking systems is as described in the Specifications and shown on Drawings.
i. Verify correct phase barrier installation.

j. Verify lubrication of moving current-carrying parts and moving and sliding surfaces.

2. Electrical Tests:

a. Perform resistance measurements through bolted connections with low-resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of lowest value.
b. Measure contact resistance across each switchblade fuseholder. Drop values may not exceed high level of manufacturer's published data. If manufacturer's published data are not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of lowest value.
c. 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. Apply voltage in accordance with manufacturer's published data. In absence of manufacturer's published data, use Table 100.1 from NETA ATS. Investigate values of insulation resistance less than those published in Table 100.1 or as recommended in manufacturer's published data.
d. Measure fuse resistance. Investigate fuse-resistance values that deviate from each other by more than 15 percent.
e. Perform ground fault test in accordance with NETA ATS Section 7.14 "Ground Fault Protection Systems, Low-Voltage."

C. Tests and Inspections for Molded-Case Circuit Breakers:

1. Visual and Mechanical Inspection:

a. Verify that equipment nameplate data are as described in the Specifications and shown on Drawings.
b. Inspect physical and mechanical condition.
c. Inspect anchorage, alignment, grounding, and clearances.
d. Verify that unit is clean.
e. Operate circuit breaker to ensure smooth operation.
f. Inspect bolted electrical connections for high resistance using one of the following methods:

1) Use low-resistance ohmmeter.

a) Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.

2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.

a) Bolt-torque levels must be in accordance with manufacturer's published data. In absence of manufacturer's published data,

use NETA ATS Table 100.12.

g. Inspect operating mechanism, contacts, and chutes in unsealed units.

h. Perform adjustments for final protective device settings in accordance with coordination study.

2. Electrical Tests:

a. Perform resistance measurements through bolted connections with low-resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of lowest value.
b. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with circuit breaker closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In absence of manufacturer's published data, use Table 100.1 from NETA ATS. Investigate values of insulation resistance less than those published in Table 100.1 or as recommended in manufacturer's published data.
c. Perform contact/pole resistance test. Drop values may not exceed high level of manufacturer's published data. If manufacturer's published data are not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of lowest value.
d. Perform insulation resistance tests on control wiring with respect to ground. Applied potential must be 500 V(dc) for 300 V rated cable and 1000 V(dc) for 600 V rated cable. Test duration must be one minute. For units with solid state components, follow manufacturer's recommendation. Insulation resistance values may be no less than 2 MΩ.
e. Determine the following by primary current injection:

1) Long-time pickup and delay. Pickup values must be as specified. Trip characteristics may not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
2) Short-time pickup and delay. Short-time pickup values must be as specified. Trip characteristics may not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
3) Ground-fault pickup and time delay. Ground-fault pickup values must be as specified. Trip characteristics may not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
4) Instantaneous pickup. Instantaneous pickup values must be as specified and within manufacturer's published tolerances.

f. Test functionality of trip unit by means of primary current injection. Pickup values and trip characteristics must be as specified and within manufacturer's published tolerances.
g. Perform minimum pickup voltage tests on shunt trip and close coils in accordance with manufacturer's published data. Minimum pickup voltage of shunt trip and close coils must be as indicated by manufacturer.

h. Verify correct operation of auxiliary features such as trip and pickup indicators; zone interlocking; electrical close and trip operation; trip-free, anti-pump function; and trip unit battery condition. Reset trip logs and indicators. Investigate units that do not function as designed.
i. Verify operation of charging mechanism. Investigate units that do not function as designed.

3. Test and adjust controls, remote monitoring, and safeties.

D. Nonconforming Work:

1. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.
2. Remove and replace defective units and retest.

E. Collect, assemble, and submit test and inspection reports.

1. Test procedures used.
2. Include identification of each enclosed switch and circuit breaker tested and describe test results.
3. List deficiencies detected, remedial action taken, and observations after remedial action.

F. Manufacturer Services:

1. Engage factory-authorized service representative to support field tests and inspections.

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 values indicated on Drawings.

3.7 PROTECTION

A. After installation, protect enclosed switches and circuit breakers from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

3.8 MAINTENANCE

A. Infrared Scanning of Enclosed Switches and Breakers: Two months after Substantial Completion, perform infrared scan of joints and connections. Remove covers so joints and connections are accessible to portable scanner. Take visible light photographs at same locations and orientations as infrared scans for documentation to ensure follow-on scans match same conditions for valid comparison.

1. Instruments and Equipment: Use infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
2. Follow-up Infrared Scanning: Perform two follow-up infrared scans of enclosed switches and breakers, one at four months and another at 11 months after Substantial Completion.
3. Instrument: Use infrared-scanning device designed to measure temperature or to detect significant deviations from normal values. Provide documentation of device calibration.
4. Report: Prepare certified report that identifies units checked and that describes scanning results. Include notation of deficiencies detected, remedial actions taken, and scanning observations after remedial action.

END OF SECTION 262816

SECTION 263213.13 - DIESEL-ENGINE-DRIVEN GENERATOR SETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Diesel-engine-driven generator sets.
2. Diesel engine.
3. Diesel fuel-oil system.
4. Control and monitoring.
5. Generator overcurrent and fault protection.
6. Generator, exciter, and voltage regulator.
7. Load bank.
8. Outdoor engine generator enclosure.
9. Remote radiator motors.
10. Vibration isolation devices.

B. Related Requirements:

1. Section 263600 "Transfer Switches" for transfer switches including sensors and relays to initiate automatic-starting and -stopping signals for engine generators.

1.2 DEFINITIONS

A. EPS: Emergency power supply.

B. EPSS: Emergency power supply system.

C. Operational Bandwidth: The total variation from the lowest to highest value of a parameter over the range of conditions indicated, expressed as a percentage of the nominal value of the parameter.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
2. Include thermal damage curve for generator.
3. Include time-current characteristic curves for generator protective device.
4. Include fuel consumption in gallons per hour at 0.8 power factor at 0.5, 0.75, and 1.0 times generator capacity.
5. Include generator efficiency at 0.8 power factor at 0.5, 0.75, and 1.0 times generator capacity.
6. Include airflow requirements for cooling and combustion air in cubic feet per

minute at 0.8 power factor, with air-supply temperature of 95, 80, 70, and 50 deg F. Provide Drawings indicating requirements and limitations for location of air intake and exhausts.

7. Include generator characteristics, including, but not limited to, kilowatt rating, efficiency, reactances, and short-circuit current capability.

B. Shop Drawings:

1. Include plans and elevations for engine generator and other components specified. Indicate access requirements affected by height of subbase fuel tank.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Identify fluid drain ports and clearance requirements for proper fluid drain.
4. Design calculations for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
5. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include base weights.
6. Include diagrams for power, signal, and control wiring. Complete schematic, wiring, and interconnection diagrams showing terminal markings for engine generators and functional relationship between all electrical components.

1.4 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of packaged engine generators and associated auxiliary components that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 DIESEL-ENGINE-DRIVEN GENERATOR SETS

A. Manufacturers: Subject to compliance with requirements, provide products by one the following:

1. Kohler Power Systems
2. Caterpillar
3. Generac
4. Cummins

B. Source Limitations: Obtain packaged engine generators and auxiliary components from single source from single manufacturer.

2.2 ENGINE GENERATOR ASSEMBLY DESCRIPTION

A. Factory-assembled and -tested, water-cooled engine, with brushless generator and

accessories.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

C. Power Rating: Standby.

D. Overload Capacity: 110 percent of service load for 1 hour in 12 consecutive hours.

E. EPSS Class: Engine generator shall be classified as a Class 2 according to NFPA 110.

F. Service Load: As indicated on drawings.

G. Power Factor: 0.8, lagging.

H. Frequency: 60 Hz.

I. Voltage: 208-V ac.

J. Phase: Three-phase, four wire, wye.

K. Induction Method: Turbocharged.

L. Governor: Adjustable isochronous, with speed sensing.

M. Mounting Frame: Structural steel framework to maintain alignment of mounted components without depending on concrete foundation. Provide lifting attachments sized and spaced to prevent deflection of base during lifting and moving.

1. Rigging Diagram: Inscribed on metal plate permanently attached to mounting frame to indicate location and lifting capacity of each lifting attachment and engine generator center of gravity.

N. Capacities and Characteristics:

1. Power Output Ratings: Nominal ratings as indicated at 0.8 power factor excluding power required for the continued and repeated operation of the unit and auxiliaries, with capacity as required to operate as a unit as evidenced by records of prototype testing.
2. Nameplates: For each major system component to identify manufacturer's name and address, and model and serial number of component.

O. Engine Generator Performance:

1. Steady-State Voltage Operational Bandwidth: 3 percent of rated output voltage from no load to full load.
2. Transient Voltage Performance: Not more than 20 percent variation for 50 percent step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within three seconds.
3. Steady-State Frequency Operational Bandwidth: 0.5 percent of rated frequency from no load to full load.
4. Steady-State Frequency Stability: When system is operating at any constant load

within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.

5. Transient Frequency Performance: Less than 5 percent variation for 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within five seconds.
6. Output Waveform: At no load, harmonic content measured line to line or line to neutral shall not exceed 5 percent total and 3 percent for single harmonics. Telephone influence factor, determined according to NEMA MG 1, shall not exceed 50 percent.
7. Sustained Short-Circuit Current: For a three-phase, bolted short circuit at system output terminals, system shall supply a minimum of 250 percent of rated full-load current for not less than 10 seconds and then clear the fault automatically, without damage to generator system components.
8. Start Time:

    a. 10 seconds.

