INVITATION TO BID

BID NUMBER: 2022-04

The Emerald Coast Utilities Authority (ECUA) invites your company to submit a bid on item (s) as listed in this bid request. It is the intent of the ECUA to receive bids that will be publicly opened at **2:00 p.m., Tuesday, August 9, 2022**, for the following:

Fuel Tanks for CWRF (Central Water Reclamation Facility) & Sanitation

Sealed bids will be received until **2:00 p.m., Tuesday, August 9, 2022,** by the Purchasing and Stores Division, Emerald Coast Utilities Authority, 9255 Sturdevant Street, Ellyson Industrial Park, Pensacola, Florida 32514. The bids received will then be publicly opened and read. The Emerald Coast Utilities Authority reserves the right to waive informalities in any bid; reject any or all bids, in whole or in part; re-bid a project, in whole or in part; and to accept a bid that in its judgment is the lowest and best bid of a responsible bidder. In accepting a bid, ECUA may award a contract based only on the base bid, the base bid plus all alternates, or the base bid plus any alternates which ECUA selects – with all decisions being made based upon what ECUA believes to be in the best interests of its ratepayers, in the reasonable exercise of its discretion. ECUA further reserves the right to increase or decrease quantities as may be required to meet the needs of ECUA, at the unit price which was bid.

LEGAL ADVERTISEMENT

Sealed bids for Invitation to Bid #2022-04, Fuel Tanks for CWRF (Central Water Reclamation Facility) & Sanitation, will be received by the Emerald Coast Utilities Authority, Purchasing and Stores Division, 9255 Sturdevant Street, Ellyson Industrial Park, Pensacola, FL 32514, until 2:00 p.m. (local time), Tuesday, August 9, 2022, at which time bids submitted will be publicly opened and read.

Specifications and information may be obtained free of charge from ECUA, Purchasing and Stores Division (850-969-6530), via email at paul.nobles@ecua.fl.gov, on the website at www.ecua.fl.gov or on BidNet Direct at www.bidnetdirect.com/florida/emeraldcoastutilitiesauthority. Bids received after 2:00 p.m. (local time), Tuesday, August 9, 2022 will be returned unopened. ECUA reserves the right to reject any or all bids and re-advertise.

Bids must be clearly marked on the envelope:

BID: Fuel Tanks for CWRF (Central Water Reclamation Facility) & Sanitation
BID#: 2022-04

Proposed Advertising Date: June 30, 2022

Emerald Coast Utilities Authority
Purchasing and Stores Division
9255 Sturdevant Street
Pensacola, Florida 32514-7038
850-969-6530

STATEMENT OF NO BID

If you **do not** intend to bid on this commodity/service, please return this form to the above address immediately. If this statement is not completed and returned, your company may be deleted from the Emerald Coast Utilities Authority Vendors' list for this commodity/service.

We the undersigned, have declined to bid on requested commodity/service ITB 2022-04, Fuel Tanks for CWRF (Central Water Reclamation Facility) & Sanitation for the following reasons:

_____ Specifications too "tight," i.e. geared toward one brand or manufacturer only (explain below).

_____ Insufficient time to respond to the Invitation to Bid.

_____ We do not offer this product or service.

_____ Our schedule would not permit us to perform.

_____ Unable to meet bond/insurance requirements.

_____ Specifications are unclear (explain below).

_____ Remove us from your vendors' list for this commodity/service.

_____ Other (specify below).

Remarks: _____
_____
_____

Company Name: _____

Signature: _____

Telephone: _____ Date: _____

NOTE: Statement of No Bid may be faxed to the Purchasing Division (850-969-3384) Attention: Paul R. Nobles or emailed to paul.nobles@ecua.fl.gov.

INSTRUCTIONS TO BIDDERS

All these terms and conditions are a part of this bid request.

1. **BID SCHEDULE**

Bids are presently scheduled to be **publicly opened and read at 2:00 p.m., August 9, 2022**, in the ECUA Finance Conference Room (Rm #2202), 2nd floor, Emergency Operations Support Addition, 9255 Sturdevant Street, Ellyson Industrial Park. ECUA staff will review all bids and forward their recommendations to the **ECUA Citizens' Advisory Committee scheduled to meet at 3:00 p.m., September 20, 2022** in the ECUA Board Room, 9255 Sturdevant Street, Ellyson Industrial Park. The ECUA Citizens' Advisory Committee recommendation will be presented to the **ECUA Board at their meeting scheduled for 3:00 p.m., September 27, 2022**, in the ECUA Board Room.

2. **BID SUBMISSION**

In a sealed envelope (or other packaging), provide **one (1) original with manual signature (so identified), one (1) copy, and one (1) electronic copy (USB flash drive).** Bids must be in the possession of the Emerald Coast Utilities Authority Purchasing and Stores Manager to be considered. Bids may be mailed or delivered to the Purchasing and Stores Division at 9255 Sturdevant Street, Ellyson Industrial Park, Pensacola, Florida, 32514, in a sealed envelope clearly marked with the bid name, time and date of the opening. Regardless of the method of delivery, each bidder shall be responsible for his/her bid(s) being delivered on time, as the Emerald Coast Utilities Authority assumes no responsibility for same. Bids offered or received after the time set for the bid opening will be rejected and returned unopened to the bidder.

3. **CONVICTION OF PUBLIC ENTITY CRIME**

A person or affiliate who has been placed on the Convicted Vendor List following a conviction for a public entity crime may not submit a bid on a contract to provide any goods or services to a public entity, may not submit a bid on a contract with a public entity for the construction or repair of a public building or public work, may not submit bids on leases of real property to a public entity, may not be awarded or perform work as a Contractor, supplier, subcontractor, or consultant under a contract with any public entity, and may not transact business with any public entity in excess of the threshold amount provided in Section 287.017, for Category Two ($35,000) for a period of 36 months from the date of being placed on the Convicted Vendor List.

4. **BID WITHDRAWAL**

No bid may be withdrawn for a period of ninety (90) days from the bid opening. Prices may not be modified during this period. Bids may be withdrawn at any time prior to the bid opening time.

5. **BID AUTHORIZATION**

All bids must be submitted on the form provided by the Emerald Coast Utilities Authority and must be signed by an authorized representative of the company placing the bid. One complete set of bid forms will be furnished each company interested in bidding.

6. **BID ERRORS**

A bidder may not modify its bid after bid opening. Errors in the extension of unit prices stated in a bid or in multiplication, division, addition, or subtraction in a bid may be corrected by the Purchasing and Stores Manager prior to award. In such cases, unit prices shall not be changed.

7. **AWARD OF BID**

ECUA reserves the right to establish priorities and to award the contract to a single bidder based upon the total bid or to multiple vendors based upon the items individually bid. ECUA also reserves the right to selectively purchase any single or any multiple items from this bid.

8. **TAXES**

Do not include any tax with your bid. The Emerald Coast Utilities Authority is exempt from federal, state and local taxes. Tax exempt number 85-8012640152C-4 applies.

9. **TERMS**

Minimum terms will be net 30 (30 days after receipt of material/service) unless a discount is involved. Terms offering a discount for prompt payment will only be considered in determining the low bid if the discount period is 15 days or greater (15 days after receipt of material/service or invoice, whichever is greater).

10. **BID TABULATIONS**

Bid tabulations will be posted for review in the Purchasing Section, 9255 Sturdevant Street, Ellyson Industrial Park on or about **August 9, 2022**, and will remain posted for 72 hours excluding weekends and holidays. The bid tabulations/list of bidders will also be posted to the ECUA website, www.ecua.fl.gov/business/bid-opportunities and BidNet Direct at www.bidnetdirect.com /florida/emeraldcoastutilitiesauthority.

11. **BID QUESTIONS**

All questions concerning the specifications or bid submission procedures can be emailed to the Purchasing and Stores Division Sole Point of Contact (POC) (as listed below) **by July 12 ,2022, noon, local time** for consideration. Answers will be provided in the form of an addendum. Only questions answered by addenda will be binding. Oral and other interpretations or classifications will be without legal effect. All addenda issued must be acknowledged in your bid response.

Emerald Coast Utilities Authority
Attn: Paul R. Nobles, Senior Purchasing Agent
Email: paul.nobles@ecua.fl.gov

12. **COMPLIANCE WITH SPECIFICATIONS**

In order to determine that your bid complies with bid specifications, product literature and/or data/information must be included with the bid proposal as indicated in the specifications. Any deviations from the bid specifications should be identified separately. Failure to include such product literature and/or data/information shall be grounds for rejection of any bid.

13. **UNIFORM COMMERCIAL CODE**

The Uniform Commercial Code (Florida Statutes, Chapter 672) shall prevail as the basis for contractual obligations between the awarded Vendor/Contractor and Emerald Coast Utilities Authority for any terms and conditions not specifically stated in this Invitation to Bid.

14. **EXECUTION OF CONTRACT**

Any action of ECUA in awarding the purchase of any material or performance of a service is subject to and conditioned upon the execution of a written purchase contract and/or a purchase order between ECUA and the vendor.

15. **CONTRACTUAL AGREEMENT**

This Invitation to Bid (ITB) shall be included and incorporated in the final contract or purchase order. The order of contract precedence will be the Standard Form Contract (or purchase order), ITB document and response. Any and all legal action necessary to enforce the contract will be held in Escambia County and the contract will be interpreted according to the Laws of Florida.

16. **BID BONDS**

Each BID must be accompanied by a BID BOND payable to the OWNER for five percent of the total amount of the BID. As soon as the BID prices have been checked and compared, the OWNER will return the BONDS of all except the three lowest responsible BIDDERS. When the AGREEMENT is executed, and the PAYMENT and PERFORMANCE BONDS have been executed and approved, the BID BONDS of the remaining BIDDERS will be returned. A certified check may be used in lieu of the BID BOND. The OWNER may make such investigations as deemed necessary to determine the ability of the BIDDER to perform the work, and the BIDDER shall furnish to the OWNER all such information and data for this purpose as the OWNER may request. The OWNER reserves the right to reject any BID if the evidence submitted by, or investigation of, such BIDDER fails to satisfy the OWNER that such BIDDER is properly qualified to carry out the obligations of the AGREEMENT and to complete the work contemplated herein. The low BIDDER will be required to perform at least fifty percent (50%) of the contract work with his/her own employees. The BIDDER to whom the contract is being awarded shall supply the names and addresses of major material suppliers and subcontractors when required to do so by the OWNER.

17. **TIME FOR COMPLETION; LIQUIDATED DAMAGES**

Contractor agrees to commence work under the Project Manual within ten (10) calendar days after written Notice to Proceed and, subject to authorized adjustments, to achieve Substantial Completion not later than two hundred forty (240) calendar days after being given Notice to Proceed, and to achieve final completion in accordance with section 6.3 of this Agreement and Standard General Condition 15.06 Final Payment, D Completion of Work not later than thirty (30) calendar days after Substantial Completion. Contractor further agrees to pay liquidated damages in the amount of $100 for each consecutive calendar day Contractor is late in achieving Substantial Completion and $50 for each consecutive calendar day Contractor is late in achieving final completion.

Upon final completion of the Work, including receipt of "As Built" drawings, Contractor's Final Affidavit, Warranty and settlement of all claims, Owner shall pay the remainder of the Final Contract Price.

When any period of time is referred to in the Contract by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

18. **PERFORMANCE AND PAYMENT BOND**

A PERFORMANCE BOND and PAYMENT BOND each in the amount of 100 percent of the contract price, with a corporate surety approved by the OWNER, will be required for the faithful performance of the contract, when the AGREEMENT is executed. Attorneys-in-fact who sign BID BONDS or PAYMENT BONDS and PERFORMANCE BONDS must file with each BOND a current certified copy of their power of attorney.

19. **AGREEMENT**

The Bidder proposes and agrees, if this Bid is accepted, to contract with the Owner in the form of contract specified, to furnish all necessary materials, equipment, machinery, tools, and labor necessary to complete the work in full and in accordance with the shown, note, described, and reasonably intended requirements of the Project.

The Bidder also agrees that, at the time of signing the Contract, he or she will furnish the required insurance certificates.

The Bidder further agrees that in case of failure on his or her part to execute said Contract, with the Certificates of Insurance and Payment and Performance Bonds within ten (10) consecutive calendar days after written notice of award of the Contract, the Contract may be awarded to the next higher responsible bidder, and the undersigned may not be considered as a responsible bidder for future contracts for a period of at least one year.

Certificate(s) of Insurance, as specified herein, shall be submitted at the time of signing the AGREEMENT. The BIDDER to whom the contract is being awarded will be required to execute the AGREEMENT and obtain the PERFORMANCE BOND, PAYMENT BOND and Insurance

on or before ten (10) calendar days following delivery of the notice of award to the BIDDER. If the BIDDER fails to properly execute the AGREEMENT or obtain the required PERFORMANCE BOND, PAYMENT BOND, or Insurance within the allotted time, the OWNER may consider the BIDDER in default, in which case the BID BOND or check accompanying the proposal shall become payable to the OWNER. The OWNER within ten (10) days of receipt of acceptable PERFORMANCE BOND, PAYMENT BOND, Insurance Certificates and the AGREEMENT signed by the CONTRACTOR to whom the contract is being awarded shall sign the AGREEMENT and return to such CONTRACTOR an executed duplicate of the AGREEMENT. Should the OWNER not execute the AGREEMENT within such period, the BIDDER may by written notice withdraw the signed AGREEMENT. The CONTRACTOR shall thereupon record the PAYMENT and PERFORMANCE BONDS at the Escambia County Courthouse and return the recorded originals to the OWNER within seven (7) days. The NOTICE TO PROCEED shall be issued within ten (10) days of the receipt of the recorded bonds by the OWNER. Should there be reasons why the NOTICE TO PROCEED cannot be issued within such period, the time may be extended by mutual agreement between the OWNER and CONTRACTOR. If the NOTICE TO PROCEED has not been issued within the ten (10) day period or within the period mutually agreed upon, the CONTRACTOR may terminate the AGREEMENT by written notice to the OWNER.

20. **PROTESTS PROTESTS**

Any person whose substantial interests are directly and adversely affected by the award or intended award of a purchase order or contract or by plans or specifications contained in an Invitation to Bid may file a protest in accordance with the following rules and Section 12 of the ECUA Act (Chapter 2001-324, Laws of Florida as amended).

Notice of protest of plans, specifications or other requirements contained in an Invitation to Bid shall be filed not later than 5:00 p.m. of the third business day following receipt of the plans or specifications. Notice of protest of the rejection of a bid as non-responsive shall be filed not later than 5:00 p.m. of the third business day following notice to the bidder of the rejection. Notice of protest of the award or intended award of a purchase order or contract to the lowest bidder shown on a posted bid tabulation shall be filed not later than 5:00 p.m. of the third business day following the posting of the bid tabulation. Notice of protest of the award or intended award of a purchase order or contract to a bidder other than the lowest bidder shown on a posted bid tabulation shall be filed not later than 5:00 p.m. of the third business day following notice of the award of a purchase order or contract.

A notice of protest shall be in writing and shall state the subject matter of the protest.

A formal written protest shall be filed within ten (10) business days after the filing of notice of protest. A formal written protest shall state with particularity the facts and the law on which the protest is based.

Notice of protest and formal written protest of plans or specifications for or the award or intended award of a contract shall be filed with the Executive Director or his or her designee.

Failure to file a notice of protest or failure to file a formal written protest within the times permitted shall constitute a waiver of proceedings under these rules and under Section 12 of Chapter 2001-324, Laws of Florida, as amended.

Upon receipt of a notice of protest which has been timely filed, the Executive Director shall stop the bid solicitation or purchase order or contract award process until the protest has been resolved. However, the bid solicitation or purchase order or contract award process may proceed when the Executive Director determines that delay would be detrimental to the interests of ECUA. Any award of a purchase order or contract under such conditions shall be subject to the outcome of the protest. After the award of a contract or purchase order resulting from a bid in which a timely protest was received and in which ECUA did not prevail, ECUA may take such action as it considers appropriate, which may include, but shall not be limited to, award of the contract or purchase order to the prevailing party, cancellation of the contract or purchase order, or rebidding.

The Executive Director shall provide reasonable opportunity to resolve a protest by agreement. If agreement is not reached within such time as the Executive Director or his or her designee considers reasonable under the circumstances, the Executive Director or his or her designee shall review the facts and the law on which the protest is based, and shall render a decision which shall be in writing and shall be promptly transmitted to the protestor.

If the protestor wishes to continue the protest beyond the decision of the Executive Director or his or her designee, the protestor shall be required to file a petition for review by the ECUA Board. This petition shall be made in writing and presented to the Executive Director within ten (10) days after notice of the decision of the Executive Director or his or her designee; otherwise, the decision of the Executive Director or his or her designee shall be final and binding. Such petition shall state the particular grounds on which it is based and may include pertinent documents and evidence relating thereto. Any grounds not stated shall be deemed to have been waived by the protestor. This petition must also be accompanied by a protest bond of an amount equal to 1.0 percent (1%) of the value of the solicitation, but in no case less than $1,000 nor greater than $10,000.00. This bond shall be in the form of a money order, certified cashier's check, or certified bank check made payable to the Emerald Coast Utilities Authority. Failure to post such bond within ten (10) business days after the decision of the Executive Director or his or her designee shall result in the protest being dismissed by the Executive Director.

The bond required by the above paragraph shall be conditioned upon the payment of all costs and charges which may be adjudged against the person filing the petition for review. If the protestor prevails, the bond shall be returned to the protestor. If however, ECUA prevails, the bond shall be forfeited, and ECUA shall be entitled to recover the costs and charges, excluding attorney's fees, of such hearing. The entire amount of the bond also shall be forfeited if it is determined that a protest was filed for a frivolous or improper purpose, including, but not limited to, the purpose of harassing, causing unnecessary delay, or causing needless cost for ECUA or another interested party/parties.

Any notice required or permitted under this bid protest procedure shall be effective when delivered personally or by facsimile, or when deposited in the U.S. mail. If notice is given only by mail,

three (3) days shall be added to the time within which a protestor may file a notice of protest or petition for review.

21. **CONTRACTS EXCEEDING ONE (1) YEAR**

When applicable, a contract may be renewed contingent upon cost factors, mutual agreement, satisfactory performance evaluations, availability of funds and ECUA Board approval. ECUA's performance and obligation to pay for the purchase of services or tangible personal property of a period in excess of one (1) fiscal year under any contractual relationship is contingent upon an annual budget approval by the ECUA Board.

22. **CONTRACTOR NOT AGENT**

Except as ECUA may specify in writing, Contractor shall have no authority, express or implied, to act on behalf of ECUA in any capacity whatsoever as an agent. Contractor shall have no authority, express or implied, pursuant to this agreement to bind ECUA to any obligation whatsoever.

23. **ASSIGNMENT PROHIBITED**

Contractor may not assign any right or obligation pursuant to this agreement. In the event that ECUA, in its sole discretion, at any time during the term of this agreement, desires the removal of any person or persons assigned by Contractor to perform services pursuant to this agreement, Contractor shall remove any such person immediately upon receiving written notice from ECUA of its desire for removal of such person or persons.

24. **CONDUCT OF PARTICIPANTS**

After the issuance of any solicitation, all bidders/proposers/protestors or individuals acting on their behalf are hereby prohibited from lobbying as defined herein or otherwise attempting to persuade or influence any elected ECUA officials, their agents or employees or any member of the relevant selection committee at any time during the blackout period as defined herein; provided, however, nothing herein shall prohibit bidders/proposers/protestors or individuals acting on their behalf from communicating with the purchasing staff concerning a pending solicitation unless otherwise provided in the solicitation or unless otherwise directed by the Purchasing Manager.

Lobbying means the attempt to influence the thinking of elected ECUA officials, their agents or employees or any member of the relevant selection committee for or against a specific cause related to a pending solicitation for goods or services, in person, by mail, by facsimile, by telephone, by electronic mail, or by any other means of communication.

25. **BLACKOUT PERIOD**

Blackout period means the period between the time the bids/proposals for Invitation to Bid or the Request for Proposal, or qualifications, or information, or requests for letters of interest, or the invitation to negotiate, as applicable, are advertised and the time the ECUA Board awards the

contract and any resulting bid protest is resolved or the solicitation is otherwise cancelled. Conduct inconsistent with this section may be grounds for disqualifying the offending proposer from consideration or any future proposal.

26. **BID INFORMALITIES**

ECUA reserves the right to waive informalities in any bid; reject any or all bids, in whole or in part; rebid a project, in whole or in part; and to accept a bid that in its judgement is the lowest and best bid from a responsible bidder. ECUA reserves the right to award this contract based upon what ECUA believes to be in the best interests of its ratepayers, in the reasonable exercise of its discretion and not solely based upon price. ECUA further reserves the right to increase or decrease quantities as may be required to meet the needs of ECUA, at the unit price which is bid. ECUA may award a contract to a primary and a secondary Contractor. In that case, ECUA will assign work to the primary Contractor unless it is determined by ECUA that circumstances dictate that work be assigned to the secondary Contractor. The two (2) Contractors may be utilized in coordination, if necessary.

27. **NON-DISCRIMINATION POLICIES**

ECUA does not discriminate on the basis of race, color, national origin, sex, creed/religion, age, marital status, disability/handicapped status, veteran status or any other legally protected status in employment or provision of service.

28. **INDEMNIFICATION**

Bidder, at its own expense and without exception, shall indemnify, defend and pay all damages, costs, expenses, including attorney fees, and otherwise hold harmless the ECUA, its employees, and agents from any liability of any nature or kind in regard to the delivery of these services.

29. **OTHER PROVISIONS**

Contractor is required to comply with public records laws codified in Chapter 119, Florida Statutes, and is specifically required to:

A. Keep and maintain public records required by ECUA to perform the service.

B. Upon request from ECUA's custodian of public records, provide ECUA with a copy of the requested records or allow the records to be inspected or copied within a reasonable time at a cost that does not exceed the cost provided in Chapter 119 or as otherwise provided by law.
C. Ensure that public records that are exempt or confidential and exempt from public records disclosure requirements are not disclosed except as authorized by law for the duration of the contract term and following completion of the contract if the Contractor does not transfer the records to ECUA.
D. Upon completion of the contract, transfer, at no cost, to ECUA all public records in possession of the Contractor or keep and maintain public records required by

ECUA to perform the service. If the Contractor transfers all public records to ECUA upon completion of the contract, the Contractor shall destroy any duplicate public records that are exempt or confidential and exempt from public records disclosure requirements. If the Contractor keeps and maintains public records upon completion of the contract, the Contractor shall meet all applicable requirements for retaining public records. All records stored electronically must be provided to ECUA, upon request from ECUA's custodian of public records, in a format that is compatible with the information technology systems of ECUA.

IF THE CONTRACTOR HAS QUESTIONS REGARDING THE APPLICATION OF CHAPTER 119, FLORIDA STATUTES, TO THE CONTRACTOR'S DUTY TO PROVIDE PUBLIC RECORDS RELATING TO THIS CONTRACT, CONTACT ECUA'S CUSTODIAN OF PUBLIC RECORDS AT 850-969-3302, BY EMAIL AT AMANDA.MILLER@ECUA.FL.GOV, OR BY MAIL AT 9255 STURDEVANT STREET, PENSACOLA, FLORIDA 32514.

30. **NO COLLUSION CLAUSE**

By submitting a response to this ITB, the bidder certifies that the bidder has not divulged to, discussed or compared his/her competitive bid with other bidders and has not colluded with any other bidders or parties to this competitive bid. Also, the bidder certifies, and in the case of a joint competitive bid each party thereto certifies as to its own organization, that in connection with the competitive bid:

- Any prices and/or cost data submitted have been arrived at independently, without consultation, communication, or agreement, for the purpose of restricting competition, as to any matter relating to such prices and/or cost data, with any other bidder or with any competitor;
- Any prices and/or cost data quoted for this competitive bid have not been knowingly disclosed by the competitive bidder and will not knowingly be disclosed by the bidder, directly or indirectly to any other bidder or to any competitor, prior to the scheduled opening and award of the contract;
- No attempt has been made or will be made by the bidder to induce any other person or firm to submit or not to submit a competitive bid for the purpose of restricting competition;
- The only person or persons interested in this competitive bid is/are the principal or principals named herein and that no person other than herein mentioned has any interest in this competitive bid or in the Agreement to be entered into.

31. **AUTHORIZED OFFER**

The person submitting the bid should indicate the extent of authorization by him or her to make a valid offer in the bid that may be accepted by ECUA to form a valid and binding contract.

