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SECTION 001100 - INVITATION TO BID

Sealed Bids will be received by the District Board of Trustees, Gulf Coast State College, Building Enrollment Services, Gardner Seminar Room 124, 5230 US Highway 98, Panama City, FL 32401, **until 2:00 P.M., local time, March 28, 2019**, at which time and place all bids will be publicly opened and read aloud, for the construction of:

DRIVER TRAINING PAD LIGHTING UPGRADES FOR GULF COAST STATE COLLEGE – NORTH BAY CAMPUS

For the District Board of Trustees, Gulf Coast State College, Panama City, Florida, according to the contract documents, drawings, specifications and general conditions pertaining thereto for the work as prepared by the Engineer:

**HG Engineers
142 Eglin Parkway SE
Fort Walton Beach, Florida, 32548
Ph: (850) 243-6723
Fax: (850) 664-5420**

Any early bids (prior to 1:50 PM, on the Bid Opening Date) shall be delivered to: College Procurement and Auxiliary Services Office, Building Enrollment Services, Room 121, on the Panama City Campus of Gulf Coast State College.

Any Bids received after the stipulated time of bid opening will be returned unopened.

In the case of discrepancies occurring in stated amounts in the Contractor's Bid, the Owner (District Board of Trustees, Gulf Coast State College) reserves the right to adopt prices written in words, or to reject the bid.

The general contractors and prime bidders who provide bids may inspect contract Documents, including drawings, specifications and general conditions relative thereto, at the Office of the Architect.

General Contractors and prime bidders may obtain electronic website drawings and specifications at their cost from Gulf Coast State College after registering with HG Engineers, 142 Eglin Parkway SE, Fort Walton Beach, FL 32548 (to facilitate distribution of possible addendums and clarifications). General Contractors may also obtain One Electronic Set of Reproducible Documents (drawings and specifications) from HG Engineers, 142 Eglin Parkway SE, Fort Walton Beach, FL 32548.

A bid bond or deposit, in the amount of five percent (5%) of the base bid will be required to accompany each bid, as guarantee that the successful bidder, will enter into a contract with the Owner, if desired by same. Any bid deposit must be in the form of a Certified Check, or a Cashier's Check. The bid bond or deposit will be held as liquidated damages, in the event that the successful bidder refuses to enter into a contract with the Owner. In addition, the successful bidder shall provide a one hundred percent (100%) Performance Bond and one hundred

percent (100%) Labor and Material Payment Bond(s), with a surety insurer authorized to do business in the State of Florida as surety, satisfactory to the Owner.

Failure to file a protest within the time prescribed in F.S. 120.57(3), or failure to post the bond or other security as required by F.S. 287.042(2)(c) shall constitute a waiver of proceedings under Chapter 120, Florida Statutes. All protests must be delivered to Gulf Coast State College, Building Enrollment Services, Gardner Seminar Room 124, 5230 US-98, Panama City, FL 32401 within the time prescribed in Chapter 120, Florida Statutes to be considered valid.

The Owner (District Board of Trustees, Gulf Coast State College, Florida) reserves the rights to reject any and all bids, to waive informalities in bidding and to accept the bid that embraces such combination of proposals and alternates as may promote the best interest of the Owner.

The bid shall remain in force for thirty (30) days after the time of opening.

Any person(s) requiring reasonable accommodations, in accordance with the provisions of the Americans With Disabilities Act, for attendance at the scheduled bid opening, shall contact the Office of the Director of Procurement and Auxiliary Services, at least seventy-two (72) hours in advance of the scheduled bid opening deadline.

A mandatory **Pre-Bid Meeting Will Be Held Monday, March 11th, 2019 at 9:00 a.m.**, in the outside of the test track at the North Bay Campus. The purpose of this meeting is to allow all bidders access to the site in order that they may familiarize themselves with all existing conditions that relate to the project.

The contract shall be for General Contractor or Electrical Contractor who shall be responsible for work of all trades.

END OF SECTION 001100

SECTION 002113 - INSTRUCTIONS TO BIDDERS

PROCUREMENT OF DOCUMENTS:

Refer to Section 00 11 00 - Invitation to Bid.

EXAMINATION OF DOCUMENTS AND SITE:

Bidders shall carefully examine the Bidding Documents, the existing facility and the construction site to obtain first hand knowledge of the existing conditions. Each bidder shall fully inform himself prior to bidding as to all existing conditions and limitations under which the work is to be performed.

INTERPRETATION OR CORRECTION OF BIDDING DOCUMENTS:

Each Bidder shall examine the Bidding Documents carefully; and, no later than seven (7) days prior to the date for receipt of Bids, he/she shall make a written request to the Architect for interpretation or correction of any ambiguity, inconsistency or error which he may discover. All interpretations or corrections will be issued as addenda. The Architect and/or Owner will not be responsible for oral clarifications. Only written addenda will become a part of the contract documents. Should any conflicts exist in the contract specifications and/or drawings, the most stringent of the items in conflict shall apply.

SUBSTITUTIONS:

Each Bidder represents that his Bid is based upon the materials and equipment described in the Bidding Documents. No substitution will be considered unless written request has been submitted to and received by the Architect for approval at least ten (10) days prior to the date for receipt of Bids. In addition to the manufacturers printed literature, each request shall include a complete description of the proposed substitute, the name of the material or equipment for which it is to be substituted, drawings, cuts, performance test data and any other data or information necessary for a complete evaluation.

If the Architect approves any proposed substitution, such approval will be set forth in an addendum. The contractor is responsible for ensuring that the prices provided include all items suitable for this project.

FAMILIARITY WITH LAWS:

The Bidder shall be familiar with all Federal, State and local laws, ordinances, rules and regulations affecting the work. Ignorance of them on the part of the Bidder shall in no way relieve him from responsibility of complying with the requirements stated therein.

FLORIDA PRODUCTS AND LABORS:

The Bidder's attention is called to Section 255.04, Florida Statutes, which requires that on public building contracts, Florida products and labor shall be used wherever price and quality are equal.

BASIS OF BID:

The Bidder shall include with his Bid all unit cost items, quantity estimates and alternates indicated on the Bid Form. Failure to comply may be cause for rejection.

If the Owner wishes to learn the relative or additional construction cost of an alternative use type of material, or an increase or decrease in scope of the project, these items will be defined as alternates and will be specifically described by the Drawings and/or Specifications. Alternates will be listed in the Bid Form in such a manner that the Bidder shall be able to clearly indicate what sums he will add to or deduct from his Base Bid.

Such alternates may or may not be accepted, but if so, it is the intention of the Owner to accept them in any order or combination he chooses and not necessarily in the order listed on the Bid Form.

No segregated Bids or assignments will be considered.

PREPARATION AND SUBMISSION OF BIDS:

Bid Form: (Submit in triplicate) Bidders shall submit an original and two copies.

Each Bidder shall use the Bid Form supplied and/or bound herein and indicate his Bid prices thereon in the proper spaces for the entire Work and for the alternatives on which he bids. Any erasures or other corrections in the Bid must be explained or noted over the signature of the Bidder. Bids containing any conditions, or irregularities of any kind may be rejected by the Owner.

List of Subcontractors:

The Contractor shall, with his bid, submit to the Owner a list of all his subcontractors. This list shall include each company name, if it is a subcontractor, the character of his work or the materials it supplies, the address and telephone number and the name of the person with whom the Contractor is dealing.

Bid Guarantee - Five Percent (5%):

Bids shall be accompanied by a Bid Guarantee which shall be a Bid Bond, Cashier's Check, or Bank Draft, made payable to:

Gulf Coast State College

Such check or bond shall be submitted with the understanding that it shall guarantee that the Bidder will not withdraw his Bid for a period of thirty (30) days after the scheduled closing time for the receipt of Bids; that, if in accordance with the form of agreement included as part of the Contract Documents; that the required bond will be given; and that, in the event of the withdrawal of Bid within said period, or failure to enter into Contract and give bond within ten (10) days after he has received notice of acceptance of his Bid, and receipt of Contract Agreement, the Bidder shall be liable to the Owner for the full amount of the Bid Guarantee as representing the damage to the Owner on account of the default of the Bidder in any particular thereof.

The Bid Guarantee shall be returned by mail to all except the three lowest Bidders after the formal opening of Bids. The Owner reserves the right to hold the Bid guarantee of the lowest three Bidders until after they have executed the Contract with the accepted Bidder and the Performance and payment Bond have been certified by the Owner.

If the Owner fails to issue an "Acceptance of Bid" to a Bidder within thirty (30) days after the date of the opening of the Bids, then the Bid Guarantee of any Bidder will be returned upon his request.

Submission of Bids:

Submit Bid in an opaque, sealed envelope. Identify the envelope with project name and name of Bidder. Submit in accordance with Invitation to Bid.

BIDDER'S QUALIFICATIONS:

1. The apparent successful bidder shall, upon the request of the Architect, furnish documentation of the following:
 - a. He or She shall meet the Contractor's Qualifications listed in Article 15010.1.
 - b. He or She is currently registered with or hold an unexpired Certificate issued by the Florida Construction Industry Licensing Board in accordance with current applicable regulations, Licensing of Construction Industry, Florida Statutes.
 - c. He or She presently maintains a permanent bona fide place of business practicing this type of work and has had the appropriate experience.
 - d. He or She has available, or can obtain, adequate equipment and financial resources to undertake and execute the Contract properly and expeditiously, in accordance with present day practices.
 - e. All subcontractors shall be fully licensed in the State of Florida and shall be bondable. Submit copies of current license and documentation from bonding company showing compliance.
 - f. He or She shall submit with the Bid the enclosed document entitled "Sworn Statement under Section 287.133(3) (a), Florida Statutes. On Public Crimes".
2. The apparent successful bidder shall also, at the request of the Architect, submit a fully executed "Contractor's Qualification Statement" AIA Document A305. Copies of A305 are available for examination at the office of the Architect.

LICENSE:

In accordance with Chapter 489.113, Florida Statutes, all individuals or entities engaging in and providing construction services shall be licensed in the State of Florida for that activity. This license requirement includes general and sub-contractors.

The successful low bidder shall be required to submit a list of all contractors to be involved in said project with applicable license numbers (see form included in these documents), including a photographic copy of current license certificates. Submittal of proof of license shall be made with, and as a part of signed contract.

Prime Contractor shall submit proof of licensure with the Bid Form. Failure to submit required proof of license shall be cause for Owner to reject bid as non-responsive, and award bid to second lowest qualified bidder.

DISQUALIFICATION OF BIDDER:

More than one Bid from an individual, firm, partnership, corporation or association under the same or different names will not be considered. Reasonable grounds for believing that a Bidder is interested in more than one Bid for the same will cause the rejection of all Bids which such Bidder is believed to be interested. Bids will be rejected if there is reason to believe that collusion exists between Bidders. Bids in which the prices are obviously unbalanced may be rejected.

MODIFICATION OF BID:

Bid modifications will be accepted from Bidders if addressed to the Owner at the place where Bids are to be received and if received prior to the opening of the Bids. Modifications may be in written or telegraphic form. Modifications will be acknowledged by the Owner before opening of formal Bids.

WITHDRAWAL OF BIDS:

Bids may be withdrawn by written or telegraphic request received from Bidders prior to the time fixed for opening. Negligence on the part of the Bidder in preparing the Bid confers no right for the withdrawal of the Bid after it has been opened.

RECEIPT OF OPENING BIDS:

Bids will be opened publicly at the time and place stated in the Invitation. The person whose duty it is to open them will decide when the specified time has arrived and no Bids received thereafter will be considered. No responsibility shall be attached to any person for the premature opening of a Bid not properly addressed and identified.

At the time fixed for the opening of Bids, the contents of the Bid Form will be made public for the information of the Bidders and other interested, who may be present either in person or by representative.

REJECTION OF BIDS:

The Owner reserves the right to reject any or all Bids when such rejection is in the interest of the Owner, and to reject the Bid of a Bidder, in the Architect's opinion, who is not in a position to perform the Contract, or whose list of subcontractors is improperly prepared.

AWARD OF CONTRACT:

The Contract will be awarded within thirty (30) days to the lowest qualified Bidder, provided his Bid is reasonable and it is in the best interest of the Owner to accept it. The Owner reserves the right to waive any informality in Bids received when such a waiver is in the best interest of the Owner.

BUILDING PERMIT:

A permit will be issued to the Contractor by the Facilities Planning and Construction Department of Gulf Coast State College.

SECURITY:

The Contractor shall be responsible for maintaining security, and the contractor shall be responsible for replacement or repair of items and/or equipment stolen, lost or damaged while the building security is under the care of the Contractor. The Contractor shall be responsible for having a job superintendent present whenever work is in progress. The Contractor shall not change superintendent without the Owners approval.

SPECIAL POLICY AND PROCEDURES:

Contractor and subcontractor personnel are not permitted to use the campus facilities.

Smoking is not permitted in any campus facility.

Profane language or improper behavior will result in immediate termination from the construction site.

The Contractor shall erect temporary barricades and fencing as required to keep the unauthorized out of the construction area, and provide signs that read. "This area is a designated construction site; anyone who trespasses on this property commits a felony per Florida Statute 810.09(2d).

END OF SECTION 002113

SECTION 002500 – OWNER DIRECT PURCHASE

Owner may elect to direct purchase poles, light fixtures, lighting controls, and panelboards for tax savings. Contractor shall work with Gulf Coast State College to facilitate this.

SECTION 004100 - BID FORM

TO: Gulf Coast State College
Building Enrollment Services
Gardner Seminar Room 124
5230 US Highway 98, Panama City, FL 32401

REFERENCE: **DRIVER TRAINING PAD LIGHTING UPGRADES
FOR
GULF COAST STATE COLLEGE – NORTH BAY CAMPUS**

Gentlemen:

The undersigned, hereinafter called "Bidder", having visited the site of the proposed Project and having become familiar with the local conditions, nature and extent of the Work, and having examined carefully the drawings and the Project Manual, proposes to furnish all labor, material, equipment and other items, facilities, and services for the proper execution and completion of the above referenced project, in full accordance with the Contract Documents prepared by **HG Engineers, 142 Eglin Parkway SE, Fort Walton Beach, Florida, 32548** in full accordance with the Invitation to Bid, Instruction to Bidders, Agreement, Technical Specification, and all other documents relating thereto on file in the Office of the Architect and if awarded the Contract, to complete said Work within the time limits specified for the following bid price.

PROVIDE NUMERICAL AND WRITTEN DOLLAR AMOUNTS

BASE BID (INCLUDING CONTROLS ALLOWANCE):

_____ (\$ _____)
Dollar Amount Included in Base Bid

There is enclosed a certified check, cashier's check, treasurer's check, bank draft, or Bid Bond in the amount of not less than five percent (5%) of the Base Bid payable to Gulf Coast State College, as a guarantee for the purpose set out in the Instructions to Bidders.

The bidder hereby agrees that:

- a. The above Proposal shall remain in full force and effect for a period of thirty (30) calendar days after the time of the opening of this Proposal and that the Bidder will not revoke or cancel this Proposal or withdraw from the competition within the said thirty (30) calendar days.
- b. In the event the contract is awarded to this Bidder, the Bidder will enter into a formal written Agreement with the Owner in accordance with the accepted bid within ten (10) calendar days after said agreement is submitted to the Bidder and will furnish to the Owner a Performance Bond and a Labor and Material Payment Bond with good and sufficient sureties, satisfactory to the Owner, in the amount of 100% of the accepted bid, on the forms and terms required in the construction documents. The Bidder further agrees that in the event of the bidder's default or breach of any of the agreements of this Proposal, the bid deposit shall be forfeited as liquidated damages.
- c. The Bidder must agree to commence work within ten (10) calendar days after the written "Notice to Proceed" and substantially complete the work as shown on **Project Schedule in Exhibit A**. Bidder must further agree to fully complete the work,

including any and all punch list items as shown on **Project Schedule in Exhibit A**. The number of days allowed for construction includes an allowance for time missed due to inclement weather.