P. Engine Generator Performance for Sensitive Loads:

1. Oversizing generator compared with the rated power output of the engine is permissible to meet specified performance.

    a. Nameplate Data for Oversized Generator: Show ratings required by the Contract Documents rather than ratings that would normally be applied to generator size installed.

2. Steady-State Voltage Operational Bandwidth: 1 percent of rated output voltage from no load to full load.
3. Transient Voltage Performance: Not more than 10 percent variation for 50 percent step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within 0.5 second.
4. Steady-State Frequency Operational Bandwidth: Plus or minus 0.25 percent of rated frequency from no load to full load.
5. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.
6. Transient Frequency Performance: Less than 2-Hz variation for 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within three seconds.
7. Output Waveform: At no load, harmonic content measured line to neutral shall not exceed 2 percent total with no slot ripple. Telephone influence factor, determined according to NEMA MG 1, shall not exceed 50 percent.
8. Sustained Short-Circuit Current: For a three-phase, bolted short circuit at system output terminals, system shall supply a minimum of 300 percent of rated full-load current for not less than 10 seconds and then clear the fault automatically, without damage to winding insulation or other generator system components.
9. Excitation System: Performance shall be unaffected by voltage distortion caused by nonlinear load.

    a. Provide permanent magnet excitation for power source to voltage regulator.

10. Start Time:

    a. Comply with NFPA 110, Type 10 system requirements.

    b. 10 seconds.

Q. Parallel Engine Generators:

1. Automatic reactive output power control and load sharing between engine generators operated in parallel.
2. Automatic regulation, automatic connection to a common bus, and automatic synchronization, with manual controls and instruments to monitor and control paralleling functions.
3. Protective relays required for equipment and personnel safety.
4. Paralleling suppressors to protect excitation systems.
5. Reverse power protection.
6. Loss of field protection.

2.3 DIESEL ENGINE

A. Fuel: ASTM D975, diesel fuel oil, Grade 2-D S15.

B. Rated Engine Speed: 1800 rpm.

C. Lubrication System: Engine or skid-mounted.

1. Filter and Strainer: Rated to remove 90 percent of particles 5 micrometers and smaller while passing full flow.
2. Thermostatic Control Valve: Control flow in system to maintain optimum oil temperature. Unit shall be capable of full flow and is designed to be fail-safe.
3. Crankcase Drain: Arranged for complete gravity drainage to an easily removable container with no disassembly and without use of pumps, siphons, special tools, or appliances.

D. Jacket Coolant Heater: Electric-immersion type, factory installed in coolant jacket system. Comply with UL 499 and with NFPA 110 requirements for Level 1 equipment for heater capacity.

E. Integral Cooling System: Closed loop, liquid cooled, with radiator factory mounted on engine generator set mounting frame and integral engine-driven coolant pump.

1. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer.

2. Size of Radiator: Adequate to contain expansion of total system coolant from cold start to 110 percent load condition.
3. Expansion Tank: Constructed of welded steel plate and rated to withstand maximum closed-loop coolant system pressure for engine used. Equip with gage glass and petcock.
4. Temperature Control: Self-contained, thermostatic-control valve modulates

coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.

5. Coolant Hose: Flexible assembly with inside surface of nonporous rubber and outer covering of aging-, UV-, and abrasion-resistant fabric.

    a. Rating: 50-psig maximum working pressure with coolant at 180 deg F, and noncollapsible under vacuum.
    b. End Fittings: Flanges or steel pipe nipples with clamps to suit piping and equipment connections.

F. Muffler/Silencer:

1. Critical type, sized as recommended by engine manufacturer and selected with exhaust piping system to not exceed engine manufacturer's engine backpressure requirements.

    a. Minimum sound attenuation of 25 dB at 500 Hz.
    b. Sound level measured at a distance of 25 feet from exhaust discharge after installation is complete shall be 78 dBA or less.

2. Semicritical type, sized as recommended by engine manufacturer and selected with exhaust piping system to not exceed engine manufacturer's engine backpressure requirements.

    a. Minimum sound attenuation of 18 dB at 500 Hz.
    b. Sound level measured at a distance of 25 feet from exhaust discharge after installation is complete shall be 78 dBA or less.

3. Commercial type, sized as recommended by engine manufacturer and selected with exhaust piping system to not exceed engine manufacturer's engine backpressure requirements.

    a. Minimum sound attenuation of 12 dB at 500 Hz.
    b. Sound level measured at a distance of 25 feet from exhaust discharge after installation is complete shall be 78 dBA or less.

G. Air-Intake Filter: Heavy-duty, engine-mounted air cleaner with replaceable dry-filter element and "blocked filter" indicator.

H. Starting System: 12-V electric, with negative ground.

1. Components: Sized so they are not damaged during a full engine-cranking cycle with ambient temperature at maximum specified in "Performance Requirements" Article.
2. Cranking Motor: Heavy-duty unit that automatically engages and releases from engine flywheel without binding.

3. Cranking Cycle: As required by NFPA 110 for system level specified.

4. Battery: Lead acid or Nickel cadmium, with capacity within ambient temperature range specified in "Performance Requirements" Article to provide specified

cranking cycle at least twice without recharging.

5. Battery Cable: Size as recommended by engine manufacturer for cable length indicated. Include required interconnecting conductors and connection accessories.

6. Battery Compartment: Factory fabricated of metal with acid-resistant finish and thermal insulation. Thermostatically controlled heater shall be arranged to maintain battery above 50 deg F regardless of external ambient temperature within range specified in "Performance Requirements" Article. Include accessories required to support and fasten batteries in place. Provide ventilation to exhaust battery gases.
7. Battery Stand: Factory-fabricated, two-tier metal with acid-resistant finish designed to hold the quantity of battery cells required and to maintain the arrangement to minimize lengths of battery interconnections.
8. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation and 35-A minimum continuous rating.

9. Battery Charger: Current-limiting, automatic-equalizing, and float-charging type designed for lead-acid or nickel-cadmium batteries. Unit shall comply with UL 1236 and include the following features:

    a. Operation: Equalizing-charging rate of 10 A shall be initiated automatically after battery has lost charge until an adjustable equalizing voltage is achieved at battery terminals. Unit shall then be automatically switched to a lower float-charging mode and shall continue to operate in that mode until battery is discharged again.
    b. Automatic Temperature Compensation: Adjust float and equalize voltages for variations in ambient temperature from minus 40 to 140 deg F to prevent overcharging at high temperatures and undercharging at low temperatures.
    c. Automatic Voltage Regulation: Maintain constant output voltage regardless of input voltage variations up to plus or minus 10 percent.
    d. Ammeter and Voltmeter: Flush mounted in door. Meters shall indicate charging rates.

    e. Safety Functions: Sense abnormally low battery voltage and close contacts providing low battery voltage indication on control and monitoring panel. Sense high battery voltage and loss of ac input or dc output of battery charger. Either condition shall close contacts that provide a battery-charger malfunction indication at system control and monitoring panel.
    f. Enclosure and Mounting: NEMA 250, Type 1, wall-mounted cabinet.

2.4 DIESEL FUEL-OIL SYSTEM

A. Comply with NFPA 37.

B. Piping: Fuel-oil piping shall be Schedule 40 black steel, complying with requirements in Section 231113 "Facility Fuel-Oil Piping." Cast iron, aluminum, copper, and galvanized steel shall not be used in the fuel-oil system.

C. Main Fuel Pump: Mounted on engine to provide primary fuel flow under starting and load conditions.

D. Fuel Filtering: Remove water and contaminants larger than 1 micron.

E. Relief-Bypass Valve: Automatically regulates pressure in fuel line and returns excess fuel to source.

F. Day Tank: Comply with UL 142, freestanding, factory-fabricated fuel tank assembly, with integral, float-controlled transfer pump and the following features:

1. Containment: Integral rupture basin with a capacity of 150 percent of nominal capacity of day tank.

   a. Leak Detector: Locate in rupture basin and connect to provide audible and visual alarm in the event of day-tank leak.

2. Tank Capacity: As recommended by engine manufacturer for an uninterrupted period of 4 hours' operation at 100 percent of rated power output of engine generator system without being refilled.
3. Pump Capacity: Exceeds maximum flow of fuel drawn by engine-mounted fuel supply pump at 110 percent of rated capacity, including fuel returned from engine.
4. Low-Level Alarm Sensor: Liquid-level device operates alarm contacts at 25 percent of normal fuel level.

5. High-Level Alarm Sensor: Liquid-level device operates alarm and redundant fuel shutoff contacts at midpoint between overflow level and 100 percent of normal fuel level.
6. Piping Connections: Factory-installed fuel supply and return lines from tank to engine; local fuel fill, vent line, overflow line; and tank drain line with shutoff valve.

7. Redundant High-Level Fuel Shutoff: Actuated by high-level alarm sensor in day tank to operate a separate motor-control device that disconnects day-tank pump motor. Sensor shall signal solenoid valve, located in fuel suction line between fuel storage tank and day tank, to close. Both actions shall remain in shutoff state until manually reset. Shutoff action shall initiate an alarm signal to control panel but shall not shut down engine generator.

G. Subbase-Mounted, Double-Wall, Fuel-Oil Tank: Factory installed and piped, complying with UL 142 fuel-oil tank. Features include the following:

1. Tank level indicator.

2. Fuel-Tank Capacity: Minimum 133 percent of total fuel required for planned operation plus fuel for periodic maintenance operations between fuel refills.
3. Leak detection in interstitial space.
4. Vandal-resistant fill cap.