If the person submitting the bid is not authorized to submit a bid that can be bound by ECUA's acceptance, such person should also obtain the signature of an authorized representative of the bidder that may result in a bound contract upon ECUA's acceptance.

Bids should be typed or written in ink, signatures should be manually signed in ink, and any corrections should be typed or made in ink and initialed.

32. **NON-CONFIDENTIALITY OF BIDS**

ECUA does not warrant the confidentiality of bids submitted in response to this ITB. All bids are subject to Florida's public records law. Bidders requiring confidentiality should not submit.

Bid Tabulations/List of Bidders will be posted for review by interested parties on the ECUA Website, www.ecua.fl.gov on or about **August 9, 2022**. It will also be posted for review in the Purchasing Section at ECUA, 9255 Sturdevant Street, (Ellyson Industrial Park) on or about **August 9, 2022**, and will remain posted for seventy-two (72) hours, excluding weekends and holidays.

33. **E-VERIFY COMPLIANCE**

Contractor hereby certifies compliance with the following: pursuant to § 448.095(2) Florida Statutes (2020), Contractor shall register with and use the E-Verify system operated by the United States Department of Homeland Security to verify the work authorization status of all new employees hired by Contractor while performing work or providing services for ECUA. Contractor shall also include in any related subcontracts a requirement that subcontractors performing work or providing services for ECUA on its behalf register with and use the E-Verify system to verify the work authorization status of all new employees hired by the subcontractor while performing work or providing services for ECUA. Additionally, Contractor shall include in any related subcontracts a requirement that subcontractors performing work or providing services for ECUA on its behalf provide Contractor with an affidavit stating that the subcontractor does not employ, contract with, or subcontract with any unauthorized alien as defined in 8 U.S.C. § 1324a(h)(3). Contractor shall maintain a copy of such affidavit for the duration of its contract with ECUA.

EMERALD COAST UTILITIES AUTHORITY
BID NUMBER: 2022-04

FUEL TANKS FOR CWRF (CENTRAL WATER RECLAMATION FACILITY) & SANITATION
SCOPE OF WORK AND SPECIFICATIONS

ECUA is requesting bids for fuel tanks for the locations at Fuel Tanks for CWRF (Central Water Reclamation Facility) & Sanitation in accordance with the following scope of work and the project drawings (Attachment 1).

ECUA CONTACT: For all questions pertaining to this ITB contact Paul R. Nobles at Paul.nobles@ecua.fl.gov.

The proposed time schedule as related to this procurement is as follows:

Event	Date/Time
Release of ITB	June 30, 2022
Deadline for Questions/Requests for Clarification*	July 12 ,2022 - 12:00 pm central time
Estimated issuance of Addendum: Questions Answered	July 14, 2022
Bid Due Date/Time (Deadline)*	**August 9, 2022 - 2:00 pm central time**
Recommendation due to Citizens' Advisory Committee/Board of Directors**	September 20, 2022/September 27, 2022
Anticipated Contract Approval/Award**	September 27
Estimated Issue of Purchase Order/Contract**	TBD / Notice To Proceed

* An addendum to this ITB will be issued if any of these dates/times change.

** These dates are after the bids are due and subject to change. However, an addendum to this ITB will not be issued if any of these dates change. Specific dates/times will be determined at each phase.

INSURANCE: Vendor awarded this contract will supply ECUA with an insurance certificate complying with insurance requirements prior to the start of the contract. (See Risk Management/Insurance Requirements)

SECTION 00001

SCOPE OF WORK

PART 1 – GENERAL

1.01 GENERAL SCOPE

A. This scope covers the furnishing, installation, testing, adjusting, and placing in operation all equipment, devices, facilities, materials, and auxiliary items necessary for the complete and successful operation of all equipment as herein described, shown on the plans, or deemed necessary for the completion of the project. All equipment shall be completely compatible with and fully integrated into the owners existing systems. Any delegated design required, freight, delivery, permitting, setup, and commissioning shall be fully inclusive of all items. An overview of the scope of work is as follows:

1. Provision of two new 12,000-gallon fuel tanks,
2. Demolition and removal of an existing 1500 Gallon Unleaded Tank.
3. Fuel for complete testing of the tanks and systems,
4. Foundations for the new fuel tanks, including bollards,
5. Pumps,
6. Monitoring equipment/controls,
7. Piping/valving/unions,
8. Cam lock connections,
9. Spill containment,
10. Emergency and standard venting,
11. Gauge pole,
12. Power/electrical systems,
13. Grounding system,
14. Connection of electrically powered equipment,
15. Temporary construction power,
16. Complete safety equipment including bumper posts/bollards and signage as recommended or required by all authorities having jurisdiction,
17. All incidentals necessary for a complete and fully operational system.

B. Piping, valving, pumping, and any additional engineering associated shall be the responsibility of the CONTRACTOR. The following is a written description of the general layouts required for each site:

1. Sanitation – 3050 Godwin Lane, Pensacola, FL 32526

    a. Provide a new diesel tank to the west of the existing unleaded and diesel fuel tanks. The new diesel tank shall be piped with isolation valves to have a common suction pipe with the existing tank to provide fuel to the existing

dispenser. It shall include a siphon pipe with isolation valves to connect it with the existing tank allowing for equalization of fuel level between the tanks.

b. The new tank shall include a 3" bulk transfer pump for use in filling fuel tankers.

c. All parts of the fuel delivery system shall work with the OWNER's existing fuel system. The physical installation, functionality, control, and event monitoring/logging shall be equal to or greater than the OWNER's existing system and it shall be fully compatible with that system.

2. CWRF - 2980 Old Chemstrand Road, Cantonment, FL 32533

a. Provide a new unleaded fuel tank northeast of the existing fuel tanks as shown on the drawings. The new tank shall include all required pumping and piping as well as a new dispenser.

b. The fuel dispenser and all parts of the fuel delivery system shall work with the OWNER's existing fuel system. The physical installation, functionality, control, and event monitoring/logging shall be equal to or greater than the existing system and it shall be fully compatible with that system.

C. CONTRACTOR shall adhere to all project specific Scope of Work and Engineering Documents provided.

1. CONTRACTOR shall submit a proposed schedule and shall provide all labor necessary to complete the project per the agreed upon schedule.

1.02 SCHEDULING

A. An overall project schedule including any pre-shutdown work shall be provided by the CONTRACTOR to OWNER for coordination of operational requirements. The OWNER and ENGINEER must be continually kept aware of any impacts, as they occur, that may affect progress. A schedule update shall be provided in writing to the OWNER and ENGINEER weekly.

1.03 GENERAL SEQUENCE OF CONSTRUCTION

A. The following is a general sequence of construction, provided for guidance and reference. CONTRACTOR shall review and provide any proposed modifications for review and approval by OWNER and ENGINEER.

1. Provide complete submittals for all equipment and services to be provided. Submittals shall be approved in writing before proceeding.

2. Purchase equipment and materials from stocking vendors and / or vendors that can deliver in a timely manner avoiding delays in construction. Materials are to be stored prior to commencing any work that might cause interruptions to the normal operation of the existing facilities.
3. Demolish and replace Panel LP-2 at the Godwin site.
4. Rough in conduit and Install foundations.
5. Install tanks, piping, associated pumps, and monitoring panels.
6. Test the pumps and equipment with the OWNER present.

B. For all disconnections and reconnections, the power shall be de-energized and Lock Out Tag Out (LOTO) Procedures used. CONTRACTOR shall coordinate shutdowns with OWNER for this work. It is the intent to minimize shut down time throughout the process.

1. Plan, coordinate, and confirm in writing all shutdowns with OWNER.
2. Shut Down and Lock Out Tag Out.
3. Check for Safe Conditions before commencing work.
4. Check for Safe Conditions before reapplying power, remove Lock Out Tag Out (LOTO) and Reenergize equipment.

1.04 WARRANTY

A. The CONTRACTOR shall warrant electrical systems, materials, and workmanship to be free from defects for a period of two (2) years from the date of substantial completion. They shall correct all defects arising within this period upon notification by the OWNER or ENGINEER, without additional compensation.

B. It is understood that the rights and benefits given the OWNER by the warranties found in the technical specifications are in addition to and not in derogation of any rights or benefits found in the special and general provisions of the contract.

1.05 REGULATORY REQUIREMENTS

A. Conform to applicable sections of the Building Code and all rules, regulations and ordinances of authorities having jurisdiction.

1.06 SAFETY

A. CONTRACTOR shall perform lockout/tagout as required by code, and in accordance with their safety program as well as OWNER’s approved LOTO Plan.

CONTRACTOR shall ensure all new feeds/process tie-ins are properly locked out until they are needed for energization.

B. The Contractor shall closely track construction completion/progress and be ready to account for all construction wiring checks prior to removal of locks.

1.13 REFERENCES

A. The ECUA Engineering Manual standards shall also be referenced for additional requirements. Where discrepancies arise between the ECUA Engineering Manual standards and these specifications, the more stringent requirement, as determined by the Engineer, shall apply.

B. The provisions of the technical specifications in this Project Manual shall apply.

END OF SECTION 000001

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1- GENERAL

1.01 SCOPE OF WORK

A. Description of scope and intent

1. CONTRACTOR shall provide all material, labor, and tools required to complete the installation of specified system.
2. Any omission of reference to items required to complete the full operational and functional system specified in the section does not relieve the CONTRACTOR of the obligation to provide same.
3. To provide installation of all items, including delivery, dispersing to the proper locations within the building, and affixing in place.
4. Installation shall be accomplished by workers skilled in their craft that will perform their work in a professional manner and will leave the premises safe, orderly and clean.
5. Drawings and general provisions of Contract, including General and Supplemental Conditions and Division 1 Specification Sections, apply to this Section.
6. CONTRACTOR is responsible for coordination of work included in this specification with all other specification sections related to furnishing of all materials, labor, permits, fees and services necessary for completion of work in this section.

B. Section Includes:

1. Formwork for cast in place concrete, with shoring, bracing, and anchorage.
2. Formwork accessories.
3. Form stripping.
4. Reinforcing steel for cast in place concrete.
5. Grout.
6. Cast in place concrete, including concrete for the following:
    a. Foundations, footings.
    b. Slabs on grade.
    c. Supported slabs.
    d. Foundation and structural walls.
    e. Equipment pads and bases.
7. Concrete curing.
8. Shoring and reshoring.

SECTION 03300

CAST-IN-PLACE CONCRETE

1.02 REFERENCES

All referenced standards refer to the edition in force at the time these plans and Specifications are issued for bidding.

A. AASHTO M 182 Standard Specification for Burlap Cloth Made from Jute or Kenaf; American Association of State Highway and Transportation Officials.

B. ACI 117 Standard Tolerances for Concrete Construction and Materials; American Concrete Institute.

C. ACI 201.2R Guide to Durable Concrete; American Concrete Institute.

D. ACI 211.1 Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; American Concrete Institute.

E. ACI 214 Recommended Practice for Evaluation of Compression Test Results of Field Concrete.

F. ACI 301 Specifications for Structural Concrete for Buildings; American Concrete Institute.

G. ACI 302.1R Guide for Concrete Floor and Slab Construction; American Concrete Institute.

H. ACI 304R Guide for Measuring, Mixing, Transporting, and Placing Concrete; American Concrete Institute.

I. ACI 305R Hot Weather Concreting; American Concrete Institute.

J. ACI 306R Cold Weather Concreting; American Concrete Institute.

K. ACI 318 Building Code Requirements for Reinforced Concrete; American Concrete Institute.

L. ACI 347R Guide to Formwork for Concrete; American Concrete Institute.

M. ACI 350 Code Requirements for Environmental Engineering Concrete Structures.

N. ACI 350.1 Specification for Tightness Testing of Environmental Engineering Concrete Containment Structures & Commentary

O. ACI 372 Guide to Design and Construction of Circular Wire-and-Strand-Wrapped Prestressed Concrete Structures

P. ACI SP 66 ACI Detailing Manual; American Concrete Institute.

Q. ASTM A 185 Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.

R. ASTM A 615 Standard Specification for Deformed and Plain Billet Steel Bars for Concrete Reinforcement.

S. ASTM C 31 Standard Practice for Making and Curing Concrete Test Specimens in the Field.

T. ASTM C 33 Standard Specification for Concrete Aggregates.

U. ASTM C 39 Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

V. ASTM C 42 Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.

W. ASTM C 94 Standard Specification for Ready Mixed Concrete.

X. ASTM C 143 Standard Test Method for Slump of Hydraulic Cement Concrete.

Y. ASTM C 150 Standard Specification for Portland Cement.

Z. ASTM C 171 Standard Specifications for Sheet Materials for Curing Concrete.

AA. ASTM C 172 Standard Practice for Sampling Freshly Mixed Concrete.

BB. ASTM C 173 Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.

CC. ASTM C 231 Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.

DD. ASTM C 260 Standard Specifications for Air Entraining Admixtures for Concrete.

EE. ASTM C 494 Standard Specifications for Chemical Admixtures for Concrete.

FF. ASTM C 618 Standard Specifications for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete.

GG. ASTM C 685 Standard Specifications for Concrete Made by Volumetric Batching and Continuous Mixing.

HH. ASTM C 881 Standard Specification for Epoxy Resin Base Bonding Systems for Concrete.

II. ASTM C 1059 Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete.

JJ. ASTM C 1107 Standard Specification for Packaged Dry, Hydraulic Cement Grout (Nonshrink).

KK. ASTM D 1751 Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).

LL. ASTM D 1752 Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.

MM. ASTM E 154 Standard Test Methods for Water Vapor Retarders Used in Contact with Earth under Concrete Slabs, on Walls, or as Ground Cover.

NN. ASTM E 329 Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction.

OO. CRSI Manual of Standard Practice; Concrete Reinforcing Steel Institute.

PP. Florida Building Code – FBC

1.03 DEFINITIONS

A. Unexposed Finish: A general use finish, with no appearance criteria, applicable to all formed concrete concealed from view after completion of construction.

B. Exposed Finish: A general use finish applicable to all formed concrete exposed to view except those indicated to receive textured finish and including surfaces which may receive a paint coating (if any).

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's product data for the following:
   1. Formwork accessories.
   2. Form liners.
   3. Concrete admixtures.
   4. Grout.
   5. Bonding compound.
   6. Epoxy bonding system

B. Aggregates: Submit test reports showing compliance with specified quality and gradation.

C. Shop Drawings: Submit shop drawings for fabrication and placement of the following:

   1. Reinforcement: Comply with ACI SP 66. Include bar schedules, diagrams of bent bars, arrangement of concrete reinforcement, and splices.
      a. Show construction joints.
      b. Include details of reinforcement at openings through concrete structures.
      c. Include elevations of reinforcement in walls.
      d. Show stirrup spacing.
      e. Concrete embedments.

   2. Shoring and reshoring for elevated concrete placement shall include:
      a. Location, size, and type of all shoring members.
      b. Location, size, and type of all reshoring members.
      c. Location, size, and type of all mud sills, blocking, temporary lateral bracing and other accessories necessary to safely support and brace the structure during construction.
      d. Prepare shop drawings under seal of professional structural ENGINEER registered in the state of Florida.

D. Quality Control Submittals

   1. Submit the following information related to quality assurance requirements specified:
   2. Design data: Submit proposed mix designs and test data before concrete operations begin. Identify for each mix submitted the method by which proportions have been selected.
      a. For mix designs based on trial mixtures, include trial mix proportions, test results, and graphical analysis and show required average compressive strength f ′cr.
      b. Indicate quantity of each ingredient per cubic yard of concrete.

c. Indicate type and quantity of admixtures proposed or required.

3. Test reports: Submit laboratory test reports for all testing specified.
4. Certifications: Submit affidavits from an independent testing agency certifying that all materials furnished under this section conform to specifications.
5. Certifications: Provide certification from manufacturers of concrete admixtures that chloride content complies with specified requirements.
6. Certifications: Submit mill test certificates for all reinforcing steel furnished under this section, showing physical and chemical analysis.
7. Placement schedule: Submit concrete placement schedule prior to start of any concrete placement operations. Include location of all joints indicated on drawings, plus anticipated construction joints.
8. Submit batch tickets complying with ASTM C 685 or delivery tickets complying with ASTM C 94, as applicable, for each load of concrete used in the work.
   a. Include on the tickets the additional information specified in the ASTM document.
9. Cold weather concreting: Submit description of planned protective measures.
10. Hot weather concreting: Submit description of planned protective measures.
11. Mass Concrete: Submit description of planned protective measures.

1.05 QUALITY ASSURANCE

A. Codes and Standards: Comply with the following documents, except where requirements of the contract documents or of governing codes and governing authorities are more stringent:

   1. ACI 301
   2. ACI 318
   3. ACI 350
   4. CRSI Manual of Standard Practice.

B. Testing Agency Services:

   1. Employ, at CONTRACTOR's expense, an independent testing agency acceptable to the ENGINEER to perform specified tests and other services required for quality assurance.
      a. Testing agency shall meet ASTM E 329 requirements.

C. Source of Materials: Obtain materials of each type from same source for the entire project.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver reinforcement to project site bundled and tagged with metal tags indicating bar size, lengths, and other data corresponding to information shown on placement drawings.

1. Concrete reinforcement materials stored on the site shall be kept on concrete blocks and supported off the ground to prevent damage and accumulation of water, dirt, or rust.

B. Store cementitious materials in a dry, weather tight location. Maintain accurate records of shipment and use.

C. Store aggregates to permit free drainage and to avoid contamination with deleterious matter or other aggregates. When stockpiled on ground, discard bottom 6 inches of pile.

D. Handle aggregates to avoid segregation.

1.07 PROJECT CONDITIONS

A. Cold Weather Concreting: Comply fully with the recommendations of ACI 306.

1. Well in advance of proposed concreting operations, advise the ENGINEER of planned protective measures including but not limited to heating of materials, heated enclosures, and insulating blankets.

B. Hot Weather Concreting: Comply fully with the recommendations of ACI 05R.

1. Well in advance of proposed concreting operations, advise the ENGINEER of planned protective measures including but not limited to cooling of materials before or during mixing, placement during evening to dawn hours, fogging during finishing and curing, shading, and windbreaks.

C. Mass Concrete: Comply fully with the recommendations of ACI 207.1R.

1. Well in advance of proposed concreting operations, advise the ENGINEER of planned protective measures including but not limited to cooling of materials before or during mixing, placement, curing, forms, height of lifts (max 8ft), and monitoring.

PART 2- PRODUCTS

2.01 FORMWORK

A. Facing Materials:

1. Unexposed finish concrete: Any standard form materials that produce structurally sound concrete.
2. Exposed finish concrete: Materials selected to offer optimum smooth, stain free final appearance and minimum number of joints. Provide materials with sufficient strength to resist hydrostatic head without bow or deflection in excess of allowable tolerances.
3. Textured finish concrete: Materials or linings as indicated on the drawings, or as required to match ENGINEER's control sample.

B. Formwork Accessories:

1. Form coating: Form release agent that will not adversely affect concrete surfaces or prevent subsequent application of concrete coatings.
2. Metal ties: Commercially manufactured types; cone snap ties, taper removable bolt, or other type which will leave no metal closer than 1-1/2 inches from surface of concrete when forms are removed, leaving not more than a 1 inch diameter hole in concrete surface.
3. Fillets: Wood or plastic fillets for chamfered corners, in maximum lengths possible.

2.02 REINFORCING MATERIALS

A. Reinforcing Bars: Provide deformed bars complying with the following, except where otherwise indicated:

1. ASTM A 615, Grade 60.

B. Welded Wire Fabric: ASTM A 185, cold drawn steel, plain.

C. Reinforcing Accessories:

1. Tie wire: Black annealed type, 16-1/2 gage or heavier.
2. Supports: Bar supports conforming to specifications of CRSI "Manual of Standard Practice."
   a. Class 1 (plastic protected) at all formed surfaces which will be exposed to weather.

b. Class 1 (plastic protected) or Class 2 (stainless steel protected) at all formed surfaces which will be exposed to view but not to weather.
c. Precast concrete blocks of strength equal to or greater than specified strength of concrete or Class 3 supports equipped with sand plates, where concrete will be cast against earth. Concrete masonry units will not be accepted.

2.03 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, and as follows:

1. Type I, except where other type is specifically permitted or required.
2. Type II shall be used for moderate sulfate resistance conditions, retaining walls and exposed concrete not included in Type V below and when hot weather concreting is required.
3. Type III shall be used for high early strength and when cold weather concreting is required.
4. Type IV shall be used for low heat of hydration when mass concreting is required.
5. Type V shall be used for high sulfate resistance conditions, all environmental and all water or wastewater liquid retaining structures (includes all wet well surfaces). (An alternate Type V cement mixture shall be a Type I/II. The CONTRACTOR shall submit the Type I/II cement for review, concrete mix design where the Type I/II was utilized and 30 concrete break test results of where the Type I/II cement was implemented).

B. Fly Ash: ASTM C 618, Type C or F.

C. Water: Potable.

D. Aggregates:

1. Normal weight concrete: ASTM C 33.
   a. Class 5M.
   b. Gradation as specified below under mix design.

E. Admixtures General: Admixtures which result in more than 0.1 percent of soluble chloride ions by weight of cement are prohibited.

F. Air Entraining Admixture: ASTM C 260 and certified by manufacturer for compatibility with other mix components.

1. Products: The following products, provided they comply with requirements of the contract documents, will be among those considered acceptable: a. “Air Mix"; The Euclid Chemical Company.
   b. “Sika Aer"; Sika Corporation.
   c. “Micro Air"; Master Builders, Inc.
   d. “Darex AEA"; W. R. Grace & Co.

G. Water Reducing, Retarding Admixture: ASTM C 494, Type D.

1. Products: The following products, provided they comply with requirements of the contract documents, will be among those considered acceptable:
   a. “Pozzolith Retarder"; Master Builders, Inc.
   b. “Eucon Retarder 75"; The Euclid Chemical Company.
   c. “Daratard 17"; W. R. Grace & Co.
   d. “PSI R Plus"; Cormix Construction Chemicals.
   e. “Plastiment"; Sika Corporation.
   f. “Protard”; Master Builders, Inc. (former Conchem product).

H. Water Reducing and Accelerating Admixtures: ASTM C 494, Type E.

1. Products: The following products, provided they comply with requirements of the contract documents, will be among those considered acceptable:
   a. “Accelguard 80"; The Euclid Chemical Company.
   b. “Pozzutec 20"; Master Builders, Inc.
   c. “Gilco Accelerator"; Cormix Construction Chemicals.

I. High Range Water Reducing Admixture (Superplasticizer): ASTM C 494, Type F or G.

1. Products: The following products, provided they comply with requirements of the contract documents, will be among those considered acceptable:
   a. “WRDA 19" or "Daracem 100"; W. R. Grace & Co.
   b. “PSP Superplasticizer"; Master Builders, Inc. (former Conchem product).
   c. “Sikament 300"; Sika Corporation.
   d. “Eucon 37"; The Euclid Chemical Company.
   e. “PSI Super”; Cormix Construction Chemicals.
   f. “Rheobuild"; Master Builders, Inc.

2.04 MISCELLANEOUS MATERIALS AND ACCESSORIES

A. Vapor Retarder: Membrane for installation beneath building slabs on grade, resistant to decay when tested in accordance with ASTM E 154, and as follows:

1. Polyethylene sheet, not less than 8 mils thick.

B. Nonshrink Grout: ASTM C 1107.

1. Minimum 4000 psi grout compressive strength
2. Type: Provide nonmetallic type only.
3. Products: The following products, provided they comply with requirements of the contract documents, will be among those considered acceptable:
   a. Nonmetallic type:
      1) “Masterflow 928"; Master Builders, Inc.
      2) “Sonogrout 14k"; Sonneborn Building Products Division ChemRex, Inc.
      3) “Euco N S Grout"; The Euclid Chemical Company.
      4) “Supreme"; Cormix Construction Chemicals.
      5) “Five Star Grout"; Five Star Products, Inc.

C. Burlap: AASHTO M 182, Class 2 jute or kenaf cloth.

D. Moisture Retaining Cover: ASTM C 171, and as follows:

1. Curing paper.
2. Plyethylene film.
3. White burlap polyethylene sheeting.

E. Bonding Compound: Non redispersable acrylic bonding admixture, ASTM C 1059, Type II.

1. Products: The following products, provided they comply with requirements of the contract documents, will be among those considered acceptable:
   a. “Everbond"; L & M Construction Chemicals, Inc.
   b. “Flex Con"; The Euclid Chemical Company.