- d. Liquidated damages shall be assessed against the final payment in the amount of \$1,000 for each consecutive calendar day the Contractor is late in achieving Substantial Completion and \$500 for each consecutive day the Contractor is late in achieving Final Completion.
- e. The Contractor shall list on a separate page the 'List of Subcontractors' and submit the list with his bid as required by 00 21 13, Page 2.
- f. All work shall comply with applicable codes, specifications, local ordinances and industry standards including, but not limited to the handling, removal, and disposal of fluorescent bulbs and ballasts. Provide Gulf Coast State College with a copy of the "Waste Manifest".

Acknowledgment is hereby made or receipt to the following Addenda issued during the bidding period.

Addendum No. _____ Dated _____

Addendum No. _____ Dated _____

Addendum No. _____ Dated _____

Florida Construction Industries Licensing Board Certification

(Name of Holder)
(Certification Number)

Signed and sealed this _____ day of _____, 20_____.

Check accordingly: Firm Name: _____

We operate as
Individual Owner () By: _____

Partnership () Title: _____

Corporation ()
Address: _____

Telephone: _____
FAX: _____

Attachments:

- 00 41 01 – TRENCH SAFETY ADDENDUM
- 00 41 02 – DRUG-FREE WORKPLACE CERTIFICATION
- 00 41 03 – PUBLIC ENTITY CRIMES STATEMENT
- 00 43 00 – LIST OF SUBCONTRACTORS
- 00 43 13 – BID BOND

END OF SECTION 004100

SECTION 004101 – TRENCH SAFETY ADDENDUM

Contractor shall comply with the FLORIDA TRENCH SAFETY ACT ACKNOWLEDGEMENT. If this project involves trench excavations that will exceed a depth of 5 feet, pursuant to Florida Statutes, Chapter 553, Part VI, Trench Safety Act will be in effect and the undersigned Bidder hereby certifies that such Act will be complied with during the construction of this Project.

Bidder acknowledges that included in the various items of the bid and in the total price are costs for complying with the Florida Trench Safety Act. Bidder further identifies the cost to be as summarized below:

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

END OF SECTION 004101

SECTION 004102 – DRUG-FREE WORKPLACE CERTIFICATION

- A. A copy of the Drug Free Certification form is included in these bid documents as required by the Gulf Coast State College Board of Trustees.
- B. A copy of the Drug-Free Certification form is contained herein. The completed form must be submitted in the bid submittal along with the other required documents.

DRUG-FREE WORKPLACE CERTIFICATION

The below signed bidder certifies that it has implemented a Drug-Free Workplace Program. In order to have a Drug-Free Workplace Program, a business shall:

1. Publish a statement notifying employees that the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance is prohibited in the workplace and specifying the actions that will be taken against employees for violations of such prohibition.
2. Inform employees about the dangers of drug abuse in the workplace, the business's policy of maintaining a drug-free workplace, any available drug counseling rehabilitation and employee assistance programs and the penalties that may be imposed upon employees for drug abuse violations.
3. Give each employee engaged in providing the commodities or contractual services that are under proposal a copy of the statement specified in subsection 1.
4. In the statement specified in subsection 1., notify the employees that, as a condition of working on the commodities or contractual services that are under proposal, the employee will abide by the terms of the statement and will notify the employer of any conviction of, or plea of guilty or nolo contendere to, any violation occurring in the workplace no later than five (5) working days after such conviction.
5. Impose a sanction on, or require the satisfactory participation in drug abuse assistance or rehabilitation program of such is available in the employee's community, by any employee who is convicted.
6. Make a good faith effort to continue to maintain a drug-free workplace through implementation of this section.

As the person authorized to sign this statement, I certify that this firm complies fully with the above Drug-Free Workplace requirements.

DATE: _____

COMPANY: _____

ADDRESS: _____

Gulf Coast State College North Bay Campus
Driver Training Pad Lighting Upgrades

CITY: _____ STATE: ____ ZIP CODE: _____

TELEPHONE: _____

SIGNATURE: _____

NAME (PRINTED): _____

TITLE: _____

END OF SECTION 004102

SECTION 004103 - PUBLIC ENTITY CRIMES STATEMENT

- A. The following information is included in these bid documents as required by Florida Statute.
- B. 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.
- C. A copy of the Sworn Statement form is contained herein. The completed form shall be submitted in the bid submittal along with the other required documents.

**SWORN STATEMENT UNDER SECTION 287.133 (3) (A)
FLORIDA STATUTES, ON PUBLIC ENTITY CRIMES**

THIS FORM MUST BE SIGNED IN THE PRESENCE OF A NOTARY PUBLIC OR OTHER OFFICER AUTHORIZED TO ADMINISTER OATHS.

- 1. This sworn statement is submitted with Bid, Proposal or Contract for
- 2. This sworn statement is submitted by
whose business address is

and (if applicable) Federal Employer Identification Number (FEIN) is _____ (If the entity has no FEIN, include the Social Security Number of the individual signing this sworn statement:

- 3. My name is _____ and my relationship to the entity named above is

4. I understand that a "public entity crime" as defined in Paragraph 287.133 (1) (g). Florida Statutes, means a violation of any state or federal law by a person with respect to and directly related to the transaction of business with any public entity or with an agency or political subdivision of any other state or with the United States, including, but not limited to, any bid or contract for goods or services to be provided to any public entity or any agency or political subdivision of any other state or of the United States and involving antitrust, fraud, theft, bribery, collusion, racketeering, conspiracy, or material misrepresentation.

5. I understand that "convicted" or "convicted" as defined in paragraph 287.133 (1) (b), Florida Statutes, means a finding of guilt or a conviction of a public entity crime with or without an adjudication of guilt, in any federal or state trial court of records relating to charges brought by indictment or information after July 1, 1989, as a result of a jury verdict, non-jury trial, or entry of a plea of guilty or nolo contendere.

6. I understand that an "affiliate" as defined in Paragraph 287 .133 (1) (a), Florida Statutes, means:

1. A predecessor or successor of a person convicted of a public entity crime; or

2. An entity under the control of any natural person who is active in the management of the entity and who has been convicted of a public entity crime. The term "affiliate" includes those officers, directors, executives, partners, shareholders, employees, members, and agents who are active in the management of an affiliate. The ownership by one of shares constituting a controlling income among persons when not for fair interest in another person, or a pooling of equipment or income among persons when not for fair market value under an length agreement, shall be a prima facie case that one person controls another person. A person who knowingly convicted of a public entity crime, in Florida during the preceding 36 months shall be considered an affiliate.

7. I understand that a "person" as defined in paragraph 287 .133 (1) (e), Florida Statutes, means any natural person or entity organized under the laws of the state or of the United States with the legal power to enter into a binding contract provision of goods or services let by a public entity, or which otherwise transacts or applies to transact business with a public entity. The term "person" includes those officers, directors, executives, partners, shareholders, employees, members, and agents who are active in management of an entity.

8. Based on information and belief, the statement which I have marked below is true in relation to the entity submitting this sworn statement. (Please indicate which statement applies)

_____ Neither the entity submitting this sworn statement, nor any officers, directors, executive, partners, shareholders, employees. member, or agents who are active in management of the entity, nor affiliate of the entity have been charged with and convicted of a public entity crime subsequent to July 1, 1989.

_____ The entity submitting this sworn statement, or one or more of the officers, directors, executives, partners, shareholders, employees, members, or agents who are active in management of the entity, or an affiliate of the entity has been charged with and convicted of a public entity crime subsequent to July 1, 1989 And (please attach a copy of the final order)

_____ The person or affiliate was placed on the convicted vendor list. There has been a subsequent proceeding before a hearing officer of the State of Florida, Division of Administrative Hearings. The final order entered by the hearing officer determined that it was in public interest to remove the person or affiliate from the convicted vendor list. (please attach a copy of the final order.)

_____ The person or affiliate has not been placed on the convicted vendor list. (Please describe any action taken by, or pending with, the department of General Services.)

(Signature)
Date:

STATE OF FLORIDA
COUNTY OF _____

PERSONALLY APPEARED BEFORE ME, the undersigned authority,
who, after first being sworn by me, affixed his/her signature at the space provided above on
this _____ day of _____, 20__, and is personally known to me, or has provided
__as identification.

Notary Public

My Commission expires:

END OF SECTION 004103

SECTION 004300 - LIST OF SUBCONTRACTORS

(List of Sub-Contractor's proposed for this project will be required at time of bidding.)

TO: _____

This list is an integral part of the Bid submitted by:

Name and address of Contractor: _____

for the construction of the **Driver Training Pad Lighting Upgrades**, Gulf Coast State College District Board of Trustees, Gulf Coast State College.

The undersigned, hereafter called "Bidder", lists below the names of the subcontractors who will perform the phases of the work indicated:

<u>Division:</u>	<u>Name of Subcontractor:</u>
Concrete Work	_____
Structural Steel	_____
Carpentry	_____
Acoustical Ceiling	_____
Painting	_____
Fire Protection	_____
Plumbing	_____
Mechanical	_____
Electrical	_____
Fire Alarm	_____

The undersigned declares that he/she has fully investigated each subcontractor listed and has determined to his/her own complete satisfaction that such subcontractor maintains a fully equipped organization, capable, technically and financially, of performing the pertinent work, and that he/she has made similar installation in a satisfactory manner.

FIRM: _____
(Name of Firm)

BY: _____
(Signature of Bidder)

(Name of Bidder)

TITLE: _____
(Title of Bidder)

DATE: _____

END OF SECTION 004300

SECTION 004313 – BID BOND

- A. The “Bid Bond”, The American Institute of Architect’s (AIA) Document A310-1970, 1970 Edition, two (2) pages, and (AIA) Document D401 – 2003 “Certification of Document’s Authenticity,” one (1) page is for reference only. Document shall be issued, as modified, on this Project as the Agreement Form. Copy upon request.

END OF SECTION 004313

SECTION 005200 – AGREEMENT FORMS

The “Standard Form of Agreement Between Owner and Contractor Where the Basis of Payment is a Stipulated Sum,” The American Institute of Architects (AIA) Document A101-2007, is for reference only. Document shall be issued, as modified, on this Project as the Agreement Form. Copy upon request.

SECTION 006113 – PERFORMANCE BOND AND PAYMENT BOND

- A. The “Performance Bond” and the “Payment Bond”, The American Institute of Architect’s (AIA) Document A312-1984, 1984 Edition, seven (7) pages, “Additions and Deletions Report for AIA Document A312 – 1984,” one (1) page and (AIA) Document D401 – 2003 “Certification of Document’s Authenticity,” one (1) page, is for reference only. Copy upon request.

SECTION 007200 – GENERAL CONDITIONS

The “General Conditions of the Contract for Construction” The American Institute of Architects (AIA) Document A201-2007, is for reference only. Document shall be issued, as modified, on this Project as the Agreement Form. Copy upon request.

SECTION 007380 - WEATHER DELAY LOG

- A. **Project: Driver Training Pad Lighting Upgrades for Gulf Coast State College – North Bay Campus**
- B. **Date:**
- C. **Weather Event:**
- D. **Work On Progress:**
- E. **Is the work on the Critical Path?**
- F. **Length of Delay:**
- G. **If the work is not on the Critical Path, how many days of delay until this work category will be on the Critical Path?**

Instructions:

1. The above information is required to be submitted with each payment request on a monthly basis.
2. This information will be required as back-up to grant a Time Extension request for delays caused by weather events.
3. Direct delays for work stoppages that are on the critical path will be given accordingly.
4. Delays for work not on the critical path shall be logged and delay logs for that category of work shall be accumulated and submitted in the event the work enters the critical patch and causes a delay of the project.
5. Delays will be granted only on the basis of adverse effect on the Critical Path of work for the project.
6. Weather delays will only be allowed in regards to delivery and unloading of the equipment. Furthermore, weather delays will only be allowed if the rainfall exceeds 1.5” of rain per day as determined by the Mobile Weather Service.

References:

CONTRACT FOR CONSTRUCTION, EXHIBIT C, DIVISION 1 (CONTRACT)

8. Any time or day lost to a weather-related delay including wet ground conditions, rain, other forms of precipitation, and cold weather conditions, shall be an extension to the construction time regardless whether the period is under normal or adverse weather conditions.

GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION – A201

Article 4.3.7.2 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.

Submitted by:

Signature:

Contractor:

END OF SECTION 007380

SECTION 007400 – PAYMENT

The “Payment”, The American Institute of Architect’s (AIA) Document G702-1992 Edition, one (1) page, G703-1992 Edition, one (1) page and G704–2000 one (1) page, included herein and shall be used, on this Project for application and process of payment is for reference only. Document shall be issued, as modified, on this Project as the Agreement Form. Copy upon request.

END OF SECTION007400

SECTION 009000 - SUPPLEMENTARY GENERAL CONDITIONS

SCOPE: The following supplements modify, change, delete or add to the "GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION", AIA Document A201, 2007 remain in effect as published.

ARTICLE 1: GENERAL PROVISIONS

1.1 BASIC DEFINITIONS

1.1.9 (ADD) Unless otherwise expressly stated, wherever in the Contract Documents the work 'provide' is used, it shall mean furnished and installed in place, complete and tested.

1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS

1.2.4 (ADD) the following: "If a discrepancy occurs on drawings, in specifications, or between drawings and specifications, the greater quantity or value takes precedence."

ARTICLE 3: CONTRACTOR

3.5 WARRANTY:

3.5.1 (ADD) The warranty herein guarantees the proper operation of all structures, components and systems constructed or installed by the contractor for a period of one year after the date of substantial completion.

If within the guarantee period, repairs or changes are required in connection with the guarantee work, which in the opinion of the Architect is rendered necessary as the result of the use of materials, equipment, or workmanship, which are defective, or inferior, or not in accordance with the terms of the Contract, the Contractor shall, promptly upon receipt of notice from the Owner, and without expense to the Owner, proceed to:

Place in satisfactory condition in every particular all of such guaranteed work, correct all defects therein; and

Make good all damages to the structure or site, or equipment or contents thereof which, in the opinion of the Architect are the result of the use of materials, equipment or workmanship which are inferior, defective, or not in accordance with the terms of the Contract, or the equipment and contents or structures or site disturbed in fulfilling any such guarantee.

3.18 INDEMNIFICATION:

3.18.1 (REVISE) "The Contractor shall, for the sum of one hundred dollars (\$100.00) and other good and valuable consideration paid by the Owner and Architect, individually, receipt of which is hereby acknowledged by the Contractor, indemnify and hold harmless the Owner and Architect and their agents and employees from and against all claims, damages, losses and expenses, including attorney's fees,

out of or resulting from the performance of the work provided that such claims, damage, loss or expense: (1) is attributable to bodily injury, sickness, disease or death, or injury to or destruction of tangible property other than the work itself, including the loss of use resulting there-from, and (2) is caused in whole or in part by a negligent act or omission of the Contractor, subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any one of them may be liable, regardless of whether or not it is caused in part by a party indemnified hereunder. This obligation shall not be construed to reduce or negate any other right or obligation of indemnity which would otherwise exist as to any party or person described in Paragraph 3.18.”