5. Containment Provisions: Comply with requirements of authorities having

jurisdiction.

2.5 CONTROL AND MONITORING

A. Automatic Starting System Sequence of Operation: When mode-selector switch on the control and monitoring panel is in the automatic position, remote-control contacts in one or more separate automatic transfer switches initiate starting and stopping of engine generator. When mode-selector switch is switched to the on position, engine generator starts. The off position of same switch initiates engine generator shutdown. When engine generator is running, specified system or equipment failures or derangements automatically shut down engine generator and initiate alarms.

B. Manual Starting System Sequence of Operation: Switching on-off switch on the generator control panel to the on position starts engine generator. The off position of same switch initiates engine generator shutdown. When engine generator is running, specified system or equipment failures or derangements automatically shut down engine generator and initiate alarms.

C. Provide minimum run time control set for 15 minutes with override only by operation of a remote emergency-stop switch.

D. Comply with UL 508A.

E. Configuration:

1. Operating and safety indications, protective devices, basic system controls, and engine gages shall be grouped in a common control and monitoring panel mounted on the engine generator. Mounting method shall isolate the control panel from engine generator vibration. Panel shall be powered from the engine generator battery.
2. Operating and safety indications, protective devices, basic system controls, and engine gages shall be grouped in a common wall-mounted control and monitoring panel. Panel shall be powered from the engine generator battery.
3. Operating and safety indications, protective devices, basic system controls, engine gages, instrument transformers, generator disconnect switch or circuit breaker, and other indicated components shall be grouped in a combination control and power panel. Control and monitoring section of panel shall be isolated from power sections by steel barriers. Panel shall be powered from the engine generator battery. Panel features shall include the following:

    a. Wall-Mounting Cabinet Construction: Rigid, self-supporting steel unit complying with NEMA ICS 6.
    b. Switchboard Construction: Freestanding unit complying with Section 262413 "Switchboards." Power bus shall be copper. Bus, bus supports, control wiring, and temperature rise shall comply with UL 891.
    c. Switchgear Construction: Freestanding unit complying with Section 262300 "Low-Voltage Switchgear."

F. Control and Monitoring Panel:

1. Digital engine generator controller with integrated LCD display, controls, and microprocessor, capable of local and remote control, monitoring, and programming, with battery backup.
2. Analog control panel with dedicated gages and indicator lights for the instruments and alarms indicated below.
3. Instruments: Located on the control and monitoring panel and viewable during operation.

    a. Engine lubricating-oil pressure gage.

    b. Engine-coolant temperature gage.
    c. DC voltmeter (alternator battery charging).
    d. Running-time meter.

    e. AC voltmeter, for each phase.
    f. AC ammeter, for each phase.
    g. AC frequency meter.
    h. Generator-voltage adjusting rheostat.

4. Controls and Protective Devices: Controls, shutdown devices, and common alarm indication, including the following:

    a. Cranking control equipment.

    b. Run-Off-Auto switch.
    c. Control switch not in automatic position alarm.

    d. Overcrank alarm.
    e. Overcrank shutdown device.
    f. Low-water temperature alarm.

    g. High engine temperature prealarm.
    h. High engine temperature.
    i. High engine temperature shutdown device.
    j. Overspeed alarm.
    k. Overspeed shutdown device.
    l. Low fuel main tank.

        1) Low-fuel-level alarm shall be initiated when the level falls below that required for operation for duration required in "Fuel Tank Capacity" Subparagraph in "Diesel Fuel-Oil System" Article.

    m. Coolant low-level alarm.

    n. Coolant low-level shutdown device.

    o. Coolant high-temperature prealarm.
    p. Coolant high-temperature alarm.
    q. Coolant low-temperature alarm.
    r. Coolant high-temperature shutdown device.
    s. EPS load indicator.

t. Battery high-voltage alarm.
u. Low cranking voltage alarm.
v. Battery-charger malfunction alarm.
w. Battery low-voltage alarm.
x. Lamp test.
y. Contacts for local and remote common alarm.

z. Low-starting air pressure alarm.
aa. Low-starting hydraulic pressure alarm.
bb. Remote manual stop shutdown device.
cc. Air shutdown damper alarm when used.
dd. Air shutdown damper shutdown device when used.

ee. Generator overcurrent-protective-device not-closed alarm.
ff. Hours of operation.
gg. Engine generator metering, including voltage, current, hertz, kilowatt, kilovolt ampere, and power factor.

G. Connection to Datalink:

1. A separate terminal block, factory wired to Form C dry contacts, for each alarm and status indication.
2. Provide connections for datalink transmission of indications to remote data terminals via Ethernet.

H. Common Remote Panel with Common Audible Alarm: Include necessary contacts and terminals in control and monitoring panel. Remote panel shall be powered from the engine generator battery.

I. Remote Alarm Annunciator: An LED indicator light labeled with proper alarm conditions shall identify each alarm event, and a common audible signal shall sound for each alarm condition. Silencing switch in face of panel shall silence signal without altering visual indication. Connect so that after an alarm is silenced, clearing of initiating condition will reactivate alarm until silencing switch is reset. Cabinet and faceplate are surface- or flush-mounting type to suit mounting conditions indicated.

1. Overcrank alarm.
2. Low water-temperature alarm.
3. High engine temperature prealarm.
4. High engine temperature alarm.
5. Low lube oil pressure alarm.
6. Overspeed alarm.
7. Low fuel main tank alarm.
8. Low coolant level alarm.
9. Low cranking voltage alarm.
10. Contacts for local and remote common alarm.
11. Audible-alarm silencing switch.
12. Air shutdown damper when used.

13. Run-Off-Auto switch.
14. Control switch not in automatic position alarm.

15. Fuel tank derangement alarm.
16. Fuel tank high-level shutdown of fuel supply alarm.
17. Lamp test.

18. Low-cranking voltage alarm.

19. Generator overcurrent-protective-device not-closed alarm.

J. Supporting Items: Include sensors, transducers, terminals, relays, and other devices and include wiring required to support specified items. Locate sensors and other supporting items on engine or generator unless otherwise indicated.

K. Remote Emergency-Stop Switch: Flush; wall mounted unless otherwise indicated; and labeled. Push button shall be protected from accidental operation.

2.6 GENERATOR OVERCURRENT AND FAULT PROTECTION

A. Overcurrent protective devices shall be coordinated to optimize selective tripping when a short circuit occurs.

1. Overcurrent protective devices for the entire EPSS shall be coordinated to optimize selective tripping when a short circuit occurs. Coordination of protective devices shall consider both utility and EPSS as the voltage source.
2. Overcurrent protective devices for the EPSS shall be accessible only to authorized personnel.

B. Generator Overcurrent Protective Device:

1. Molded-case circuit breaker, thermal-magnetic type; 100 percent rated; complying with UL 489:

   a. Tripping Characteristic: Designed specifically for generator protection.
   b. Trip Rating: Matched to generator output rating.
   c. Shunt Trip: Connected to trip breaker when engine generator is shut down by other protective devices.
   d. Mounting: Adjacent to, or integrated with, control and monitoring panel.

2. Molded-case circuit breaker, electronic-trip type; 100 percent rated; complying with UL 489:

   a. Tripping Characteristics: Adjustable long-time and short-time delay and instantaneous.
   b. Trip Settings: Selected to coordinate with generator thermal damage curve.
   c. Shunt Trip: Connected to trip breaker when engine generator is shut down by other protective devices.
   d. Mounting: Adjacent to, or integrated with, control and monitoring panel.

3. Insulated-case circuit breaker, electronic-trip type; 100 percent rated; complying with UL 489:

a. Tripping Characteristics: Adjustable long-time and short-time delay and instantaneous.
b. Trip Settings: Selected to coordinate with generator thermal damage curve.
c. Shunt Trip: Connected to trip breaker when engine generator is shut down by other protective devices.
d. Mounting: Adjacent to, or integrated with, control and monitoring panel.

4. Molded-case type disconnect switch; 100 percent rated:

a. Trip Rating: Matched to generator output rating.
b. Shunt Trip: Connected to trip switch when signaled by generator protector or by other protective devices.

C. Generator Protector: Microprocessor-based unit shall continuously monitor current level in each phase of generator output, integrate generator heating effect over time, and predict when thermal damage of alternator will occur. When signaled by generator protector or other engine generator protective devices, a shunt-trip device in the generator disconnect switch shall open the switch to disconnect the generator from load circuits. Protector performs the following functions:

1. Initiates a generator overload alarm when generator has operated at an overload equivalent to 110 percent of full-rated load for 60 seconds. Indication for this alarm is integrated with other engine generator malfunction alarms. Contacts shall be available for load shed functions.
2. Under single- or three-phase fault conditions, regulates generator to 300 percent of rated full-load current for up to 10 seconds.
3. As overcurrent heating effect on the generator approaches the thermal damage point of the unit, protector switches the excitation system off, opens the generator disconnect device, and shuts down the engine generator.
4. Senses clearing of a fault by other overcurrent devices and controls recovery of rated voltage to avoid overshoot.

D. Ground-Fault Indication: Comply with NFPA 70, "Emergency System" signals for ground fault.

1. Indicate ground fault with other engine generator alarm indications.
2. Trip generator protective device on ground fault.