F. Epoxy Bonding Systems: Epoxy adhesive for bonding fresh concrete to hardened concrete and for grouting wall pipes, bolts and reinforcing dowels. ASTM C 881; type, grade, and class as required for project conditions.

1. Products: The following products, provided they comply with requirements of the contract documents, will be among those considered acceptable:
   a. “Concresive LPL"; Master Builders, Inc.
   b. “Sikadur 32 Hi Mod"; Sika Corporation.
   c. “Euco #452 Epoxy System"; The Euclid Chemical Company.
   d. “Sikastix 390”.
   e. “EucoEpoxy 461”.
   f. “Five Star Epoxy Grout”.
   g. “Sikstix 370”.
   h. “EucoEpocy 463”.

G. Expansion Joint Filler

1. Expansion Joint Filler shall be performed non-extruding and resilient type meeting the Specifications of ASTM D1751, or D1752, unless otherwise specified.
2. All expansion joints in base slabs on grade other than hydraulic structures shall be fiber expansion joints of required slab depth meeting the requirement of ASTM D1751, Type I and AASHTO M213. Exposed joints shall be sealed as specified below.
3. All expansion joints in hydraulic structures shall be ¾ inch sponge rubber expansion joints of required wall thickness meeting the requirements of ASTM D1752, Type I and AASHTO M153, Type I. Joints shall be sealed on both sides as specified below.
   a. Nonextruding bituminous type: ASTM D 1751.
   b. Sponge rubber type: ASTM D 1752, Type I.

H. Expansion Joint Sealer

1. Joint sealants for hydraulic structures shall be one of the following, or approved equal:
   a. “CM-60” two-part gray tone, as manufactured by W. R. Meadows, Inc., applied over a backer rod sized for the joint. Underwater primer shall be used on all joints subject to immersion. Standard “CM-60” primer shall be applied to all other joints. Sealant depth shall be one-half the width of the joint.
   b. The sealant shall be a two-part, polyurethane sealant “Eucolastic I” by the Euclid Chemical Company or “Sikaflex 1a” by Sika Chemical Company. Joint width should be 4 times the expected joint movement, but not less than ¼ inch. All joints shall be primed with “Eucolastic Primer” by the Euclid Chemical Company or “Sikaflex 429” by Sika Chemical Company.

I. PVC Waterstops

Waterstops: Made of Polyvinyl Chloride (PVC) and of subzero grade, Plastigrip, Type W-6 as manufactured by Progress Unlimited, Inc. or approved equivalent.

1. Minimum 4" x 3/16" or as specified on the drawings.
2. Produced from a compound, the base resin of which shall be virgin PVC.
3. Minimum Properties:
   a. 2000 psi minimum tensile strength, ASTM D412-51T
   b. 350% minimum elongation, ASTM D412-51T
   c. -35 degrees F minimum low temperature brittleness, ASTM D746-57T
   d. 65-75 shore 'A' durometer hardness, ASTM D676-59T
   e. 0.15 maximum water absorption, ASTM D570-59T
4. Field Splicing:
   a. Butt splices shall be fused welded using a thermostatically controlled Teflon PVC Waterstop iron at the Manufacturer's recommended temperature
   b. Lapping, gluing or use of adhesives shall not be permitted.
   c. Provide factory made waterstop fabrications for all changes of directions, intersections, and transitions leaving only butt joint splicing for the field.
5. Center waterstop in the joint and secure in correct position.
6. Use ribbed center bulb for all moving joints. Use dumbbell for all non-movement joints.
7. Always place the center bulb in the center of the expansion joint. Do not embed the center bulb in concrete.
8. Vibrate concrete around waterstops thoroughly to prevent honeycombing and to ensure contact between concrete and waterstop.

2.05 CONCRETE MIX DESIGN

A. Review: Do not begin concrete operations until proposed mix has been reviewed by the ENGINEER.

B. Proportioning of Normal Weight Concrete: Comply with recommendations of ACI 211.1.

C. Required Average Strength: Establish the required average strength f ′cr of the design mix on the basis of trial mixtures as specified in ACI 301, and proportion mixes accordingly. Employ an independent testing agency acceptable to the ENGINEER for preparing and reporting proposed mix design.

D. Proportion normal-weight concrete mix to produce an average strength at 28 day as follows unless otherwise indicated on the drawings:

1. Columns, beams, walls, footings and slabs: 4000 psi
2. Masonry Filled Grout: 3000 psi
3. Prestressed Elements: 5000 psi

E. Fly Ash:

1. The CONTRACTOR may elect to replace a portion of the Portland cement with fly ash up to a maximum of 25 percent by weight of cement plus fly ash.

F. Admixtures:

1. Air entraining admixture: Add at rate to achieve specified air content.
   a. Do not use in slabs on grade scheduled to receive topping, unless manufacturer of topping recommends use over air entrained concrete.
2. Water reducing and retarding admixture: Add as required in concrete mixes to be placed at ambient temperatures above 90 degrees F.
3. Water reducing and accelerating admixture: Add as required in concrete mixes to be placed at ambient temperatures below 50 degrees F.
4. High range water reducing admixture (superplasticizer): Add as required for placement and workability.
5. Do not use admixtures not specified or approved.

G. Design mix to meet or exceed each requirement specified. Where more than one criterion is specified, the most stringent shall apply. For example, a minimum cement content or maximum water cement ratio might result in strengths greater than the minimum specified; likewise, a greater cement content or lower water cement ratio may be required in order to achieve the required strength.
   1. Specified compressive strength f'(c) (ASTM C 39): As noted
   2. Maximum water cement ratio by weight:
      a. 0.4 for concrete toppings subject to traffic
      b. 0.45 for all other concrete
   3. Maximum slump: As recommended in ACI 211.1. and ACI 350 as applicable.
   4. Gradation of coarse aggregate: ASTM C 33 standard gradation with maximum nominal size of 3/4 inches.
   5. Total air content (ASTM C 173 or ASTM C 231): 5 percent.

H. Mix Adjustments: Provided that no additional expense to OWNER is involved, CONTRACTOR may submit for ENGINEER’s approval requests for adjustment to approved concrete mixes when circumstances such as changed project conditions, weather, or unfavorable test results occur. Include laboratory test data substantiating specified properties with mix adjustment requests.

2.06 CONTROL OF MIX IN THE FIELD

A. Slump: A tolerance of up to 1 inch above that specified will be permitted for 1 batch in 5 consecutive batches tested. Concrete of lower slump than that specified may be used, provided proper placing and consolidation is obtained.
   1. If slump upon arrival at the site is lower than 1 inch below the value specified, one addition of water in accordance with ASTM C 94 will be permitted to bring slump within tolerance, provided that:
      a. A positive means is available to measure the amount of water added at the site.
      b. The specified (or approved) maximum water cement ratio is not exceeded.
      c. Not more than 45 minutes have elapsed since batching.

B. Total Air Content: A tolerance of plus or minus 1 1/2 percent of that specified will be allowed for field measurements.

C. Do not use batches that exceed tolerances.

2.07 CONCRETE MIXING

A. On Site Equipment: Mix concrete materials in appropriate drum type batch machine mixer, in compliance with ASTM C 685. Mix each batch minimum of 1 1/2 minutes and maximum of 5 minutes before discharging concrete. Clean thoroughly at end of day and before changing concrete type.

B. Transit Mixers: Mix concrete materials in transit mixers, complying with requirements of ASTM C 94.

   1. At ambient temperatures of 85 to 90 degrees F, reduce mixing and delivery time to 75 minutes.
   2. At ambient temperatures above 90 degrees F, reduce mixing and delivery time to 60 minutes.

PART 3- EXECUTION

3.01 CONCRETE FORM PREPARATION

A. General: Comply with requirements of ACI 301 for formwork, and as herein specified. The CONTRACTOR is responsible for design, ENGINEER, and construction of formwork, and for its timely removal.

B. Earth Forms: Hand trim bottoms and sides of earth forms to profiles indicated on the drawings. Remove loose dirt before placing concrete.

C. Design: Design and fabricate forms for easy removal, without impact, shock, or damage to concrete surfaces or other portions of the work. Design to support all applied loads until concrete is adequately cured, within allowable tolerances and deflection limits.

D. Construction: Construct and brace formwork to accurately achieve end results required by contract documents, with all elements properly located and free of distortion. Provide for necessary openings, inserts, anchorages, and other features shown or otherwise required.

1. Joints: Minimize form joints and make watertight to prevent leakage of concrete.
   a. Align joints symmetrically at exposed conditions.
2. Chamfers: Provide chamfered edges and corners at exposed locations, unless specifically indicated otherwise on the drawings.
3. Permanent openings: Provide openings to accommodate work of other trades, sized and located accurately. Securely support items built into forms; provide additional bracing at openings and discontinuities in formwork.
4. Temporary openings: Provide temporary openings for cleaning and inspection in most inconspicuous locations at base of forms, closed with tight fitting panels designed to minimize appearance of joints in finished concrete work.

E. Tolerances for Formed Surfaces: Comply with minimum tolerances established in ACI 117, unless more stringent requirements are indicated on the drawings.

F. Release Agent: Provide either form materials with factory applied non-absorptive liner or field applied form coating. If field applied coating is employed, thoroughly clean and recondition formwork and reapply coating before each use. Rust on form surfaces is unacceptable.

3.02 VAPOR RETARDER INSTALLATION

A. General: Place vapor retarder sheet over prepared base material, aligning longer dimension parallel to direction of pour and lapped 6 inches. Seal joints with appropriate tape.

3.03 PLACING REINFORCEMENT

A. General: Comply with requirements of ACI 301 and as herein specified.

B. Preparation: Clean reinforcement of loose rust and mill scale, soil, and other materials which adversely affect bond with concrete.

C. Placement: Place reinforcement to achieve not less than minimum concrete coverages required for protection. Accurately position, support, and secure reinforcement against displacement. Provide Class C tension lap splices complying with ACI 318 unless otherwise indicated. Do not field bend partially embedded bars unless otherwise indicated or approved.

1. Use approved bar supports and tie wire, as required. Set wire ties to avoid contact with or penetration of exposed concrete surfaces. Tack welding of reinforcing is not permitted.
2. Wire fabric: Install in maximum lengths possible, lapping adjoining pieces not less than one full mesh. Offset end laps to prevent continuous laps in either direction, and splice laps with tie wire.

D. Welding: Welding of reinforcement is not permitted.

3.04 JOINT CONSTRUCTION

A. Construction Joints: Locate and install construction joints as indicated on drawings. If construction joints are not indicated, locate in manner which will not impair strength and will have least impact on appearance, as acceptable to the ENGINEER. Construction joints in retaining walls and walls of concrete tanks or structures subject to hydrostatic pressure shall be intentionally roughened to a full amplitude of approximately ¼ inch.

1. Keyways: Provide keyways not less than 1 1/2 inches deep.
2. Reinforcement: Continue reinforcement across and perpendicular to construction joints, unless details specifically indicate otherwise.

B. Isolation Joints: Construct isolation joints in slabs poured on grade at points of contact with vertical components, such as foundation walls and column pedestals. Install expansion joint filler to full concrete depth. Recess top edge of filler 1/8 inch where joints are unsealed.

C. Expansion Joints: Construct expansion joints where indicated. Install expansion joint filler to full depth of concrete. Recess edge of filler to depth indicated to receive joint sealant and backer rod as specified herein and detailed on drawings.

D. Control Joints: Construct contraction joints in building slabs poured on grade to form panels of sizes indicated on drawings, but not more than 20 feet apart in either direction.

1. Saw cuts: Form control joints by means of saw cuts one fourth the depth of the slab, performed as soon as possible after slab finishing without dislodging aggregate.

3.05 INSTALLATION OF EMBEDDED ITEMS

A. General: Set anchorage devices and other items required for other work connected to or supported by cast in place concrete, using templates, setting drawings, and instructions from suppliers of items to be embedded.

1. Edge Forms and Screeds: Set edge forms and intermediate screeds as necessary to achieve final elevations indicated for finished slab surfaces.

3.06 WATERSTOPS

A. Waterstops shall be provided at all joints to seal off leakage of liquid from or into concrete tanks or structures subject to hydrostatic pressures. The type of waterstops used shall be as shown on the Drawings and as specified herein. The CONTRACTOR shall submit to the ENGINEER for approval the proposed procedure and schedule of concrete placing operations along with a detailed layout of the waterstop materials required showing sizes, lengths and types of joints.

B. Where required for proper location of waterstops, whether shown on the Drawings or not, starter walls of up to 1-1/2 inches in height and monolithic with slabs shall be provided at all wall construction joints. Reinforcing steel shall not be depressed at waterstops but shall have only the amount of concrete covering shown or specified. Starter walls as specified shall be required whether shown on the Drawings or not, unless specified concrete cover over reinforcing steel is 3 inches or greater.

3.07 CONCRETE PLACEMENT

A. Preparation: Provide materials necessary to ensure adequate protection of concrete during inclement weather before beginning installation of concrete.

B. Inspection: Before beginning concrete placement, inspect formwork, reinforcing steel, and items to be embedded, verifying that all such work has been completed.

1. Wood forms: Moisten immediately before placing concrete in locations where form coatings are not used.

C. Placement General: Comply with requirements of ACI 304 and as follows:

1. Concreting should be carried on at such a rate that the concrete is at all times plastic and flows readily into spaces between reinforcement.
2. Schedule continuous placement of concrete to prevent the formation of cold joints.
3. Provide construction joints if concrete for a particular element or component cannot be placed in a continuous operation.
4. Deposit concrete as close as possible to its final location, to avoid segregation.
5. Concrete shall be worked around reinforcement and embedded fixtures and into corners of forms.
6. The following shall be prohibited from use:
   a. Partially hardened concrete.
   b. Contaminated concrete.
   c. Re-tempered concrete.
   d. Re-mixed concrete after initial set has occurred.

D. Placement in Forms: Limit horizontal layers to depths which can be properly consolidated, but in no event greater than 24 inches.

1. Consolidate concrete by means of mechanical vibrators, inserted vertically in freshly placed concrete in a systematic pattern at close intervals. Penetrate previously placed concrete to ensure that separate concrete layers are knitted together.
2. Vibrate concrete sufficiently to achieve consistent consolidation without segregation of coarse aggregates.
3. Do not use vibrators to move concrete laterally.

E. Slab Placement: Schedule continuous placement and consolidation of concrete within planned construction joints.

1. Thoroughly consolidate concrete without displacing reinforcement or embedded items, using internal vibrators, vibrating screeds, roller pipe screeds, or other means acceptable to ENGINEER.
2. Strike off and level concrete slab surfaces, using highway straightedges, darbies, or bull floats before bleed water can collect on surface. Do not work concrete further until finishing operations are commenced.

F. Cold Weather Placement: Comply with recommendations of ACI 306 when air temperatures are expected to drop below 40 degrees F either during concrete placement operations or before concrete has cured.

1. Do not use frozen or ice laden materials.
2. Do not place concrete on frozen substrates.

G. Hot Weather Placement: Comply with recommendations of ACI 305R when ambient temperature before, during, or after concrete placement is expected to exceed 90 degrees F or when combinations of high air temperature, low relative humidity, and wind speed are such that the rate of evaporation from freshly poured concrete would otherwise exceed 0.2 pounds per square foot per hour.

1. Do not add water to approved concrete mixes under hot weather conditions.
2. Provide mixing water at lowest feasible temperature and provide adequate protection of poured concrete to reduce rate of evaporation.
3. Use fog nozzle to cool formwork and reinforcing steel immediately prior to placing concrete.

H. Mass Concrete Placement: Comply with recommendations of ACI 207.1R when any volume of concrete with dimensions large enough to require that measures be taken to cope with generation of heat from hydration of the cement and attendant volume change to minimize cracking.

1. When the minimum dimension of the concrete exceeds 36 inches and the ratio of volume of concrete to the surface area is greater than 12 inches, provide for mass concrete.
2. Lifts shall not exceed 8ft.

3.08 FINISHING FORMED SURFACES

A. Repairs, General: Repair surface defects, including tie holes, immediately after removing formwork.

1. Remove honeycombed areas and other defective concrete down to sound concrete, cutting perpendicular to surface or slightly undercutting. Dampen patch location and area immediately surrounding it prior to applying bonding compound or patching mortar.
2. Before bonding compound has dried, apply patching mixture matching original concrete in materials and mix except for omission of coarse aggregate, and using a blend of white and normal Portland cement as necessary to achieve color match. Consolidate thoroughly and strike off slightly higher than surrounding surface.

B. Textured Form Finish: Repair tie holes and patch defective areas to match pattern created by form construction or form liners.

C. Unexposed Form Finish: Repair tie holes and patch defective areas. Rub down or chip off fins or other raised areas exceeding ¼-inch height.

D. Exposed Form Finish: Repair and patch defective areas, with fins or other projections completely removed and smoothed.
   1. Smooth rubbed finish: Apply to surfaces indicated no later than 24 hours after form removal.
      a. Wet concrete surfaces to be finished and rub with Carborundum brick or other abrasive until uniform color and texture are achieved.
      b. Do not apply separate grout mixture.
   2. Contiguous unformed surfaces: Strike smooth and float to a similar texture tops of walls, horizontal offsets, and other unformed surfaces adjacent to or contiguous with formed surfaces. Continue final finish of formed surfaces across unformed surfaces, unless otherwise specifically indicated.

3.09 FINISHING SLABS

A. Finishing Operations

   1. Do not directly apply water to slab surface or dust with cement.
   2. Use hand or powered equipment only as recommended in ACI 302.1R.
   3. Screeding: Strike off to required grade and within surface tolerances indicated. Verify conformance to surface tolerances. Correct deficiencies while concrete is still plastic.
   4. Bull Floating: Immediately following screeding, bull float or darby before bleed water appears to eliminate ridges, fill in voids, and embed coarse aggregate. Recheck and correct surface tolerances.
   5. Do not perform subsequent finishing until excess moisture or bleed water has disappeared and concrete will support either foot pressure with less than ¼-inch indentation or weight of power floats without damaging flatness.
   6. Final floating: Float to embed coarse aggregate, to eliminate ridges, to compact concrete, to consolidate mortar at surface, and to achieve uniform, sandy texture. Recheck and correct surface tolerances.

B. Coordinate appearance and texture of required final finishes with the ENGINEER before application.

   1. Apply final finishes in the locations indicated on the drawings.

C. Float Finish: As specified above.

D. Broomed Float Finish: After floating and when water sheen has practically disappeared, apply uniform transverse corrugations approximately 1/16-inch deep, without tearing surface.

E. Slab Surface Tolerances:

1. Achieve flat, level planes except where grades are indicated. Slope uniformly to drains.
2. Floated finishes: Depressions between high spots shall not exceed 5/16 inch under a 10-foot straightedge.

F. Repair of Slab Surfaces: Test slab surfaces for smoothness and to verify surface plane to tolerance specified. Repair defects as follows:

1. High areas: Correct by grinding after concrete has cured for not less than 14 days.
2. Low areas: Immediately after completion of surface finishing operations, cut out low areas and replace with fresh concrete. Finish repaired areas to blend with adjacent concrete. Proprietary patching compounds may be used when approved by the ENGINEER.
3. Crazed or cracked areas: Cut out defective areas, except random cracks and single holes not exceeding 1 inch in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts. Dampen exposed concrete and apply bonding compound. Mix, place, compact, and finish patching concrete to match adjacent concrete.
4. Isolated cracks and holes: Groove top of cracks and cut out holes not over 1 inch in diameter. Dampen cleaned concrete surfaces and apply bonding compound; place dry pack or proprietary repair compound acceptable to ENGINEER while bonding compound is still active:
    a. Dry pack mix: One part Portland cement to 2-1/2 parts fine aggregate and enough water as required for handling and placing.
    b. Install patching mixture and consolidate thoroughly, striking off level with and matching surrounding surface. Do not allow patched areas to dry out prematurely.

3.10 CONCRETE CURING AND PROTECTION

A. General

1. Prevent premature drying of freshly placed concrete and protect from excessively cold or hot temperatures until concrete has cured.
2. Provide curing of concrete by one of the methods listed and as appropriate to service conditions and type of applied finish in each case.

B. Curing Period

1. Not less than 7 days for standard cements and mixes.
2. Not less than 4 days for high early strength concrete using Type III cement.

C. Curing Temperature

1. Concrete shall be maintained above 50 degrees F and in moist condition during the entire curing period.

D. Formed Surfaces: Cure formed concrete surfaces by moist curing with forms in place for full curing period.

1. Keep wooden or metal forms moist when exposed to heat of the sun.
2. If forms are removed prior to completion of curing process, continue curing by one of the applicable methods specified.

E. Surfaces Not in Contact with Forms

1. Start initial curing as soon as free water has disappeared, but before surface is dry.
2. Keep continuously moist for not less than 3 days by uninterrupted use of any of the following:
   a. Water ponding.
   b. Water saturated sand.
   c. Water fog spray.
   d. Saturated burlap: Provide 4-inch minimum overlap at joints.
3. Begin final curing procedures immediately following initial curing and before concrete has dried.
   a. Moisture retaining cover: Lap not less than 3-inches at edges and ends, and seal with waterproof tape or adhesive. Repair holes or tears during curing period with same tape or adhesive. Maintain covering in intimate contact with concrete surface. Secure to avoid displacement.
      1) Extend covering past slab edges at least twice the thickness of slab.

2) Do not use plastic sheeting on surfaces which will be exposed to view when in service.
3) Continue final curing to end of curing period.

F. Avoid rapid drying at end of curing period.

G. During and following curing period, protect concrete from temperature changes of adjacent air in excess of 5 degrees F per hour and 50 degrees F per 24 hours. Progressively adjust protective measures to provide uniform temperature changes over entire concrete surface.

3.11 SHORES AND SUPPORTS

A. General: Comply with recommendations of ACI 347 for shoring and reshoring in multistory construction.

B. Low Rise Construction: Extend shoring from ground to roof for structures 4 stories or less in height.

C. Reshoring: Remove shores and reshore in a planned sequence, to avoid damage to partly cured concrete. Locate and provide adequate reshoring to safely support work without excessive stress or deflection.

D. Provide as a package, shoring and reshoring drawings prepared by or under the direct supervision of a specialty ENGINEER registered in the State of Florida.

3.12 REMOVAL OF FORMS AND SUPPORTS

A. Non Load Bearing Formwork: Provided that concrete has hardened sufficiently that it will not be damaged, forms not actually supporting weight of concrete or weight of soffit forms may be removed after concrete has cured at not less than 50 degrees F for 24 hours. Maintain curing and protection operations after form removal.

B. Load Bearing Formwork: Do not remove shoring and forms supporting weight of concrete, such as beam soffits, joists, slabs, and other structural elements, until concrete has attained at least the specified compressive strength f'(c) and until the CONTRACTOR has determined that the actual compressive strength attained is adequate to support the weight of the concrete and superimposed loads.

C. Keep reshores in place a minimum of 15 days after placing upper tier, and longer if required, until concrete has attained at least the specified compressive strength f'(c)

and until the CONTRACTOR has determined that the actual compressive strength attained is adequate to support the weight of the concrete and superimposed loads.

D. Keep supports in place until heavy loads due to construction operations have been removed.

E. Test field cured specimens to determine potential compressive strength of concrete for specific locations.

3.13 MISCELLANEOUS CONCRETE ITEMS

A. Fill in: Fill in holes and openings left in concrete structures for passage of work by other trades after such work is in place. Place such fill in concrete to blend with existing construction, using same mix and curing methods.

B. Equipment Bases and Foundations: Provide machine and equipment bases and foundations, as indicated on Drawings. Set anchor bolts at correct elevations, complying with diagrams or templates of equipment manufacturer.

1. Grout base plates and foundations as indicated with non-shrink grout.
2. Use nonmetallic grout for exposed conditions, unless otherwise indicated.
3. Equipment bases shall be sized to provide a minimum of 1.5” between the edge of the equipment bases and the edge of the equipment being served.
4. Provide conduit windows through equipment bases of electrical equipment sized no larger than the conduit windows of the equipment being served.
5. Equipment bases for electrical equipment shall be a minimum of 4” thick with chamfered edges.

C. Reinforced Masonry: Provide concrete grout for reinforced masonry where indicated on Drawings and as scheduled.

3.14 CONCRETE REPAIRS

A. General: Repairs due to poor workmanship shall be made by the CONTRACTOR at the CONTRACTOR’s expense and shall be approved by the ENGINEER prior to repair procedure being implicated.