ARTICLE 5: SUBCONTRACTORS

5.2.2 Substitute the following for Subparagraph 5.2.2:

"The Contractor shall not contract with any person or entity declared ineligible under Federal laws or regulations from participating in federally assisted construction projects or to whom the Owner or the Architect has made reasonable objection under the provisions of Subparagraph 5.2.1. The Contractor shall not be required to contract with anyone to whom has a reasonable objection."

ARTICLE 7: CHANGES IN WORK

7.1 General

7.1.1 (ADD) "Maximum percentages of overhead and profit which may be added by the Contractor to actual costs of such changes in the work are specifically set forth as follows:

For all work done by his organization, or subsidiaries of his organizations, including work traditionally considered as subcontractor work, the Contractor may add 15% of his actual costs for combined overhead and profit.

For any work performed by a subcontractor or forces under the respective subcontractor including any sub-subcontractors or persons not in the direct employ of the subcontractor, a total of 15% of the cost of the change, with 10% to be assigned to the subcontractor and any forces under him and the General Contractor may add 5% of the above subcontractor's cost for his overhead and profit.

The above percentages shall be considered reasonable allowance for overhead and profit due to the contractor.

The Contractor shall submit receipts or other evidence showing his costs and his right to the payment claims. All changes in work shall be provided with a detailed cost breakdown indicating material and labor units for all work to be performed. In addition, the cost breakdown shall contain all current tax and labor burden. The allowable amount for the material tax shall be 7.25% and for labor burden shall be 30%.

ARTICLE 11: INSURANCE AND BONDS

11.1 CONTRACTORS LIABILITY INSURANCE

11.1.2 (ADD) "The Contractor shall not commence any work in connection with this agreement until he has obtained all of the following types of insurance with the Owner as additional named insured and such insurance has been approved by the Owner, nor shall the Contractor allow any subcontractor to commence work on his subcontract until all similar insurance required of the subcontractor to commence work on his subcontract has been obtained and approved.

All insurance policies shall be with insurers qualified and doing business in Florida.

THE CONTRACTOR SHALL PROCURE AND MAINTAIN FOR THE LIFE OF THIS CONTRACT:

1. Workers Compensation and Employers' Liability as follows:
 - a. WC Statutory Limits per FS 440
 - b. E.L. - Each Accident \$500,000
 - c. E.L. Disease – Each Employee \$500,000
 - d. E.L. Disease – Policy Limit \$500,000
2. Comprehensive General Liability with minimum limits as follows:
 - a. Each Occurrence - \$ 1,000,000
 - b. Damage to Rented Premises (Each occurrence)- \$100,000
 - c. Medical Expense (Any one person) \$5,000
 - d. Personal Advertising Injury - \$1,000,000
 - e. General Aggregate - \$2,000,000
 - f. Products-Completed Aggregate - \$2,000,000
 - g. General Aggregate applies to Per Project
3. Automobile Liability providing coverage on any auto to include all owned, hired and non-owned vehicle with following minimum limits:
 - a. Combined Single Limit (Each Accident) - \$1,000,000 OR
 - b. Bodily Injury per person - \$500,000, Bodily Injury per Accident - \$1,000,000, Property Damage per Accident - \$500,000
4. Excess/Umbrella Liability on Occurrence Form with following limit:
 - a. \$1,000,000 each occurrence
 - b. \$2,000,000 aggregate
 - c. Retention /Deductible - \$5,000

11.1.2 (ADD) "The Contractor liability policy shall provide "XCU" (Explosion, Collapse, Underground Damage) coverage for those classifications in which they are

included.

Broad Form Property Damage shall be required on Contractor's public liability so that completed operations coverage extends to work performed by the Contractor.

11.1.5 (ADD) Builders Risk Insurance: Contractor shall purchase and maintain in effect a completed value builder's risk policy issued by an admitted carrier in an amount equal to the full completed value of the project. Such insurance shall be issued on an all risk form. The Contractor shall be responsible for any deductible amounts.

11.4.3 (ADD) The Contractor shall furnish a Performance Bond in an amount equal to one hundred percent (100%) of the Contract Sum as security for the faithful performance of this Contract and also a Labor and Material Payment Bond in an amount not less than one hundred percent (100%) of the Contract Sum or in a penal sum not less than that prescribed by State, Territorial or local law, as security for the payment of persons performing labor on the Project under this Contract and furnishing materials in connection with this Contract. The Performance Bond and the Labor and Material Payment Bond may be in one or in separate instruments in accordance with local law and shall be delivered to the Owner not later than the date of execution of the Contract. The premium for the required bonds shall be paid by the Contractor. "These bonds shall be executed on behalf of the Contractor in the same manner and by the same person who executed the agreement.

11.4.4 (ADD) "To be acceptable as surety on Performance and Payment Bonds, a surety company shall comply with the following provisions:

The Surety Company must be admitted to do business in the State of Florida. The surety Company shall have been in business and have a record of successful continuous operations for at least five years. The Surety Company shall have at least the following minimum ratings:

Contract Amount	Policy Holders	Required Rating
0 - 100,000	B	CLASS VII
100,000 - 500,000	A	CLASS VIII
500,000 - 750,000	A	CLASS IX
750,000 - 1,000,000	A	CLASS X
1,000,000 - 1,250,000	A	CLASS XI
1,250,000 - 1,500,000	A	CLASS XI
1,500,000 - 2,000,000	A	CLASS XII
2,000,000 - 2,500,000	A	CLASS XII

*From Best's key rating guide.

Best's Policy Holder's Rating of "A" and "B" (which signifies A--Excellent, and B-Good, based upon good underwriting, economic management, adequate reserves for undisclosed liabilities, net resources for unusual stock and sound investment) or an equivalent rating from the Insurance Commissioner, if not rated

by Best's. Neither the Surety Company nor any reinsurer shall expose itself to any loss on any one risk in an amount exceeding ten (10%) percent of its surplus to policyholders.

In the case of a surety insurance company, there shall be deducted in addition to the deduction for reinsurance, the amount assumed by any co-surety, the value of any security deposited, pledged or held subject to the content of the Surety and for the protection of the Surety."

Furnish in triplicate a Performance Bond and a Payment Bond, each in the amount of 100% of the Contract Sum, written by a surety licensed to do business in the state where the Project is located. The prescribed form of the Performance Bond and Payment Bond is AIA Document A313.

ARTICLE 15: CLAIMS AND DISPUTES

15.4 ARBITRATION- Delete sections 15.4 through 15.4.4.3 in their entirety.

END OF SECTION 009000

EXHIBIT A - PROJECT SCHEDULE



142 Eglin Parkway SE
Fort Walton Beach, FL 32548-5545
850.243.6723 / 888.618.3143 Toll Free
www.humber-garick.com

Christopher A. Garick, P.E. RCDD
Thomas A. Alexander, P.E. LEED AP
Daniel J. White, PE., LEED AP (BD+C)
James C. Hendricks, Jr., P.E. CEP

Gulf Coast State College North Bay Campus Driver Training Pad Lighting Upgrades Project Schedule

- Construction Documents – Friday, February 22nd, 2019
- News Herald Advertisement - Week of February 24th, 2019 (3 consecutive weeks)
- Mandatory Pre-bid Meeting – Monday, March 11th, 2019 (9AM CST at jobsite)
- Last day for Questions - Thursday, March 14th, 2019 (4:00pm CST)
- BID DAY – Thursday, March 28th, 2019 (2:00pm CST)
- GCSC Board Meeting – Thursday, April 18th, 2019
- Notice to proceed – Friday, April 19th, 2019
- Substantial Completion – Wednesday, July 3rd, 2019
- Final Completion – Wednesday, July 17th, 2019

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SECTION 260500 - ELECTRICAL GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

The Electrical General Requirements are supplementing and applicable to Division 26 Sections and shall apply to all phases of work specified herein, shown on the Drawings, or required to provide a complete installation of electrical systems. Section 26 is sub-divided for convenience only.

A. This Section includes the following:

1. Job Conditions
2. Regulatory Requirements
3. Electrical equipment coordination and installation.
4. Submittals, Operating and Maintenance instructions and As-built drawings.
5. Common electrical installation requirements.
6. Warranty of work.

1.2 JOB CONDITIONS:

- A. Site Inspections: Before submitting proposals, each bidder should visit the site and fully familiarize himself with all job conditions and shall be fully informed as to the extent of his work. No consideration will be given after bid opening date for alleged misunderstanding as to the requirements of work involved in connecting to the utilities or as to requirements of materials to be furnished. The contractor shall contact the utility prior to bid and make appropriate provisions in such bid as required by the utility for the utility's routing and connection.
- B. Scheduled Interruptions: Planned interruptions of utilities service, to any facility affected by this contract, shall be carefully planned and approved by Architect at least ten (10) days in advance of the requested interruption. The Contractor shall not interrupt services until the Architect has granted specific approval. The request shall indicate services to be affected, date and time of interruption and duration of outage. Request for interruption of service will not be approved until all equipment and materials required for the completion of that particular phase of work are on the job site. The work may have to be scheduled after normal working hours.
- C. Accidental Interruptions: All excavation and/or remodeling work required shall be performed with care so as not to interrupt other existing services (water, gas, electrical, sewer, sprinklers, etc.). If accidental utility interruption resulting from work performed by the Contractor occurs, service shall be immediately restored to its original condition without delay, by and at the expense of the Contractor, using skilled workmen of the trade required.

1.3 REGULATORY REQUIREMENTS:

- A. Permits, Fees, and Inspections: This Contractor shall secure and pay for all permits, and inspections required on work performed under this section of the Specifications. He

shall assume full responsibility for all assessments and taxes necessary for the completion and acceptance of the work. The Owner will arrange for utility power including any impact fees.

- B. Applicable Standards and Codes: The electrical installation shall comply with all applicable building codes; local, state, and federal ordinances; and the 2014 edition of the National Electrical Code. In case of a discrepancy among these applicable regulatory codes and ordinances, the most stringent requirement shall govern. The Contractor shall notify the Architect in writing of any such discrepancy. Should the Contractor perform any work that does not comply with the applicable regulatory codes and ordinances he shall bear all cost arising in correcting the deficiencies. Application standards and codes shall include all local ordinances, all state laws, and the applicable requirements of the following:
1. American National Standards Institute - ANSI
 2. National Electrical Manufacturer's Association - NEMA
 3. National Fire Protection Association – NFPA (latest editions)
 4. The National Electric Code – NEC – NFPA 70, 2014 Edition
 5. The Life Safety Code – NFPA 101, current Florida Edition
 6. The National Fire Alarm Code – NFPA 72, current Florida Edition
 7. Florida Building Code, 2017 Edition
 8. Underwriters' Laboratories, Inc. – UL
- C. Drawings and Specifications: The drawings and these specifications are complementary each to the other. What is called for by one shall be as binding as if called for by both. Omissions from the drawings and specifications of details of work which are evidently necessary to carry out the intent of the drawings and specifications, or which are customarily performed, shall not relieve the Contractor from performing such work. In any case of discrepancy in the figures or catalog numbers, the matter shall be submitted to the Architect, who shall promptly make a determination in writing. Any adjustment by the Contractor shall be at the Contractor's own risk and expense. Electrical drawings are diagrammatic only. Do not scale these drawings. All equipment shall be installed in accordance with manufacturer's recommendations and any conflicting data shall be verified before bidding.
- D. The Contractor shall after completion of the work, furnish the Architect a certificate of final inspection and approval from the applicable local inspection department. Make necessary changes to plans and specifications to meet code standards at no additional cost to the Owner.

1.4 COOPERATION:

- A. Interfacing with Other Crafts: It shall be the responsibility of the Contractor to cooperate and coordinate with all other crafts working on this project. This Contractor shall do all cutting, trenching, backfill and structural removals to permit entry of the electrical system components. The General Contractor shall do all patching and finishing.
- B. Equipment Furnished Under Other Sections: This Contractor shall furnish and install, complete electrical roughing-in and connections to all equipment furnished under other sections and indicate on drawings. This includes all outlets as shown on mechanical

and electrical drawings. All such equipment shall be set in place as work of other sections.

C. Heating and Air Conditioning:

1. The Contractor shall furnish all branch circuit wiring to motors and control panels or centers including disconnects, receptacles, switches, and appurtenances to which the system at the units may be connected, to provide a complete system of wiring for power. Control equipment and control circuit wiring is specified in the Mechanical Section.
2. Control devices to be included in the branch circuit, except those furnished integrals with the equipment, will be delivered by the Heating and Air Conditioning Contractor and installed by the Electrical Contractor.

1.5 WORKMANSHIP:

All work shall be executed in a neat and substantial manner by skilled workman, well qualified, and regularly engaged in the type of work required. Substandard work shall be removed and replaced by the Contractor at no cost to the Owner.

1.6 APPROVAL OF MATERIALS AND EQUIPMENT:

A. Prior-Submittals: The Contractor shall base his proposal on the materials specified herein and on the drawings. Reference to a particular product by manufacturer, trade name, or catalog number establishes the quality standards of material and equipment required for this installation and is not intended to exclude products equal in quality and similar design. The Architect reserves the sole right to decide the equality of materials proposed for use in lieu of these specified. It shall be the Contractor's responsibility to furnish the information and data sufficient to establish the quality and utility of the items in question, including furnishing of samples if required.

B. Submittals:

1. Submittals: The Contractor shall submit a list of equipment proposed for installation. He shall submit catalog data and shop drawings on all proposed systems and their components. Where substitutions alter the design or space requirements, the Contractor shall defray all items of cost for the revised design and construction including costs to all allied trades involved. Provide six (6) copies of submittals and shop drawings as a minimum unless the General Conditions requires a greater number of copies.
 - a. Submittals Schedule: Submittals shall be submitted within thirty (30) days after the contract is awarded. It is not the responsibility of the Engineer to expedite the review of submittals if the contractor has not adequately prepared the submittals in a time efficient manner. The contractor bears all the responsibility for the added time requirements of resubmittals.
 - b. Identification: Place a permanent label or title block on each submittal for identification. Each major section of submittals such as power equipment, lighting equipment, fire alarm, etc., shall be secured in a booklet or stapled with a covering index which lists the following information:
 - 1) Project name and date

- 2) Name, address, and phone number of General contractor and project manager.
 - 3) Name, address, and phone number of Sub-contractor and project manager.
 - 4) Supplier of equipment with phone number and person responsible for this project.
 - 5) Index of each item covered in submittal and model number.
 - 6) Any deviation from contract documents shall be specifically noted on submittal cover index and specifically identified with highlighting, encircling, or boldly on specific submittal sheet.
- c. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
- 1) Include previous submittal review comments.
 - 2) For each item being resubmitted, include previous review comment and explain how resubmitted item meets the criteria of the previous review comment.

2. Electrical and Mechanical/Plumbing/Fire Protection Equipment Coordination:

The electrical power equipment submittals shall be accompanied by a letter verifying coordination of electrical services for all mechanical, plumbing, and fire protection equipment requiring power. The letter shall follow the format listed below.

To: _____
(General Contractor)

Re: _____
(Project name and location)

We the undersigned subcontractors certify that we have coordinated the electrical requirements for mechanical, plumbing, and fire protection sprinkler equipment as evidenced by the coordination chart listed herein.

Item	Load Full Load Amps	1 Phase or 3 Phase	Number of Electrical Connections	Maximum Overcurrent Protection	Minimum Overcurrent Protection	Breaker Proposed	Circuit Proposed

The above list details all required electrical connections for mechanical equipment.

Signed: _____

For: _____
Mechanical Subcontractor

The above list details all required electrical connections for plumbing equipment.