2.7 GENERATOR, EXCITER, AND VOLTAGE REGULATOR

A. Comply with NEMA MG 1.

B. Drive: Generator shaft shall be directly connected to engine shaft. Exciter shall be rotated integrally with generator rotor.

C. Electrical Insulation: Class H or Class F.

D. Stator-Winding Leads: Brought out to terminal box to permit future reconnection for other voltages if required. Provide six-lead alternator.

E. Range: Provide limited range of output voltage by adjusting the excitation level.

F. Construction shall prevent mechanical, electrical, and thermal damage due to vibration, overspeed up to 125 percent of rating, and heat during operation at 110 percent of rated capacity.

G. Enclosure: Dripproof.

H. Instrument Transformers: Mounted within generator enclosure.

I. Voltage Regulator: Solid-state type, separate from exciter, providing performance as specified and as required by NFPA 110.

1. Adjusting Rheostat on Control and Monitoring Panel: Provide plus or minus 5 percent adjustment of output-voltage operating band.

2. Maintain voltage within 15 percent on one step, full load.
3. Provide anti-hunt provision to stabilize voltage.
4. Maintain frequency within 10 percent and stabilize at rated frequency within 5 seconds.

J. Strip Heater: Thermostatically controlled unit arranged to maintain stator windings above dew point.

K. Windings: Two-thirds pitch stator winding and fully linked amortisseur winding.

L. Subtransient Reactance: 12 percent, maximum.

2.8 LOAD BANK

A. Description:

1. Permanent, outdoor, weatherproof, remote-controlled, forced-air-cooled, resistive unit capable of providing a balanced three-phase, delta-connected load to engine generator at 100 percent rated-system capacity, at 80 percent power factor, lagging.Unit shall be capable of selective control of load in 25 percent steps and with minimum step changes of approximately 5 and 10 percent available.

B. Resistive Load Elements: Corrosion-resistant chromium alloy with ceramic and stainless-steel supports. Elements shall be double insulated and designed for repetitive on-off cycling. Elements shall be mounted in removable aluminized-steel heater cases. Galvanized steel is prohibited. Element's maximum resistance shall be between 100 and 105 percent of rated resistance.

C. Reactive Load Elements: Epoxy-encapsulated reactor coils.

D. Load-Bank Heat Dissipation: Integral fan with totally enclosed motor shall provide uniform cooling airflow through load elements. Airflow and coil operating current shall be such that, at maximum load, with ambient temperature at the upper end of specified range, load-bank elements operate at not more than 50 percent of maximum continuous temperature rating of resistance elements.

E. Load-Element Switching: Remote-controlled contactors switch groups of load elements. Contactor coils are rated 120 V. Contactors shall be located in a separate NEMA 250, Type 3R enclosure within load-bank enclosure, accessible from exterior through hinged doors with tumbler locks.

F. Contactor Enclosures: Heated by thermostatically controlled strip heaters to prevent condensation.

G. Load-Bank Enclosures: NEMA 250, Type 3R, aluminized steel complying with NEMA ICS 6. Louvers at cooling-air intake and discharge openings shall prevent entry of rain and snow. Openings for airflow shall be screened with 1/2-inch- square, galvanized-steel mesh. Reactive load bank shall include automatic shutters at air intake and discharge. Components other than resistive elements shall receive exterior epoxy coating with compatible primer. Comply with requirements in Section 099600 "High-Performance Coatings."

H. Protective Devices: Power input circuits to load banks shall be fused, and fuses shall be selected to coordinate with generator circuit breaker. Fuse blocks shall be located in contactor enclosure. Cooling airflow and overtemperature sensors shall automatically shut down and lock out load bank until manually reset. Safety interlocks on access panels and doors shall disconnect load power, control, and heater circuits. Fan motor shall be separately protected by overload and short-circuit devices. Short-circuit devices shall be noninterchangeable fuses with 200,000-A interrupting capacity.

I. Load-Bank Remote-Control Panel: Separate from load bank in NEMA 250, Type 1 enclosure with a control power switch and pilot light, and switches controlling groups of load elements.

J. Control Sequence: Control panel may be preset for adjustable single-step loading of generator during automatic exercising.

2.9 OUTDOOR ENGINE GENERATOR ENCLOSURE

A. Description:

1. Vandal-resistant, sound-attenuating, weatherproof steel housing; wind resistant up to 170 mph. Multiple panels shall be lockable and provide adequate access to components requiring maintenance. Panels shall be removable by one person without tools. Instruments and control shall be mounted within enclosure.

   a. Sound Attenuation Level: Level II

2. Prefabricated or pre-engineered, galvanized-steel-clad, integral structural-steel-framed, walk-in enclosure; erected on concrete foundation.

B. Structural Design and Anchorage: Comply with ASCE/SEI 7 for wind loads up to 100 mph.

C. Hinged Doors: With padlocking provisions.

D. Space Heater: Thermostatically controlled and sized to prevent condensation.

E. Lighting: Provide weather-resistant LED lighting with 30 fc average maintained.

F. Thermal Insulation: Manufacturer's standard materials and thickness selected in coordination with space heater to maintain winter interior temperature within operating limits required by engine generator components.

G. Muffler Location: Within enclosure.

H. Engine-Cooling Airflow through Enclosure: Maintain temperature rise of system components within required limits when unit operates at 110 percent of rated load for two hours with ambient temperature at top of range specified in system service conditions.

1. Louvers: Fixed-engine, cooling-air inlet and discharge. Stormproof and drainable louvers prevent entry of rain and snow.
2. Automatic Dampers: At engine cooling-air inlet and discharge. Dampers shall be closed to reduce enclosure heat loss in cold weather when unit is not operating.

3. Ventilation: Provide temperature-controlled exhaust fan interlocked to prevent operation when engine is running.

I. Interior Lights with Switch: Factory-wired, vapor-proof luminaires within housing; arranged to illuminate controls and accessible interior. Arrange for external electrical connection.

1. AC lighting system and connection point for operation when remote source is available.
2. DC lighting system for operation when remote source and generator are both unavailable.

J. Convenience Outlets: Factory-wired, GFCI. Arrange for external electrical connection.

2.10 REMOTE RADIATOR MOTORS

A. Description: NEMA MG 1, Design B, medium-induction, random-wound, squirrel-cage motor.

B. Efficiency: Energy efficient, as defined in NEMA MG 1.

C. Service Factor: 1.15.

D. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.

E. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

F. Temperature Rise: Match insulation rating.

G. Code Letter Designation:

1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
2. Motors Smaller Than 15 HP: Manufacturer's standard starting characteristic.

H. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

I. Controllers, Electrical Devices, and Wiring: Electrical devices and connections are specified in electrical Sections.

2.11 VIBRATION ISOLATION DEVICES

A. Elastomeric Isolator Pads: Oil- and water-resistant elastomer or natural rubber, arranged in single or multiple layers, molded with a nonslip pattern and galvanized-steel baseplates of sufficient stiffness for uniform loading over pad area, and factory cut to sizes that match requirements of supported equipment.

1. Material: Natural rubber separated by steel shims.

2. Shore A Scale Durometer Rating: 30.

3. Number of Layers: Minimum of Two.
4. Minimum Deflection: 1 inch.

B. Restrained Spring Isolators: Freestanding, steel, open-spring isolators with seismic restraint.

1. Housing: Steel with resilient vertical-limit stops to prevent spring extension due to wind loads or if weight is removed; factory-drilled baseplate bonded to 1/4-inch-thick, elastomeric isolator pad attached to baseplate underside; and adjustable equipment-mounting and -leveling bolt that acts as blocking during installation.
2. Outside Spring Diameter: Not less than 80 percent of compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Minimum Deflection: 1 inch.

C. Comply with requirements in Section 232116 "Hydronic Piping Specialties" for vibration isolation and flexible connector materials for steel piping.

D. Comply with requirements in Section 233113 "Metal Ducts" for vibration isolation and flexible connector materials for exhaust shroud and ductwork.

E. Vibration isolation devices shall not be used to accommodate misalignments or to make bends.

2.12 FINISHES

A. Indoor and Outdoor Enclosures and Components: Manufacturer's standard finish over corrosion-resistant pretreatment and compatible primer.

2.13 SOURCE QUALITY CONTROL

A. Prototype Testing: Factory test engine generator using same engine model, constructed of identical or equivalent components and equipped with identical or equivalent accessories.

1. Tests: Comply with IEEE 115 and with NFPA 110, Level 1 Energy Converters.

B. Project-Specific Equipment Tests: Before shipment, factory test engine generator and other system components and accessories manufactured specifically for this Project. Perform tests at rated load and power factor. Include the following tests:

1. Test components and accessories furnished with installed unit that are not identical to those on tested prototype to demonstrate compatibility and reliability.
2. Test generator, exciter, and voltage regulator as a unit.
3. Full load run.
4. Maximum power.
5. Voltage regulation.
6. Transient and steady-state governing.
7. Single-step load pickup.
8. Safety shutdown.

9. Provide 14 days' advance notice of tests and opportunity for observation of tests by Owner's representative.

10. Report factory test results within 10 days of completion of test.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, equipment bases, and conditions, with Installer present, for compliance with requirements for installation and other conditions affecting packaged engine generator performance.

B. Examine roughing-in for piping systems and electrical connections. Verify actual locations of connections before packaged engine generator installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities

occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:

1. Notify Owner no fewer than seven working days in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without Owner's written permission.

3.3 INSTALLATION

A. Comply with NECA 1 and NECA 404.

B. Comply with packaged engine generator manufacturers' written installation and alignment instructions and with NFPA 110.