B. Perform cosmetic repairs of concrete surfaces as specified under concrete application.

C. Perform structural repairs with prior approval of the ENGINEER for method and procedure, using epoxy bonding systems. The ENGINEER's approval is required for repair methods using materials other than those specified.

3.15 QUALITY CONTROL TESTING DURING CONSTRUCTION

A. Refer to Section 01410 for additional concrete testing requirements for the project.

B. Composite Sampling and Making and Curing of Specimens: ASTM C 172 and ASTM C 31.

1. Take samples at point of discharge.
2. For pumped concrete, perform sampling and testing at the frequencies specified herein at point of delivery to pump, and perform additional sampling and testing at the same frequency at discharge from line.
3. Results obtained at discharge from line shall be used for acceptance of concrete.

C. Slump: ASTM C 143. One test per strength test and additional tests if concrete consistency changes.

1. Modify sampling to comply with ASTM C 94.

D. Air Content of Normal Weight Concrete: ASTM C 173 or ASTM C 231. One test per strength test performed on air entrained concrete.

E. Concrete Temperature:

1. Test hourly when air temperature is 40 degrees F or below.
2. Test hourly when air temperature is 90 degrees F or above.
3. Test each time a set of strength test specimens is made.

F. Compressive Strength Tests: ASTM C 39.

1. Compression test specimens: Mold and cure one set of 4 standard cylinders for each compressive strength test required.
2. Testing for acceptance of potential strength of as delivered concrete:
   a. Obtain samples on a statistically sound, random basis.
   b. Minimum frequency:
      1) One set per 100 cubic yards or fraction thereof for each day's pour of each concrete class.
      2) One set per 3500 square feet of slab or wall area or fraction thereof for each day's pour of each concrete class.
      3) When the above testing frequency would provide fewer than 5 strength tests for a given class of concrete during the project, conduct testing

from not less than 5 randomly selected batches, or from each batch if fewer than 5.

c. Test one specimen per set at 7 days for information unless an earlier age is required.
d. Test 2 specimens per set for acceptance of strength potential; test at 28 days unless other age is specified. The test result shall be the average of the two specimens. If one specimen shows evidence of improper sampling, molding, or testing, the test result shall be the result of the remaining specimen; if both show such evidence, discard the test result and inform the ENGINEER.
e. Retain one specimen from each set for later testing, if required.
f. Strength potential of as delivered concrete will be considered acceptable if all of the following criteria are met:
   1) No individual test result falls below specified compressive strength by more than 500 psi.
   2) Average of any 3 consecutive strength test results equals or exceeds specified compressive strength f'c.
   3) Testing for evaluation of field curing:
      a) Frequency: 1 field set of specimens per strength acceptance test.
      b) Mold specimens from same sample used for strength acceptance tests. Field cure, and test at same age as for strength acceptance tests.
      c) Evaluate construction and curing procedures and implement corrective action when strength results for field cured specimens are less than 85 percent of test values for companion laboratory cured specimens.

3. Removal of forms or supports: Mold additional specimens and field cure with concrete represented; test to determine strength of concrete at proposed time of form or support removal.

G. Test Results: Testing agency shall report test results in writing to ENGINEER and CONTRACTOR within 24 hours of test.

1. Test reports shall contain the following data:
   a. Project name, number, and other identification.
   b. Name of concrete testing agency.
   c. Date and time of sampling.
   d. Concrete type and class.
   e. Location of concrete batch in the completed work.
   f. All information required by respective ASTM test methods.
2. Nondestructive testing devices such as impact hammer or sonoscope may be used at ENGINEER's option for assistance in determining probable concrete strength at various locations or for selecting areas to be cored, but such tests shall not be the sole basis for acceptance or rejection.

3. The testing agency shall make additional tests of in place concrete as directed by the ENGINEER when test results indicate that specified strength and other concrete characteristics have not been attained.
   a. Testing agency may conduct tests of cored cylinders complying with ASTM C 42, or tests as directed.
   b. Cost of additional testing shall be borne by the CONTRACTOR when unacceptable concrete has been verified.

H. Water Tightness of Water Containing Walls

1. All basins, tanks, manholes, storm drainage structures, and wet wells are hydraulic structures and shall be watertight. Water tightness testing shall be conducted prior to any application of coatings or painting systems to the tank, basin, manhole, or wet well as per Sections 09900 and 13216. Each structure shall be filled with water, full depth (above maximum water level), prior to backfilling (unless otherwise noted) and kept full of water for 48 hours prior to starting the tightness testing. After 48-hours the level in the tank shall be measured and the testing period shall begin and conducted over a 24-hour period. The CONTRACTOR shall exercise every precaution to secure water tightness by careful mixing and placing of the concrete to obtain a homogeneous mixture at maximum density, without air pockets or voids, using the minimum practical amount of water in the mix. Extreme care shall be used to secure continuity of water stops at expansion and construction joints, to seal off holes from wall ties, and when placing concrete about wall sleeves, wall pipes and other obstructions. The CONTRACTOR shall fix all leaks.
2. The CONTRACTOR shall furnish, at his own expense, any pumps, piping, and appurtenances to provide the test water for the water tightness testing and any water post-loading operations of structures.
3. All structures shall be watertight.

END OF SECTION 03300

SECTION 16010

BASIC ELECTRICAL REQUIREMENTS

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Basic Electrical Requirements specifically applicable to Division 16 Sections, in addition to Division 1 - General Requirements.

1.02 REFERENCES

A. The ECUA Engineering Manual standards shall also be referenced for additional requirements. Where discrepancies arise between the ECUA Engineering Manual standards and these specifications, the more stringent requirement shall apply.

1.03 SCOPE

A. Refer to Section 000001.

1.04 WORKING CLEARANCES

A. Working clearances around equipment requiring electrical services shall be verified by CONTRACTOR to comply with NEC requirements. Should there be apparent violations of clearances; the CONTRACTOR shall notify the ENGINEER before proceeding with connection or placing of equipment.

B. In the case of panelboards, safety switches and other equipment requiring wire and cable terminations, the CONTRACTOR shall ascertain that lug sizes and wiring gutters or space allowed for proper accommodation and termination of the wires and cables are adequate.

1.05 WORKMANSHIP

A. Workmanship under this Division shall be accomplished by persons skilled in the performance of the required task. All work shall be done in keeping with conventions of the trade. Work of this Division shall be closely coordinated with work of other trades to avoid conflict and interference.

1.06 PROTECTION OF ELECTRICAL EQUIPMENT

A. Electrical equipment shall be protected from the weather, especially from water dripping or splashing upon it, always during shipment, storage and after installation. Should any apparatus be subjected to possible injury by water, it shall be thoroughly dried out and put through a dielectric test, at the expense of the CONTRACTOR, to

ascertain the suitability of this apparatus. The results of the test shall be submitted to the ENGINEER and if the apparatus is found to be unsuitable, the CONTRACTOR shall replace it without additional cost to the OWNER.

B. Electrical equipment space heaters and motor space heaters shall be energized during storage periods and prior to being placed into operation to prevent moisture and condensation from damaging internal components.

1.07 WARRANTY

A. Refer to Section 000001

1.08 TEMPORARY POWER AND LIGHTS DURING CONSTRUCTION

A. Refer to Section 000001

1.09 MATERIAL STANDARDS

A. Material shall be new and comply with standards of Underwriters' Laboratories, Inc., where standards have been established for the product and the various NEMA, ANSI, ASTM, IEEE, AEIC, IPCEA or other publications referenced.

1.10 TEST EQUIPMENT

A. The CONTRACTOR shall provide all test equipment and supplies deemed necessary by the ENGINEER at no extra cost to the OWNER. These supplies shall include but not be limited to the following: volt meters, amp meters, clamp-on ground rod test meter, light meters, generator load banks and temporary cables, watt meters, harmonic distortion test equipment, thermal image camera, megger tester, high pot test equipment, power quality analyzers, recording power meter, and oscilloscopes.

1.11 REFERENCES

A. ANSI/NFPA 70 – National Electrical Code.
B. ANSIC2 – National Electrical Safety Code.
C. NEMA – National Electrical Manufacturer's Assoc.
D. UL – Underwriters Laboratories
E. NFPA – National Fire Protection Assoc.
F. IEEE – The Institute of Electrical and Electronics Engineers
G. IESNA – The Illuminating Engineering Society of North America
H. NETA – International Electrical Testing Association
I. API – American Petroleum Institute

J. AGA – American Gas Association

K. Recommended Standards for Water Works and Wastewater Facilities (10 State Standards) as published by Great Lakes – Upper Mississippi River Board of State Public Health and Environmental Managers.

1.12 SUBMITTALS

A. The CONTRACTOR installing all electrical work shall review and approve all electrical shop drawings prior to submittal to the ENGINEER for review. As part of the review, the installer shall certify the following:

a. I hereby certify that the (equipment) (material) (article) shown and marked in this submittal is in compliance with the contract drawings and specifications, can be installed in the allocated space, will be stored in accordance with the manufacturer's recommendation, will be installed per NEC, and is submitted for approval.

Certified by:_____ Date: _____

b. Contractor shall state clearly in each submittal any deviations from the contract documents, referencing applicable specification sections and reasoning for deviation. Deviations are contingent upon ENGINEER review and approval.

B. Submit shop drawings and product data grouped to include complete submittal of related systems, products, and accessories in a single submittal. No electrical work may be performed until shop drawings are approved. Submit shop drawings in accordance with the requirements of the respective division 16 specification section included as part of these project documents. Included are such things as:

1. Low Voltage Power/Electrical System
   a. Motor controllers (Owner furnished; Contractor installed)
   b. Conduit and Conduit Fittings
   c. Wire
   d. Pull Boxes
   e. Circuit Breakers
   f. Disconnects
   g. Conduit Support Systems
2. Miscellaneous Electrical Equipment
   a. Miscellaneous Electrical Parts

3. Drawings
   a. Coordination drawing of all electrical areas
   b. Conduit layout drawings
   c. Duct drawings
   d. As-Built Drawings

C. Mark dimensions and values in units to match those specified.

1.13 REGULATORY REQUIREMENTS

A. Conform to applicable sections of the Building Code and all local rules, regulations, and ordinances.

1.14 FINAL INSPECTION AND TESTING

A. After the electrical installation is complete, the CONTRACTOR shall deliver to the ENGINEER the following information with his request for final inspection.
   1. One set of contract drawings marked to show all significant changes in equipment ratings and locations, alterations in locations of conduit runs, or of any data differing from the contract drawings. This shall include revised or changed panelboard and switchgear schedules.
   2. Certificates of final inspection from local authority.
   3. A tabulation of all motors listing their respective manufacturer, horsepower, nameplate voltage and current, actual running current after installation and overload heater rating.

B. The electrical work shall be thoroughly tested to demonstrate that the entire system is in proper working order and in accordance with the plans and specifications. Each motor with its control shall be run as nearly as possible under operating conditions for a sufficient length of time to demonstrate correct alignment, wiring capacity, speed, and satisfactory operation. All main switches and circuit breakers shall be operated, but not necessarily at full load. CONTRACTOR may be required during final inspection, at the request of the ENGINEER to furnish test instruments for use during the testing.

C. All wiring shall be given a megger test using a 1000 Volt megger and a conductor continuity test. These tests shall be performed upon delivery to project site and after conductors are pulled, but before final connections are made. The ENGINEER shall be given two (2) days' written notice of the anticipated test date so that he may witness the test if so desired. In any event, the CONTRACTOR shall record the circuit

designation and the megger reading on each phase. This written record shall be submitted to the ENGINEER prior to energization of associated equipment. The cost of this test or any retest caused by insufficient megger readings shall be the responsibility of the CONTRACTOR (All tests shall be done in accordance with NETA Standards).

1.15 STAFFING

A. The electrical CONTRACTOR shall provide a "Master Electrician" who has been deemed a "Master Electrician" by exam through the State, or any other local permitting authority as the electrical superintendent for the project. The electrical superintendent shall be on the project site any time any electrical work is performed by the CONTRACTOR.

1.16 AS-BUILT DRAWINGS

A. The as-built drawings shall include detailed drawings of all duct banks, underground conduit, above ground conduit, power distribution equipment, PLC control panels, and control instrument drawings. The duct bank and conduit drawings shall indicate exact location of all duct banks, underground electrical wiring, and fiber optic cable.
   1. The location shall indicate the following:
      a. Centerline location
      b. Width / Cross section
      c. Depth

B. As-built drawings shall be furnished to the ENGINEER in AutoCAD 2018 and PDF format.

END OF SECTION 16010

SECTION 16060

GROUNDING AND BONDING

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. For definitions of grounding and bonding terms see NFPA 70.

1.02 SUMMARY

A. Section includes grounding and bonding systems and equipment.
   1. Underground distribution grounding.
   2. Ground bonding common with lightning protection system.
   3. Foundation steel electrodes.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.04 INFORMATIONAL SUBMITTALS

A. As-Built Data: Plans showing dimensioned as-built locations of grounding features specified in "Field Quality Control" Article, including the following:
   1. Test wells.
   2. Ground rods.
   3. Ground rings.
   4. Grounding arrangements and connections for separately derived systems.

B. Field quality-control reports.

1.05 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.
   1. Include the following:
      a. Instructions for periodic testing and inspection of grounding features at test wells ground rings grounding connections for separately derived systems based on NETA MTS.
         1) Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.

2) Include recommended testing intervals.

1.06 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Burndy; Part of Hubbell Electrical Systems.
   2. ERICO International Corporation.
   3. Herger Lightning and Grounding.
   4. ILSCO.
   5. O-Z/Geaney; A Brand of the EGS Electrical Group.
   6. Robbins Lightning, Inc.
   7. Or Engineer approved equal

2.02 SYSTEM DESCRIPTION

A. Complete grounding system including connections to proposed equipment and structures and interconnection with existing grounding system according to these specifications and the contract drawings.

2.03 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.

C. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 4 inches (6.3 by 100 mm) in cross section, with 9/32-inch (7.14-mm) holes spaced 1-1/8 inches (28 mm) apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V and shall be Lexan or PVC, impulse tested at 5000 V.

D. Grounding and Bonding Conductors
   1. All raceways and equipment shall be provided with an equipment grounding conductor as shown on the drawings. When the equipment grounding conductor is not shown on the drawings, provide an equipment grounding conductor per Table 250.122 of the NEC.
   2. All service entrance equipment shall be provided with a grounding electrode conductor between the service entrance ground and the grounding electrode system as shown on the drawings. When the grounding electrode conductor is not shown on the drawing, provide a grounding electrode conductor per Table 250.66 of the NEC.
   3. Main bonding jumper installed between the service entrance ground and neutral and shall be sized per Table 250.66 of the NEC.
   4. System bonding jumper installed between the separately derived system ground and neutral and shall be sized per Table 250.66 of the NEC.

2.04 CONNECTORS

A. Listed and labeled by a Nationally Recognized Testing Laboratory (NRTL) acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

D. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.05 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel, sectional type; 3/4 inch by 10 feet (19 mm by 3 m) min.

B. Chemical-Enhanced Grounding Electrodes: Copper tube, straight or L-shaped, charged with nonhazardous electrolytic chemical salts.
   1. Termination: Factory-attached No. 4/0 AWG bare conductor at least 48 inches (1200 mm) long.
   2. Backfill Material: Electrode manufacturers recommended material.

PART 3 – EXECUTION

3.01 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Underground Grounding Conductors: Install bare copper conductor, No. 4/0 AWG minimum.
   1. Bury at least 24 inches (600 mm) below grade.
   2. Duct-Bank Grounding Conductor: Bury 12 inches (300 mm) above duct bank when indicated as part of duct-bank installation.

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. Grounding Bus: Install in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
   1. Install bus horizontally, on insulated spacers 2 inches (50 mm) minimum from wall, 6 inches (150 mm) above finished floor unless otherwise indicated.
   2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.

E. 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.

3.02 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

A. Comply with IEEE C2 grounding requirements.

B. Grounding Manholes and Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inches (100 mm) will extend above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches (50 mm) above to 6 inches (150 mm) below concrete. Seal floor opening with waterproof, non-shrink grout.

C. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper bonding conductor. Train conductors'

level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields according to written instructions by manufacturer of splicing and termination kits.

D. Pad-Mounted Transformers and Switches: Install two ground rods and ground ring around the pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Install copper conductor not less than No. 2 AWG for ground ring and for taps to equipment grounding terminals. Bury ground ring not less than 6 inches (150 mm) from the foundation.

3.03 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

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, Heat-Tracing, and Anti-frost Heating 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 Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. 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. 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.

F. Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

3.04 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.

C. 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. When service grounding is not detailed on the drawings, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

D. Test Wells: Ground rod driven through drilled hole in bottom of handhole. Handholes shall be at least 12 inches (300 mm) deep, with cover.
   1. Test Wells: Install at least one test well for each service unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.

E. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
   1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
   2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
   3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

F. Grounding and Bonding for Piping:
   1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug- type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street

side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.

2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

G. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet (18 m) apart.

H. Ground Ring: Install a grounding conductor, electrically connected to each building structure ground rod and to each steel column, extending around the perimeter of area.
   1. Install copper conductor not less than No. 2/0 AWG or as shown on the drawing for ground ring and for taps to building steel.
   2. Bury ground ring not less than 24 inches (600 mm) from building's foundation.

I. Concrete-Encased Grounding Electrode (Ufer Ground): Fabricate according to NFPA 70; using electrically conductive coated steel reinforcing bars or rods, at least 20 feet (6.0 m) long. If reinforcing is in multiple pieces, connect by the usual steel tie wires or exothermic welding to create the required length.

3.05 FIELD QUALITY CONTROL

A. Perform tests and inspections.
   1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
   2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
   3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells, and at individual ground rods. Make tests at ground rods before any conductors are connected.
      a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
      b. Perform tests by fall-of-potential method according to IEEE 81 and NETA Standards.
   4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations

of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

5. Prepare test and inspection reports.

B. Grounding system will be considered defective if it does not pass tests and inspections.

C. Report measured ground resistances that exceed the following values:
   1. Power and lighting equipment or system with capacity of 1000 kVA and less: 5 ohms.
   2. Power and lighting equipment or system with capacity more than 1000 kVA: 3 ohms.
   3. Power distribution units or panelboards serving electronic equipment: 3 ohm(s).
   4. Substations and pad-mounted equipment: 5 ohms.
   5. Manhole grounds: 10 ohms.

D. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Engineer promptly and include recommendations to reduce ground resistance.

END OF SECTION 16060

SECTION 16071

HANGERS AND SUPPORTS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including the ECUA Engineering Manual, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:
   1. Hangers and supports for electrical equipment and systems.
   2. Construction requirements for concrete bases.

1.03 DEFINITIONS

A. RMC: Rigid metal conduit.

1.04 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified Florida registered professional ENGINEER, using performance requirements and design criteria indicated.

B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

C. Design equipment supports capable of supporting combined operation weight of supported equipment and connected systems and components.

D. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for the Project, with a minimum structural safety factor of five times the applied force.

1.05 ACTION SUBMITTALS

A. Product Data: For the following:
   1. Steel slotted support systems.
   2. Nonmetallic slotted support systems.

B. Shop Drawings: Signed and sealed by a qualified professional ENGINEER in the state of Florida. Show fabrication and installation details and include calculations for the following:
   1. Steel slotted channel systems: Include product data for components.
   2. Nonmetallic slotted channel systems: Include product data for components.
   3. Equipment supports.

1.06 INFORMATIONAL SUBMITTALS

A. Welding Certificates

1.07 QUALITY ASSURANCE

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

B. Comply with NFPA 70.

1.08 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolts inserts into bases. Concrete, reinforcement, and framework requirements are specified together with concrete Specifications.

B. Coordinate installation of roof mounted electrical with structural and architectural specification and drawings.

PART 2 – PRODUCTS

2.01 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
   1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Allied Tube & Conduit
      b. Cooper B-Line, Inc.
      c. ERICO International Corporation.
      d. GS Metals Corp.
      e. Thomas & Betts Corporation.
      f. Unistrut; Atkore International.
      g. Wesanco, Inc.
      h. Or approved equal
   2. Metallic Coatings: Hot dip galvanized after fabrication and applied according to MFMA-4.
   3. Painted Coatings: Manufacturers standard painted coating applied according to MFMA-4.
   4. Channel Dimensions: Selected for applicable load criteria.

B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
   1. Provide cable strain relief for manufacturer provided cables where installation is intended to be vertically in free air. Support grips shall be sized for the cable and shall prevent the cables from being damaged by the process or installation, while ensuring maintenance activities are not inhibited.

C. Conduit and Cable Support Devices shall be as indicated below (unless noted otherwise in drawings):
   1. PVC Conduit – PVC, stainless steel, or fiberglass in areas corrosive to stainless steel
   2. Aluminum Conduit – stainless steel

D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

E. Structured Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
   1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened Portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
      a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
         1) Hilti, Inc.
         2) ITW Ramset/Red Head; Illinois Tool Works, Inc.
         3) MKT Fastening, LLC.
         4) Simpson Strong-Tie Co., Inc.
         5) Or Approved Equal
   2. Mechanical-Expansion Anchors: Insert-wedge type, stainless steel, for use in hardened Portland cement concrete with tensions, shear, and pullout capacities appropriate for supported loads and building materials in which used.
      a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
         1) Cooper B-Line, Inc.
         2) Empire Tool and Manufacturing Co., Inc.
         3) Hilti, Inc.
         4) ITW Ramset/Red Head; Illinois Tool Works, Inc.

5) MKT Fastening, LLC.
6) Or Approved Equal

3. Concrete Inserts: Steel or malleable-iron, slotted support system units like MMS Type 18; complying with MFMA-4 or MSS SP-58.
4. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
5. Toggle Bolts: All springhead type.
6. Hanger Rods: Threaded.

2.02 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

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

PART 3 – EXECUTION

3.01 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and system except if requirements in this Section are more stringent.

B. Maximum, Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for RMC as scheduled in NECA 1, where its Table 1 lists maximum spacing less than stated in NFPA 70. Minimum rod size shall be $^{3}/_{8}$ inch in diameter.

C. Provide cable strain relief for manufacturer provided cables where installation is intended to be vertically in free air. Support grips shall be sized for the cable and shall prevent the cables from being damaged by the process or installation, while ensuring maintenance activities are not inhibited.

D. Multiple Raceways or Cables: Install trapeze-type supports fabricated with slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
1. Secure raceways and cables to these supports with single-bolt conduit clamps.

3.02 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200lb (90kg).

C. 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
      a. Expansion anchor fasteners.
      b. Powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches (100mm) thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches (100mm) thick.
   5. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
   6. To S.S.: S.S. metal screws.
   7. Items Mounted to Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panel boards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.

D. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.03 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Cut, fit, and replace 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.

3.04 CONCRETE BASES

A. Construct concrete bases of dimensions indicated but not less than 4 inches (100mm) larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Use 3000-psi (20.7-MPa) 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements as specified in the contract documents.

C. Anchor equipment to concrete base.

1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instruction, and directions furnished with items to be embedded.
2. Install anchor bolts to elevations required for proper attachment to supported equipment.
3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.05 PAINTING

A. Touch-up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA1 requirements for touching up field-painted surfaces.
   1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05mm).

END OF SECTION 16071

SECTION 16075

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including the ECUA Engineering Manual Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:
   1. Identification for raceway and metal-clad cable.
   2. Identification for conductors of power, communication, and control cable.
   3. Underground-line warning tape.
   4. Warning labels and signs.
   5. Instruction signs.
   6. Equipment identification labels.
   7. Miscellaneous identification products.

1.03 SUBMITTALS

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

B. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.

C. Samples: For each type of label and sign to illustrate size, colors, lettering style, mounting provisions, and graphic features of identification products.

1.02 QUALITY ASSURANCE

A. Comply with ANSI A13.1, ANSI C2, and ANSI Z635.4.
B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.145

1.05 COORDINATION

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

B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

C. Coordinate installation of identifying devices with location of access panels and doors.

D. Install identifying devices before installing acoustical ceilings and similar concealment.

E. Install all signs and labels horizontal (level) and consistent for similar equipment and panels.

PART 2 – PRODUCTS

2.01 RACEWAY AND METAL-CLAD CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

C. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

D. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; 2 inches wide; compounded for outdoor use.

2.02 CONDUCTORS, COMMUNICATION, AND CONTROL CABLE IDENTIFICATION MATERIALS

A. Aluminum Wraparound Marker Labels: Cut from 0.014-inch- thick aluminum sheet, with stamped, embossed, or scribed legend, and fitted with tabs and matching slots for permanently securing around wire or cable jacket or around groups of conductors.