Signed: _____

For: _____
Plumbing Subcontractor

The above list details all required electrical and fire alarm connections for fire protection equipment.

Signed: _____

For: _____
Fire Protection Sprinkler

Subcontractor

The above list of equipment has been reviewed and the required connections are being provided. (Any exceptions or request for direction shall be listed here)

Signed: _____

For: _____
Electrical Subcontractor

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Protection: Take necessary precautions to protect all material, equipment, apparatus and work from damage. Failure to do so to the satisfaction of the Architect will be sufficient cause for the rejection of the material, equipment or work in question. Contractor is responsible for the safety and good condition of the materials installed until final acceptance by the owner.
- B. Cleaning: Conduit openings shall be capped or plugged during installation. Fixtures and equipment shall be tightly covered and protected against dirt, moisture, chemical and mechanical injury. At the completion of the work the fixtures, material and equipment shall be thoroughly cleaned and delivered in condition satisfactory to the Architect.

1.8 TESTING AND BALANCING:

Make tests that may be required by the Owner or the Architect in connection with the operation of the electrical system in the buildings. Balance all single-phase loads connected to all panelboards in the buildings to insure approximate equal divisions of these loads on the main secondary power supply serving the buildings. All tests shall be made in accordance with the latest standards of the IEEE and the NEC. The installation shall be tested for performance, grounds and insulation resistance. A "megger" type instrument shall be used. Contractor shall perform circuit continuity and operational

tests on all equipment furnished or connected by Contractor. The tests shall be made in the presence of the Architect or his representative. The Contractor shall notify the Architect at least twenty-four (24) hours in advance of tests. The Contractor shall provide all testing equipment and all costs shall be borne by him. Written reports shall be made of all tests. All faults shall be corrected immediately.

- A. A letter shall be written giving the following:
 - 1. Measured amps on each phase of each panel.
 - 2. Resistance to ground of each new grounding electrode.
 - 3. Measured voltage phase to phase and phase to neutral at each panel.
 - 4. Ground continuity and polarity instrument used.

1.9 OPERATING AND MAINTENANCE INSTRUCTIONS/AS BUILT DRAWINGS:

- A. Four (4) complete sets of instructions containing the manufacturer's operating and maintenance instructions for each piece of equipment shall be furnished to the Owner. Each set shall be permanently bound and shall have a hard cover. One complete set shall be furnished at the time that the test procedure is submitted, and remaining sets shall be furnished before the Contract is completed. Flysheets shall be placed before instructions covering each subject. The instruction sheets shall be approximately 8-1/2" by 11" with large sheets of Drawings folded in. The instructions shall include information for major pieces of equipment and systems.
- B. Upon completion of the work and at the time designated, the services of one project engineer shall be provided by the Contractor to instruct the representative of the Owner in the operation and maintenance of the systems.
- C. This Contractor shall provide as-built Drawings at the completion of the job. Drawings shall show all significant changes in equipment, wiring, routing, location, etc. All underground conduit routing shall be accurately indicated with locations dimensioned. As-built drawings shall be submitted for review as red-lined on a field hard copy. After review by the Architect, the Contractor will be given digital AutoCAD files and shall make revisions and resubmit final on disk.

1.10 GUARANTEE AND SERVICE:

Upon completion of all tests and acceptance, the Contractor shall furnish the Owner a written guarantee covering the electrical work done for a period of one (1) year from date of acceptance. Guarantee includes equipment capacity and performance ratings specified without excessive noise levels. Upon notice from the Architect or the Owner, the Contractor shall, during the guarantee period, rectify and replace any defective material or workmanship and repair any damage caused thereby without additional cost.

PART 2 – PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

- A. Comply with NECA 1.
- B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.
- C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
- D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
- E. Right of Way: Give to raceways and piping systems installed at a required slope.

END OF SECTION 260500

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (600 VOLTS OR LESS)

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

1.2 SUBMITTALS

- A. Field quality-control test reports.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with the National Electric Code - NFPA 70, edition as stated in Section 260500.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

2.2 CONDUCTORS AND CABLES

- A. Manufacturers:
 - 1. American Insulated Wire Corp.; a Leviton Company.
 - 2. General Cable Corporation.
 - 3. Senator Wire & Cable Company.
 - 4. Southwire Company.
 - 5. Okonite
- B. Refer to Part 3 "Conductor and Insulation Applications" Article for insulation type, cable construction, and ratings.

- C. Conductor Material: Copper. Solid conductor for No. 12 AWG and smaller, stranded for No. 10 AWG and larger. Aluminum conductors are permitted only for feeders rated for 100 amps or greater.
- D. Conductor Insulation Types: THHN-THWN.

2.3 CONNECTORS AND SPLICES

- A. Manufacturers:
 - 1. AMP Incorporated/Tyco International.
 - 2. Hubbell/Anderson.
 - 3. O-Z/Gedney; EGS Electrical Group LLC.
 - 4. 3M Company; Electrical Products Division.
 - 5. AFC Cable Systems, Inc.
- B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.1 CONDUCTOR AND INSULATION APPLICATIONS (All conductors shall be Copper)

- A. Service Entrance: Type THHN-THWN, single conductors in raceway.
- B. Exposed Feeders: Type THHN-THWN, single conductors in raceway.
- C. Feeders Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.
- D. Feeders Concealed in Concrete, below Slabs-on-Grade, and in Crawlspace: Type THHN-THWN, single conductors in raceway.
- E. Exposed Branch Circuits, including in accessible ceiling spaces: Type THHN-THWN, single conductors in raceway.
- F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.
- G. Branch Circuits Concealed in Concrete and below Slabs-on-Grade: Type THHN-THWN, single conductors in raceway.
- H. Cord Drops and Portable Appliance Connections: Type SOOW cable
- I. Fire Alarm Circuits: Type THHN-THWN, in raceway.
- J. Class 1 Control Circuits: Type THHN-THWN, in raceway.
- K. Class 2 Control Circuits: Power-limited cable, concealed in building finishes.

3.2 INSTALLATION

- A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.
- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or raceway.
- D. Install exposed raceways parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- E. Support raceways according to Division 26 Section "Electrical Supports."
- F. Seal around raceways and cables penetrating fire-rated elements according to Division 26 Section "Firestop Systems and Sleeves."
- G. Identify and color-code conductors and cables according to Division 26 Section "Electrical Identification."
- H. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than un-spliced conductors.
- I. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches (150 mm) of slack.
- J. MC cables with a ground may be used as a fixture whip only and shall be limited to 6 foot or less. No other MC cable will be acceptable.

3.3 FIELD QUALITY CONTROL

- A. Testing: Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.3.1. Certify compliance with test parameters.
- B. Test Reports: Prepare a written report to record the following:
 - 1. Test procedures used.
 - 2. Test results that comply with requirements.
 - 3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

END OF SECTION 260519

SECTION 260523 – FIRESTOP SYSTEMS AND SLEEVES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
1. Through penetration firestop systems.
 2. Sleeves for raceways and cables.
 3. Sleeve seals.

1.2 PERFORMANCE REQUIREMENTS

- A. Rated Systems: Provide through-penetration firestop systems with the following ratings determined per UL 1479:
1. F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, but not less than that equaling, or exceeding fire-resistance rating of constructions penetrated.
 2. T-Rated Systems: For the following conditions, provide through-penetration firestop systems with T-ratings indicated, as well as F-ratings, where systems protect penetrating items exposed to potential contact with adjacent materials in occupiable floor areas:
 - a. Penetrations located outside wall cavities.
 - b. Penetrations located outside fire-resistance-rated shaft enclosures.
 3. L-Rated Systems: Where through-penetration firestop systems are indicated in smoke barriers, provide through-penetration firestop systems with L-ratings of not more than 3.0 cfm/sq. ft (0.01524cu. m/s x sq. m) at both ambient temperatures and 400 deg F (204 deg C).
- B. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.
- C. For through-penetration firestop systems exposed to view, provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that has been approved by FMG according to FMG 4991, "Approval of Firestop Contractors."
- B. Installation Responsibility: Assign installation of through-penetration firestop systems and fire-resistive joint systems in Project to a single qualified installer.

- C. Fire-Test-Response Characteristics: Provide through-penetration firestop systems that comply with the following requirements and those specified in Part 1 "Performance Requirements" Article:
 - 1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL or another agency performing testing and follow-up inspection services for firestop systems acceptable to authorities having jurisdiction.
 - 2. Through-penetration firestop systems are identical to those tested per testing standard referenced in "Part 1 Performance Requirements" Article. Provide rated systems bearing classification marking of qualified testing and inspecting agency.
- D. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.
- E. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until each installation has been examined by building inspector, if required by authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the through-penetration firestop systems indicated for each application that are produced by one of the following manufacturers:
 - 1. A/D Fire Protection Systems Inc.
 - 2. Hilti, Inc.
 - 3. Nelson Firestop Products.
 - 4. NUCO Inc.
 - 5. RectorSeal Corporation (The).
 - 6. Specified Technologies Inc.
 - 7. 3M; Fire Protection Products Division.
 - 8. Tremco; Sealant/Weatherproofing Division.

2.2 FIRESTOPPING

- A. Compatibility: Provide through-penetration firestop systems that are compatible with one another; with the substrates forming openings; and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.
- B. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use only components specified by through-penetration firestop

system manufacturer and approved by qualified testing and inspecting agency for firestop systems indicated.

2.3 SLEEVES FOR RACEWAYS AND CABLES

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- C. Coordinate sleeve selection and application with selection and application of firestopping.

2.4 SLEEVE SEALS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
 - 1. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
 - 2. Pressure Plates: Plastic. Include two for each sealing element.
 - 3. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

PART 3 - EXECUTION

3.1 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

- A. General: Install through-penetration firestop systems to comply with Part 1 "Performance Requirements" Article and with firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
 - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.
- C. Install fill materials for firestop systems by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.

2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.
- D. Identification: Identify through-penetration firestop systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of edge of the firestop systems so that labels will be visible to anyone seeking to remove penetrating items or firestop systems. Use mechanical fasteners for metal labels. Include the following information on labels:
1. The words "Warning - Through-Penetration Firestop System - Do Not Disturb. Notify Building Management of Any Damage."
 2. Contractor's name, address, and phone number.
 3. Through-penetration firestop system designation of applicable testing and inspecting agency.
 4. Date of installation.
 5. Through-penetration firestop system manufacturer's name.
 6. Installer's name.

3.2 FIELD QUALITY CONTROL

- A. Inspecting Agency: Owner will engage an independent inspecting agency to inspect through-penetration firestops. Independent inspecting agency shall comply with ASTM E 2174 requirements including those related to qualifications, conducting inspections, and preparing test reports.
- B. Where deficiencies are found, repair or replace through-penetration firestop systems so they comply with requirements.
- C. Proceed with enclosing through-penetration firestop systems with other construction only after inspection reports are issued and firestop installations comply with requirements.

3.3 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.
- B. Coordinate sleeve selection and application with selection and application of firestopping.
- C. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

- E. Cut sleeves to length for mounting flush with both surfaces of walls.
- F. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level.
- G. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed.
- H. Seal space outside of sleeves with grout for penetrations of concrete and masonry and with approved joint compound for gypsum board assemblies.
- I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint.
- J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials.
- K. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.
- L. Aboveground, Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- M. Underground, Exterior-Wall Penetrations: Install "wall pipes" for sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between raceway or cable and sleeve for installing mechanical sleeve seals.

END OF SECTION 260523

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes methods and materials for grounding systems and equipment.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Field quality-control test reports.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 CONDUCTORS

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
 - 1. Solid Conductors: ASTM B 3.
 - 2. Stranded Conductors: ASTM B 8.
 - 3. Tinned Conductors: ASTM B 33.
 - 4. Bonding Cable: 28,700 circular mils, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
 - 5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
 - 6. Bonding Jumper: Copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
 - 7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

2.2 CONNECTORS

- A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.
- B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts.
 - 1. Pipe Connectors: Clamp type, sized for pipe.
- C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.3 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel, sectional type; 3/4 inch in diameter by 16 feet long (19 mm by 3 m).

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger, unless otherwise indicated.
- B. Underground Grounding Conductors: Install insulated copper conductor, No. 2/0 AWG minimum. Bury at least 24 inches (600 mm) below grade.
- C. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.
- D. Conductor Terminations and Connections:
 - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 - 2. Underground Connections: Welded connectors, except at test wells and as otherwise indicated.
 - 3. Connections to Ground Rods at Test Wells: Bolted connectors.
 - 4. Connections to Structural Steel: Welded connectors.

3.2 EQUIPMENT GROUNDING

- A. 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. Computer and Rack-Mounted Electronic Equipment Circuits: Install insulated equipment grounding conductor in branch-circuit runs from equipment-area power panels and power-distribution units.
- B. 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.
- C. Water Heater and Heat-Tracing Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.
- D. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate insulated equipment grounding conductor. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.
- E. Signal and Communication Equipment: For telephone, alarm, voice and data, and other communication equipment, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.
1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-2-by-12-inch (6-by-50-by-300-mm) grounding bus.
 2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.
- F. Metal Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

3.3 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Ground Rods: Drive rods until tops are 2 inches (50 mm) below finished floor or final grade, unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating, if any.
 2. For grounding electrode system, install at least two rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.
- C. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.
1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
 2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install so vibration is not transmitted to rigidly mounted equipment.
 3. Use exothermic-welded connectors for outdoor locations, but if a disconnect-type connection is required, use a bolted clamp.
- D. Grounding and Bonding for Piping: Provide grounding for all new metal pipes.
- E. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install bonding jumper to bond across flexible duct connections to achieve continuity.

3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections and prepare test reports:
1. After installing new grounding electrode systems but before permanent electrical circuits have been energized, test for compliance with requirements.
 2. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells.
 - a. Measure ground resistance not less than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
 - b. Perform tests by fall-of-potential method according to IEEE 81.
- B. Report measured ground resistances that exceed 5 ohms.

END OF SECTION 260526

SECTION 260529 - ELECTRICAL SUPPORTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Hangers and supports for electrical equipment and systems.
2. Construction requirements for concrete bases.

1.2 SUBMITTALS

- A. Product Data: Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of support component used.
- B. Shop Drawings for Supports: For supports and their attachments to structure not defined on Drawings, identify hardware, and indicate analysis, forces, strengths, materials, and dimensions, signed and sealed by a qualified professional engineer.

1.3 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed under this Project, with a minimum structural safety factor of five the applied force.
- B. Steel Slotted Support Systems: Comply with MFMA-3, factory-fabricated components for field assembly, and provide finish suitable for the environment in which installed.
1. Available Manufacturers:
 - a. Cooper B-Line; a division of Cooper Industries.

- b. ERICO International Corporation.
 - c. Allied Support Systems; Power-Strut Unit.
 - d. GS Metals Corp.
 - e. Michigan Hanger Co., Inc.; O-Strut Div.
 - f. National Pipe Hanger Corp.
 - g. Thomas & Betts Corporation.
 - h. Unistrut; Tyco International, Ltd.
 - i. Wesanco, Inc.
2. Channel Dimensions: Selected for structural loading.
- C. Raceway and Cable Supports: As described in NECA 1.
- D. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- E. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.
- F. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- G. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
1. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
 - a. Available Manufacturers:
 - 1) Cooper B-Line; a division of Cooper Industries.
 - 2) Empire Tool and Manufacturing Co., Inc.
 - 3) Hilti, Inc.
 - 4) ITW Construction Products.
 - 5) MKT Fastening, LLC.
 - 6) Powers Fasteners.
 2. Concrete Inserts: Steel or malleable-iron slotted-support-system units similar to MSS Type 18; complying with MFMA-3 or MSS SP-58.
 3. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
 4. Through Bolts: Structural type, hex head, high strength. Comply with ASTM A 325.
 5. Toggle Bolts: All-steel springhead type.
 6. Hanger Rods: Threaded steel.