C. Equipment Mounting:

1. Install packaged engine generators on cast-in-place concrete equipment bases. Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."
2. Coordinate size and location of concrete bases for packaged engine generator. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

3. Install packaged engine generator having a minimum deflection of 1 inch on 4-inch- high concrete base. Secure enclosure to anchor bolts installed in concrete bases. Concrete base construction is specified in Section 260548.16 "Seismic Controls for Electrical Systems."

D. Install packaged engine generator to provide access, without removing connections or accessories, for periodic maintenance.

E. Cooling System: Install Schedule 40 black steel piping with welded joints for cooling water piping between engine generator and heat exchanger. Piping materials and installation requirements are specified in Section 232113 "Hydronic Piping."

1. Install isolating thimbles where exhaust piping penetrates combustible surfaces. Provide a minimum of 9 inches of clearance from combustibles.
2. Insulate cooling-system piping and components according to requirements in Section 230719 "HVAC Piping Insulation."

F. Exhaust System: Install Schedule 40 black steel piping with welded joints and connect to engine muffler. Install thimble at wall. Piping shall be same diameter as muffler outlet.

1. Install flexible connectors and steel piping materials.
2. Insulate muffler/silencer and exhaust system components.

3. Install isolating thimbles where exhaust piping penetrates combustible surfaces

with a minimum of 9 inches of clearance from combustibles.

G. Drain Piping: Install condensate drain piping to muffler drain outlet full size of drain connection with a shutoff valve, stainless-steel flexible connector, and Schedule 40 black steel pipe with welded joints.

H. Fuel Piping:

1. Diesel storage tanks, tank accessories, piping, valves, and specialties for fuel systems are specified in Section 231113 "Facility Fuel-Oil Piping."
2. Copper and galvanized steel shall not be used in the fuel-oil piping system.

I. Install electrical devices furnished by equipment manufacturers but not specified to be factory mounted.

3.4 CONNECTIONS

A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping and specialties.

B. Connect fuel, cooling-system, and exhaust-system piping adjacent to packaged engine generator to allow space for service and maintenance.

C. Connect cooling-system water piping to engine generator and heat exchanger with flexible connectors.

D. Connect engine exhaust pipe to engine with flexible connector.

E. Connect fuel piping to engines with a gate valve and union and flexible connector.

F. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

G. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Provide a minimum of one 90-degree bend in flexible conduit routed to the engine generator from a stationary element.

H. Balance single-phase loads to obtain a maximum of 10 percent unbalance between any two phases.

3.5 IDENTIFICATION

A. Identify system components according to Section 260553 "Identification for Electrical Systems."

B. Install a sign indicating the generator neutral is bonded to the main service neutral at the main service location.

3.6 FIELD QUALITY CONTROL

A. Testing Agency:

1. Owner will engage a qualified testing agency to perform tests and inspections.
2. Engage a qualified testing agency to perform tests and inspections.
3. Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
4. Perform tests and inspections with the assistance of a factory-authorized service representative.

B. Tests and Inspections:

1. Perform tests recommended by manufacturer and each visual and mechanical inspection and electrical and mechanical test listed in first two subparagraphs below, as specified in NETA ATS. Certify compliance with test parameters.

a. Visual and Mechanical Inspection:

1) Compare equipment nameplate data with Drawings and the Specifications.
2) Inspect physical and mechanical condition.
3) Inspect anchorage, alignment, and grounding.
4) Verify that the unit is clean.

b. Electrical and Mechanical Tests:

1) Perform insulation-resistance tests according to IEEE 43.

a) Machines Larger Than 200 hp: Test duration shall be 10 minutes. Calculate polarization index.
b) Machines 200 hp or Less: Test duration shall be one minute. Calculate the dielectric-absorption ratio.

2) Test protective relay devices.
3) Verify phase rotation, phasing, and synchronized operation as required by the application.
4) Functionally test engine shutdown for low oil pressure, overtemperature, overspeed, and other protection features as applicable.

5) Perform vibration test for each main bearing cap.
6) Verify correct functioning of the governor and regulator.

2. NFPA 110 Acceptance Tests: Perform tests required by NFPA 110 that are additional to those specified here, including, but not limited to, single-step full-load pickup test.
3. Battery Tests: Equalize charging of battery cells according to manufacturer's written instructions. Record individual cell voltages.

a. Measure charging voltage and voltages between available battery

terminals for full-charging and float-charging conditions. Check electrolyte level and specific gravity under both conditions.

b. Test for contact integrity of all connectors. Perform an integrity load test and a capacity load test for the battery.

c. Verify acceptance of charge for each element of the battery after discharge.

d. Verify that measurements are within manufacturer's specifications.

4. Battery-Charger Tests: Verify specified rates of charge for both equalizing and float-charging conditions.

5. System Integrity Tests: Methodically verify proper installation, connection, and integrity of each element of engine generator system before and during system operation. Check for air, exhaust, and fluid leaks.

6. Exhaust-System Back-Pressure Test: Use a manometer with a scale exceeding 40-inch wg. Connect to exhaust line close to engine exhaust manifold. Verify that back pressure at full-rated load is within manufacturer's written allowable limits for the engine.

7. Exhaust Emissions Test: Comply with applicable government test criteria.

8. Voltage and Frequency Transient Stability Tests: Use recording oscilloscope to measure voltage and frequency transients for 50 and 100 percent step-load increases and decreases, and verify that performance is as specified.

9. Harmonic-Content Tests: Measure harmonic content of output voltage at 25 and 100 percent of rated linear load. Verify that harmonic content is within specified limits.

10. Noise Level Tests: Measure A-weighted level of noise emanating from engine generator installation, including engine exhaust and cooling-air intake and discharge, at four locations 25 feet from edge of the generator enclosure and at the property line, and compare measured levels with required values.

C. Coordinate tests with tests for transfer switches and run them concurrently.

D. Test instruments shall have been calibrated within the past 12 months, traceable to NIST Calibration Services, and adequate for making positive observation of test results. Make calibration records available for examination on request.

E. Leak Test: After installation, charge exhaust, coolant, and fuel systems and test for leaks. Repair leaks and retest until no leaks exist.

F. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation for generator and associated equipment.

G. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

H. Remove and replace malfunctioning units and retest as specified above.

I. Retest: Correct deficiencies identified by tests and observations, and retest until specified requirements are met.

J. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation resistances, time delays, and other values and observations. Attach a label or tag to each tested component indicating satisfactory completion of tests.

K. Infrared Scanning: After Substantial Completion, but not more than 60 days after final acceptance, perform an infrared scan of each power wiring termination and each bus connection while running with maximum load. Remove all access panels so terminations and connections are accessible to portable scanner.

1. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan 11 months after date of Substantial Completion.
2. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
3. Record of Infrared Scanning: Prepare a certified report that identifies terminations and connections checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.7 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of manufacturer's authorized service representative. Include quarterly preventive maintenance and exercising to check for proper starting, load transfer, and running under load. Include routine preventive maintenance as recommended by manufacturer and adjusting as required for proper operation. Parts shall be manufacturer's authorized replacement parts and supplies.

3.8 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain packaged engine generators.

END OF SECTION 263213.13

SECTION 263600 - TRANSFER SWITCHES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Molded-case-type automatic transfer switches.
2. Transfer switch accessories.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Molded-case-type automatic transfer switches.
2. Transfer switch accessories.

B. Product Data Submittals: For each product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for transfer switches.
2. Include rated capacities, operating characteristics, electrical characteristics, and accessories.

C. Shop Drawings:

1. Include plans, elevations, sections, details showing minimum clearances, conductor entry provisions, gutter space, and installed features and devices.
2. Include material lists for each switch specified.
3. Single-Line Diagram: Show connections between transfer switch, bypass/isolation switch, power sources, and load; and show interlocking provisions for each combined transfer switch and bypass/isolation switch.

4. Riser Diagram: Show interconnection wiring between transfer switches, bypass/isolation switches, annunciators, and control panels.

1.3 QUALITY ASSURANCE

A. Testing Agency Qualifications:

1. Member company of NETA.

a. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

1.4 FIELD CONDITIONS

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service:

1. Notify Owner no fewer than seven days in advance of proposed interruption of electrical service.

1.5 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of transfer switch or transfer switch components that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NEMA ICS 1.

C. Comply with NFPA 99.

D. Comply with NFPA 110.

E. Comply with UL 1008 unless requirements of these Specifications are stricter.

F. Indicated Current Ratings: Apply as defined in UL 1008 for continuous loading and total system transfer, including tungsten filament lamp loads not exceeding 30 percent of switch ampere rating, unless otherwise indicated.

G. Tested Fault-Current Closing and Short-Circuit Ratings: Adequate for duty imposed by protective devices at installation locations in Project under the fault conditions indicated, based on testing according to UL 1008.

1. Where transfer switch includes internal fault-current protection, rating of switch and trip unit combination shall exceed indicated fault-current value at installation location.

2. Short-time withstand capability for three cycles.

H. Repetitive Accuracy of Solid-State Controls: All settings shall be plus or minus 2 percent or better over an operating temperature range of minus 20 to plus 70 deg C.

I. Resistance to Damage by Voltage Transients: Components shall meet or exceed voltage-surge withstand capability requirements when tested according to IEEE C62.62. Components shall meet or exceed voltage-impulse withstand test of NEMA ICS 1.