B. Self-laminating vinyl labels with printed 3/16-inch identification protected by translucent lamination adhered to cables or conductors with permanent acrylic tape. Resistance to chemical or other solvents, water, dirt, and oils. UL approved and RoHS compliant.

2.03 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Cable Ties: Fungus-inert, self-extinguishing, 1-piece, self-locking, Type 6/6 nylon cable ties.
   1. Minimum width: 3/16 inch.
   2. Tensile Strength: 50lb, minimum.
   3. Temperature Range: Minus 40 to plus 185 deg F.

4. Color: Black, except where used for color-coding.

B. Paint: Paint materials and application requirements are specified in Division 9 painting Sections.

PART 3 – EXECUTION

3.01 APPLICATION

A. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A: Identify with snap-around label.
   1. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

B. Accessible Raceways and Cables of Auxiliary Systems: Identify the following systems with color-coded, snap-around, color-coding bands:
   1. Snap-Around Labels: Slit, pre-tensioned, flexible, preprinted, color-coded acrylic sleeves, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
   2. Mechanical and Electrical Supervisory System: Green and blue.
   3. Control Wiring: Green and red.

C. Power, Control, Instrumentation, and Branch Circuit Identification: Where cables or conductors terminate on terminal blocks or equipment, use wrap around vinyl sleeves with pre-printed labels.
   1. Cables and conductors shall be identified with a tag on each end indicating its opposite end termination location.
   2. Line 1 shall indicate the cable or circuit number found in the conduit and cable schedule or panelboard circuit for contractor supplied and field routed cables and conductors not found in the conduit and cable schedule. For example: “P- PP-6001” for circuits in the schedule or “LP-0100-24” for panelboard circuits.
   3. Line 2 shall indicate the opposite end location termination point with equipment designation, terminal block designation, and terminal number. For example: “CP-1600, TB1-24”.

D. Power-Circuit Conductor Identification: For primary and secondary conductors No. 1/0 AWG and larger in vaults, pull and junction boxes, manholes, and hand holes use metal tags. Identify source and circuit number of each set of conductors. For single conductor cables, identify phase in addition to the above.
   1. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking nylon tie fastener.

E. Branch-Circuit Conductor Identification: Where there are conductors for more than

three branch circuits in same junction or pull box, use color-coding conductor tape. Identify each ungrounded conductor according to source and circuit number.

1. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

F. Conductor Color Code Identification: Where the premises wiring system has branch circuits supplied from more than one nominal voltage system, each ungrounded conductor of a given branch circuit shall be identified by color coded tape or cable insulation at all termination, connection or splice points.

G. Conductors to Be Extended in the Future: Attach write-on tags to conductors and list source and circuit number.

1. Write-On Tags: Polyester tag, 0.015-inch thick, with corrosion-resistant grommet and polyester or nylon tie for attachment to conductor or cable.
2. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.

H. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, signal, sound, intercommunications, voice, and data connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and Operation and Maintenance Manual.
4. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

I. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable. Install underground-line warning tape for both direct-buried cables and cables in raceway. During backfilling of trenches install continuous underground-line warning tape directly above line at 12 inches above duct. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.

1. Description:
   a. Permanent, bright-colored, continuous-printed, polyethylene tape.
   b. Not less than 6 inches wide by 4 mils thick.
   c. Compounded for permanent direct-burial service.
   d. Embedded continuous metallic strip or core.
   e. Printed legend shall indicate type of underground line.

J. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Comply with 29 CFR 1910.145 and apply self-adhesive warning labels. 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. 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.
   2. Comply with NFPA 70 and 29 CFR 1910.145.
   3. 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.
   4. Baked-Enamel Warning Signs: Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application. 1/4-inch grommets in corners for mounting. Nominal size, 7 by 10 inches.
   5. Metal-Backed, Butyrate Warning Signs: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch galvanized-steel backing; and with colors, legend, and size required for application. 1/4-inch grommets in corners for mounting. Nominal size, 10 by 14 inches.
      a. Warning label and sign shall include, but are not limited to, the following legends:
      b. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
      c. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."

K. Instruction Signs:
   1. Operating Instructions: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with ENGINEER/OWNER APPROVED instructions where needed for system or equipment operation. Instructions are needed for all equipment unless otherwise noted.
      a. Signs shall be engraved, laminated acrylic or melamine plastic, minimum 1/16-inch thick for signs up to 20 sq. in. and 1/8-inch thick for larger sizes.
      b. The engraved legend shall be ½ -inch white letters on brown face, and punched or drilled for mechanical fasteners.
      c. The signs shall be installed with stainless hardware.
   2. Emergency Operating Instructions: Install emergency operating instruction signs at equipment used for power transfer, safety shutdown, or any other locations requiring operation in an emergency.

a. Signs shall be engraved, laminated acrylic or melamine plastic, minimum 1/16-inch thick for signs up to 20 sq. in. and 1/8-inch thick for larger sizes.
b. The engraved legend shall be ½ -inch white letters on red face, and punched or drilled for mechanical fasteners.
c. The signs shall be installed with stainless hardware.

L. 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 and Outdoor Equipment: Use engraved, laminated acrylic or melamine labels, punched or drilled for screw mounting. Identification labels shall have black letters on a white background. Unless otherwise indicated, provide a single line of text with 1/2-inch high letters on 1 1/2- inch high label; where 2 lines of text are required, use labels 2-inches high. Mount labels with stainless hardware. (Labels for field mounted equipment shall include the name of the equipment, and the location from which power is feed. See example below:
1) Main Station Control Panel SCP-1
a) Fed from LP-1
2) RAS Pump
a) Fed from SWBD-1 via TX-1
b. Elevated Components: Increase the size of the labels and letters to those appropriate for viewing from the floor.
2. Equipment to Be Labeled:
a. Identification labeling of some items listed below may be required by individual Sections or by NFPA 70.
b. Panelboards, electrical cabinets, and enclosures.
c. Transformers.
d. Disconnect switches.
e. Motor starters.
f. Monitoring and control equipment.
g. Terminals, racks, and patch panels for voice and data communication and for signal and control functions.
h. Control systems
i. Field mounted control devices

3.02 INSTALLATION PRACTICES

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. Attach non-adhesive signs and plastic labels with screws and auxiliary hardware appropriate to the location and substrate.

D. 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 or, for sizes LARGER than No. 10 AWG if authorities having jurisdiction permit, field applied.
   2. Colors for 208/120-V Circuits:
      a. Phase A: Black.
      b. Phase B: Red.
      c. Phase C: Blue.
   3. Colors for 480/277-V Circuits:
      a. Phase A: Brown.
      b. Phase B: Orange.
      c. Phase C: Yellow.
   4. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.
   5. Where the premises wiring system has branch circuits supplied from more than one nominal voltage system, the color codes used to identify each phase, neutral (if applicable) and ground conductor throughout the system shall be permanently posted at each branch-circuit panelboard or similar branch-circuit distribution equipment. Provide factory printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment, unless otherwise indicated.

E. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.

F. Painted Identification: Prepare surface and apply paint according to Section 09900.

END OF SECTION 16075

SECTION 16121

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, the ECUA Engineering Manual Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Wires and cables rated 600 V and less.
   2. Connectors, splices, and terminations rated 600 V and less.

1.03 DEFINITIONS

A. VFD: Variable Frequency Drive

1.04 ACTION SUBMITTALS

A. Submit the following:
   1. Product data: for each type of product

1.05 INFORMATIONAL SUBMITTALS

A. Submit the following:
   1. Field quality-control reports
   2. Standard test record sheets

PART 2 – PRODUCTS

2.01 CONDUCTORS AND CABLES

A. Manufacturers: Subject to compliance with requirements provide products by use of the following:
   1. Alpha Wire.
   2. Belden Inc.
   3. Encore Wire Corporation.
   4. General Cable Technologies Corporation.
   5. Southwire Incorporated.

B. Copper Conductors: Comply with NEMA WC 70/ICEA S-95-658. Unless specifically shown on the plans as aluminum.

C. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THHN-2- THWN-2, Type XHHW-2, RHW-2 Low Smoke, SOW and Type SO.

D. Multiconductor Cable: Comply with NEMA WC 70/ICEA S-95-658 for metal-clad cable, Type MC, Type SO with ground wire.
E. VFD Cable:
    1. Comply with UL1277, UL 1685, and NFPA 70 for Type TC-ER cable.
    2. Type TC-ER with oversized crosslinked polyethylene insulation, dual spirally wrapped copper tape shields and three bare symmetrically applied ground wires, and sunlight- and oil-resistant outer PVC jacket.
    3. Comply with UL requirements for cables in Classes I and II, Division 2 hazardous location applications.
    4. Cable shall be rated for 1000V unless otherwise indicated

2.02 CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    1. AFC Cable Systems, Inc.
    2. Gardner Bender.
    3. Hubbell Power Systems, Inc.
    4. Ideal Industries, Inc.
    5. IIsco; a branch of Bardes Corporation.
    6. NSi Industries LLC.
    7. O-Z/Gedney; a brand of the EGS Electrical Group.
    8. 3M; Electrical; Markets Division.
    9. Tyco Electronics.

B. Description: Factory-fabricated connectors of size, capacity rating, material, type, and class for application and service indicated.

2.03 SYSYEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

PART 3 – EXECUTION

3.01 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper, stranded.
B. General Branch Circuits in building for lighting and receptacles: Copper, stranded.

3.02 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. All water and wastewater facilities:
   1. Feeders concealed in concrete, below slabs-on-grade, and underground: Type XHHW-2, single conductors in raceway.
   2. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and underground: Type XHHW-2, single conductors in raceway.
   3. Class 1 Control Circuits: Type XHHW-2, in raceway.
   4. Class 2 Control Circuits: Type XHHW-2, in raceway.

B. VFD Output Circuits: VFD Cable as defined in this section.

3.03 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

B. Complete raceway installation between conductor and cable termination points according to Division 16 prior to pulling conductors and cables.

C. Use manufacturers-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufactures recommended maximum pulling tensions and sidewall pressure values.

D. Use pulling means; including fish tape, cable, rope, and blanket-weave wire/cable grips that will not damage cables or raceway.

E. Support cables according to Section 16071 “Hangers and Supports for Electrical Systems”.

3.04 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer’s published torque tightening values. If manufacturer’s torque values are not indicated, use those specified in UL 486A-486B. All torque tightening equipment shall be calibrated before use with calibration records available for inspection.

B. Make splices, terminations and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than un-spliced conductors.
1. Use oxide inhibitor in each splice, termination, and tap for aluminum conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches (150 mm) of slack.

3.05 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 16075 “Identification for Electrical Systems.”

B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.06 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 16131, “Sleeves and Sleeve Seals for Electrical Raceways and Cabling.”

3.07 FIRESTOPPING

A. Apply fire stopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to the project specifications.

3.08 FIELD QUALITY CONTROL

A. An ENGINEER approved, independent, third-party testing agency shall perform the following tests and inspections:
   1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Record all results and submit to engineer for approval. Certify compliance with manufacturer’s test parameters, in the absence of Manufacturer’s published data; certify compliance with the table listed in NETA Acceptance Testing Specification.
   2. NETA Acceptance Testing Specification is the minimum level of testing that will be required on all projects with the most relevant inspection and test procedures extracted as listed below. The following list includes additional tests that will be required unless stated otherwise.
      a. Pre-connection
         1) Visual mechanical inspection.
         2) Perform resistance measurements through bolted connections with a low resistance DC Ohm meter or an insulation resistance test meter.
         3) Continuity of all protective conductors to be recorded using a low resistance DC Ohmmeter or an insulation resistance test meter.
         4) Check continuity of all conductors and verify correct cable connections.
         5) Check polarity of all conductors.

6) Perform insulation resistance test on each conductor with respect to ground and all adjacent conductors using an insulation resistance test meter. Each conductor must be tested for 1 minute.
7) Verify uniform resistance of all parallel conductors.

b. Post-connection
1) Test and record the impedance at the supply origin.
2) Test and record the ground fault loop impedance between all live conductors and ground at the furthest extents of each final circuit. This test is to be completed using a fault loop Impedance tester and all results must be in compliance with the Circuit Protective Device (CPD) limits from the Manufacturer.
3) Test and record the operating trip time of all GFI and GFCI's devices to ensure compliance with NEC and Manufacturer's published data. This test is to be completed using a GFCI test meter.
4) Other functional testing may be listed here if required.

B. Test and Inspection Reports: Prepare a written report to record the following:
1. Procedures used.
2. List of all personal performing testing, with resumes upon request.
3. Summit all test results on the enclosed test forms, see form to follow. Additional test results shall be written on the reverse side of the form.
4. Results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

C. Cables will be considered defective if they do not pass tests and inspections.

END OF SECTION 16120

SECTION 16130

RACEWAYS AND BOXES

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including the ECUA Engineering Manual, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Metal conduits, tubing, and fittings.
   2. Nonmetal conduits, tubing, and fittings.
   3. Metal wireways and auxiliary gutters.
   4. Nonmetal wireways and auxiliary gutters.
   5. Surface raceways.
   6. Boxes, enclosures, and cabinets.
   7. Handholes and boxes for exterior underground cabling.

1.03 DEFINITIONS

A. ARC: Aluminum rigid conduit.

B. PVC: Polyvinyl Chloride Conduit Schedule 40, Schedule 80

C. LFMC: Liquid tight Flexible Metallic Conduit

1.04 ACTION SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

1.05 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:
   1. Structural members in paths of conduit groups with common supports.
   2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.

B. Source quality-control reports.

PART 2 – PRODUCTS

2.01 METAL CONDUITS, TUBING, AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. AFC Cable Systems, Inc.
   2. Allied Tube & Conduit.
   3. Anamet Electrical, Inc.
   4. Electri-Flex Company.
   5. O-Z/Gedney.
   6. Picoma Industries.
   7. Republic Conduit.
   8. Robroy Industries.
   9. Southwire Company.
   10. Thomas & Betts Corporation.
   11. Western Tube and Conduit Corporation.
   12. Wheatland Tube Company.
   13. or Approved Equal.

B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. ARC: Comply with ANSI C80.5 and UL 6A.

D. FMC: Comply with UL 1; Aluminum.

E. LFMC: Flexible aluminum conduit with PVC jacket and complying with UL 360.

F. Fittings for Aluminum Conduit: Comply with NEMA FB 1 and UL 514B.
   1. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions were installed, and including flexible external bonding jumper.
   2. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch (1 mm), with overlapping sleeves protecting threaded joints.

G. Joint Compound for ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.02 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. AFC Cable Systems, Inc.
   2. Anamet Electrical, Inc.
   3. Arnco Corporation.
   4. CANTEX Inc.
   5. CertainTeed Corporation.
   6. Condux International, Inc.
   7. Electri-Flex Company.
   8. Kraloy.
   9. Electrical Products.
   10. Niedax-Kleinhuis USA, Inc.
   11. RACO; Hubbell.
   12. Thomas & Betts Corporation.
   13. or Approved Equal.

B. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. See Evaluations for descriptions of nonmetallic conduit types.

D. RNC: Type EPC-80-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.

E. Continuous HDPE: Comply with UL 651B.

F. Coilable HDPE: Preassembled with conductors or cables, and complying with ASTM D 3485.

G. RTRC: Comply with UL 1684A and NEMA TC 14.

2.02 METAL WIREWAYS AND AUXILIARY GUTTERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Cooper B-Line, Inc.
   2. Hoffman.
   3. Mono-Systems, Inc.
   4. Square D.
   5. or Approved Equal.

B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 for interior or Type 4X stainless steel for exterior unless otherwise indicated, and sized according to NFPA 70.
   1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Wireway Covers: Hinged type for NEMA 1 and hinged, flanged-and-gasketed type for NEMA 4X unless otherwise indicated.

E. Finish: Manufacturer's standard enamel finish.

2.04 NONMETALLIC WIREWAYS AND AUXILIARY GUTTERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Allied Molded Products, Inc.
   2. Hoffman.
   3. Carlon Electrical Products.
   4. Niedax-Kleinhuis USA, Inc.
   5. or Approved Equal.

B. Listing and Labeling: Nonmetallic wireways and auxiliary gutters shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Description: Fiberglass polyester or PVC, extruded and fabricated to required size and shape, and having hinged cover with captive screws.

D. Fittings and Accessories: Couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings shall match and mate with wireways as required for complete system.

2.05 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Adalet.
   2. Cooper Technologies Company; Cooper Crouse-Hinds.
   3. EGS/Appleton Electric.
   4. Erickson Electrical Equipment Company.

5. FSR Inc.
6. Hoffman.
7. Hubbell Incorporated.
8. Kraloy.
9. Milbank Manufacturing Co.
10. Mono-Systems, Inc.
11. O-Z/Gedney.
12. RACO; Hubbell.
13. Robroy Industries.
14. Spring City Electrical Manufacturing Company.
15. Stahlin Non-Metallic Enclosures.
16. Thomas & Betts Corporation.
17. Wiremold / Legrand.
18. or Approved Equal.

B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

C. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, Form 7, aluminum to match raceway type, with gasketed cover.

D. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

E. Small Pull and Junction Boxes: NEMA OS 1.

F. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, Form 7 cast aluminum with gasketed cover, unless otherwise noted.

G. Device Box Dimensions: 4 inches square by 2-1/8 inches deep (100 mm square by 60 mm deep), unless otherwise noted.

H. Gang-able boxes are prohibited, unless specifically noted.

I. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 4X Stainless Steel for outdoor locations, Type 12 for indoor locations, with continuous-hinge cover with flush latch unless otherwise indicated.
   1. Metal Enclosures: finished inside and out with manufacturer's standard enamel.
   2. Nonmetallic Enclosures: Fiberglass.
   3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

J. Cabinets:
   1. NEMA 250, Type 4X Stainless Steel for outdoor locations, Type 12 for indoor locations, with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
   2. Hinged door in front cover with flush latch and concealed hinge.

3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.
6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.06 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. General Requirements for Handholes and Boxes:
   1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
   2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Armorcast Products Company.
      b. Carson Industries LLC.
      c. NewBasis.
      d. Oldcastle Precast, Inc.
      e. Quazite: Hubbell Power System, Inc.
      f. Synertech Molded Products.
      g. Or approved equal.
   2. Standard: Comply with SCTE 77.
   3. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
   4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
   5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
   6. Cover Legend: Molded lettering, as required to identify system indicated on the drawings.
   7. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
   8. Handholes 24-inches wide by 24-inches long by 24-inches deep and larger: Have inserts for cable racks and pulling-in irons installed before concrete is poured.

2.07 SOURCE QUALITY CONTROL FOR UNDERGROUND ENCLOSURES

A. Handhole and Pull-Box Prototype Test: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.
   1. Tests of materials shall be performed by an independent testing agency.
   2. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional ENGINEER in the State of Florida shall certify tests by manufacturer.
   3. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012 and traceable to NIST standards.

PART 3 – EXECUTION

3.01 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
   1. Exposed Conduit: Aluminum rigid conduit (ARC)
   2. Concealed Conduit, Aboveground: RNC, Type EPC-40-PVC, unless otherwise indicated on drawings.
   3. Underground Conduit: RNC, Type EPC-40-PVC when concrete encased, Type EPC-80-PVC when direct buried.
   4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC unless otherwise indicated on drawings.
   5. Connection between structures (Including between ground storage tanks and stair platforms): LFMC unless otherwise indicated on drawings. Power level 120VAC and above LFMC between rigid conduit sections or between rigid conduit and equipment shall have an insulated ground jumper installed between insulated ground bushings.
   6. Boxes and Enclosures, Aboveground: NEMA 250, Type 4X Stainless steel unless otherwise indicated on drawings.

B. Indoors: Apply raceway products as specified below unless otherwise indicated:
   1. Exposed, Not Subject to Physical Damage: ARC.
   2. Exposed, Not Subject to Severe Physical Damage: ARC.
   3. Exposed and Subject to Severe Physical Damage: ARC. Raceway locations include the following:
      a. Loading dock.
      b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
      c. Mechanical rooms.
      d. Gymnasiums.

5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
6. Damp or Wet Locations: ARC unless otherwise noted.
7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4X stainless steel in institutional and commercial kitchens and damp or wet locations, unless otherwise noted.
8. Corrosive environments (i.e. hypochlorite storage area): Type EPC-80-PVC

C. Minimum Raceway Size: 3/4-inch (21-mm) trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.
1. Rigid Steel Conduit: Use threaded rigid conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. PVC Externally Coated, Rigid Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
3. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20. Insulated grounding bushings where applicable.

E. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.

F. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

G. Install surface raceways only where indicated on Drawings.

H. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F (49 deg C).

3.02 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

B. 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.

C. Complete raceway installation before starting conductor installation.

D. Arrange stub-ups so curved portions of bends are not visible above finished slab.

E. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches (300 mm) of changes in direction.

F. Support conduit within 12 inches (300 mm) of enclosures to which attached.

G. Raceways Embedded in Slabs:
   1. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot (3-m) intervals.
   2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
   3. Arrange raceways to keep a minimum of 3 inches of concrete cover in all directions.
   4. Do not embed threadless fittings in concrete unless specifically approved by ENGINEER for each specific location.
   5. Some authorities having jurisdiction may not permit nonmetallic tubing in fire- rated slabs in subparagraph below.
   6. Change from ENT to ARC before rising above floor.

H. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

I. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.

J. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch (35mm) trade size and insulated throat metal bushings on 1-1/2-inch (41-mm) trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

K. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

L. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

M. Cut conduit perpendicular to the length. For conduits 2-inch (53-mm) trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

N. Install pull wires 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 wire. Clean and cap underground raceways designated as spare above grade alongside raceways in use.

O. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish like that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.

P. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
   1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
   2. Where an underground raceway enters a building or structure.
   3. Where otherwise required by NFPA 70.

Q. Comply with manufacturer's written instructions for solvent welding RNC and fittings.

R. Expansion-Joint Fittings:
   1. Provide expansion joint fitting any time conduit systems cross building expansion joints or structural expansion joints.
   2. Provide expansion fittings as recommended by the manufacturer of the conduit.
   3. Provide expansion fittings per NFPA 70.
   4. Formula in first subparagraph below provides about 15 percent safety factor (extra expansion-contraction capability).
   5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

S. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches (1830 mm) of flexible conduit for recessed and semi-recessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
   1. Use LFMC in damp or wet locations subject to severe physical damage.
   2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.

3. Provide a separate ground jumper for all liquid tight flexible power level conduits runs utilizing insulated grounding bushings sized as follows:
   a. ¾" to 1" conduit - #12 AWG insulated ground
   b. 1 ¼" to 2" conduit - #8 AWG insulated ground
   c. 2 ½" to 6" conduit - #4 AWG insulated ground

T. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.

U. Provide a flat surface for a raintight connection between boxes and cover plate or supported equipment and box.

V. Horizontally separate boxes mounted on opposite sides of walls, so they are not in the same vertical channel.

W. Locate boxes so that cover or plate will not span different building finishes.

X. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

Y. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

Z. Set metal floor boxes level and flush with finished floor surface.

AA. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.03 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:
   1. Excavate trench bottom to provide firm and uniform support for conduit.
   2. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches (300 mm) of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction per 95 percent modified proctor density.
   3. Install manufactured rigid conduit elbows for stub-ups at poles and equipment and at building entrances through floor. Wrap conduit with 2 coats of 3M Scotch Wrap or Approved Equal.

a. Couple conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches (75 mm) of concrete for a minimum of 12 inches (300 mm) on each side of the coupling.
b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend conduit horizontally a minimum of 60 inches (1500 mm) from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.

4. Underground Warning Tape: Comply with requirements in Section 16075 "Identification for Electrical Systems."

3.04 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 16131 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.05 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.
1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 16130

SECTION 16131

SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including the ECUA Engineering Manual Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
   2. Sleeve-seal systems.
   3. Sleeve-seal fittings.
   4. Grout.
   5. Silicone sealants.

B. Related Requirements:
   1. For penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items, use UL listed assemblies for the type and installation applied.

1.03 ACTION SUBMITTALS

A. Submit the following:
   1. Product data: for each type of product

PART 2 – PRODUCTS

2.01 SLEEVES

A. Wall Sleeves:
   1. Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.

B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized sheet; 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

C. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40. (For use with grounding electrode conductors only.)

D. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.

E. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

F. Sleeves for Rectangular Openings:
   1. Material: Galvanized.
   2. Minimum Metal Thickness:
      a. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and with no side larger than 16 inches (400 mm), thickness shall be
      0.052 inch (1.3 mm).
      b. For sleeve cross-section rectangle perimeter 50 inches (1270 mm) or more and one or more sides larger than 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

2.02 SLEEVE-SEAL SYSTEMS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Advance Products & Systems, Inc.
      b. CALPICO, Inc.
      c. Metraflex Company (The).
      d. Pipeline Seal and Insulator, Inc.
      e. Proco Products, Inc.
      f. or Approved Equal.
   2. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
   3. Pressure Plates: Stainless steel.
   4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.03 SLEEVE-SEAL FITTINGS

A. Description: Manufactured plastic, sleeve-type, water stop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber water stop collar with center opening to match piping OD.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Presealed Systems.
      b. or Approved Equal.

2.04 GROUT

A. Description: Nonshrink; recommended for interior and exterior sealing openings

in non-fire-rated walls or floors.

B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

2.05 SILICONE SEALANTS

A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.
   1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.

B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

PART 3 – EXECUTION

3.01 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

A. Comply with NECA 1.

B. Comply with NEMA VE 2 for cable tray and cable penetrations.

C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:
   1. Interior Penetrations of Non-Fire-Rated Walls and Floors:
      a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 07900 "Joint Sealants."
      b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall, so no voids remain. Tool exposed surfaces smooth; protect material while curing.
   2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
   3. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed or unless seismic criteria require different clearance.
   4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.

5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level. Install sleeves during erection of floors.

D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:
   1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
   2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.

E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe 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.

G. Underground, Exterior-Wall and Floor Penetrations: Install steel pipe sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

3.02 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.

B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.03 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position water stop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal the space around outside of sleeve-seal fittings.

END OF SECTION 16131

SECTION 16289

LOW-VOLTAGE SURGE PROTECTION

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes field-mounted SPDs for low-voltage (120 to 600 V) power distribution and control equipment.

B. Related Requirements:
   1. Section 16441 "Panelboards" for factory installed SPDs.

1.03 DEFINITIONS

A. In: Nominal discharge current.

B. MCOV: Maximum continuous operating voltage.

C. Mode(s), also Modes of Protection: The pair of electrical connections where the VPR applies.

D. MOV: Metal-oxide varistor; an electronic component with a significant non-ohmic current-voltage characteristic.

D. OCPD: Overcurrent protective device.

E. SCCR: Short-circuit current rating.

F. SPD: Surge protective device.

G. VPR: Voltage protection rating.

1.04 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
   2. Copy of UL Category Code VZCA certification, as a minimum, listing the tested values for VPRs, I nominal ratings, MCOVs, type designations,

OCPD requirements, model numbers, system voltages, and modes of protection.

1.05 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

B. Sample Warranty: For manufacturer's special warranty.

1.06 CLOSUEOUT SUBMITTALS

A. Maintenance Data: For SPDs to include in maintenance manuals.

1.07 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to replace or replace SPDs that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: Five years from date of Substantial Completion.

1.08 MANUFACTURERS

A. Subject to compliance with requirements, provide products by one of the following:
   1. Surge Suppression, Inc.
   2. Phoenix Contact
   3. Or Engineer Approved Equal

PART 2 – PRODUCTS

2.01 GENERAL SPD REQUIREMENTS

A. SPD with Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

C. All Surge Protective Devices (SPDs) shall be tested and listed to the latest edition of ANSI/UL 1449-2006. “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

D. MCOV of the SPD shall be the nominal system voltage.

E. SPD units shall be UL 1283 Listed as an Electromagnetic Interference Filter and

marked accordingly.

F. Provide SPDs with the following modes of protection:
   1. Three-Phase, Four Wire systems: 10 Modes: L1-L2, L2-L3, L3-L1, L1-N, L2-N, L3-N, L1-G, L2-G, L3-G, N-G
   2. Three-Phase, Three Wire systems: 6 Modes: L1-L2, L2-L3, L3-L1, L1-G, L2-G, L3-G
   3. Single-Phase, Three Wire Systems: 6 Modes: L1-L2, L2-N, N-L1, L1-G, L2-G, N-G

2.02 SERVICE ENTRANCE AND TRANSFER SWITCH SUPPRESSOR

A. SPDs: Listed under UL 1449, Type 1.
   1. SPDs with the following features and accessories:
      a. Integral disconnect switch and overcurrent protection.
      b. Internal thermal protection that disconnects the SPD before damaging internal suppressor components.
      c. Indicator light display for protection status.
      d. Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of protection status.
      e. Digital Display Surge counter that counts the number of surges the device has experienced since installation.
      f. Audible alarm

B. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than 240kA. The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in each mode.

C. Protection modes and UL 1449 VPR for grounded wye circuits with 480Y/277 V, 208Y/120 V or 240/120 V, three-phase, four-wire circuits shall not exceed the following:
   1. Line to Neutral: 1200 V for 480Y/277 V; 700 V for 208Y/120 & 240/120 V.
   2. Line to Ground: 1200 V for 480Y/277 V; 1200 V for 208Y/120 & 240/120 V.
   3. Line to Line: 2000 V for 480Y/277 V 1000 V for 208Y/120 & 240/120 V.

D. Protection modes and UL 1449 VPR for 240/120 V, single-phase, three-wire circuits shall not exceed the following:
   1. Line to Neutral: 700 V.
   2. Line to Ground: 1000
   3. Line to Line: 1000 V.

E. SCCR: Equal or exceed 200 kAIC.

F. Nominal Discharge Current (In) Rating: 20 kA.

2.03 SWITCHBOARD, PANELBOARD AND MCC SUPPRESSORS

A. SPDs: Comply with UL 1449, Type 2.
   1. Include LED indicator lights for power and protection status.
   2. Internal thermal protection that disconnects the SPD before damaging internal suppressor components.
   3. Include Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of protection status

B. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than 100 kA. The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in each mode.

C. Protection modes and UL 1449 VPR for grounded wye circuits with, three-phase, four-wire circuits shall not exceed the following:
   1. Line to Neutral: 1200 V for 480Y/277 V or 700 V for 208Y/120 V & 240/120 V.
   2. Line to Ground: 1200 V for 480Y/277 V or 700 V for 208Y/120 V & 240/120 V.
   3. Neutral to Ground: 1200 V for 480Y/277 V or 700 V for 208Y/120 V & 240/120 V.
   4. Line to Line: 2000 V for 480Y/277 V or 1200 V for 208Y/120 V & 240/120 V.

D. Protection modes and UL 1449 VPR for 240/120-V, single-phase, three-wire circuits shall not exceed the following:
   1. Line to Neutral: 600V.
   2. Line to Ground: 600V.
   3. Neutral to Ground: 600V.
   4. Line to Line: 1000V.

E. SCCR: Equal or exceed 100K AIC min or per the one-line diagram

F. Nominal Discharge Current (In) Rating: 20 kA

G. Sinewave Tracking/Frequency Responsive Capability.
   1. SPDs installed to protect Switchboards, Panelboards or MCCs serving sensitive electronic equipment shall utilize voltage independent, frequency responsive dedicated Sinewave Tracking circuitry to mitigate the effects

of switching or ringing surges.

a. Sensitive Electronic Equipment shall include, but is not limited to:
   1) Variable Frequency Controllers
   2) Lighting with Electronic Ballasts

2. EMI/RFI filtering specifically will not be considered as equal to sinewave tracking.
3. Devices with Sinewave Tracking circuitry shall be tested in accordance with the latest edition of IEEE C62.41.2 for a Category A Ring Wave (2000 volt – 67-amp ring wave)
   a. The maximum amplitude shall be less than 50V peak deviation from the insertion point of the surge on the sine wave to the peak of the transient.

2.04 ENCLOSURES

A. Indoor Enclosures: NEMA 250, Type 1.

B. Outdoor Enclosures: NEMA 250, Type 4X.

2.05 CONDUCTORS AND CABLES

A. Power Wiring: Same size as SPD leads, complying with Section 16120 "Low-Voltage Electrical Power Conductors and Cables."

PART 3 – EXECUTION

3.01 INSTALLATION

A. Comply with NECA 1.

B. Install an OCPD or disconnect as required to comply with the UL listing of the SPD. DO NOT WIRE DIRECT TO PANEL BUS

C. Install SPDs with conductors between suppressor and points of attachment as short and straight as possible and adjust circuit-breaker positions to achieve shortest and straightest leads. Do not splice and extend SPD leads unless specifically permitted by manufacturer. Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground.

D. Use crimped connectors and splices only. Wire nuts are unacceptable.

E. Wiring:
   1. Power Wiring: Comply with wiring methods in Section 16120 "Low-Voltage Electrical Power Conductors and Cables."

2. Controls: Comply with wiring methods in Section 16120 "Low-Voltage Electrical Power Conductors and Cables."

3.02 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative.
   1. Compare equipment nameplate data for compliance with Drawings and Specifications.
   2. Inspect anchorage, alignment, grounding, and clearances.
   3. Verify that electrical wiring installation complies with manufacturer's written installation requirements.

B. An SPD will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.03 STARTUP SERVICE

A. Complete startup checks according to manufacturer's written instructions.

B. Do not perform insulation-resistance tests of the distribution wiring equipment with SPDs installed. Disconnect SPDs before conducting insulation-resistance tests and reconnect them immediately after the testing is over.

C. Energize SPDs after power system has been energized, stabilized, and tested.

END OF SECTION 16289

SECTION 16410

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes:
   1. Molded Case Circuit Breakers (MCCBs)
   2. Non-fusible switches

1.03 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels. Coordinate with other disciplines to ensure installation does not impact constructability and meets installation requirements of the contract documents and manufacturer’s recommendations.

1.04 SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
   1. Enclosure types and details.
   2. Current and voltage ratings.
   3. Short-circuit current ratings (interrupting and withstand, as appropriate).
   4. Include evidence of NRTL listing for series rating of installed devices.
   5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
   6. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

B. Shop Drawings as follows:
   1. Plans, elevations, sections, details
   2. Wiring Diagrams: For power, signal, and control wiring.

C. Field quality-control reports.
   1. Test procedures used.
   2. Test results that comply with requirements.

3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

1.05 QUALITY ASSURANCE

A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with NFPA 70.

1.06 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
   1. Ambient Temperature: Not less than minus 22 deg F and not exceeding 110 deg F.
   2. Altitude: Not exceeding 3,300 feet.

1.07 WARRANTY

A. Manufacturer's Warranty:
   1. Warranty Period: One year from date of Substantial Completion. Manufacturer agrees to repair or replace equipment that fail in materials or workmanship within specified warranty period.

PART 2 – PRODUCTS

2.01 NON-FUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Square D; a brand of Schneider Electric.
   2. Engineer approved equal.

B. Type HD, Heavy Duty, Single Throw, 240 or 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Type HD, Heavy Duty, Double Throw, 240 or 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

D. Accessories: The switches shall include the following accessories where required.
   1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
   2. Neutral Kit: Internally mounted at the factory; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
   3. Isolated Ground Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
   4. Auxiliary Contact Kit: One NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.
   5. Hook stick Handle: Allows use of a hook stick to operate the handle.
   6. Lugs: Mechanical type, suitable for number, size, and conductor material.

2.02 MOLDED-CASE CIRCUIT BREAKERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
   2. Siemens Energy & Automation, Inc.
   3. Square D; a brand of Schneider Electric.

B. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents. Breaker shall be suitable for service entrance and shall be 100% rated.

C. Electronic Trip Circuit Breakers: Field-replaceable rating plug, rms sensing, with the following field-adjustable settings:
   1. Instantaneous trip.
   2. Long- and short-time pickup levels.
   3. Long- and short-time time adjustments.
   4. Ground-fault pickup level, time delay, and I^2t response.

D. Features and Accessories (provide only when shown on the drawings as required):
   1. Standard frame sizes, trip ratings, and number of poles.
   2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.

3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.
4. Ground-Fault Protection: Comply with UL 1053; integrally mounted, self-powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.
5. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.
6. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
7. Auxiliary Contacts: One SPDT switch with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
8. Alarm Switch: One normally open contact that operates only when circuit breaker has tripped.
9. Surge Protection: Furnish surge protection devices on the load side of the main service breaker in accordance with Section 16289 – Low Voltage Surge Protection. SPDs shall be factory wired and integral to the main service breaker enclosure.
10. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
11. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function.
12. Electrical Operator: Provide remote control for on, off, and reset operations.

2.03 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
   1. Indoor, Conditioned Dry and Clean Locations: NEMA Type 1.
      a. Line side shall be bottom entry.
      b. Load side shall be top entry.
   2. Outdoors: NEMA 4X SS
      a. No Top Entry

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

C. Install fuses in fusible devices.

D. Comply with NECA 1.

3.03 IDENTIFICATION

A. Comply with requirements in specification 16075 “Identification for Electrical Systems”.
   1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
   2. Label each enclosure with engraved metal or laminated-plastic nameplate.
   3. Service entrance equipment shall be labelled by the manufacturer or installation contractor with nominal system voltage, available fault current, OCPD clearing time, and date label was applied. Where arc flash labels are also applied, the required information can be distributed between the labels.

3.04 FIELD QUALITY CONTROL

A. Acceptance Testing Preparation:
   1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
   2. Test continuity of each circuit.

B. Tests and Inspections:
   1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. 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.
   3. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

C. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.05 ADJUSTING

A. Adjust moving parts and operable components to function smoothly and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges based on results of “Overcurrent Protective Devices Arc - Flash Study".

END OF SECTION 16410

SECTION 16441

PANELBOARDS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Distribution panelboards.
   2. Lighting and appliance branch-circuit panelboards.
   3. Electronic-grade panelboards.

1.03 DEFINITIONS

A. SVR: Suppressed voltage rating.

B. SPD: Surge Protection Device

1.04 ACTION SUBMITTALS

A. Product Data: For each type of panelboard, switching and overcurrent protective device, transient voltage suppression 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. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
   2. Detail enclosure types and details for types other than NEMA 250, Type 1.
   3. Detail bus configuration, current, and voltage ratings.
   4. Short-circuit current rating of panelboards and overcurrent protective devices.
   5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
   6. Include wiring diagrams for power, signal, and control wiring.

1.05 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Field Quality-Control Reports:
   1. Test procedures used.
   2. Test results that comply with requirements.

3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

C. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing indicating the connected load for each breaker in accordance with the NEC. Schedule to be typed and dated.

1.06 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. Include the following:
   1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
   2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

1.07 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Keys: Two spares for each type of panelboard cabinet lock.
   2. Circuit Breakers Including GFCI and Ground Fault Equipment Protection (GFEP) Types: Provide spare breakers as shown in the schedules on the drawings
   3. Fuses for Fused Switches: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
   4. Fuses for Fused Power-Circuit Devices: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.

1.08 QUALITY ASSURANCE

A. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with NEMA PB 1.

E. Comply with NFPA 70.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Store in accordance with the manufacturer's recommendations.

B. Handle and prepare panelboards for installation according to NEMA PB 1.

1.10 PROJECT CONDITIONS

A. Environmental Limitations:
   1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
   2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:
      a. Ambient Temperature: Not exceeding minus 22 deg F (minus 30 deg C) to plus 104 deg F (plus 40 deg C).
      b. Altitude: Not exceeding 6600 feet (2000 m).

B. Service Conditions: NEMA PB 1, usual service conditions, as follows:
   1. Ambient temperatures within limits specified.
   2. Altitude not exceeding 6600 feet (2000 m).

C. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by OWNER or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
   1. Notify ENGINEER and OWNER no fewer than 10 working days in advance of proposed interruption of electric service.
   2. Do not proceed with interruption of electric service without ENGINEER and OWNER's written permission.
   3. Comply with NFPA 70E.

1.11 COORDINATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork

requirements are specified with concrete.

1.12 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace surge protection devices that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS FOR PANELBOARDS

A. Enclosures: see plan sheet panel schedule for enclosure types and mounting.
   1. Provide rated enclosures as shown below unless otherwise indicated on plans:
      a. Indoor Dry and Clean Locations: NEMA, Type 1.
      b. Indoor Damp or Wet Locations: NEMA, Type 4X.
      c. Indoor Corrosive Locations: NEMA, Type 4X Fiberglass
      d. Outdoor Locations: NEMA, Type 4X
      e. Wash-Down Areas: NEMA, Type 4X 316 stainless steel
      f. Other Wet or Damp Indoor Locations: NEMA, Type 4X.
      g. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA, Type 12.
      h. For conditions not addressed above, provide rated enclosures for environmental conditions at installed locations.
   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.
   4. Skirt for Surface-Mounted Panelboards: Same gage and finish as panelboard front with flanges for attachment to panelboard, wall, and ceiling or floor.
   5. Gutter Extension and Barrier: Same gage and finish as panelboard enclosure; integral with enclosure body. Arrange to isolate individual panel sections.
   6. Finishes:
      a. Panels and Trim: Steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
      b. Back Boxes: Galvanized steel unless indicated otherwise on panel schedule.
      c. Fungus Proofing: Permanent fungicidal treatment for overcurrent protective devices and other components. (Only required with the relative humidity is above 90% and the electrical room or space is not conditioned.)
   7. Directory Card: Inside panelboard door, mounted in transparent card holder. All breaker text to be typed and dated. Directory card shall include the source

of supply to the panelboard. Directory card shall include typed contact information for the electrical CONTRACTOR.

B. Incoming Mains Location: Top or bottom per CONTRACTOR's installation method unless specifically indicated on the drawings.

C. Phase, Neutral, and Ground Buses:
1. Material: Hard-drawn copper, 98 percent conductivity.
2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
3. Isolated Ground Bus: Adequate for branch-circuit isolated ground conductors; insulated from box.
4. Neutral Bus: 100% of the phase bus capacity unless otherwise indicated.
5. Extra-Capacity Neutral Bus (when shown on the drawings): Neutral bus rated 200 percent of phase bus and UL listed as suitable for nonlinear loads.
6. Split Bus: Vertical buses divided into individual vertical sections.

D. Conductor Connectors: Suitable for use with conductor material and sizes.
1. Material: Hard-drawn copper, 98 percent conductivity.
2. Main and Neutral Lugs - Mechanical type.
3. Ground Lugs and Bus-Configured Terminators: Mechanical type.
4. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
5. Sub-feed (Double) Lugs: Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
6. Gutter-Tap Lugs: Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
7. Extra-Capacity Neutral Lugs: Rated 200 percent of phase lugs mounted on extra-capacity neutral bus.

E. Service Equipment Label: NRTL labeled for use as service equipment for panelboards with one or more main service disconnecting and overcurrent protective devices.

F. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

G. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short- circuit current available at terminals.

2.02 PERFORMANCE REQUIREMENTS

A. Surge Suppression: Factory installed as an integral part of indicated panelboards, complying with UL 1449 SPD Type 2. Provide SPD devices per Section 16289.

2.03 DISTRIBUTION PANELBOARDS

A. Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   1. Eaton
   2. Square D;
   3. Rockwell Automation

B. Panelboards: NEMA PB 1, power and feeder distribution type.

C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.
   1. For doors more than 36 inches (914 mm) high, provide two latches, keyed alike.

D. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.

E. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes larger than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

F. Branch Overcurrent Protective Devices: Fused switches.

2.04 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   1. Eaton
   2. Square D;
   3. Rockwell Automation

B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

C. Mains as shown on the drawings

D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

E. Doors: Provide Door-in-Door Construction with concealed hinges; secured with flush latch with tumbler lock; keyed alike.

F. Column-Type Panelboards: Narrow gutter extension, with cover, to overhead junction box equipped with ground and neutral terminal buses.

2.05 ELECTRONIC-GRADE PANELBOARDS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   1. Current Technology; a subsidiary of Danahar Corporation.
   2. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
   3. Liebert Corporation.
   4. Siemens Energy & Automation, Inc.
   5. Square D; a brand of Schneider Electric.

B. Panelboards: NEMA PB 1; with factory-installed, integral SPD; labeled by an NRTL for compliance with UL 67 after installing SPD.

C. Doors: Provide Door-in-Door Construction with Secured with vault-type latch with tumbler lock; keyed alike.

D. Main Overcurrent Protective Devices: Bolt-on thermal-magnetic circuit breakers.

E. Branch Overcurrent Protective Devices: Bolt-on thermal-magnetic circuit breakers.

F. Buses:
   1. Copper phase and neutral buses; 200 percent capacity neutral bus and lugs.
   2. Copper equipment and isolated ground buses.

2.06 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   1. Eaton
   2. Square D;
   3. Rockwell Automation

B. Molded-Case Circuit Breaker (MCCB): Comply with 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 magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
   2. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:
      a. Instantaneous trip.
      b. Long- and short-time pickup levels.
      c. Long- and short-time time adjustments.
      d. Ground-fault pickup level, time delay, and I squared x t response.
   3. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-

through ratings less than NEMA FU 1, RK-5.

4. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
5. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground- fault protection (30-mA trip).
6. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Comply with UL 1699; 120/240-V, single-pole configuration.
7. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:
   a. Standard frame sizes, trip ratings, and number of poles.
   b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
   c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high- intensity discharge (HID) lighting circuits.
   d. Ground-Fault Protection: Integrally mounted or Remote-mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
   e. Communication Capability: as shown on the controls drawings when specifically indicated.
   f. Shunt Trip: as shown on the drawings.
   g. Undervoltage Trip as shown on the drawings.
   h. Auxiliary Contacts: Where shown on the drawings, two SPDT switches with "a" and "b" contacts; "a" contact's mimic circuit-breaker contacts and "b" contacts operate in reverse of circuit-breaker contacts.
   i. Alarm Switch: Where shown on the drawings, single-pole, normally open contact that actuates only when circuit breaker trips.
   j. Key Interlock Kit: Where shown on the drawings, externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
   k. Zone-Selective Interlocking: Where shown on the drawings, integral with electronic trip unit; for interlocking ground-fault protection function with other upstream or downstream devices.
   l. Multipole units enclosed in a single housing or factory assembled to operate as a single unit.
   m. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in off position.
   n. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.

C. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.
   1. Fuses, and Spare-Fuse Cabinet: Comply with requirements specified in Section 16491 "Fuses."
   2. Fused Switch Features and Accessories: Standard ampere ratings and number

of poles.

3. Auxiliary Contacts: When shown on the drawings provide two normally open and normally closed contact(s) that operate with switch handle operation.

2.07 ACCESSORY COMPONENTS AND FEATURES

A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

B. Portable Test Set: For testing functions of solid-state trip devices without removing from panelboard. Include relay and meter test plugs suitable for testing panelboard meters and switchboard class relays.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Receive, inspect, handle, and store panelboards according to NEMA PB 1.1.

B. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.

C. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install panelboards and accessories according to NEMA PB 1.1.

B. Equipment Mounting:

C. Floor Mounted panelboards on concrete bases, 4-inch (100-mm) nominal thickness. Comply with requirements for concrete in the project specifications. If no concrete is specified use 3000 psi.

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 base.
2. For panelboards, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

a. Install anchor bolts to elevations required for proper attachment to panelboards.

4. Attach panelboard to the vertical finished or structural surface behind the panelboard.

D. Wall/Rack Mounted:
1. Mount to wall/rack using Unistrut with bolts/mounting hardware approved by the structural ENGINEER or architect.

E. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.

F. Mount panelboards such that the highest operator is less than 78” above finished floor.

G. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

H. Install overcurrent protective devices and controllers not already factory installed.
1. Set field-adjustable, circuit-breaker trip ranges.

I. Install filler plates in unused spaces.

J. Stub a minimum of four 1-inch (27-GRC) empty conduits but not less than 25% of the combined cross-sectional area of the all other live conduit from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub a minimum of four 1-inch (27-GRC) empty conduits but not less than 25% of the combined cross-sectional area of the all other live conduit into raised floor space or below slab not on grade. This is for recessed panelboards only.

K. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.

L. Comply with NECA 1.

3.03 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Section 16075 "Identification for Electrical Systems."

B. Create a directory to indicate installed circuit loads after balancing panelboard loads, incorporate Owner's final room designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 16075 "Identification for Electrical Systems."

D. Device Nameplates: Label each branch circuit device in distribution panelboards with a nameplate complying with requirements for identification specified in Section 16075 "Identification for Electrical Systems."

3.04 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. Perform tests and inspections.
   1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Acceptance Testing Preparation:
   1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
   2. Test continuity of each circuit.