2.3 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with NECA 1 for application of hangers and supports for electrical equipment and systems, unless requirements in this Section or applicable Code are stricter.

3.2 SUPPORT INSTALLATION

- A. Comply with NECA 1 for installation requirements, except as specified in this Article.
- B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.
- C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).
- D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods, unless otherwise indicated by Code:
 - 1. To Wood: Fasten with lag screws or through bolts.
 - 2. To New Concrete: Bolt to concrete inserts.
 - 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 - 4. To Existing Concrete: Expansion anchor fasteners.
 - 5. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
 - 6. To Light Steel: Sheet metal screws.
 - 7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount on slotted-channel racks attached to substrate.
- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- B. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

- A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions.

- B. Construct concrete bases of dimensions indicated but not less than 4 inches (100 mm) larger in both directions than supported unit, and so expansion anchors will be a minimum of 10 bolt diameters from edge of the base.
 - 1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around full perimeter of the base.
 - 2. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
 - 3. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 4. Install anchor bolts to elevations required for proper attachment to supported equipment.
 - 5. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
 - 6. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete.

3.5 INSTALLATION OF SEISMIC-RESTRAINT COMPONENTS

- A. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.
- B. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.
- C. Restraint Cables: Provide slack within maximums recommended by manufacturer.
- D. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, upper truss chords of bar joists, or at concrete members.

3.6 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

- A. Make flexible connections in runs of raceways, cables, wireways, cable trays, and busways where they cross expansion joints, where adjacent sections or branches are supported by different structural elements, and where they terminate with connection to electrical equipment that is anchored to a different structural element from the one supporting them as they approach equipment.

END OF SECTION 260529

SECTION 260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.
- B. See Division 26 Section "Through-Penetration Firestop Systems" for firestopping materials and installation at penetrations through walls, ceilings, and other fire-rated elements.
- C. See Division 26 Section "Basic Electrical Materials and Methods" for supports, anchors, and identification products.
- D. See Division 26 Section "Electrical Supports" for bracing of raceways, boxes, enclosures, and cabinets.
- E. See Division 26 Section "Wiring Devices" for devices installed in boxes and for floor-box service fittings.

1.2 SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets indicated.
- B. Shop Drawings: Show fabrication and installation details of components for raceways, fittings, boxes, enclosures, and cabinets.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

2.2 METAL CONDUIT AND TUBING

A. Manufacturers:

1. AFC Cable Systems, Inc.
2. Alfex Inc.
3. Anamet Electrical, Inc.; Anaconda Metal Hose.
4. Electri-Flex Co.
5. Grinnell Co./Tyco International; Allied Tube and Conduit Div.
6. LTV Steel Tubular Products Company.
7. Manhattan/CDT/Cole-Flex.
8. O-Z Gedney; Unit of General Signal.
9. Wheatland Tube Co.

B. Rigid Steel Conduit: ANSI C80.1.

C. EMT and Fittings: ANSI C80.3.

1. Fittings: Steel, Set-screw or compression type. No die-cast.

D. LFMC: Flexible steel conduit with PVC jacket.

E. Fittings: NEMA FB 1; compatible with conduit and tubing materials.

2.3 NONMETALLIC CONDUIT AND TUBING

A. Manufacturers:

1. American International.
2. Anamet Electrical, Inc.; Anaconda Metal Hose.
3. Arnco Corp.
4. Cantex Inc.
5. Certainteed Corp.; Pipe & Plastics Group.
6. Condux International.
7. ElecSYS, Inc.
8. Electri-Flex Co.
9. Lamson & Sessions; Carlon Electrical Products.
10. Manhattan/CDT/Cole-Flex.
11. RACO; Division of Hubbell, Inc.
12. Spiralduct, Inc./AFC Cable Systems, Inc.
13. Thomas & Betts Corporation.

B. RNC: NEMA TC 2, Schedule 40 and Schedule 80 PVC.

C. RNC Fittings: NEMA TC 3; match to conduit or tubing type and material.

2.4 METAL WIREWAYS

A. Manufacturers:

1. Hoffman.
2. Square D.

- B. Material and Construction: Sheet metal sized and shaped as indicated.
- C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- D. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.
- E. Wireway Covers: Screw-cover type.
- F. Finish: Manufacturer's standard enamel finish.

2.5 BOXES, ENCLOSURES, AND CABINETS

- A. Manufacturers:
 - 1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
 - 2. Emerson/General Signal; Appleton Electric Company.
 - 3. Erickson Electrical Equipment Co.
 - 4. Hoffman.
 - 5. Hubbell, Inc.; Killark Electric Manufacturing Co.
 - 6. O-Z/Gedney; Unit of General Signal.
 - 7. RACO; Division of Hubbell, Inc.
 - 8. Thomas & Betts Corporation.
 - 9. Walker Systems, Inc.; Wiremold Company (The).
- B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.
- C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, Type FD, with gasketed cover.
- D. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- E. Cast-Metal Pull and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.
- F. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous hinge cover and flush latch.
 - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
 - 2. Nonmetallic Enclosures: Plastic, finished inside with radio-frequency-resistant paint.
- G. Cabinets: NEMA 250, Type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage and include accessory feet where required for freestanding equipment.

2.6 FACTORY FINISHES

- A. Finish: For raceway, enclosure, or cabinet components, provide manufacturer's standard paint applied to factory-assembled surface raceways, enclosures, and cabinets before shipping.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors:

1. Exposed: Galvanized Rigid steel.
2. Concealed: Galvanized Rigid steel.
3. Underground, Single Run: SCH 40 PVC.
4. Underground, Grouped: SCH 40 PVC.
5. Connection to Vibrating Equipment (Including Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
6. Boxes and Enclosures: NEMA 250, Type 3R.

B. Indoors:

1. Exposed: EMT in unfinished areas where shown or permitted.
2. Concealed: EMT or MC cabling within same room only. MC homeruns will not be allowed.
3. Connection to Vibrating Equipment (Including Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC; except use LFMC in damp or wet locations or where exposed to view (not concealed).
4. Damp or Wet Locations: Galvanized Rigid steel conduit.
5. Boxes and Enclosures: NEMA 250, Type 1, except as follows:
 - a. Damp or Wet Locations: NEMA 250, Type 4, nonmetallic.
6. Flexible metal conduit: Where applications are not concealed by the building construction, liquid tight flexible conduit and grounding type fittings shall be used and system shall be fully bonded.

- C. Minimum Raceway Size: 1/2-inch trade size (DN 16), except underground shall be 3/4" minimum.

- D. Raceway Fittings: Compatible with raceways and suitable for use and location.

3.2 INSTALLATION

- A. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- B. Complete raceway installation before starting conductor installation.
- C. Support raceways as specified in Division 26 Section "Electrical Supports."
- D. Install temporary closures to prevent foreign matter from entering raceways.

- E. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portions of bends are not visible above finished slab.
- F. Make bends and offsets so ID is not reduced. Keep legs of bends in same plane and keep straight legs of offsets parallel, unless otherwise indicated.
- G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.
 - 1. Install concealed raceways with a minimum of bends in shortest practical distance, considering type of building construction and obstructions, unless otherwise indicated.
- H. Raceways Embedded in Slabs: Install in middle 1/3 of slab thickness where practical and leave at least 2 inches (50 mm) of concrete cover.
 - 1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
 - 2. Space raceways laterally to prevent voids in concrete.
 - 3. Run conduit larger than 1-inch trade size (DN 27) parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
 - 4. Change from nonmetallic tubing to Schedule 80 nonmetallic conduit, rigid steel conduit, or IMC before rising above floor, except PVC branch circuits may rise concealed in walls to first box maximum 48" AFF.
- I. Install exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.
 - 1. Run parallel or banked raceways together on common supports.
 - 2. Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.
- J. Join raceways with fittings designed and approved for that purpose and make joints tight.
 - 1. Use insulating bushings to protect conductors.
- K. Tighten set screws of threadless fittings with suitable tools.
- L. Terminations:
 - 1. Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts, one inside and one outside box.
 - 2. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.

- M. Install pull cords in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull cord.
- N. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:
 - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 - 2. Where otherwise required by NFPA 70.
- O. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with finished floor. Extend conductors to equipment with rigid steel conduit; FMC may be used 6 inches (150 mm) above the floor. Install screwdriver-operated, threaded plugs flush with floor for future equipment connections.
- P. Flexible Connections: Use maximum of 72 inches (1830 mm) of flexible conduit for recessed and semi-recessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use LFMC in damp or wet locations or where exposed to view (not concealed). Install separate ground conductor across flexible connections.
- Q. Surface Raceways: Install a separate, green, ground conductor in raceways from junction box supplying raceways to receptacle or fixture ground terminals.
- R. Install hinged-cover enclosures and cabinets plumb. Support at each corner.

3.3 PROTECTION

- A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

SECTION 260553 – IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Identification for conductors and communication and control cable.
 - 2. Warning labels and signs.
 - 3. Equipment identification labels.

1.2 SUBMITTALS

- A. Product Data: For each electrical identification product indicated.

1.3 QUALITY ASSURANCE

- A. Comply with ANSI A13.1.

1.4 COORDINATION

- A. Coordinate identification names, abbreviations, colors, and other features with requirements in the Contract Documents, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual, and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

PART 2 - PRODUCTS

2.1 CONDUCTOR, FIRE ALARM AND CONTROL-CABLE IDENTIFICATION MATERIALS

- A. Marker Tape: Vinyl or vinyl -cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

2.2 WARNING LABELS AND SIGNS

- A. Comply with NFPA 70 and 29 CFR 1910.145.
- B. Self-Adhesive Warning Labels: Factory printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment, unless otherwise indicated.
- C. Baked-Enamel Warning Signs: Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application. 1/4-inch (6.4-mm) grommets in corners for mounting. Nominal size, 7 by 10 inches (180 by 250 mm).
- D. Fasteners for Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

- E. Warning label and sign shall include, but are not limited to, the following legends:
 - 1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
 - 2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES (915 mm)."

2.3 EQUIPMENT IDENTIFICATION LABELS

- A. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm). Overlay shall provide a weatherproof and ultraviolet-resistant seal for label.
- B. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).

PART 3 - EXECUTION

3.1 APPLICATION

- A. Auxiliary Electrical Systems Conductor and Cable Identification: Use marker tape to identify field-installed alarm, control, signal, sound, intercommunications, voice, and data wiring connections.
 - 1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and cable pull points. Identify by system and circuit designation.
 - 2. Use system of designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
- B. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Comply with 29 CFR 1910.145 and apply baked-enamel warning signs. Identify system voltage with black letters on an orange background. Apply to exterior of door, cover, or other access.
 - 1. 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.
 - 2. Equipment Requiring Workspace Clearance According to NFPA 70: Unless otherwise indicated, apply to door or cover of equipment but not on flush panelboards and similar equipment in finished spaces.
- C. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:
 - a. Indoor Equipment: Self-adhesive, engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where 2 lines of text are required, use labels 2 inches (50 mm) high.
 - b. Outdoor Equipment: Engraved, laminated acrylic or melamine label, drilled for screw attachment.
 - c. Elevated Components: Increase sizes of labels and legend to those appropriate for viewing from the floor.
2. Equipment to Be Labeled:
 - a. Panelboards, electrical cabinets, and enclosures.
 - b. Electrical switchgear and switchboards.
 - c. Disconnect switches.
 - d. Enclosed circuit breakers.
 - e. Motor starters.
 - f. Push-button stations.
 - g. Power transfer equipment.
 - h. Contactors.
 - i. Lighting Control Panels
 - j. Room Lighting Controllers

3.2 INSTALLATION

- A. Verify identity of each item before installing identification products.
- B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- C. Apply identification devices to surfaces that require finish after completing finish work.
- D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
- E. Attach non-adhesive signs and plastic labels with screws and auxiliary hardware appropriate to the location and substrate.
- F. Color-Coding for Phase and Voltage Level Identification, 600 V and Less: Use the colors listed below for ungrounded service, feeder, and branch-circuit conductors.
 1. Color shall be factory applied.
 2. Colors for 240/120-V Circuits:
 - a. Phase A: Black.
 - b. Phase B: Red.
 - c. Neutral: White.

END OF SECTION 260553

SECTION 260923 - EXTERIOR WIRELESS LIGHTING CONTROLS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Control Hardware.
- B. Software.
- C. Network.
- D. Monitoring.
- E. Outdoor photo controls.

1.2 REFERENCES

- A. ANSI C136.10 - American National Standard for Roadway and Area Lighting Equipment - Locking-Type Photo control Devices and Mating Receptacles - Physical and Electrical Interchangeability and Testing; 2010.
- B. ANSI C136.24 - American National Standard for Roadway and Area Lighting Equipment -Nonlocking (Button) Type Nodes; 2004 (R2010).
- C. NECA 1- Standard for Good Workmanship in Electrical Construction; 2010.
- D. NECA 130 - Standard for Installing and Maintaining Wiring Devices; National Electrical Contractors Association; 2010.
- E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2008.
- F. NFPA 70 - National Electrical Code; National Fire Protection Association.
- G. UL 773 - Plug-in Locking Type Nodes for Use with Area Lighting; Current Edition, Including All Revisions. UL 916 - Energy Management Equipment,
- H. UL 917 - Clock-Operated Switches.

1.3 DESIGN / PERFORMANCE REQUIREMENTS

- A. Conform to requirements of NFPA 70.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01 30 00 - Administrative Requirements.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Ratings, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.

- C. Shop Drawings: Wiring diagrams for the various components of the WattStopper System specified. Include fixture Identifier (pole number) for each node location on site lighting plans and Wireless Network Manager / Antenna location
- D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- E. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.
- F. Manufacturer's Certificates: Certify products meet or exceed specified requirements.
- G. Closeout Submittals:
 - 1. Project Record Documents: Record actual installed locations and settings for lighting control devices.
 - 2. Operation and Maintenance Manual:
 - a. Include approved Shop Drawings and Product Data.
 - b. Include Sequence of Operation, identifying operation for each room or space.
 - c. Include manufacturer's maintenance information.
 - d. Operation and Maintenance Data: Include detailed information on device programming and setup.
 - e. Include startup and test reports.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing of networked lighting control products with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in installation of networked lighting control products with minimum three years documented experience.
- C. System Components: Demonstrate that individual components have undergone quality control and testing prior to shipping.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store products in a clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions until ready for installation

1.7 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.8 WARRANTY

- A. Manufacturer shall provide a 5 year limited warranty on products within this installation and consisting of a one for one control replacement.

1.9 EXTRA MATERIALS

- A. See Section 01 60 00 - Product Requirements.

- B. Deliver extra sets of items for Owner's use in maintenance as follows:
 - 1. 10 Extra Nodes (NWTL-111-2P-V2)

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: WattStopper, which is located at: 2700 Zanker Rd., Suite 168; San Jose, CA 95134; Tel: 408.988.5331; Fax: 408.988.5373; Email:[request info \(\);](mailto:requestinfo@legrand.us) Web:<https://www.legrand.us/wattstopper.aspx>
- B. Requests for substitutions will be not be considered.