J. Electrical Operation: Accomplish by a nonfused, momentarily energized solenoid or electric-motor-operated mechanism. Switches for emergency or standby purposes shall be mechanically and electrically interlocked in both directions to prevent simultaneous connection to both power sources unless closed transition.

K. Service-Rated Transfer Switch:

1. Comply with UL 869A and UL 489.
2. Provide terminals for bonding the grounding electrode conductor to the grounded service conductor.
3. In systems with a neutral, the bonding connection shall be on the neutral bus.
4. Provide removable link for temporary separation of the service and load grounded conductors.

5. Surge Protective Device: Service rated.

6. Ground-Fault Protection: Comply with UL 1008 for normal bus.
7. Service Disconnecting Means: Externally operated, manual mechanically actuated.

L. Neutral Switching: Where four-pole switches are indicated, provide neutral pole switched simultaneously with phase poles.

M. Neutral Terminal: Solid and fully rated unless otherwise indicated.

N. Oversize Neutral: Ampacity and switch rating of neutral path through units indicated for oversize neutral shall be double the nominal rating of circuit in which switch is installed.

O. Heater: Equip switches exposed to outdoor temperatures and humidity, and other units indicated, with an internal heater. Provide thermostat within enclosure to control heater.

P. Battery Charger: For generator starting batteries.

1. Float type, rated 2 A.
2. Ammeter to display charging current.
3. Fused ac inputs and dc outputs.

Q. Annunciation, Control, and Programming Interface Components: Devices at transfer switches for communicating with remote programming devices, annunciators, or annunciator and control panels shall have communication capability matched with remote device.

R. Factory Wiring: Train and bundle factory wiring and label, consistent with Shop Drawings, by color-code or by numbered or lettered wire and cable with printed markers at terminations. Color-coding and wire and cable markers are specified in Section 260553 "Identification for Electrical Systems."

1. Designated Terminals: Pressure type, suitable for types and sizes of field wiring indicated.
2. Power-Terminal Arrangement and Field-Wiring Space: Suitable for top, side, or bottom entrance of feeder conductors as indicated.
3. Control Wiring: Equipped with lugs suitable for connection to terminal strips.
4. Accessible via front access.

S. Enclosures: General-purpose NEMA 250, Type 3R, complying with NEMA ICS 6 and UL 508, unless otherwise indicated.

2.2 MOLDED-CASE-TYPE AUTOMATIC TRANSFER SWITCHES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. ABB, Electrification Business
2. Caterpillar, Inc.; Electric Power Division
3. Cummins Power Generation
4. Eaton
5. Emerson Electric Co., Automation Solutions
6. Generac
7. Kohler Power Systems
8. Lake Shore Electric Corporation

B. Comply with Level 1 equipment according to NFPA 110.

C. Switch Characteristics: Designed for continuous-duty repetitive transfer of full-rated current between active power sources.

1. Limitation: Switches using contactor-based components are unacceptable.

2. Switch Action: Double throw; mechanically held in both directions.
3. Contacts: Silver composition or silver alloy for load-current switching.
4. Conductor Connectors: Suitable for use with conductor material and sizes.
5. Material: Tin-plated aluminum

6. Main and Neutral Lugs: Compression type.

7. Ground Lugs and Bus-Configured Terminators: Compression type.
8. Ground bar.
9. Connectors shall be marked for conductor size and type according to UL 1008.

D. Automatic Open-Transition Transfer Switches: Interlocked to prevent the load from being closed on both sources at the same time.

1. Sources shall be mechanically and electrically interlocked to prevent closing both sources on the load at the same time.

E. Automatic Delayed-Transition Transfer Switches: Pauses or stops in intermediate

position to momentarily disconnect both sources, with transition controlled by programming in the automatic transfer-switch controller. Interlocked to prevent the load from being closed on both sources at the same time.

1. Adjustable Time Delay: For override of normal-source voltage sensing to delay transfer and engine start signals for alternative source. Adjustable from zero to six seconds, and factory set for one second.
2. Sources shall be mechanically and electrically interlocked to prevent closing both sources on the load at the same time.

3. Fully automatic break-before-make operation with center off position.
4. Fully automatic break-before-make operation with transfer when two sources have near zero phase difference.

F. Automatic Closed-Transition Transfer Switches: Connect both sources to load momentarily. Transition is controlled by programming in the automatic transfer-switch controller.

1. Fully automatic make-before-break operation when transferring between two available power sources.
2. Load transfer without interruption, through momentary interconnection of both power sources not exceeding 100 ms.
3. Initiation of No-Interruption Transfer: Controlled by in-phase monitor and sensors confirming both sources are present and acceptable.

   a. Initiation occurs without active control of generator.
   b. Automatic transfer-switch controller takes active control of generator to match frequency, phase angle, and voltage.
   c. Controls ensure that closed-transition load transfer closure occurs only when the two sources are within plus or minus 5 electrical degrees maximum, and plus or minus 5 percent maximum voltage difference.

4. Failure of power source serving load initiates automatic break-before-make transfer.

G. Manual Switch Operation, Load-Breaking: Under load, with door closed and with either or both sources energized. Transfer time is same as for electrical operation. Control circuit automatically disconnects from electrical operator during manual operation.

H. Manual Switch Operation, Non-Load-Breaking: Unloaded. Control circuit automatically disconnects from electrical operator during manual operation.

I. Electric Nonautomatic Switch Operation: Electrically actuated by push buttons designated "Normal Source" and "Alternative Source." Switch shall be capable of transferring load in either direction with either or both sources energized.

J. Signal-Before-Transfer Contacts: A set of normally open/normally closed dry contacts operates in advance of retransfer to normal source. Interval shall be adjustable from 1 to 30 seconds.

K. Digital Communication Interface: Matched to capability of remote annunciator or

annunciator and control panel.

L. Transfer Switches Based on Molded-Case-Switch Components: Comply with UL 489 and UL 869A.

M. Automatic Transfer-Switch Controller Features:

1. Controller operates through a period of loss of control power.

2. Undervoltage Sensing for Each Phase of Normal Source: Sense low phase-to-ground voltage on each phase. Pickup voltage shall be adjustable from 85 to 100 percent of nominal, and dropout voltage shall be adjustable from 75 to 98 percent of pickup value. Factory set for pickup at 90 percent and dropout at 85 percent.
3. Voltage/Frequency Lockout Relay: Prevent premature transfer to generator. Pickup voltage shall be adjustable from 85 to 100 percent of nominal. Factory set for pickup at 90 percent. Pickup frequency shall be adjustable from 90 to 100 percent of nominal. Factory set for pickup at 95 percent.
4. Time Delay for Retransfer to Normal Source: Adjustable from zero to 30 minutes, and factory set for 10 minutes. Override shall automatically defeat delay on loss of voltage or sustained undervoltage of emergency source, provided normal supply has been restored.
5. Test Switch: Simulate normal-source failure.
6. Switch-Position Pilot Lights: Indicate source to which load is connected.
7. Source-Available Indicating Lights: Supervise sources via transfer-switch normal- and emergency-source sensing circuits.

    a. Normal Power Supervision: Green light with nameplate engraved "Normal Source Available."
    b. Emergency Power Supervision: Red light with nameplate engraved "Emergency Source Available."

8. Unassigned Auxiliary Contacts: Two normally open, single-pole, double-throw contacts for each switch position, rated 10 A at 240-V ac.
9. Transfer Override Switch: Overrides automatic retransfer control so automatic transfer switch will remain connected to emergency power source regardless of condition of normal source. Pilot light indicates override status.

10. Engine Starting Contacts: One isolated and normally closed, and one isolated and normally open; rated 10 A at 32-V dc minimum.
11. Engine Shutdown Contacts:

    a. Instantaneous; shall initiate shutdown sequence at remote engine-generator controls after retransfer of load to normal source.
    b. Time delay adjustable from zero to five minutes, and factory set for five minutes. Contacts shall initiate shutdown at remote engine-generator controls after retransfer of load to normal source.

12. Engine-Generator Exerciser: Solid-state, programmable-time switch starts engine generator and transfers load to it from normal source for a preset time, then retransfers and shuts down engine after a preset cool-down period. Initiates exercise cycle at preset intervals adjustable from 7 to 30 days. Running periods

shall be adjustable from 10 to 30 minutes. Factory settings shall be for 7-day exercise cycle, 20-minute running period, and 5-minute cool-down period. Exerciser features include the following:

a. Exerciser Transfer Selector Switch: Permits selection of exercise with and without load transfer.
b. Push-button programming control with digital display of settings.
c. Integral battery operation of time switch when normal control power is unavailable.

N. Large-Motor-Load Power Transfer:

1. In-Phase Monitor: Factory-wired, internal relay controls transfer so contacts close only when the two sources are synchronized in phase and frequency. Relay shall compare phase relationship and frequency difference between normal and emergency sources and initiate transfer when both sources are within 15 electrical degrees, and only if transfer can be completed within 60 electrical degrees. Transfer shall be initiated only if both sources are within 2 Hz of nominal frequency and 70 percent or more of nominal voltage.
2. Motor Disconnect and Timing Relay Controls: Designated starters in loss of power scenario shall disconnect motors before transfer and reconnect them selectively at an adjustable time interval after transfer. Control connection to motor starters shall be through wiring external to automatic transfer switch. Provide adjustable time delay between 1 and 60 seconds for reconnecting individual motor loads. Provide relay contacts rated for motor-control circuit inrush and for actual seal currents to be encountered.