D. Tests and Inspections:
   1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. 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.
   3. Perform the following infrared scan tests and inspections and prepare reports:
      a. Initial Infrared Scanning: After Substantial Completion, but not more than
         60 days after Final Acceptance, perform an infrared scan of each panelboard. Remove front panels so joints and connections are accessible to portable scanner.
      b. Instruments and Equipment:
         1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

E. Panelboards will be considered defective if they do not pass tests and inspections.

F. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.05 ADJUSTING

A. Adjust moving parts and operable component to function smoothly and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as specified in the "Overcurrent Protective Device Coordination Study."

C. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes.
   1. Measure as directed during period of normal system loading.
   2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
   3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.
   4. Tolerance: Difference exceeding 20 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.

3.06 PROTECTION

A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions.

END OF SECTION 16441

SECTION 335461

MOTOR FUEL EQUIPMENT AND ACCESSORIES

PART 1 GENERAL

1.01 SUMMARY

This section defines the requirements for the aboveground fuel storage tank and accessories.

1.02 GOVERNING STANDARDS

API: API RP 2003 (2008; 7th Ed) Protection Against Ignitions Arising out of Static, Lightning, and Stray Currents
API RP 540 (1999; R 2004) Electrical Installations in Petroleum Processing Plants

ASTM: ASTM A193/A193M (2012a) Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service and Other Special Purpose Applications
ASTM A194/A194M (2012) Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High-Pressure or High-Temperature Service

IEEE: IEEE 1100 (2005) Emerald Book IEEE Recommended Practice for Powering and Grounding Electronic Equipment
IEEE 142 (2007) Recommended Practice for Grounding of Industrial and Commercial Power Systems - IEEE Green Book

NEMA: NEMA 250 (2008) Enclosures for Electrical Equipment (1000 Volts Maximum)

NFPA: NFPA 30 (2012; Errata 2011; Errata 2011) Flammable and Combustible Liquids Code
NFPA 30A (2012; Errata 2011) Code for Motor Fuel Dispensing Facilities and Repair Garages
NFPA 70 (2011; Errata 2 2012) National Electrical Code

STI: STI 700-50-5007 (2010) Installation Instructions for Shop Fabricated Aboveground Tanks for Flammable, Combustible Liquids

UL: UL 142 (2006; Reprint Feb 2010) Steel Aboveground Tanks for Flammable and Combustible Liquids
UL 2085 (1997) Standard for Protected Aboveground Tanks for Flammable and Combustible Liquids

1.03 SUBMITTALS

Owner's Representative approval is required for all submittals. Submit the following in accordance with SUBMITTAL PROCEDURES listed in the Project Documents:

1. Product Data
   Aboveground Storage Tank
   Submersible Pumps
   Interstitial Leak Detection Monitoring System

Mechanical Clock Level Gauge
Remote Tank Fill Box
Pressure Vacuum Vent
Emergency Vents
Atmospheric Tank Vent
Fill Line Adapter and Cap
Emergency Break Shear Valve
Thermal Relief Valve Assembly Components
Overfill Prevention Valve
Fuel Dispensers
Dispenser Pedestal
Piping, Valves and Fittings
Fuel Hoses / Hose Retrievers / Breakaways
Fuel Nozzles
Tank Access Stairway

2. Test Reports
   Aboveground Storage Tank Tightness Tests
   Tank Manufacturer's Tests
   Tank Fill Tests

3. Certificates
   Contractor Qualifications
   Permitting
   Registration
   Licensed Personnel

4. Manufacturer's Instructions
   Aboveground Storage Tank
   Submersible Pumps
   Interstitial Leak Detection Monitoring System
   Mechanical Clock Level Gauge
   Remote Tank Fill Box
   Emergency Vents
   Pressure Vacuum Vent
   Atmospheric Tank Vent
   Fill Line Adapter and Cap
   Emergency Break Shear Valve
   Thermal Relief Valve Assembly Components
   Overfill Prevention Valve
   Fuel Dispensers
   Dispenser Pedestal
   Piping, Valves and Fittings
   Fuel Hoses / Hose Retrievers / Breakaways
   Fuel Nozzles

Tank Access Stairway

5. Operation and Maintenance Data
Aboveground Storage Tank
Submersible Pumps
Interstitial Leak Detection Monitoring System
Mechanical Clock Level Gauge
Remote Tank Fill Box
Emergency Vents
Pressure Vacuum Vent
Emergency Break Shear Valve
Thermal Relief Valve Assembly Components
Overfill Prevention Valve
Fuel Dispensers
Dispenser Pedestal
Piping, Valves and Fittings
Fuel Hoses / Hose Retrievers / Breakaways
Fuel Nozzles
Tank Access Stairway

1.04 QUALITY ASSURANCE

A. Contractor Qualifications

1. Each installation Contractor shall have successfully completed at least 3 projects of the same scope, and the same size or larger within the last 6 years, and demonstrated specific installation experience in regard to the specific system installation to be performed. Each installation Contractor shall have taken, if applicable, manufacturer's training courses on the installation of storage tanks and shall meet all applicable licensing requirements in the state. Submit a letter listing prior projects, the date of construction, a point of contact for each prior project, the scope of work of each prior project, and a detailed list of work performed. The letter shall also provide evidence of prior manufacturer's training, state licensing, and other related information.

B. Regulatory Requirements

1. Permitting: Obtain necessary permits in conjunction with the installation of the storage tank and appurtenances as required by federal, state, and/or local authority.

2. Registration: Obtain and complete all required tank registration forms required by federal, state, and local authorities. Submit all tank

registration forms within 30 days after contract award. The Contractor shall submit the forms to the proper regulatory agencies.

3. Licensed Personnel: Tank installers shall be licensed/certified by the State of Florida.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Handle, store, and protect equipment and materials to prevent damage before and during installation in accordance with the manufacturer's recommendations, and as approved by the Owner’s Representative. Replace damaged or defective items.

1.06 PROJECT/SITE CONDITIONS

A. Exposed moving parts, parts that produce high operating temperatures and pressures, parts that may be electrically energized, and parts that may be a hazard to operating personnel shall be insulated, fully enclosed, guarded, or fitted with other types of safety devices. Install safety devices so that proper operation of equipment is not impaired.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. General

1. Provide materials and equipment that are standard products of a manufacturer regularly engaged in the manufacturing of such products that are of a similar material, design and workmanship. Provide materials and equipment that have been in satisfactory commercial or industrial use for a minimum 2 years prior to bid opening. The 2 year period shall include applications of the equipment and materials under similar circumstances and of similar size. Provide materials and equipment that have been for sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2 year period.

B. Nameplates

1. Attach nameplates to all specified equipment defined herein. List on each nameplate the manufacturer's name, address, component type or style, model or serial number, catalog number, capacity or size, and the system that is controlled. Construct plates of stainless steel. Install nameplates in prominent locations with nonferrous screws,

nonferrous bolts, or permanent adhesive. Minimum size of nameplates shall be one by 2.5 inches. Lettering shall be the normal block style with a minimum 0.25 inch height. Accurately align all lettering on nameplates.

2.02 MATERIALS

A. Internal parts and components of equipment, piping, piping components, and valves that could be exposed to fuel during system operation shall not be constructed of zinc coated (galvanized) metal. Do not install cast iron bodied valves in piping systems that could be exposed to fuel during system operation.

2.03 ABOVEGROUND FUEL STORAGE TANK

A. Secondarily Contained Steel Tank
   1. Provide a factory-assembled storage tank with a capacity of 12,000 gallons for Diesel Fuel. The tank shall include a primary storage tank and an integral factory-fabricated secondary containment. Tank assembly shall be accordance with NFPA 30 and NFPA 30A and be designed and manufactured for a rectangular type tank installation. Storage tank shall comply with UL 2085. Primary tank shall be of factory-welded, steel construction that conforms to UL 142. Tank assembly shall have lifting lugs that allow tank relocation.

B. Tank Construction
   1. The primary steel tank shall be cylindrical in shape and have continuous welds on all exterior seams, manufactured in accordance with UL listing requirements and UL Standard 142. The primary steel tank shall have an emergency vent system as per NFPA 30 Code requirements. The tank shall have a thru-tank leak detector tube to allow for physical checkup and monitoring capability between the primary and the secondary containment. The tank shall be shop fabricated and tested in accordance with the UL listings. All openings shall be from the top only. All exposed metal must be coated to inhibit corrosion.

C. Electrical
   1. Tank gauging probe shall be designed for above ground storage tank applications and shall have performance characteristics permitting 0.1 gallons per hour or better in-tank leak test with continuous gauging accuracy of +/- 0.005 inches for product, +/- 0.001 for water. Probe shall be supplied with water detection and shall be UL approved for use in Class I, Division 1, Group C and D hazardous locations. Furnish and install tank gauging probes for the Underground Storage Tank. Probe shall be Veeder-Root Model 846391-3XX or approved equal.

2. Secondary containment leak sensors shall be designed for liquid detection of double wall tank interstitial spaces. Sensors shall include both wiring and sensor fault detection as a standard feature. Furnish and install secondary containment leak sensors for the interstitial space of the above ground storage tank. Non-discriminating steel tank interstitial sensor shall be Veeder-Root Model 794380-460 or approved equal.
3. The system shall be furnished with an overfill alarm and acknowledge switch utilizing a relay output for high product level. The overfill alarm and acknowledge switch shall be compatible with the liquid level and leak management system console. The overfill alarm and acknowledge switch shall have a built-in 0 to 60 second timer and a noise level from 78 to 103dB at 10 feet. Low level shall be 5%, high level shall be 90%.
4. Testing shall be performed to ensure console, probe, sensor, and alarm are all working satisfactorily. Training shall be given to owner and building personnel before project closeout for the tank level management system.

D. Warranty
1. The tank system shall have a warranty of 30 years.

E. Acceptable Manufacturers
1. Acceptable Tank Manufacturers
a. Convault
b. Highland Tank
c. Approved Equal

2.04 TANK PROTECTIVE COATINGS

A. Aboveground Tanks
1. Exterior surfaces and supports shall be coated with the factory applied coating system comprising of zinc rich primer, epoxy 2nd coat and polyurethane top coat, 8 mils minimum total coating system thickness. Color shall be white.
2. If a concrete encased tank is used, protect the exterior concrete surfaces of the aboveground tank with the manufacturer's standard coating system that shall resist weather and reflect sunlight. Tank exterior concrete color shall be white.

2.05 TANK COMPONENTS

A. Tank Manway
1. Tank manway shall have an internal diameter as indicated on the drawings. Provide each manway with a matching flanged watertight manway cover. Manway covers shall be UL listed, be constructed of pressed or mild steel, and include a UL listed gasket.

B. Tank Piping Penetrations
   1. Provide a welded-in-place double tapered National Pipe Thread (NPT) coupling for each tank piping connection.

C. Tank Striker/Impact Plates
   1. Provide an interior striker/impact plate under each tank manway and pipe connection. Each plate shall be a minimum of ¼ inch in thickness and be larger in diameter than the tank penetration. Each plate shall be welded to the tank bottom at the factory (full circumference connection).

D. Exterior Tank Stairway and Platform
   1. Provide OSHA Standard 1910.24 compliant exterior stairway and platforms to the dimensions shown on the drawings. Stairway frame shall be of square steel tube and channel all welded construction with 42” high rails around the platform. Stair treads shall consist of fiberglass safety grating 24” wide x 9-1/2” deep and slope at a 45 deg angle of climb in accordance with OSHA requirements. Finish shall be painted safety yellow.

E. Aboveground Tank Emergency Vents
   1. Vents for emergency venting of storage components and interstitial spaces shall be normally-closed, ul listed type that vents outward and upward. Vent shall conform to NFPA 30 and UL 142. Provide vent with cubic feet per minute (cfm) rating permanently labeled on the vent’s exterior.

2.06 TANK LEVEL GAUGING SYSTEMS

A. Tank Strapping Table
   1. Furnish 2 certified strapping tables (calibration charts) for each tank compartment. Tables shall indicate the liquid contents in gallons for each 1/16 inch of tank depth. Strapping tables shall be laminated. Provide an electronic media file for strapping tables.

B. Clock Level Gauge
   1. Gauge shall be the level sensing, mechanically actuated clock type that provides the tank level readout in a standard 12 hour clock face. Small hand represents feet and the large hand represents inches. Gauge shall be accurate to plus or minus 1/8 inch and shall measure the liquid level over the full range of a tank's height. Gauge shall have vapor tight seals up to 5 psi to prevent condensation from fogging the viewing glass.

2.07 SUBMERSIBLE PUMPS

A. Pump Type
   1. Provide rotary turbine, diaphragm, gear vane submersible pump to be mounted on the top of the fuel tank
   2. The pump shall be rated for 40 gpm.

3. Pump shall be 1.5 HP, 120V/230V / 1PH / 60Hz electrical service and shall be UL rated.

B. Pump Materials

1. All materials in contact with the liquid shall be compatible with diesel fuel and gasoline

2.08 TRANSFER PUMPS

A. Pump Type

1. Provide rotary, diaphragm, gear vane submersible pump to be mounted on the top of the fuel tank
2. The pump shall be rated for 300 gpm.
3. Pump shall be 3 HP, 230V / 1PH / 60Hz electrical service and shall be UL rated.

B. Pump Materials

1. All materials in contact with the liquid shall be compatible with diesel fuel and gasoline

2.09 FUEL DISPENSERS

A. Remote Fuel Dispenser

1. Provide a UL listed remote standalone fuel dispenser with all panels constructed of galvanized steel. Cabinet shall have powder coated finish. Dispenser shall be mounted atop a pedestal by same manufacturer.
2. Contractor shall provide a dispenser capable of supplying a minimum of 16 gpm from one 1” diameter hose. Hose length shall be a minimum of 15 ft. in length. Provide hose rated for diesel service at the length specified above with an OPW 11BP nozzle with locking device and automatic shut-off.
3. Provide 1-1/2” NPT inlet connections and 1” NPT discharge connections. Provide a 3/4” reducing bushing for gasoline discharge.
4. Provide lighted, non-computer mechanical register with power reset with interlock and non-resettable totalizer. Meter shall be micro-accurate 2-piston positive displacement type design. Provide 100:1 ratio pulsers to transmit electrical pulses for each register revolution for connection to the existing fuel inventory system. Fuel dispenser pulser output shall be compatible with existing fuel inventory system.
5. Electrical power shall be 120V / 1PH / 60Hz.

2.10 PIPING, VALVES AND FITTINGS

A. Steel Piping

1. Pipe shall be black steel, galvanized; seamless or electric resistance welded per ASTM A 53, Grade B, Schedule 40 pipe. Joining method shall be socket weld.
2. Fittings for steel pipe shall be forged, (socket welded or where indicated on Contract Drawings, threaded), 3,000-pound W.O.G., conforming to ASTM A105, Grade 2 and ASME B16.11.

B. Ball Valves
1. Ball valves shall be full port valves with brass body and capable of operating under a 600 PSIG non-shock working pressure. Valves shall be UL 842 listed. Ends shall be socket welded or threaded when within a containment box.

C. Check Valves
1. Check valves shall be socket welded or flanged type with brass body and nitrile composite gasket. Discs and seating rings shall be compatible with diesel fuel. The disc shall be guided and controlled to contact the entire seating surface.

2.11 TANK ACCESSORIES

A. Tank Accessories as Shown on Drawings
1. Interstitial Leak Detection Monitoring System
2. Tank Remote Fill Spill Boxes
3. Dispenser Pedestal
4. Atmospheric Tank Vent
5. Fill Line Adaptor and Cap
6. Overfill Prevention Valve
7. Emergency Shear Valve
8. Anti-Siphon Valve

2.12 EMERGENCY FUEL LOCKOUT/STOP SWITCH

A. Emergency Fuel Lockout/Stop switch shall be explosion-proof, weatherproof, mushroom type ,located a minimum of 20' and maximum of 100' from fuel dispensing islands or as shown on the plans shutting off all power to the fuel island. The switch shall be pole mounted five (5') feet above grade a minimum of 20' and a maximum of 100' from the dispenser at the location The sign shall be mounted above the switch reading: EMERGENCY FUEL SHUT-OFF SWITCH. The sign shall be 12" x 18" and letters shall be 2" tall, or approved equal. The sign shall be weather resistant.

2.13 SAFETY EQUIPMENT

A. A. Fire Extinguisher - The fire extinguisher shall be a 40-pound unit as manufactured by Walter Kidde and Company, to be pole or wall mounted

with suitable plated steel strap hardware so as not to be greater than 5' above finished grade to the base of the holder.

B. B. Provide Authorities having jurisdiction approved warning signs and dispenser operating instructions in fuel dispensing areas. Signs shall include:

1. EMERGENCY FUEL SHUT-OFF SWITCH (as described in Section 2.12)
2.

NO SMOKING
NO CELL PHONE USE
TURN ENGINE OFF
DO NOT TOP OFF
DO NOT PUMP FUEL DURING FUEL DELIVERIES
IN CASE OF SPILLS CALL
(XXX-XXX-XXXX)

2.14 OTHER ACCESSORIES

A. Concrete Anchor Bolts
   1. Concrete anchors shall be stainless steel

B. Bolts and Studs
   1. Bolts and studs shall be stainless steel and conform to AST A193/A193M, Grade 8.

C. Nuts
   1. Nuts shall be stainless steel and conform to ASTM A194/A194M, Grade 8.

D. Washers
   1. Provide flat, circular stainless steel washers under each bolt head and each nut. Stainless steel washers shall conform to ASTM A194/A194M, Grade 8.

E. Thread Sealant
   1. Utilize “FASSEAL-ATS” GASOILA pipe compound manufactured by Federal Process Co., Cleveland, Ohio, or approved equal.

2.15 FINISHES

A. Protective Coating
   1. Unless otherwise specified, provide equipment and components fabricated from ferrous metal with the manufacturer's standard factory finish. For equipment and component surfaces subject to temperatures above 120 degrees F, the factory coating shall be appropriately designed for the temperature service.
   2. Exterior Surfaces: Furnish and install factory applied coating system comprising of zinc rich primer, epoxy 2nd coat and polyurethane top coat, 8 mils minimum total coating system thickness. Color shall be white

PART 3 EXECUTION

3.01 INSTALLATION

A. Install the Work of this section in accordance with the item manufacturer's printed installation instructions, unless otherwise shown or specified.

B. Install work so that parts requiring periodic inspection, operation, maintenance, and repair are readily accessible. Handle storage tank with extreme care to prevent damage during placement and install in accordance with the manufacturer's installation instructions and NFPA 30 or NFPA 30A, as applicable. Inspect the exterior surface of the tank for obvious visual damage prior to and during the placement of each storage tank. Repair surface damage to storage tank according to manufacturer's requirements before proceeding with the system installation.

3.02 FUEL STORAGE TANK

A. Tank Handling: Store, handle, and place tanks with care and in a manner that will minimize damage to tanks and protective exterior coating. Place tanks in position carefully and with a minimum of handling. Maintain standoff distances from buildings and other structures as indicated on drawings. Repair any damaged tank coating in accordance with the appropriate UL or STI standard.

3.03 TANK ACCESSORIES

A. Properly level, align, and secure equipment in place in accordance with manufacturer's instructions. Provide supports for equipment, appurtenances, and pipe as required. Install anchors, bolts, nuts, washers, and screws where required for securing the work in place. Sizes, types, and spacing's of anchors and bolts not indicated or specified shall be as required for proper installation and operation.

3.04 FIELD QUALITY CONTROL AND CONNECTION PLAN

A. Pressure test tanks in accordance with the following:

1. Pressure test the primary compartment of the aboveground tank and interstitial space with air to a pressure stipulated by the tank manufacturer for a minimum of 60 minutes.
2. Repair leaks.
3. Retest until no leaks are detected.

B. Field Testing Leak, Level and Overfill Monitoring System:

1. Conduct field testing as per manufacturer’s recommendations.
2. Perform tests to demonstrate ability of system to detect leaks, annunciate alarms including overfill.

C. Pipe Tightness Testing

1. Hydrostatically test piping system to either 150% of working pressure for 60 minutes. All piping found leaking shall be repaired or replaced. Perform tests on piping in strict accordance with manufacturer's recommendations and other applicable code requirements.

D. Emergency Fuel Shut-Off Testing

1. Perform tests to demonstrate ability of system to shut off operations of all fueling equipment.

E. Fuel Dispenser Testing

1. Conduct field testing as per manufacturer’s recommendations.

2. Perform tests to demonstrate operability of fuel dispensing system.

F. Tank Fill Tests

1. For the tank fill tests, fill each storage tank with fuel in order to verify that the tank overfill protection device functions as designed. Stop filling each tank immediately once the overfill devices operates. Do not overfill any storage tank more than the 90 percent level. Correct and retest any problems the overfill device until each operate as specified herein. During the tests, verify that all tank gauges are calibrated and operating appropriately.

3.05 FIELD PAINTING

A. Field paint all uncoated exposed steel surfaces with epoxy paint, minimum 8 mils DFT. Do not paint stainless steel and aluminum surfaces. Do not coat equipment or components provided with a complete factory coating. Prior to any field painting, clean surfaces to remove dust, dirt, rust, oil, and grease.

B. Exterior Surfaces: Furnish and install factory applied coating system comprising of zinc rich primer, epoxy 2nd coat and polyurethane topcoat, 8 mils minimum total coating system thickness. Color shall be white

3.06 MANUFACTURER'S FIELD SERVICES

A. Furnish factory trained representative for 8 hours of on-site time during tanks installation.

B. Furnish factory trained representative of system supplier for 8 hours of on-site time during testing of leak/level monitoring system for training of facility personnel.

RISK MANAGEMENT POLICY AND STANDARDS FOR AGREEMENTS, CONTRACTS AND LEASES

DEFINITIONS

The following definitions apply to these Risk Management Provisions:

Contract - The contract or agreement of which these Risk Management Provisions are a part for the construction, alteration, repair, or demolition of a structure or facility.

Organization - The Emerald Coast Utilities Authority, an independent Special District created by the Laws of Florida, its Board, officers, employees, volunteers, representatives, and agents.

Other Party - The other party to the Contract of which these Risk Management Provisions are a part, any subsidiaries or affiliates, officers, employees, volunteers, representatives, agents, Contractors, and subcontractors.

HOLD HARMLESS

The Other Party agrees to hold the Organization and the members of its governing board and its other officers and employees harmless against all claims for bodily injury, sickness, disease, death, personal injury, or damage to property or loss of use resulting therefrom, arising out of or related to the Contract, to the extent such claims are caused by the negligence, recklessness, or intentional wrongful misconduct of the Other Party and persons or entities employed or utilized by the Other Party in the performance of the Contract.

PAYMENT ON BEHALF OF ORGANIZATION

The Other Party agrees to pay on behalf of the Organization all claims described in the above "Hold Harmless" paragraph, and to pay the reasonable costs and fees of the attorneys selected by the Organization, at trial and on appeal, to defend the Organization and its officers and employees against such claims. Provided, however, that the total liability of the Other Party to the Organization under the above "Hold Harmless" paragraph and this "Payment on Behalf of Organization" paragraph shall not exceed the sum of One Million Dollars ($1,000,000) per claim or occurrence.

Such payment on behalf of the Organization shall be in addition to any and all other legal remedies available to the Organization and shall not be considered to the exclusive remedy of the Organization.

LOSS CONTROLS/SAFETY

Precaution shall be exercised at all times by the Other Party for the protection of all persons, including employees, and property. The Other Party shall comply with all laws, regulations, or ordinances relating to safety and health, and shall make special effort to detect hazardous

conditions and shall take prompt action where loss control/safety measures should reasonably be expected.

The Organization may order work to be stopped if conditions exist that present immediate danger to persons or property. The Other party acknowledges that such stoppage will not shift responsibility for any loss or damages from the Other Party to the Organization.

SEVERABILITY

The provisions of these Risk Management Provisions are severable. In the event a court of competent jurisdiction should declare any provision of these Risk Management Provisions to be void or contrary to public policy such provision shall be stricken from these Risk Management Provisions, and the remaining provisions shall be enforced as though the provision determined to be void or contrary to public policy had not been included herein.

INSURANCE - BASIC COVERAGES REQUIRED

The Other Party shall procure and maintain the following described insurance, except for coverages specifically waived by the Organization, on policies and with insurers acceptable to the Organization. These insurers shall have A.M. Best (or equivalent) rating of no less than A:VII unless otherwise agreed to by the Organization.