2.2 EXTERIOR WIRELESS LIGHTING CONTROLS - GENERAL

- A. System: Provide WattStopper / Legrand, Exterior Wireless Lighting Controls for exterior lighting indicated on the Drawings and specified in Section 26 56 33 - Walkway Lighting [26 56 00].
 - 1. Description: WattStopper Wireless Network consists of WattStopper radio frequency (RF) controllers (nodes) communicating with Wireless Network Managers, and optional Servers to consolidate Wireless Network Managers into a single interface. The Network includes software applications for secure management, control and monitoring of the nodes, a database of control and operational data, and a web interface designed to display operational data and interface with individual units in a network of controls.
 - 2. Operating Sequence:
 - a. Automatic Operation (Dimming):
 - 1) Local astronomic control of On/Off with options to reduce light levels on internal schedules.
 - 2) Event capabilities in the Wireless Network Manager can override local schedules in the Nodes to control ON/OFF or dim levels.
 - 3) Events can be scheduled in advance using the 365 day scheduling capabilities.
 - b. Group Controls:
 - 1) Groups may be managed by using Tags for groups to represent physical or virtual zones.
 - 2) Groups may be controlled based upon photocells, motion sensors, schedules or other inputs to the system using with Input / Output Nodes.
 - 3) Group control may include On/Off or preset light levels.
- B. Ratings: Ratings shall be as listed for each control individually.

2.3 CONTROL HARDWARE

- A. Network Controls: WattStopper network consists of a series of WattStopper wireless lighting and I/O controls communicating with each other over a wireless IP network, WattStopper dimming control modules interfacing with fixtures and dimming drivers, and WattStopper Wireless Network Managers that communicates with a single web based Central Management System (CMS). The wireless network will support two types of wireless devices:
 - 1. Twist lock dimming controls (NWTL-111)
 - a. 30 to 1,000 watts.

- b. 100-480 volts AC
 - c. Input - dry contact closure from any 3 wire Wattstopper sensor
 - d. 24 VDC Power source for low voltage sensors
 - e. Complies with ANSI C136 .10.
 - f. Collects data from the Node, then sends data wirelessly to Wireless Network Server.
 - g. Average power consumption under 2 watts.
 - h. Minus 40 to 70 degrees C; up to 90 degrees C interface per ANSI; base rated at 120 degrees C.
 - i. Wirelessly interfaces with the Wireless Network Manager.
2. I/O Modules
- a. For connection of motion, photo or other sensors, and switches to the wireless network.
 - b. 4 - I/O configuration.
 - c. Catalog numbers -WIO-4UI.
3. Control
- a. Remote on/off control .
 - b. Grouped scheduling (energy savings).
 - c. Dimming control modules shall include individual and group control.
 - d. Dimming module provides wireless dimming control for any fixture with 0 to 10V dimming ballast/driver.
4. Wireless enabled communication.
- a. 2.4 GHz -802.15 .4 compatible.
 - b. FCC Part 15 approved.
 - c. 1,000 foot clear line of sight.
 - d. Self-healing tree network with repeating Nodes.
5. Control
- a. Remote continuous dimming control.
 - b. Momentary contacts.
 - c. Lights Automatic.
 - d. Lights 100 percent.
 - e. Lights Off.

2.4 ACCESSORIES

- A. Antenna mounts and cables for radio operation.
- B. Wireless Network Managers shall be preconfigured to connect to the Wireless Network Server and require no explicit configuration.
- C. Wireless Network Managers shall include the following features:
 - 1. Synchronizes wireless network and manages Node time.
 - 2. Receives inputs and executes individual and group commands.
 - 3. Overrides local schedules for event planning.
 - 4. Stores Node historical data.
 - 5. Transmits node data back to Wireless Network Server.
 - 6. Wireless 2.4 GHz - 802 .15.4 Control Network.
 - a. FCC Part 15 approved.
 - b. 1,000 foot clear line of sight.
 - c. Supports up to 200 nodes.
 - 7. WiFi Network - 802.11N.
 - 8. General

- a. 320J MOV - 6,500 amp surge protection.
- b. Voltage 100-130 VAC.
- c. Wireless Network Server shall operate in minus 40 to plus 70 degrees C ambient temperatures.
- d. System shall be scalable and capable of supporting networks of varying size.
- e. All servers in the Wireless Network Server shall use the NTP protocol to ensure that their clocks are in sync.

2.5 SOFTWARE

- A. WattStopper Wireless Network shall interface with a network capable of displaying data collected.
- B. WattStopper Network shall interface with a web portal providing remote user control over elements within the network.
- C. Web portal shall include the following functions and control views:
 1. Function - a Scripting engine that assists in automating tasks such as commissioning or reporting.
 2. Settings - A configuration tool to enable applications, communications, ports, email, and protocols.
 3. Users - to add access rights such as settings, help, alarm, eqipm, graphics, history, notes, reports, and schedule access for specific user accounts.
 4. Debug - a trouble shooting, logging and reporting tool to manage the scripting functions.
 5. Help - Online, content sensitive assistance.
 6. Alarm - Reporting tool for alarms, can print, email or text alarm conditions.
 7. Builder - A database builder that imports all available connections and allows the selection of sensors and control points to be integrated into the system for monitoring and control.
 8. Connectors - A configuration too to enable multiple protocols to be enabled, configured and managed.
 9. Control - A user interface for setting up control logic including scheduling and Inputs / Output relationships and sequences of operation.
 10. Energy - A energy reporting tool using Power, Energy and rate structures for analyzing energy use and costs.
 11. Equipment - A tool used to organized sensors and control points associated with a piece of equipment or room.
 12. Graphics - A tool for visualizing data. Can be used with mapping programs or CAD drawings to display loads or sensors.
 13. Historian - A time based visualization tool to view one or multiple data points from any device connected to the network.
 14. Job - An automation tool for synchronizing systems or performing automated tasks on a scheduled basis.
 15. KPI - A visualization tool that compares building or system performance against user defined Key Performance Indexes.
 16. Note - A tool used to communicate additional information about a device or area, can be used in troubleshooting or system maintenance.
 17. Reports - Standard and customized information organized to meet the customers' requirements for specific period performance.
 18. Schedule - Standard time based, astronomic and holiday schedules for control

- system operation.
19. Weather - a link to weather stations to bring in information from outside weather sources including sunrise/sunset times, temperatures, humidity, sunlight levels and other relevant weather data.
- D. Dashboard view shall summarize the status of all Nodes, and Wireless Network Managers within the network:
1. Users shall be able to quickly determine the operational status of all Nodes within the system.
 2. Users shall be able to export status data.
 3. Users shall be able to print status data in a format conducive to presentation.
 4. Users shall be able to request additional information about abnormal operations within the system.
 - a. Users shall be able to see basic information about malfunctions .
 - b. Users shall be able to see the location of each malfunctioning device
Users shall be able to see a seven day history of each device.
 - c. Users with appropriate permissions shall be able to create work orders.
 - d. The Map view shall provide a geographical representation of system assets.
 - e. Users shall be able to navigate around the map using standard navigational constructs.
 5. Users shall be able to determine which assets are operating normally and which ones are malfunctioning in some way based on the icons used to represent each fixture.
 6. Users with appropriate permissions shall be able to relocate a fixture from within the Map view.
 7. Users with appropriate permissions shall be able to add or view notes about a fixture from within the Map view.
 8. Users with appropriate permissions shall be able to view or edit the attributes collected about each fixture during node activation from within the Map view.
 9. Users with appropriate permissions shall be able to issue the following commands to fixtures from within the Map view.
 - a. Turn on or off for x time, x not to exceed one day.
 - b. Turn on or off until y time, y not to exceed one day. Return to normal operation.
 - c. Dim to x level for y time, x ranging from 0-100 and y not to exceed one day
 10. Users with appropriate permissions shall be able to issue commands to groups as well as individual units within the system.
 11. Users with appropriate permissions shall be able to create work orders from within the Map view.
 12. All users shall have read only access to the information on the Map view regardless of permissions.
 13. History view shall provide historical data for all fixtures.
 - a. History shall be available for either seven days or thirty days.
 - b. History view shall include filters that focus attention on specific assets or operational conditions.
 14. History view shall include daily and hourly data for each fixture in the system. Data shall be available in both report and graphical formats.
- E. Grouping view shall enable users to interact with units within the network as a single

group:

1. Users shall be able to define a subset of units on the network as a group from within the Grouping view.
 2. Users shall be able to name each group from within the Grouping view.
 3. Users shall be able to add additional nodes to a group from within the Grouping view.
 4. Users shall be able to remove devices from a group from within the Grouping view.
 5. Users shall be able to view information about the status of all devices within a group from the Grouping view.
 6. Status information displayed in the Grouping view shall use the same format as the same information within the Dashboard view.
- F. Scheduling view shall enable users to schedule commands:
1. Users shall be able to define schedules from within the Scheduling view.
 2. Users shall be able to issue schedules from within the Scheduling view.
 3. Users shall be able to define events from within the Scheduling view.
 4. Users shall be able to issue events from within the Scheduling view.
 5. The Scheduling view shall recognize and use groups defined within the Grouping view.
 6. Events shall take priority over Node schedules if both are in place for the same units at the same time.

2.6 NETWORKING

- A. Nodes within the network shall be capable of remote turn off and turn on.
- B. Nodes within the network shall be capable of assignment to groups which can be controlled over the network as a single unit.
- C. Nodes within the network shall communicate with neighbor controls and Wireless Network Manager devices via Gigahertz radio signals within a network.
- D. Nodes within the network shall have a communications range of 1,000 feet between devices.
- E. Communications between controls are optimized with a direct line of sight.
- F. Historical data shall have an adjustable collection interval resolution starting at one minute.
- G. Data sent from individual controls via radio signals shall be encrypted
- H. Data sent from the Wireless Network Manager to the Wireless Network Server shall be encrypted.
- I. Nodes within the network shall provide troubleshooting information over the network in the form of alarms:
 1. All troubleshooting reports shall include the MAC number of the associated photocontrol.
 2. Fixture malfunctions shall be reported.
 3. Cycling fixtures shall be reported.
 4. Day burning fixtures shall be reported.

5. Uncommunicative photo controls shall be reported.
 6. Power details for fixtures shall be reported.
 7. Photo control within the network shall operate as a standard standalone photocontrol if networking fails.
 8. Performance of scheduled operations shall continue while in standalone mode.
- J. No node within an installation shall be a communications bottleneck. If any control within an installation is unavailable for communication for any reason, the signal shall be sent via different path.
- K. Daily data collation shall run from midnight to midnight each night.

2.7 MONITORING

- A. System shall monitor the following:
1. Remote Monitoring and Diagnostics
 2. Fixture Malfunction
 3. Cycling
 4. Day-burner
 5. Unspecified Malfunction
 6. No Communication
 7. No power
 8. Low System Voltage
 9. High System Voltage
 10. High V Delta
 11. Low Wattage
 12. Excessive Power Use
 13. Fixture on a Group Control
- B. System shall provide runtime charts (bar or line), and allow comparison of variables against similar devices (voltage, watts, amps, etc).

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until measurements have been verified and work areas have been properly prepared.
- B. If preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 INSTALLATION

- A. Install system in accordance with the approved system shop drawings and manufacturer's instructions.
- B. Wireless Network:
1. Install server in location indicated on the Drawings.
 2. Install Network Manager(s).
 3. Install the antenna to connector at the Wireless Network Manager.
 4. Mast arm/pole mounting: Use 7-8 foot pounds (9 .5-10.9 Newton meters) of

torque to fasten two 5/16-18 bolts around bracket holding the pole.

- C. Install and connect photocontrol as directed by the manufacturer.
- D. Dimming Control Modules: Install as directed by the manufacturer.
 - 1. Mount dimming control module in NEMA receptacle with a minimum of components blocking line of sight to the NEMA receptacle.
 - 2. Module identification label must be visible when the wiring compartment is opened and a clear path provided sufficient for a barcode scanner to scan the label. If not possible, provide a duplicate identification label applied to the interior of the fixture in a location that is accessible to a barcode scanner when the enclosure is opened.
 - 3. Dimming control modules are rated to 85C ambient, resulting in a 90 degree C case temperature maximum at the indicated thermocouple point (see datasheet). End applications must ensure that these limits are not exceeded.
 - 4. Do not mount the dimming control module where it may come into contact with the mast arm during installation.
- E. Provide power source and power supplies for Wireless Network Server and Operator Control Station.
- F. Follow manufacturers' instructions for installation and all low voltage wiring.
- G. Comply with energy code lighting control system "Acceptance Requirements". Acceptance tests are used to verify that lighting controls were installed and calibrated correctly. Tests may require that a responsible party certify that controls are installed and calibrated properly. Verify requirements with building authority.

3.3 STARTUP AND ACTIVATION

- A. System installation process shall rely on barcodes to capture data:
 - 1. The following information shall be encapsulated into a barcode associated with each fixture each unit:
 - a. Lamp type.
 - b. Wattage.
 - c. Fixture manufacturer.
 - d. Pole type.

3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- B. Tests and Inspections: Tests shall be witnessed by Owner's Representative.
 - 1. Verify connection of power wiring and load circuits.
 - 2. Verify connection and location of controls.
 - 3. Verify lighting management hubs and system data program is installed.
 - 4. Verify proper connection of panel links (low voltage/data).
 - 5. Verify addresses have been assigned to exterior photo sensors and lighting control devices.
 - 6. Verify system operation control by control.
 - 7. Verify proper operation of manufacturer's interfacing equipment.

8. Verify proper operation of servers, client station PC, and installed programs.
- C. Network lighting controls will be considered defective if it does not pass tests and inspections.
 1. Correct wiring deficiencies and replace damaged or defective lighting control devices.
 2. Retest and confirm proper operation.
- D. Provide a report in table format including each room or space that has occupancy sensors and/or light level sensors installed. Indicate the following for each space:
 1. Date of test or inspection.
 2. Pole Number and Fixture Address.
 3. Quantity and Type of each device installed
 4. Sequence of Operation for the control each zone controlled.
 5. Verification that the control of each space complies with the Sequence of Operation.
 6. Test Reports for each device.
 7. Photo control Sensors, indicate the following:
 - a. Ambient light level at which the lights turn on (low level).
 - b. Ambient light level at which the lights turn off.
 - c. Location of light level readings.
 - d. Time delay settings.
 8. Manual Controls, indicate the following:
 - a. Light fixture output steps up to 100 percent upon manual activation.
 - b. Light fixture output steps down to low level upon manual activation.
 - c. Light fixture output resets to default low level photocontrol operation after lights are turned off (by methods, manual or automatic means).
 - d. Time delay settings.

3.5 DEMONSTRATION AND TRAINING

- A. Before Substantial Completion, arrange and provide a one-day Owner instruction period to designated Owner personnel. Set-up, starting of the lighting control system and Owner instruction includes:
 1. Confirmation of entire system operation and communication to each device.
 2. Confirmation of operation of individual relays, switches, and sensors.
 3. Confirmation of system Programming, photocell settings, override settings, etc.
 4. Provide training to cover installation, maintenance, troubleshooting, programming, and repair and operation of the lighting control system.

3.6 PRODUCT SUPPORT AND SERVICE

- A. Factory telephone support shall be available at no cost to the owner. Factory assistance shall consist of assistance in solving application issues pertaining to the control equipment.

END OF SECTION 260923

SECTION 262416 - PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes distribution panelboards and lighting and appliance branch-circuit panelboards.