3. Programmed Neutral Switch Position: Switch operator with programmed neutral position arranged to provide a midpoint between the two working switch positions, with an intentional, time-controlled pause at midpoint during transfer. Adjustable pause from 0.5 to 30 seconds minimum, and factory set for 0.5 second unless otherwise indicated. Time delay occurs for both transfer directions. Disable pause unless both sources are live.

2.3 TRANSFER SWITCH ACCESSORIES

A. Bypass/Isolation Switches:

1. Source Limitations: Same manufacturer as transfer switch in which installed.
2. Comply with requirements for Level 1 equipment according to NFPA 110.
3. Description: Manual type, arranged to select and connect either source of power directly to load, isolating transfer switch from load and from both power sources. Include the following features for each combined automatic transfer switch and bypass/isolation switch:

a. Means to lock bypass/isolation switch in the position that isolates transfer switch with an arrangement that permits complete electrical testing of transfer switch while isolated. Interlocks shall prevent transfer-switch operation, except for testing or maintenance, while automatic transfer switch is isolated.

b. Provide means to make power available to transfer-switch control circuit for testing and maintenance purposes.
c. Drawout Arrangement for Transfer Switch: Provide physical separation from live parts and accessibility for testing and maintenance operations. Transfer switch and bypass/isolation switch shall be in isolated compartments.
d. Transition:

1) Provide closed-transition operation when transferring from main transfer switch to bypass/isolation switch on the same power source.
2) Provide open-transition operation when transferring between power sources.

e. Bypass/Isolation Switch Current, Voltage, Closing, and Short-Circuit Withstand Ratings: Equal to or greater than those of associated automatic transfer switch, and with same phase arrangement and number of poles.
f. Contact temperatures of bypass/isolation switches shall not exceed those of automatic transfer-switch contacts when they are carrying rated load.

g. Manual Control: Constructed so load bypass and transfer-switch isolation can be performed by one person in no more than two operations in 15 seconds or less. Operating handles shall be externally operated.
h. Automatic and Nonautomatic Control: Automatic transfer-switch controller shall also control the bypass/isolation switch.
i. Legend: Manufacturer's standard legend for control labels and instruction signs shall describe operating instructions.
j. Maintainability: Fabricate to allow convenient removal of major components from front without removing other parts or main power conductors.

4. Interconnection of Bypass/Isolation Switches with Automatic Transfer Switches: Factory-installed copper bus bars; plated at connection points and braced for the indicated available short-circuit current.

B. Remote Annunciator System:

1. Source Limitations: Same manufacturer as transfer switch in which installed.
2. Functional Description: Remote annunciator panel shall annunciate conditions for indicated transfer switches.
3. Annunciation panel display shall include the following indicators:

a. Sources available, as defined by actual pickup and dropout settings of transfer-switch controls.
b. Switch position.
c. Switch in test mode.
d. Failure of communication link.

4. Annunciator Panel: LED-lamp type with audible signal and silencing switch.

a. Indicating Lights: Grouped for each transfer switch monitored.
b. Label each group, indicating transfer switch it monitors, location of switch, and identity of load it serves.

c. Mounting: Flush, modular, steel cabinet unless otherwise indicated.
d. Lamp Test: Push-to-test or lamp-test switch on front panel.

C. Remote Annunciator and Control System:

1. Source Limitations: Same manufacturer as transfer switch in which installed.
2. Include the following functions for indicated transfer switches:

a. Indication of sources available, as defined by actual pickup and dropout settings of transfer-switch controls.
b. Indication of switch position.
c. Indication of switch in test mode.
d. Indication of failure of digital communication link.
e. Key-switch or user-code access to control functions of panel.
f. Control of switch-test initiation.

g. Control of switch operation in either direction.
h. Control of time-delay bypass for transfer to normal source.

3. Malfunction of annunciator, annunciation and control panel, or communication link shall not affect functions of automatic transfer switch. In the event of failure of communication link, automatic transfer switch automatically shall revert to standalone, self-contained operation. Automatic transfer-switch sensing, controlling, or operating function shall not depend on remote panel for proper operation.
4. Remote Annunciation and Control Panel: Solid-state components. Include the following features:

a. Controls and indicating lights grouped together for each transfer switch.
b. Label each indicating light control group. Indicate transfer switch it controls, location of switch, and load it serves.
c. Digital Communication Capability: Matched to that of transfer switches supervised.

d. Mounting: Flush, modular, steel cabinet unless otherwise indicated.

2.4 SOURCE QUALITY CONTROL

A. Factory Tests: Test and inspect components, assembled switches, and associated equipment according to UL 1008. Ensure proper operation. Check transfer time and voltage, frequency, and time-delay settings for compliance with specified requirements. Perform dielectric strength test complying with NEMA ICS 1.

B. Prepare test and inspection reports.

1. For each of the tests required by UL 1008, performed on representative devices, for legally required systems. Include results of test for the following conditions:

a. Overvoltage.
b. Undervoltage.

c. Loss of supply voltage.
d. Reduction of supply voltage.
e. Alternative supply voltage or frequency is at minimum acceptable values.
f. Temperature rise.
g. Dielectric voltage-withstand; before and after short-circuit test.
h. Overload.
i. Contact opening.
j. Endurance.
k. Short circuit.
l. Short-time current capability.
m. Receptacle withstand capability.
n. Insulating base and supports damage.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Floor-Mounting Switch: Anchor to floor by bolting.

1. Install transfer switches on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."

2. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases.
3. Provide workspace and clearances required by NFPA 70.

B. Annunciator and Control Panel Mounting: Flush in wall unless otherwise indicated.

C. Identify components according to Section 260553 "Identification for Electrical Systems."

D. Set field-adjustable intervals and delays, relays, and engine exerciser clock.

E. Comply with NECA 1.

3.2 CONNECTIONS

A. Wiring to Remote Components: Match type and number of cables and conductors to generator sets, control, and communication requirements of transfer switches as recommended by manufacturer. Increase raceway sizes at no additional cost to Owner if necessary to accommodate required wiring.

B. Wiring Method: Install cables in raceways and cable trays except within electrical enclosures. Conceal raceway and cables except in unfinished spaces.

1. Comply with requirements for raceways specified in Section 260533.13 "Conduits for Electrical Systems."

C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.

D. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

E. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

F. Connect twisted pair cable according to Section 260523 "Control-Voltage Electrical Power Cables."

G. Connect twisted pair cable according to Section 271513 "Communications Copper Horizontal Cabling."

H. Route and brace conductors according to manufacturer's written instructions and Section 260529 "Hangers and Supports for Electrical Systems." Do not obscure manufacturer's markings and labels.

I. Brace and support equipment according to Section 260548.16 "Seismic Controls for Electrical Systems."

J. Final connections to equipment shall be made with liquidtight, flexible metallic conduit no more than 18 inches in length.

3.3 FIELD QUALITY CONTROL

A. Administrant for Tests and Inspections:

1. Owner will engage qualified testing agency to administer and perform tests and inspections.
2. Engage qualified testing agency to administer and perform tests and inspections.
3. Engage factory-authorized service representative to administer and perform tests and inspections on components, assemblies, and equipment installations, including connections.
4. Administer and perform tests and inspections with assistance of factory-authorized service representative.

B. Tests and Inspections:

1. After installing equipment, test for compliance with requirements according to NETA ATS.
2. Visual and Mechanical Inspection:

   a. Compare equipment nameplate data with Drawings and Specifications.
   b. Inspect physical and mechanical condition.
   c. Inspect anchorage, alignment, grounding, and required clearances.
   d. Verify that the unit is clean.
   e. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.

f. Verify that manual transfer warnings are attached and visible.
g. Verify tightness of all control connections.
h. Inspect bolted electrical connections for high resistance using one of the following methods, or both:

1) Use of low-resistance ohmmeter.
2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method according to manufacturer's published data.

i. Perform manual transfer operation.
j. Verify positive mechanical interlocking between normal and alternate sources.
k. Perform visual and mechanical inspection of surge arresters.
l. Inspect control power transformers.

1) Inspect for physical damage, cracked insulation, broken leads, tightness of connections, defective wiring, and overall general condition.
2) Verify that primary and secondary fuse or circuit-breaker ratings match Drawings.
3) Verify correct functioning of drawout disconnecting contacts, grounding contacts, and interlocks.

3. Electrical Tests:

a. Perform insulation-resistance tests on all control wiring with respect to ground.

b. Perform a contact/pole-resistance test. Compare measured values with manufacturer's acceptable values.
c. Verify settings and operation of control devices.
d. Calibrate and set all relays and timers.
e. Verify phase rotation, phasing, and synchronized operation.
f. Perform automatic transfer tests.
g. Verify correct operation and timing of the following functions:

1) Normal source voltage-sensing and frequency-sensing relays.
2) Engine start sequence.
3) Time delay on transfer.
4) Alternative source voltage-sensing and frequency-sensing relays.
5) Automatic transfer operation.
6) Interlocks and limit switch function.
7) Time delay and retransfer on normal power restoration.
8) Engine cool-down and shutdown feature.

4. Measure insulation resistance phase-to-phase and phase-to-ground with insulation-resistance tester. Include external annunciation and control circuits. Use test voltages and procedure recommended by manufacturer. Comply with manufacturer's specified minimum resistance.

a. Check for electrical continuity of circuits and for short circuits.
b. Inspect for physical damage, proper installation and connection, and integrity of barriers, covers, and safety features.
c. Verify that manual transfer warnings are properly placed.
d. Perform manual transfer operation.