These insurance requirements shall not limit the liability of the Other Party. The Organization does not represent these types or amounts of insurance to be sufficient or adequate to protect the Other Party's interests or liabilities, but are merely minimums.

Except for workers compensation, the Other Party waives its right of recovery against the Organization, to the extent permitted by its insurance policies.

The Other Party's deductibles/self-insured retentions shall be disclosed to the Organization and may be disapproved by the Organization. They shall be reduced or eliminated at the option of the Organization. The Other Party is responsible for the amount of any deductible or self-insured retention.

Insurance required of the Other Party or any other insurance of the Other Party shall be considered primary, and insurance of the Organization, if any, shall be considered excess, as may be applicable to claims which arise out of the Hold Harmless, Payment on Behalf of Organization, Insurance, Certificates of Insurance and any Additional Insurance provisions of this agreement, contract or lease.

Additional Insured

Except for workers compensation and professional liability, the Other Party's insurance policies shall be endorsed to name the Organization as an additional insured for "bodily injury", "property damage" or "personal and advertising injury" caused, in whole or in part, by the Other Party's acts or omissions; or the acts or omissions of those acting on the Other Party's behalf; in the performance of the Other Party's ongoing operations for the Organization. The preferred Commercial General Liability coverage endorsement is ISO Form CG 20 10.

Workers Compensation Coverage

The Other Party shall purchase and maintain workers compensation insurance for all workers compensation obligations imposed by state law and employer's liability limits of at least $100,000 each accident and $100,000 each employee/$500,000 policy limit for disease.

The Other Party shall also purchase any other coverages required by law for the benefit of employees.

General, Automobile and Excess or Umbrella Liability Coverage

The Other Party shall purchase and maintain coverage on forms no more restrictive than the latest editions of the Commercial General Liability and Business Auto policies of the Insurance Services Office.

Minimum limits of $1,000,000 per occurrence for all liability must be provided, with excess or umbrella insurance making up the difference, if any, between the policy limits of underlying policies (including employers liability required in the Workers Compensation Coverage section) and the total amount of coverage required.

Commercial General Liability Coverage - Occurrence Form Required

Coverage A shall include bodily injury and property damage liability for premises, operations, products and completed operations, independent Contractors, contractual liability covering this agreement, contract or lease, broad form property damage, and property damage resulting from explosion, collapse or underground (x,c,u) exposures.

Coverage B shall include personal injury.

Coverage C, medical payments, is not required.

The Other Party is required to continue to purchase products and completed operations coverage, at least to satisfy this agreement, contract or lease, for a minimum of three years beyond the Organization's acceptance of renovation or construction projects.

Business Auto Liability Coverage

Business Auto Liability coverage is to include bodily injury and property damage arising out of ownership, maintenance or use of any auto, including owned, nonowned and hired automobiles and employee nonownership use.

Excess or Umbrella Liability Coverage

Umbrella Liability insurance is preferred, but an Excess Liability equivalent may be allowed. Whichever type of coverage is provided, it should be at least "following form" and shall not be more restrictive than the underlying insurance policy coverages.

EVIDENCE/CERTIFICATES OF INSURANCE

Required insurance shall be documented in Certificates of Insurance, including indication that the policy(s) is endorsed to provide the Organization at least 30 days in advance notice of cancellation, nonrenewal or adverse change.

New Certificates of Insurance are to be provided to the Organization at least 15 days prior to coverage renewals.

If requested by the Organization, the Other Party shall furnish complete copies of the Other Party's insurance policies, forms and endorsements.

For Commercial General Liability coverage the Other Party shall, at the option of the Organization, provide an indication of the amount of claims payments or reserves chargeable to the aggregate amount of liability coverage.

Receipt of certificates or other documentation of insurance or policies or copies of policies by the Organization, or by any of its representatives, which indicate less coverage than required does not constitute a waiver of the Other Party's obligation to fulfill the insurance requirements herein.

ADDITIONAL INSURANCE

If checked below, the Organization requires the following additional types of insurance.

☒ **Pollution/Environmental Impairment Liability Coverage**

Pollution/environmental impairment liability insurance is to be purchased to cover pollution and/or environmental impairment which may arise from this agreement or contract. The recommended minimum coverage is $1,000,000. The coverage period shall be extended beyond the date of the completed project, until the expiration date of the performance bond.

EMERALD COAST UTILITIES AUTHORITY

GENERAL PROVISIONS

PURCHASE ORDER/CONTRACT

1. Supplies are of domestic origin unless indicated by bidder. This request does not commit Emerald Coast Utilities Authority to pay any cost incurred in the preparation or submission of this quotation or to procure or contract for supplies or services.

2. DELIVERY, INSPECTION AND ACCEPTANCE – Delivery, inspection and acceptance will be at destination unless otherwise provided. Until delivery and acceptance and after any rejections, risk of loss will be on the Contractor unless loss results from negligence of ECUA. Notwithstanding the requirements for any ECUA inspection and test contained in specifications applicable to this contract, except where specialized inspections or tests are specified for performance solely by ECUA, the Contractor shall perform or have performed the inspections and tests required to substantiate that the supplies and services provided under the contract conform to the drawings, specifications, and contract requirement listed herein, including if applicable, the technical requirements for the manufacturer's part numbers specified herein.

3. ENTIRE AGREEMENT – The terms, specifications and drawings included in this order when duly executed constitute the entire agreement between the parties unless otherwise stated on the face of the order. No modification or waiver of terms of this agreement shall be binding unless in writing signed by a duly authorized representative of ECUA and confirmed by such a representative of the Vendor. This agreement shall be interpreted in accordance with the laws of the State of Florida.

4. DELIVERY OF EXCESS QUANTITIES OF $100 OR LESS – The Contractor is responsible for the delivery of each item quantity; within allowable variations, if any. If the Contractor delivers and ECUA receives quantities of any item in excess of the quantity called for (after considering any allowable variation in quantity) such excess quantities will be treated as being delivered for the convenience of the Contractor. ECUA may retain such excess quantities up to $100 in value without compensating the interests therein. Quantities in excess of $100 will, at the option of ECUA, either be returned at the Contractor's expense or retained and paid for by ECUA at the contract unit price. DELIVERIES In the event of failure to deliver material of the quality or within the time specified, ECUA may cancel order and buy elsewhere. Failure of ECUA to exercise this option with respect to any installment shall not be deemed a waiver with respect to future installments, if any.

5. DELIVERY TICKETS – All shipments under this agreement shall be accompanied with delivery tickets, or sales slips, in triplicate, which shall contain the following minimum information: a] Name of supplier; b] Blanket Purchase Order/Contract number; c] Date of call; d] Call number; e] Itemized list of supplies or services furnished; f] Quantity, unit price and extension of each item, less applicable discounts (unit price and extensions need not be shown when incompatible with the use of automated systems, provided that the invoice is

itemized to show this information); and g] Date of delivery or shipment. Upon delivery, the receiving office will retain one copy of the related delivery ticket and will sign the other two copies and return them to the supplier or his/her agent. One of these copies may subsequently be required to support the invoice.

6. PAYMENTS –Invoices shall be submitted in triplicate (one copy shall be marked "Original") unless otherwise specified and shall contain the following information: a] Contract or Order number b] Item number c] contract description of supplies or services d] sizes e] quantities f] unit prices and g] extended totals. Bill of Lading number and weight of shipment will be shown for shipments of Bills of Lading. Unless otherwise specified, payment will be made on partial deliveries accepted by ECUA when the amount due on such deliveries so warrants.

7. DISCOUNTS – In connection with any discount offered, time will be computed from date of delivery suppliers to carrier when acceptance is at the point of origin or from date of delivery at destination when delivery and acceptance are at these points or from the date the correct invoice or voucher is received in the office specified by ECUA, if the latter is later than date of delivery. Payment is deemed to be made for the purpose of earning the discount on the date of mailing of the ECUA check.

8. CONVICT LABOR – In connection with the performance of work under this contract, the Contractor agrees not to employ any person undergoing sentence of imprisonment except as provided by Public Law 89.176, September 10, 1965 (18 U.S.C. 40821 ch21) Executive Order 11755, December 29, 1973.

9. COVENANT AGAINST CONTINGENT FEES – The Contractor warrants that no person or selling agency has been employed or retained to solicit or secure this contract upon agreement or understanding for a commission, percentage, brokerage, or contingent fee, excepting bona fide employees or bona fide established commercial or selling agencies maintained by the Contractor for the purpose of securing business. For breach or violation of this warranty ECUA shall have the right to annul this contract without liability or in its discretion to deduct from the contract price or consideration or otherwise recover the full amount of such commission, percentage, brokerage, or contingent fee.

10. CONTINGENCIES – Neither party shall be liable for delays or defaults due to acts of God, government authority or public enemy, war, fires, floods, epidemics, strikes, labor troubles, freight embargoes, or contingencies reasonably beyond its control. The party so affected, upon prompt written notice to the other party, shall be excused from making or taking deliveries hereunder to the extent of such prevention or restriction. At ECUA's option, deliveries so omitted shall be made on notice thereof to the Vendor, upon cessation of such contingency even though such might have been operative at the date of this order.

11. GRATUITIES – (a) ECUA may, by written notice to the Contractor, terminate the right of the Contractor to proceed under this contract if it is found after notice and hearing by the Executive Director or his/her duly authorized representative, that gratuities (in the form of entertainment, gifts, or otherwise) were offered or given by the Contractor, or any agent or representative of the Contractor, to any officer or employee of ECUA with a view toward

securing a contract or securing favorable treatment with respect to the awarding or amending, or the making of any determinations with respect to the performing of such contract, provided, that the existence of the facts upon which the Executive Director or his/her duly authorized representative make such findings shall be in issue and may be reviewed in any competent court, (b) In the event this contract is terminated as provided in paragraph (a) hereof, ECUA shall be entitled 1] to pursue the same remedies against the Contractor as it could pursue in the event of a breach of the contract by the Contractor and 2] as a penalty and in addition to any other damages to which it may be entitled by law to exemplary damages in an amount (as determined by the Executive Director or his/her duly authorized representative) which shall be not less than three nor more than ten times the costs incurred by the Contractor in providing any such gratuities to any such officer or employee, (c) The rights and remedies of ECUA provided in this clause shall not be exclusive or in addition to any other rights and remedies provided by law or under the contract.

12. CONDITION FOR ASSIGNMENT – This Purchase Order/Contract shall not be assigned in full or in part without the written consent of ECUA. Such consent shall not relieve the Contractor from its obligations and liabilities.

13. GOVERNMENT REGULATIONS – Vendor warrants that all applicable laws and regulations of governmental authority, covering the production, sale and delivery of the materials specified herein, have complied with and shall indemnify and save ECUA harmless from and against any liability or loss resulting from Vendor's failure to do so.

14. TAXES – ECUA is exempt from Federal Taxes on transportation charges and any Federal Excise Tax, if you prepaid transportation do not pay tax as ECUA will not reimburse you for the taxes paid. ECUA is exempt from State Sales Tax.

15. CHANGES – The Purchasing and Stores Manager may at any time, by written order, and without notice to the sureties, make changes, within the general scope of this contract, in 1] drawings, designs, or specifications, where the supplies to be furnished are to be specially manufactured for ECUA in accordance therewith; 2] method of shipment or packing and 3] place of delivery. If any such change causes an increase or decrease in the cost of, or the time required for the performance of this contract, whether changed or not changed by any such order, an equitable adjustment shall be made by written modification of this contract. Any claim by the Contractor for adjustment under this clause must be asserted within 30 days from the date of receipt by the Contractor of the notification of change provided that the Purchasing and Stores Manager, if he/she decides that the facts justify such action, may receive and act upon any such claim asserted prior to final payment, under the contract. Failure to agree to any adjustment shall be a dispute concerning a question of fact within the meaning of the clause of this contract entitled "Disputes." However, nothing in this clause shall excuse the Contractor from proceeding with this contract as changed.

16. TERMINATION FOR DEFAULT – The Purchasing and Stores Manager, by written notice, may terminate this contract, in whole or in part, for failure of the Contractor to perform any of the provisions hereof, in such event, the Contractor shall be liable for damages; including the excess cost of reprocuring similar supplies or services; provided that if 1] it is determined

for any reason that the Contractor was not in default or 2] the Contractor's failure to perform is without his/her and his/her subcontractors control, fault or negligence, the termination shall be deemed to be a termination for convenience under paragraph 17. As used in this provision the term "subcontractor" and "subcontractors" means subcontractors at any tier.

17. TERMINATION FOR CONVENIENCE – The Purchasing and Stores Manager by written notice, may terminate this contract, in whole or in part, when it is in the best interest of ECUA. If this contract is for supplies and is so terminated, the Contractor shall be compensated for goods delivered and accepted up to the date of termination at the discretion of the Executive Director. To the extent that this contract is for services and is so terminated, ECUA shall be liable only for payment in accordance with the payment provisions of this contract for services rendered prior to the effective date of termination.

18. ASSIGNMENT OF CLAIMS – Claims for monies due or to become due under this Contract shall be assigned only pursuant to the Assignment of Claims Act of 1940, as amended (31 U.S.C 203, 41 U.S.C. 15). However, payments to an assignee of monies under this contract shall not, to the extent provided in said Act, as amended, be subject to reduction or set-off (see Clause 12).

19. EXTENT OF OBLIGATION – ECUA is obligated under a call-type Purchase Order/Contract only to the extent of authorized calls actually placed against this agreement.

20. PRICING – The prices to ECUA for all purchases made under this Purchase Order/Contract shall be as low as or lower than those charged the suppliers most favored customer, in addition to any discounts for prompt payment.

21. WARRANTIES – In addition to all warranties, established by statute or common law or set forth elsewhere in this order, the Vendor expressly warrants that all material or services covered herein shall conform to all specifications, drawings, samples, and descriptions furnished or adopted by ECUA and shall be of the best quality and fit and sufficient for the purpose for which purchased, if specified hereon, merchantable of good material and workmanship, and free from all latent and patent defects. ECUA's failure to give notice to Vendor of any breach of warranty shall not discharge Vendor's liability. Without limiting the generality of the foregoing, Vendor agrees to be responsible for all defects in design, workmanship, and materials, which may become apparent within twenty four (24) months of receipt by ECUA.

22. PATENTS – Vendor shall protect and indemnify ECUA against all claims, Judgments, and expenses arising from infringement or any patent by any of the goods delivered hereunder. Vendor shall defend or settle at its own expense any proceeding brought against ECUA for such infringement provided Vendor is notified promptly of the commencement of such proceeding and is given authority, information and assistance by ECUA for the defense or settlement thereof.

23. INSTALLATION – If this order required the services of ECUA experts or employees of ECUA safety rules and fire regulations, Vendor assumes full responsibility for their acts and

omissions and agrees to save ECUA harmless from any claims arising therefrom and to accept exclusive liability for payroll and other taxes imposed upon the employer by law. Vendor will undertake to keep the materials and premises involved free from any lien whatever for materials and labor incident to the performance of Vendor's obligations hereunder. If Vendor furnishes materials and services for construction and improvement of realty and the installation of personality for a lump sum amount, Vendor agrees to furnish an analysis thereof as ECUA may reasonably require for accounting purposes. Vendor shall be solely responsible for materials furnished by ECUA on other than a charge basis in connection with this order.

24. ATTORNEY'S FEES – In the event of any dispute between the parties concerning the terms and provisions of this Purchase Order/Contract, the party prevailing in such dispute shall be entitled to collect from the other party all costs incurred in such dispute, including reasonable attorney's fees.

25. MERGER CLAUSE – This Purchase Order/Contract contains the entire understanding among the parties and supersedes any prior understandings and/or written or oral agreements among them respecting the within subject matter. There are no representations, agreements, arrangements, or understandings, oral or written, between or among the parties hereto relating to the subject matter hereof that are not fully expressed herein.

26. DEVIATION FROM SPECIFICATIONS – ECUA has the sole authority to determine if any deviation from the specifications cited is acceptable.

27. E-VERIFY COMPLIANCE – Pursuant to § 448.095(2) Florida Statutes (2020), Contractor shall register with and use the E-Verify system operated by the United States Department of Homeland Security to verify the work authorization status of all new employees hired by Contractor while performing work or providing services for Emerald Coast Utilities Authority (ECUA). Contractor shall also include in any related subcontracts a requirement that subcontractors performing work or providing services for ECUA on its behalf register with and use the E-Verify system to verify the work authorization status of all new employees hired by the subcontractor while performing work or providing services for ECUA. Additionally, Contractor shall include in any related subcontracts a requirement that subcontractors performing work or providing services for ECUA on its behalf provide Contractor with an affidavit stating that the subcontractor does not employ, contract with, or subcontract with any unauthorized alien as defined in 8 U.S.C. § 1324a(h)(3). Contractor shall maintain a copy of such affidavit for the duration of its contract with ECUA.

EMERALD COAST UTILITIES AUTHORITY
BID NUMBER: 2022-04
FUEL TANKS FOR CWRF (CENTRAL WATER RECLAMATION FACILITY) & SANITATION
BID FORM

TO: EMERALD COAST UTILITIES AUTHORITY DATE: _____
PENSACOLA, FLORIDA

Ladies and Gentlemen:

In accordance with your Invitation to Bid, instructions and specifications, attached hereto, and subject to all conditions thereof, I (we), the undersigned, hereby propose and agree if this bid is accepted, to contract with the Emerald Coast Utilities Authority to furnish any items or service requested herein and deliver same without additional cost to the Emerald Coast Utilities Authority at the specified location for the bid(s) listed below.

The undersigned further declares that he/she has carefully examined the specifications and is thoroughly familiar with them and their provision. He/She further declares that no other person other than the bidder herein named has any interest in this bid or in the contract to be executed, and that it is made without connection with any other person(s) making bids for the same articles, and it is in all respects fair and without collusion and fraud.

Failure to provide all of the following information may result in automatic rejection of bid.

Fuel Tank Installation for CWRF (Central Water Reclamation Facility), 2980 Old Chemstrand Road, Cantonment, FL 32533

$ _____

Fuel Tank Installation for Sanitation, 3050 Godwin Lane, Pensacola, FL 32526

$ _____

Total $ _____

EXCEPTIONS: YES_____ NO_____
(Exceptions include the whole bid document, our specifications, instructions to bidders and general provisions).

DELIVERY SCHEDULE:

_____
(FOB PENSACOLA)

PAYMENT TERMS:

_____
(NET 30 UNLESS DISCOUNT OFFERED)

VENDOR: _____

BY: _____
(PRINT OR TYPE)

SIGNATURE: _____

TITLE: _____

ADDRESS: _____

_____

_____

TELEPHONE: (___) _____

FAX NUMBER: (___) _____

EMAIL: _____

FEID NUMBER: _____

ACKNOWLEDGE RECEIPT OF ALL ADDENDA ISSUED (IF APPLICABLE):

NUMBER ___ DATED _____ NUMBER ___ DATED _____
NUMBER ___ DATED _____ NUMBER ___ DATED _____

IT IS ESSENTIAL THAT THE SUBMISSION INCLUDE THE FOLLOWING SIGNED FORMS.

EXECUTED ATTACHED FORMS:

____ BID FORM
____ EQUAL OPPORTUNITY FORM
____ CERTIFICATION OF NON-SEGREGATED FACILITIES FORM
____ DRUG-FREE WORKPLACE FORM
____ E-VERIFY FORM
____ BID BONDS

HOW DID YOU FIND OUT ABOUT THIS BID?

ECUA website _____ Escambia Sun Press _____ BidNet Direct _____

Other _____ (Please specify) _____

EQUAL OPPORTUNITY CLAUSE

During the performance of this contract, the Contractor agrees as follows:

(1) The Contractor will not discriminate against any employee or applicant for employment because of race, color, creed/religion, sex, national origin, disability/handicap, age, marital status, veteran status, or any other legally protected status. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, creed/religion, sex, national origin, disability/handicap, age, marital status, veteran status, or any other legally protected status. Such action shall include, but not be limited to the following: Employment, upgrading, demotion, or transfer, recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the contracting officer setting forth the provisions of this nondiscrimination clause.

(2) The Contractor will in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, creed/religion, sex, national origin, disability/handicap, age, marital status, veteran status, or any other legally protected status.

(3) The Contractor will send to each labor union or representative of workers which he has a collective bargaining agreement or other contract or understanding, a notice advising the labor union or workers' representative of the Contractor's commitments under Section 202 of Executive Order 11246 of September 24, 1965, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(4) In the event of the Contractor's noncompliance with the nondiscrimination clauses of this contract or with any of such rules, regulations, or orders, this contract may be cancelled, terminated or suspended in whole or in part and the Contractor may be declared ineligible for further contracts with the Emerald Coast Utilities Authority. Provided, however, that no such action shall be taken without prior notice to the Contractor and an opportunity for a hearing before the governing Board of the Emerald Coast Utilities Authority or its designee.

(5) The Contractor will include the provisions of paragraphs (1) through (4) in every subcontract or purchase order for an amount exceeding ten thousand dollars ($10,000) in any twelve 12) month period, so that such provisions will be binding upon each subcontractor or vendor.

_____ _____

Signature Date

_____

Name & Title of Signer

CERTIFICATION OF NON-SEGREGATED FACILITIES

By the submission of this bid, the bidder, offeror, applicant, or subcontractor certifies that he/she does not maintain or provide for his/her employees any segregated facilities at any of his/her establishments, and that he/she does not permit his/her employees to perform their services at any location under his/her control, where segregated facilities are maintained. He/she certifies further that he/she will not maintain or provide for his/her employees any segregated facilities at any of his/her establishments, and that he/she will not permit his/her employees to perform their services at any location, under his/her control, where segregated facilities are maintained. The bidder, offeror, applicant, or subcontractor agrees that a breach of this certification is a violation of the Equal Opportunity Clause in this contract. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, rest rooms and wash rooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive or are in fact segregated on the basis of race, color, creed/religion, national origin, age, marital status, or veteran status because of habit, local custom, or otherwise. He/she further agrees that (except where he/she has obtained identical certifications from proposed subcontractors for specific time periods) he/she will obtain identical certifications from proposed subcontractors prior to the award of subcontracts or purchase orders exceeding $10,000; that he/she will retain such certifications in his/her files and make them available to the Emerald Coast Utilities Authority upon request.

Provided, however, that such certifications shall not be required in the case of purchase orders or contracts which, in case of a Federal Government contract or subcontract, would be exempt from compliance with the Equal Opportunity Clause by 41 CFR S60-1.5. This section provides for the exemption of transactions not exceeding $10,000, contracts and subcontracts for indefinite quantities established not to exceed $10,000 in any contract year, contracts with certain educational institutions, work on or near Indian reservations, facilities (including, but not limited to, agencies, instrumentalities or subdivision of state or local government) which are separate and distinct from activities of the prime Contractor or subcontractor related to the performance of the contract or subcontract, and emergencies involving national security.

_____ _____

Signature Date

_____

Name & Title of Signer

DRUG-FREE WORKPLACE FORM

The undersigned vendor in accordance with Florida Statute 287.087 hereby certifies that _____ does:
(Name of Business)

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 bid 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 bid, 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 of Chapter 1893 or of any controlled substance law of the United States or any state, for a violation occurring in the workplace no later than five (5) days after such conviction.

5. Impose a sanction on, or require the satisfactory participation in a drug abuse assistance or rehabilitation program if such is available in the employee's community, by any employee who is so 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 the statement, I certify that this firm complies fully with the above requirements.

_____ _____
Bidder's Signature Date

Company:_____ Bid/RFP/PO:_____

E-VERIFY STATEMENT OF COMPLIANCE

Contractor hereby certifies compliance with the following:

Pursuant to § 448.095(2) Florida Statutes (2020), Contractor shall register with and use the E-Verify system operated by the United States Department of Homeland Security to verify the work authorization status of all new employees hired by Contractor while performing work or providing services for ECUA. Contractor shall also include in any related subcontracts a requirement that subcontractors performing work or providing services for ECUA on its behalf register with and use the E-Verify system to verify the work authorization status of all new employees hired by the subcontractor while performing work or providing services for ECUA. Additionally, Contractor shall include in any related subcontracts a requirement that subcontractors performing work or providing services for ECUA on its behalf provide Contractor with an affidavit stating that the subcontractor does not employ, contract with, or subcontract with any unauthorized alien as defined in 8 U.S.C. § 1324a(h)(3). Contractor shall maintain a copy of such affidavit for the duration of its contract with ECUA.

_____ _____

Bidder's Signature Date

Company:_____ Bid/RFP/PO:_____