1.2 SUBMITTALS

- A. Product Data: For each type of panelboard, overcurrent protective device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: For each panelboard and related equipment.
 - 1. Dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings. Include the following:
 - a. Enclosure types and details for types other than NEMA 250, Type 1.
 - b. Bus configuration, current, and voltage ratings.
 - c. Short-circuit current rating of panelboards and overcurrent protective devices.
 - d. UL listing for series rating of installed devices.
 - e. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
 - 2. Wiring Diagrams: Power, signal, and control wiring.
 - 3. Field quality-control test reports.
 - 4. Operation and maintenance data.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NEMA PB 1.
- C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Panelboards, Overcurrent Protective Devices, Controllers, Contactors, and Accessories:
 - a. Eaton Corporation; Cutler-Hammer Products.
 - b. Siemens Energy & Automation, Inc.
 - c. Square D.
 - d. General Electric

2.2 MANUFACTURED UNITS

- A. Enclosures: Flush- and surface-mounted cabinets. NEMA PB 1, Type 1.
 1. Rated for environmental conditions at installed location.
 - a. Outdoor Locations: NEMA 250, Type 3R.
 - b. Other Wet or Damp Indoor Locations: NEMA 250, Type 3R.
 - c. Hazardous Areas Indicated on Drawings: NEMA 250, Type 7C.
 2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
 3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
- B. Phase and Ground Buses: Tin-plated Copper or Aluminum.
- C. Conductor Connectors: Suitable for use with conductor material.
 1. Ground Lugs and Bus Configured Terminators: Compression type.
- D. Service Equipment Label: UL labeled for use as service equipment for panelboards with main service disconnect switches.
- E. Future Devices: Mounting brackets, bus connections, and necessary appurtenances required for future installation of devices.
- F. Panelboard Short-Circuit Rating:
 1. UL label indicating series-connected rating with integral or remote upstream overcurrent protective devices. Include size and type of upstream device allowable, branch devices allowable, and UL series-connected short-circuit rating.
 2. Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- B. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.4 OVERCURRENT PROTECTIVE DEVICES

- A. Molded-Case Circuit Breaker: UL 489, with interrupting capacity to meet available fault currents.
 - 1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable LSIG trip unit functions for circuit-breaker frame sizes 250 A and larger.
 - 2. GFCI Circuit Breakers: Single- and two-pole configurations with 30-mA trip sensitivity.
 - 3. Molded-Case Circuit-Breaker Features and Accessories: Standard frame sizes, trip ratings, and number of poles.
 - a. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
 - b. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for switching high intensity discharge lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
 - c. Shunt Trip: 120-V trip coil energized from separate circuit.

2.5 ACCESSORY COMPONENTS AND FEATURES

- A. Furnish accessory set including tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.
- B. Furnish portable test set to test functions of solid-state trip devices without removal from panelboard.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install panelboards and accessories according to NEMA PB 1.1.
- B. Comply with mounting and anchoring requirements specified in Division 26 Section "Electrical Supports."
- C. Mount top of trim 74 inches (1880 mm) above finished floor, unless otherwise indicated.
- D. Mount plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish.
- E. Install overcurrent protective devices and controllers.
 - 1. Set field-adjustable switches and circuit-breaker trip ranges.
- F. Install filler plates in unused spaces.

- G. Stub four 1-inch (27-GRC) empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch (27-GRC) empty conduits out below slab to exterior and cap both ends.
- H. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 26 Section "Electrical Identification."
- I. Panelboard Nameplates: Label each panelboard with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.
- J. Ground equipment according to Division 26 Section "Grounding and Bonding."
- K. Connect wiring according to Division 26 Section "Conductors and Cables."

3.2 FIELD QUALITY CONTROL

- A. Prepare for acceptance tests as follows:
 - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- B. Perform the following field tests and inspections and prepare test reports:
 - 1. Perform each visual and mechanical inspection stated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

END OF SECTION 262416

SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Single and duplex receptacles, ground-fault circuit interrupters, and integral surge suppression units.
 - 2. Single- and double-pole snap switches.
 - 3. Device wall plates.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.
- C. Samples: One for each type of device and wall plate specified, in each color specified.
- D. Field quality-control test reports.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

- 1. Wiring Devices:
 - a. Bryant Electric, Inc./Hubbell Subsidiary.
 - b. Hubbell Incorporated; Wiring Device-Kellems.
 - c. Leviton Mfg. Company Inc.
 - d. Pass & Seymour/Legrand; Wiring Devices Div.
- 2. Multioutlet Assemblies:
 - a. Hubbell Incorporated; Wiring Device-Kellems.
 - b. Wiremold Company (The).

2.2 RECEPTACLES

- A. Straight-Blade-Type Receptacles: Comply with NEMA WD 1, NEMA WD 6, DSCC W-C-596G, and UL 498.
- B. Straight-Blade and Locking Receptacles: Heavy-Duty grade.
- C. Straight-Blade Receptacles: Manufacturer's top grade below Hospital grade.
- D. GFCI Receptacles: Straight blade, feed-through type, Heavy-Duty grade, with integral NEMA WD 6, Configuration 5-20R duplex receptacle; complying with UL 498 and UL 943. Design units for installation in a 2-3/4-inch- (70-mm-) deep outlet box without an adapter.

2.3 PENDANT CORD/CONNECTOR DEVICES

- A. Description: Matching, locking-type plug and receptacle body connector, NEMA WD 6, Configurations L5-20P and L5-20R, Heavy-Duty grade.
 - 1. Body: Nylon with screw-open cable-gripping jaws and provision for attaching external cable grip.
 - 2. External Cable Grip: Woven wire-mesh type made of high-strength galvanized-steel wire strand, matched to cable diameter, and with attachment provision designed for corresponding connector.

2.4 SWITCHES

- A. Single- and Double-Pole Switches: Comply with DSCC W-C-896F and UL 20.
- B. Snap Switches: Heavy-Duty grade, quiet type.
- C. Combination Switch and Receptacle: Both devices in a single gang unit with plaster ears and removable tab connector that permit separate or common feed connection.
 - 1. Switch: 20 A, 120/277-V ac.
 - 2. Receptacle: NEMA WD 6, Configuration 5-20R.

2.5 WALL PLATES

- A. Single and combination types to match corresponding wiring devices.
 - 1. Plate-Securing Screws: Metal with head color to match plate finish.
 - 2. Material for Finished Spaces: Smooth Metal 302/304 stainless steel with satin finish.
 - 3. Material for Unfinished Spaces: Smooth Metal 302/304 stainless steel with satin finish except where shown surface shall be "bell" die-cast aluminum with similar plates.
 - 4. Material for Wet Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in "wet locations."

2.6 FINISHES

- A. Color:
 - 1. Wiring Devices: Gray

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install devices and assemblies level, plumb, and square with building lines.
- B. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical, and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.
- C. Remove wall plates and protect devices and assemblies during painting.

3.2 IDENTIFICATION

- A. Comply with Division 26 Section "Electrical Identification."

3.3 CONNECTIONS

- A. Ground equipment according to Division 26 Section "Grounding and Bonding."
- B. Connect wiring according to Division 26 Section "Conductors and Cables."

3.4 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
 - 1. After installing wiring devices and after electrical circuitry has been energized, test every outlet for proper polarity, ground continuity, and compliance with requirements.
 - 2. Test GFCI operation with both local and remote fault simulations according to manufacturer's written instructions.
- B. Remove malfunctioning units, replace with new units, and retest as specified above.

END OF SECTION 262726

SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following individually mounted, enclosed switches and circuit breakers:
 - 1. Fusible switches.
 - 2. Molded-case circuit breakers.
 - 3. Enclosures.

1.2 SUBMITTALS

- A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated.
- B. Shop Drawings: Diagram power, signal, and control wiring.
- C. Field quality-control test reports.
- D. Operation and maintenance data.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

2.2 FUSIBLE SWITCHES

- A. Manufacturers:

1. Eaton Corporation; Cutler-Hammer Products.
 2. Siemens Energy & Automation, Inc.
 3. Square D/Group Schneider.
 4. General Electric
- B. Fusible Switch, 600 A and Smaller: NEMA KS 1, Type HD, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept two 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; and labeled for copper and aluminum neutral conductors.
 3. Auxiliary Contact Kit: Auxiliary set of contacts arranged to open before switch blades open.

2.3 MOLDED-CASE CIRCUIT BREAKERS AND SWITCHES

- A. Manufacturers:
1. Eaton Corporation; Cutler-Hammer Products.
 2. Siemens Energy & Automation, Inc.
 3. Square D/Group Schneider.
 4. General Electric
- B. Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents.
1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable LSIG trip unit functions 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. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller and let-through ratings less than NEMA FU 1, RK-5.
 4. GFCI Circuit Breakers: Single- and two-pole configurations with 5-mA trip sensitivity.
- C. Molded-Case Circuit-Breaker Features and Accessories:
1. Standard frame sizes, trip ratings, and number of poles.
 2. Lugs: Mechanical style suitable for number, size, trip ratings, and conductor material.
 3. Application Listing: Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
 4. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
 5. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.

2.4 ENCLOSURES

- A. NEMA AB 1 and NEMA KS 1 to meet environmental conditions of installed location.
 - 1. Outdoor Locations: NEMA 250, Type 3R.
 - 2. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with applicable portions of NECA 1, NEMA PB 1.1, and NEMA PB 2.1 for installation of enclosed switches and circuit breakers.
- B. Mount individual wall-mounting switches and circuit breakers with tops at uniform height, unless otherwise indicated.
- C. Comply with mounting and anchoring requirements specified in Division 26 Section "Electrical Supports."
- D. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 26 Section "Electrical Identification."

3.2 FIELD QUALITY CONTROL

- A. Prepare for acceptance testing as follows:
 - 1. Inspect mechanical and electrical connections.
 - 2. Verify switch and relay type and labeling verification.
 - 3. Verify rating of installed fuses.
- B. Perform the following field tests and inspections and prepare test reports:
 - 1. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

END OF SECTION 262816

SECTION 264313 - SURGE PROTECTIVE DEVICES

PART 1 - GENERAL

1.1 SUMMARY:

This section describes the quality, performance, and installation of Parallel Connected, AC Power, Panel Type, Surge Protective Devices (SPDs).

1.2 QUALITY ASSURANCE:

All Surge Protective Devices (SPDs) shall be tested and *listed* to ANSI/UL 1449-2006 (UL 1449 3rd Edition) and Complimentary Listed to UL 1283 by an independent testing agency, with the experience and capability to conduct the testing indicated, that is a member company of the International Electrical Testing Association or is a Nationally Recognized Testing Laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction. This agency must comply with ANSI/IEEE C62.45 test procedures for all categories established in C62.41 (1991). "Manufactured in accordance with UL 1449" is not equivalent to being listed to ANSI/UL 1449-2006 and does not meet the intention of this specification.

1.3 CODES AND STANDARDS:

- A. ANSI/IEEE Std C62.41.1™-2002, IEEE Guide on the Surge Environment in Low-Voltage (1000 V and Less) AC Power Circuits
- B. ANSI/IEEE Std C62.41.2™-2002, IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits
- C. ANSI/IEEE Std C62.45™ -2002, IEEE Recommended Practice on Surge Testing for Equipment Connected to Low-Voltage (1000 V and Less) AC Power Circuits
- D. ANSI C84.1, American National Standard for Electric Power Systems and Equipment – Voltage Ratings (60 Hertz)
- E. ANSI/IEEE Standard 1100-2005, IEEE Recommended Practice for Power and Grounding Electronic Equipment (Emerald Book) - Clause 8.6.1
- F. National Fire Protection Association (NFPA) 70 (N.E.C.) – 2002 - Article 285
- G. ANSI/UL Standards 1449-2006 Listed (UL 1449 Third Edition), UL 1283 Listed, CUL Listed & CE compliant "low-voltage directive."
- H. IEEE Standard C62.72™ - 2007 – IEEE Guide for the Application of Surge-Protective Devices for Low-Voltage (1000 V or less) AC Power Circuits

1.4 MANUFACTURER QUALIFICATIONS:

- A. All surge suppression devices shall be manufactured by an ISO 9001-2000 certified company normally engaged in the design, development, and manufacture of such equipment, with at least 10 years of engineering experience in the design and manufacture of permanently connected SPD devices.
- B. The surge suppressor manufacturer shall provide unlimited free replacement of the entire SPD for all inoperable SPD units during the warranty period.
- C. Subject to compliance with specification requirements, provide products by one of the following:
 - 1. Surge Suppression Incorporated
 - 2. Intermatic, Inc
 - 3. Liebert
 - 4. Advanced Protection Technologies

1.5 SUBMITTALS:

- A. Surge suppression submittals shall include, but shall not be limited to the following items:
- B. Complete schematic data for all suppressors indicating part numbers, conductor sizes, etc.
- C. Dimensioned drawing of each suppressor type indicating mounting arrangement.
- D. Manufacturer's ANSI/UL 1449-2006 Third Edition listing classification page and listing number(s).
- E. Manufacturer's UL 1283 listing classification page and listing number(s).
- F. Certified test data from independent third party NRTL documenting ANSI/IEEE C62.41-2002 performance and the ability of the device to meet or exceed all requirements of this specification. Include complete let-through voltage/measured limiting voltage test data (not Voltage Protection Rating), test graphs, and scope traces for each mode for each product submitted for Category's C, B, A (including Cat A, 2 kV, 67 A, 100 kHz ring wave at both 90 & 270-degree electrical phase angles).
- G. Letter from manufacturer stating products are in strict compliance with the recommendations of IEEE Standard 1100-2005, Clause 8.6.1 and incorporate 10 individual dedicated discrete modes of protection for three-phase Wye systems, including direct line-to-line components. (Reduced-mode variations will not be accepted).
- H. Certificate of declaration that product is CE low voltage directive compliant
- I. Statement of manufacturer's warranty duration and replacement policy.

PART 2 - PRODUCTS

2.1 REQUIREMENTS:

- A. All SPDs shall be tested and listed to ANSI/UL 1449-2006 (UL 1449 3rd Edition) & Complimentary Listed to UL 1283 by a Nationally Recognized Testing Laboratory (NRTL) (i.e. CSA, UL, etc)
- B. The Surge Protective Devices (SPDs) shall be of a parallel-connected design using fast-acting transient energy protection components that will divert and dissipate the surge energy.
- C. The SPD shall be self-restoring and fully automatic.
- D. The SPD shall be tested and listed by an NRTL as a complete assembly to a symmetrical fault current rating greater than or equal to the available fault current at the location of installation at the connected panel, in accordance with NEC Article 285 and shall be marked with the short circuit current rating (SCCR). If the available fault current is unknown, then the SCCR of the SPD shall be 200 kAIC.
- E. Permanently connected devices mounted parallel to the service, and 208/120V sub panels are required.
- F. The SPD shall have a Nominal Discharge Current (I_n) of 20 kA. ((The Nominal Discharge Current Test was designed to establish that the SPD remains functional after 15 surges at various currents (3 kA, 5 kA, 10 kA, and 20 kA) using the test procedure described in ANSI/UL 1449-2006. 20kA is the most severe.))

Fusing:

- 1. The SPD shall provide as a minimum, over-current, over temperature protection in the form of component-level thermal fusing to ensure safe failure and prevent thermal runaway. This component-level fusing shall be an integral part of the MOV itself and not silver wire (or other) independently laid across each MOV.
- 2. Surge protective devices shall contain integral short circuit current safety fusing within each device for over-current requirements of the NEC. This fusing will be independent of the "component-level" fusing and be specifically for over-current protection and shall be constructed utilizing surge rated, cartridge fuses and not rated 'silver-fuse-wire' (or other).
- 3. The use of any mechanical or electro-mechanical thermal/over-current protection (i.e. moving parts and/or springs and shutters) in combination with or for the protection of the suppression elements is not permitted.
- 4. The fusing mechanisms employed must effectively coordinate their performance in conjunction with the high current abnormal over-voltage testing under ANSI/UL 1449-2006 (a.k.a. UL 1449 3rd Edition).