5. After energizing circuits, perform each electrical test for transfer switches stated in NETA ATS and demonstrate interlocking sequence and operational function for each switch at least three times.

a. Simulate power failures of normal source to automatic transfer switches and retransfer from emergency source with normal source available.

b. Simulate loss of phase-to-ground voltage for each phase of normal source.
c. Verify time-delay settings.
d. Verify pickup and dropout voltages by data readout or inspection of control settings.
e. Test bypass/isolation unit functional modes and related automatic transfer-switch operations.

f. Perform contact-resistance test across main contacts and correct values exceeding 500 microhms and values for one pole deviating by more than 50 percent from other poles.
g. Verify proper sequence and correct timing of automatic engine starting, transfer time delay, retransfer time delay on restoration of normal power, and engine cool-down and shutdown.

6. Ground-Fault Tests: Coordinate with testing of ground-fault protective devices for power delivery from both sources.

a. Verify grounding connections and locations and ratings of sensors.

C. Coordinate tests with tests of generator and run them concurrently.

D. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation and contact resistances and time delays. Attach a label or tag to each tested component indicating satisfactory completion of tests.

E. Transfer switches will be considered defective if they do not pass tests and inspections.

F. Remove and replace malfunctioning units and retest as specified above.

G. Prepare test and inspection reports.

H. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each switch. Remove all access panels so joints and connections are accessible to portable scanner.

1. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record

for device.

2. Record of Infrared Scanning: Prepare a certified report that identifies switches checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.
3. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each switch 11 months after date of Substantial Completion.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain transfer switches and related equipment.

B. Training shall include testing ground-fault protective devices and instructions to determine when the ground-fault system shall be retested. Include instructions on where ground-fault sensors are located and how to avoid negating the ground-fault protection scheme during testing and circuit modifications.

C. Coordinate this training with that for generator equipment.

END OF SECTION 263600

SECTION 264313 - SURGE PROTECTIVE DEVICES FOR LOW-VOLTAGE ELECTRICAL POWER CIRCUITS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Type 1 surge protective devices (SPDs).
2. Type 2 surge protective devices (SPDs).
3. Enclosures.
4. Conductors and cables.

B. Related Requirements:

1. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.

2. Section 262416 "Panelboards" for integral SPDs installed by panelboard manufacturer.
3. Section 262726 "Wiring Devices" for integral SPDs installed by receptacle manufacturer.

1.2 DEFINITIONS

A. In: Nominal discharge current.

B. Maximum Continuous Operating Voltage (MCOV): The maximum designated RMS value of the power frequency voltage that may be continuously applied to the mode of protection of an SPD.

C. Metal-Oxide Varistor (MOV): An electronic component with a significant bidirectional, nonlinear current-voltage characteristic.

D. Mode(s), Modes of Protection, or Protection Modes: Electrical paths where the SPD offers defense against transient overvoltages. Examples include: line to neutral (L-N), line to ground (L-G), line to line (L-L), and neutral to ground (N-G).

E. SCCR: Short-circuit current rating.

F. 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.

G. 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.

H. Voltage Protection Rating (VPR): A rating selected from UL 1449 list of preferred values assigned to each mode of protection.

1.3 ACTION SUBMITTALS

A. Product Data:

1. For each type of product.

a. Include electrical characteristics, specialties, and accessories for SPDs.
b. Certification of compliance with UL 1449 by qualified electrical testing laboratory recognized by authorities having jurisdiction including the following information:

1) Tested values for VPRs.
2) In ratings.
3) MCOV, type designations.
4) OCPD requirements.
5) Manufacturer's model number.
6) System voltage.
7) Modes of protection.

B. Field quality-control reports.

1.4 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For manufacturer's special warranty.

1.5 WARRANTY

A. Special Manufacturer Extended Warranty: Manufacturer warrants that SPDs perform in accordance with specified requirements and agrees to provide repair or replacement of SPDs that fail to perform as specified within extended warranty period.

1. Initial Extended Warranty Period: Five year(s) from date of Substantial Completion, for labor, materials, and equipment.
2. Follow-On Extended Warranty Period: 10 year(s) from date of Substantial Completion, for materials only, f.o.b. the nearest shipping point to Project site.

PART 2 - PRODUCTS

2.1 TYPE 1 SURGE PROTECTIVE DEVICES (SPDs)

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. ABB, Electrification Business
2. Advanced Protection Technologies Inc. (APT)
3. Citel, Inc.
4. DITEK Surge Protection
5. Eaton
6. Intermatic, Inc
7. Leviton Manufacturing Co., Inc.
8. Liebert; Vertiv Holdings Co.
9. Mersen USA
10. Schneider Electric USA, Inc.
11. Siemens Industry, Inc., Energy Management Division

B. Source Limitations: Obtain devices from single source from single manufacturer.

C. General Characteristics:

1. Reference Standards: UL 1449, Type 1.
2. MCOV: Not less than 125 percent of nominal system voltage for 208Y/120 V and 120/240 V power systems, and not less than 115 percent of nominal system voltage for 480Y/277 V power systems.
3. Peak Surge Current Rating: Minimum single-pulse surge current withstand rating per phase must not be less than 200 kA. Peak surge current rating must be arithmetic sum of the ratings of individual MOVs in a given mode.
4. Protection modes and UL 1449 VPR for grounded wye circuits with 480Y/277 V & 208Y/120 V, three-phase, four-wire circuits must not exceed the following:

    a. Line to Neutral: 1200 V for 480Y/277 V, 700 V for 208Y/120 V.
    b. Line to Line: 2000 V for 480Y/277 V, 1200 V for 208Y/120 V.

5. Protection modes and UL 1449 VPR for 240/120 V, single-phase, three-wire circuits must not exceed the following:

    a. Line to Neutral: 700 V.
    b. Line to Line: 1200 V.

6. SCCR: Not less than 100 kA.
7. In Rating: 20 kA.

D. Options:

1. Include integral disconnect switch.
2. Include internal thermal protection that disconnects the SPD before damaging internal suppressor components.
3. Include indicator light display for protection status.
4. Include audible alarm.
5. Include NEMA ICS 5, dry Form C contacts rated at 2 A and 24 V(ac) for remote monitoring of protection status.
6. Include surge counter.

2.2 TYPE 2 SURGE PROTECTIVE DEVICES (SPDs)

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. ABB, Electrification Business
2. Advanced Protection Technologies Inc. (APT)
3. Citel, Inc.
4. DITEK Surge Protection
5. Eaton
6. Intermatic, Inc
7. Leviton Manufacturing Co., Inc.
8. Liebert; Vertiv Holdings Co.
9. Mersen USA
10. Schneider Electric USA, Inc.
11. Siemens Industry, Inc., Energy Management Division

B. Source Limitations: Obtain devices from single source from single manufacturer.

C. General Characteristics:

1. Reference Standards: UL 1449, Type 2.
2. MCOV: Not less than 125 percent of nominal system voltage for 208Y/120 V and 120/240 V power systems, and not less than 115 percent of nominal system voltage for 480Y/277 V power systems.
3. Peak Surge Current Rating: Minimum single-pulse surge current withstand rating per phase must not be less than 100 kA. Peak surge current rating must be arithmetic sum of the ratings of individual MOVs in a given mode.
4. Protection modes and UL 1449 VPR for grounded wye circuits with 480Y/277 V & 208Y/120 V, three-phase, four-wire circuits must not exceed the following:

   a. Line to Neutral: 1200 V for 480Y/277 V, 700 V for 208Y/120 V.
   b. Line to Ground: 1200 V for 480Y/277 V, 700 V for 208Y/120 V.
   c. Neutral to Ground: 1200 V for 480Y/277 V, 700 V for 208Y/120 V.
   d. Line to Line: 2000 V for 480Y/277 V, 1200 V for 208Y/120 V.

5. Protection modes and UL 1449 VPR for 240/120 V, single-phase, three-wire circuits must not exceed the following:

   a. Line to Neutral: 700 V.
   b. Line to Ground: 700 V.
   c. Neutral to Ground: 700 V.
   d. Line to Line: 1200 V.

6. SCCR: Equal or exceed 100 kA.
7. In Rating: 20 kA.

D. Options:

1. Include LED indicator lights for power and protection status.
2. Include internal thermal protection that disconnects the SPD before damaging internal suppressor components.
3. Include NEMA ICS 5, dry Form C contacts rated at 2 A and 24 V(ac) for remote

monitoring of protection status.
4. Include surge counter.

2.3 ENCLOSURES

A. Indoor Enclosures: Type 1.

B. Outdoor Enclosures: Type 3R or Type 4X.

2.4 CONDUCTORS AND CABLES

A. Power Wiring: Same size as SPD leads, complying with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide OCPD and disconnect for installation of SPD in accordance with UL 1449 and manufacturer's instructions.

B. Install leads between disconnects and SPDs short, straight, twisted, and in accordance with manufacturer's instructions. Comply with wiring methods in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

1. Do not splice and extend SPD leads unless specifically permitted by manufacturer.
2. Do not exceed manufacturer's recommended lead length.
3. Do not bond neutral and ground.

C. Use crimped connectors and splices only. Wire nuts are unacceptable.

3.2 STARTUP SERVICE

A. Complete startup checks in accordance with manufacturer's instructions.

B. Do not perform insulation-resistance tests of the distribution wiring equipment with SPDs installed. Disconnect SPDs before conducting insulation-resistance tests; reconnect them immediately after the testing is over.

C. Energize SPDs after power system has been energized, stabilized, and tested.

END OF SECTION 264313