MCOV: The SPD shall have a maximum continuous operating voltage (MCOV) capable of sustaining 115% of nominal RMS voltage continuously without degrading.

Component Limitations: The SPD shall only use solid-state clamping components to limit the surge voltage and divert the surge current. SPD components that "crowbar" short-circuit the AC power system (e.g. spark gaps, gas tubes, selenium cells, or SCR's) shall not be acceptable. Device circuitry shall be bi-directional, enclosed in a UL listed encapsulated thermal stress reducing compound, and be of a parallel design.

Protection Modes: The SPD system shall provide (per IEEE Std. 1100-1999 8.6.1) dedicated, independent, distinct, individual protection circuitry for every possible mode in the electrical distribution system at the point of SPD application. For example, a 277/480V or 120/208V, 3-phase Wye, 4-wire plus ground system has 10 distinct modes that require independent and dedicated protection (i.e., L1-L2, L2-L3, L3-L1, L1-N, L2-N, L3-N, L1-G, L2-G, L3-G, N-G). None of these modes of protection depend on protection elements purposed for other protection modes. Reduced mode SPD with only 3, 4, or 7 dedicated, distinct, independent protection modes are not acceptable. When a mode of protection is specified, the protective mode shall be included. Thus, Line-to-Neutral-to-Line is *not acceptable* where Line-to-Line is Specified.

Status Indicators: SPD units shall have panel front status monitors as a minimum to indicate a continuous positive status of each protected phase. A remote audible alarm option must be supplied where the specifying engineer deems it necessary and cost effective under the circumstances. Refer to the appropriate drawings and schedules for these details.

Equipment Certification: Items shall be listed to ANSI/UL 1449-2006, shall bear the seal of the NRTL, shall bear the Marking "Listed to UL 1449", shall have been tested under ANSI/UL 1449-2006, and shall be marked in accordance with the referenced standard. SPD units shall be UL 1283 Listed as an Electromagnetic Interference Filter and marked accordingly. All surge suppression devices shall be manufactured by an ISO 9001-2001 certified company normally engaged in the design, development, and manufacture of such equipment.

Circuit Configuration: The circuit configuration of the suppression units shall be bi-directional, thermal stress reducing, encapsulated, custom parallel connected, and solid state. (Series units or units equipped with "load carrying" components are expressly prohibited due to the possibility of single point series failures causing power interruption to protected loads.)

Enclosures: Unless otherwise noted, provide NEMA 1 or better enclosure for indoor mounting and NEMA 4 enclosure or better for all outdoor locations. All units will contain Form C, N/O or N/C, dry relay contacts, if so specified, and weatherproof fittings to maintain the required NEMA integrity.

Maintenance Restrictions: No suppression unit shall be supplied which requires scheduled preventive maintenance or replacement parts. Units requiring functional testing, special test equipment, or special training to monitor surge protection device (SPD) status are not acceptable. SPD shall require NO routine maintenance. SPD devices are considered non-repairable items and shall be fully replaced upon failure.

Commonality: All SPDs at the service entrance, distribution panels, and sub-panels shall be from the same manufacturer.

All SPDs shall meet or exceed the following performance criteria:

Service Entrance (Category C): The SPD shall provide a minimum protection of 240kA per phase (three-phase Wye) and be capable of meeting the Category C-High Let-Through Voltage criteria as shown in the Section VII, below.

Branch Panels/Panelboards (Category A): The SPD shall provide a minimum protection of 120kA per phase and be capable of meeting the Category B-High Let-Through Voltage criteria as shown in the Section VII, below.

2.2 ANSI/IEEE C62.41 LET-THROUGH VOLTAGE

- A. The SPD shall meet the Let-Through Voltage requirements shown in the tables below for voltage and locations specified. All voltages shall be peak ($\pm 10\%$) Positive Polarity, Time base = $10\mu\text{S}$, Sampling Rate = 500ms/s to ensure maximum transient capture. [These settings assure Let-through Voltage test results are accurate]. Surge voltages shall be measured from the insertion of the surge on the sine wave to the peak of the surge. All tests are Static (unpowered), except for the 120V circuits that are Dynamic (powered). Let-through voltages on static tests calculated by subtracting sine wave peak from let-through measured from zero. All tests shall be performed in accordance with UL 1449 Third Edition with measurements performed at a point on the leads 15.24 cm (6 inches) outside of the device enclosure. No data measured at a module, lugs, component, or undefined location will be accepted. These settings assure Let-through Voltage test results are accurate. SPDs shall meet the following criteria:

Service Entrance: (120/208V, 3 Phase 4 Wire)

ANSI/IEEE Cat. C Impulse Wave The let-through voltage based on ANSI/IEEE C62.41 and C62.45 recommended procedures for the ANSI/IEEE Cat. C Impulse Wave (20kV, 10,000 amps) at the 90-degree phase angle, shall be less than (values are total let-through voltage (LTV) measured from the insertion point of the transient on the sine wave to the peak of the transient):

Mode / Voltage	277 / 480V
L-N	410V
L-L	686V
L-G	420V
N-G	806V

Panelboards: (120/208V 3 Phase 4 Wire and 277/480V 3 Phase 4 Wire)

ANSI/IEEE Cat. B Combination Wave Impulse Let-Through Voltage: The let-through voltage based on ANSI/IEEE C62.41 and C62.45 recommended procedures for the ANSI/IEEE Cat. B Combination Wave Impulse (6kV, 3000 amps) at the 90-degree phase angle shall be less than; (values are total let-through voltage (LTV) measured from the insertion point of the transient on the sine wave to the peak of the transient):

Mode / Voltage	120 / 208Y	277 / 480V
L-N	296V	443V
L-L	473V	721V
L-G	297V	450V
N-G	578V	942V

PART 3 - EXECUTION

3.1 WARRANTY

- A. All SPD devices shall be warranted to be free from defects in materials and workmanship under normal use in accordance with the instructions provided for a period of ten (10) years from date of substantial completion.
- B. Any SPD device that shows evidence of failure or incorrect operation, including damage as the result of lightning strikes, during the warranty period shall be replaced as a complete unit (not just modules, subassemblies, or components) by the manufacturer at no charge to the owner. Warranty will provide for multiple exchanges of any inoperable devices at any time during the warranty period that starts at the date of substantial completion of the system to which the surge suppressor is installed.
- C. SPD manufacturers whose warranty does not meet the requirements listed above standard shall submit a letter extending the warranty to meet these standards with the product submittal.

3.2 INSTALLATION

- A. Provide surge suppressor at each building service entrance and at other distribution and panelboard locations as indicated on the drawings. The SPD shall be located immediately adjacent to the switchboard or panelboard being protected (close-nipple to panel-boards). The SPD may not be located integral (switchgear manufacturer installed) within the switchboard or panelboard(s) unless the switchgear manufacturer providing such SPD products expressly meets or exceeds ALL parameters of this specification for the SPD. These SPDs shall be individually tested and Listed to ANSI/UL 1449-2006 according to their type and not be listed solely as part of the larger assembly. SPD devices not meeting or exceeding the performance of this specification will be deemed unacceptable.
- B. Do not energize or connect service entrance equipment and panelboards to their sources until TVSS devices are properly installed and connected.
- C. Do not perform insulation resistance tests of the distribution wiring equipment with the TVSS installed. Disconnect before conducting insulation resistance tests, and reconnect immediately after the testing is over.
- D. Install the SPD with #10 AWG minimum conductors to dedicated 30-amp breaker(s) in panel per manufacturer's installation instructions and close to the Neutral Bus. The dedicated breaker shall serve as a means of service disconnect for the SPD so that the electrical panel remains energized during SPD servicing. The installer may rearrange breaker locations to ensure the shortest and straightest leads to the SPD. If a dedicated breaker is not provided, an SPD with internal 30-amp fuse or a UL Listed fused disconnect switch shall be installed as a minimum. The conductors serving the SPD shall be twisted together (one twist per 12" of wire) to reduce the SPD system input impedance and shall be kept at the minimum length. The SPD shall be installed in strict accordance with the manufacturer's recommended practices and in compliance with N.E.C. requirements, State, and Local Codes.
- E. Lead lengths shall not exceed 14 inches.

- F. The electrical contractor shall verify the proper application of the SPD (i.e., voltage, phases, etc.). The electrical contractor shall ensure that all Neutral conductors are bonded to the system Ground at the service entrance or the serving isolation transformer prior to installation of the associated SPD. The electrical contractor will ensure that neutral-to-ground bonds do not exist at locations that are not service entrances or newly derived power sources.
- G. The electrical contractor shall furnish all labor, materials, equipment, and services necessary for and incidental to the installation of the SPD system components as specified herein.
- H. The electrical contractor shall coordinate with other electrical work as necessary to interface installation of the transient voltage surge suppression systems with other work on the site.
- I. The SPD installation shall be certified by a licensed electrician that the installation is in accordance with the manufacturer's recommendations, applicable electrical code requirements and the requirements of the specification above. Any deficiencies noted shall be corrected by the Contractor. Provide written documentation of this inspection as part of the closeout documentation.
- J. The Manufacturer or qualified representative shall inspect the final installation and conduct a four-hour scheduled familiarization and maintenance instruction with Administration and Maintenance personnel.

END OF SECTION 264313

SECTION 265600 – LED EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Exterior solid-state luminaires that are designed for and exclusively use LED lamp technology.
2. Luminaire supports.
3. Luminaire-mounted photoelectric relays.

B. Related Requirements:

1. Section 260923 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.

1.2 DEFINITIONS

- A. CCT: Correlated color temperature.
- B. CRI: Color rendering index.
- C. Fixture: See "Luminaire."
- D. IP: International Protection or Ingress Protection Rating
- E. Lumen: Measured output of lamp and luminaire, or both.
- F. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of luminaire.
- B. Shop Drawings: For nonstandard or custom luminaires.
 1. Include plans, elevations, sections, and mounting and attachment details.
 2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 3. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Plans, drawn to scale and coordinated.
- B. Product Certificates: For each type of the following:
 - 1. Luminaire.
 - 2. Photoelectric relay.
- C. Sample warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.
 - 1. Provide a list of all lamp types used on Project. Use ANSI and manufacturers' codes.
 - 2. Provide a list of all photoelectric relay types used on Project; use manufacturers' codes.

1.6 FIELD CONDITIONS

- A. Mark locations of exterior luminaires for approval by Architect prior to the start of luminaire installation.

1.7 WARRANTY

- A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 5 year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 LUMINAIRE 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. NRTL Compliance: Luminaires shall be listed and labeled for indicated class and division of hazard by an NRTL.
- C. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.

- D. UL Compliance: Comply with UL 1598 and listed for wet location.
- E. Lamp base complying with ANSI C81.61.
- F. CRI of minimum 70. CCT of 4,000 K.
- G. L70 lamp life of 50,000 hours.
- H. Lamps dimmable from 100 percent to 0 percent of maximum light output.
- I. Nominal Operating Voltage: 120 V ac or 277 V ac.
- J. In-line Fusing: Separate in-line fuse for each luminaire.
- K. Source Limitations: For luminaires, obtain each color, grade, finish, type, and variety of luminaire from single source with resources to provide products of consistent quality in appearance and physical properties.

2.2 LUMINAIRE TYPES

- A. Area and Site:
 - 1. Luminaire Shape: Round.
 - 2. Mounting: Building.
 - 3. Luminaire-Mounting Height: As indicated on lighting fixture schedule.
 - 4. Distribution: As indicated on lighting fixture schedule.

2.3 MATERIALS

- A. Metal Parts: Free of burrs and sharp corners and edges.
- B. Sheet Metal Components: Corrosion-resistant aluminum. Form and support to prevent warping and sagging.
- C. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses.
- D. Diffusers and Globes:
 - 1. Acrylic Diffusers: 100 percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
 - 2. Glass: Annealed crystal glass unless otherwise indicated.
 - 3. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.
- E. Lens and Refractor Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.

- F. Reflecting surfaces shall have minimum reflectance as follows unless otherwise indicated:
 - 1. White Surfaces: 85 percent.
 - 2. Specular Surfaces: 83 percent.
 - 3. Diffusing Specular Surfaces: 75 percent.

- G. Housings:
 - 1. Rigidly formed, weather- and light-tight enclosure that will not warp, sag, or deform in use.
 - 2. Provide filter/breather for enclosed luminaires.

2.4 FINISHES

- A. Variations in Finishes: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

- B. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.

- C. Factory-Applied Finish for Aluminum Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
 - 1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
 - 2. Natural Satin Finish: Provide fine, directional, medium satin polish (AA-M32); buff complying with AA-M20 requirements; and seal aluminum surfaces with clear, hard-coat wax.
 - 3. Class I, Clear-Anodic Finish: AA-M32C22A41 (Mechanical Finish: Medium satin; Chemical Finish: Etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.
 - 4. Class I, Color-Anodic Finish: AA-M32C22A42/A44 (Mechanical Finish: Medium satin; Chemical Finish: Etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker), complying with AAMA 611.
 - a. Color: Dark bronze.

- D. Factory-Applied Finish for Steel Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
 - 1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1 or SSPC-SP 8.

2. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.
 - a. Color: As selected from manufacturer's standard catalog of colors.

2.5 LUMINAIRE SUPPORT COMPONENTS

- A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

- A. Comply with NECA 1.
- B. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.
- C. Install lamps in each luminaire.
- D. Fasten luminaire to structural support.
- E. Supports:
 1. Sized and rated for luminaire weight.
 2. Able to maintain luminaire position after cleaning and relamping.
 3. Support luminaires without causing deflection of finished surface.
 4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.
- F. Wall-Mounted Luminaire Support:
 1. Attached to structural members in walls.
- G. Wiring Method: Install cables in raceways. Conceal raceways and cables.
- H. Install luminaires level, plumb, and square with finished grade unless otherwise indicated.
- I. Coordinate layout and installation of luminaires with other construction.
- J. Adjust luminaires that require field adjustment or aiming. [Include adjustment of photoelectric device to prevent false operation of relay by artificial light sources, favoring a north orientation.]

- K. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" and Section 260533 "Raceways and Boxes for Electrical Systems" for wiring connections and wiring methods.

3.2 INSTALLATION OF INDIVIDUAL GROUND-MOUNTED LUMINAIRES

- A. Install on concrete base with top 4 inches above finished grade or surface at luminaire location. Cast conduit into base, and finish by troweling and rubbing smooth. Concrete materials, installation, and finishing are specified in Section 033000 "Cast-in-Place Concrete."

3.3 CORROSION PREVENTION

- A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.
- B. Steel Conduits: Comply with Section 260533 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch- thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.4 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

- A. Inspect each installed luminaire for damage. Replace damaged luminaires and components.
- B. Perform the following tests and inspections.
 - 1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
 - 2. Verify operation of photoelectric controls.
- C. Illumination Tests:
 - 1. Measure light intensities at night. Use photometers with calibration referenced to NIST standards. Comply with the following IES testing guide(s):
 - a. IES LM-5.
 - b. IES LM-50.
 - c. IES LM-52.
 - d. IES LM-64.
 - e. IES LM-72.

2. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
- D. Luminaire will be considered defective if it does not pass tests and inspections.
 - E. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

END OF SECTION 265600