Utility Electrical Projects 2018
Invitation for Bids # PSUT-18-06

General Information		
Project Cost Estimate	$950,000	See Section 1.4
Project Timeline	120 calendar days from NTP with an estimated start date of November 1, 2018	See Section 1.4
Evaluation of Proposals	Staff	See Section 1.6
Mandatory Pre-Bid Meeting	9:00 a.m. on August 23 2018 at the Public Services Building Large Conference Room, 8300 S. Palm Drive, Pembroke Pines, FL 33025	See Section 1.7
Question Due Date	August 25, 2018	See Section 1.7
Proposals will be accepted until	2:00 p.m., September 5 2018	See Section 1.7
5% Proposal Security / Bid Bond	Required	See Section 4.1
100% Payment and Performance Bonds	Required	See Section 4.2

THE CITY OF PEMBROKE PINES
PURCHASING DIVISION
8300 SOUTH PALM DRIVE
PEMBROKE PINES, FLORIDA 33025
(954) 518-9020

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SECTION 1 - INSTRUCTIONS

1.1 NOTICE

Notice is hereby given that the City Commission of the City of Pembroke Pines is seeking sealed proposals for:

IFB # PSUT-18-06
Utility Electrical Projects 2018

Solicitations may be obtained from the City of Pembroke Pines website at http://www.ppines.com/index.aspx?NID=667 and on the www.BidSync.com website.

If you have any problems downloading the solicitation, please contact the BidSync Support line at 1-800-990-9339.

If additional information help is needed with downloading the solicitation package please contact the Purchasing Office at (954) 518-9020 or by email at purchasing@ppines.com. The Purchasing Office hours are between 7:00 a.m. - 6:00 p.m. on Monday through Thursday and is located at 8300 South Palm Drive, Pembroke Pines, Florida 33025.

The City requires all questions relating to the solicitation be entered through the "Ask a Question" option tab available on the BidSync website. Responses to the questions will be provided online at www.bidsync.com. Such request must be received by the "Question Due Date" stated in the solicitation. The issuance of a response via BidSync is considered an Addendum and shall be the only official method whereby such an interpretation or clarification will be made.

Proposals will be accepted until 2:00 p.m., Wednesday, September 5, 2018, Proposals must be **submitted electronically at www.BidSync.com**. The sealed electronic proposals will be publicly opened at 2:30 p.m. by the City Clerk's Office, in the City Hall Administration Building, 4th Floor Conference Room located at 601 City Center Way, Pembroke Pines, Florida, 33025.

1.2 PURPOSE

The City of Pembroke Pines is seeking proposals from qualified firms, hereinafter referred to as the Contractor, to construct various utility electrical projects, in accordance with the terms, conditions, and specifications contained in this solicitation.

1.3 SCOPE OF WORK

There are three utility electrical projects included:

1. A new manual transfer switch for the east stand-by generator system at the City WWTP. **(See Attachment P – WWTP East Portable Generator Connection Improvements Drawings & Specifications)**

2. A new stand-by generator set and ATS at the City eastern wellfield. **(See Attachment Q – Eastern Wellfield Generator and ATS Drawings & Specifications)**

3. Electrical upgrades to the eastern wellfield power supply and VFD systems. **(See Attachment R – Hillers Electrical Engineering, Inc. Evaluation of Eastern Wellfield)**
    - Please note the City will issue an addendum with additional information for project #3 above

1.4 PROJECT COST ESTIMATE & TIMELINE

Staff estimates this project to cost approximately $950,000, which does not include permit costs.

Please note the City will include a Permit Allowance for this project**, therefore proposers should not include permit costs in their total proposal price.**

The work shall be completed within 120 days from issuance of CITY's Notice to Proceed, with an estimated start date of November 1, 2018

1.4.1 PERMITS

The City anticipates this project to require the following permits:

Permit	Agency	Cost (or related method of calculation)
Engineering	City of Pembroke Pines Engineering Department	4.67% of construction costs
Building	City of Pembroke Pines Building Department (Calvin, Giordano & Associates, Inc.)	2.80% of construction costs

1.4.2 PERMIT ALLOWANCE

The City shall include a "Permit Allowance" for this project. The Contractor shall obtain all required permits to complete the work, however the City shall utilize the Permit Allowance to reimburse the contractor for the related permit, license, impact or inspection fees. Payments will be made to the contractor based on the actual cost of

permits upon submission of paid permit receipts. The City shall not pay for other costs related to obtaining or securing permits.

The City shall determine the amount of the allowance at time of award. The allowance may be based on a specified percent of the proposed project amount and shall be established for the specific project being performed under the contract. This dollar amount shall be shown on the specific project purchase order as a distinct item from the vendor's overall offer to determine the total potential dollar value of the contract. Any Permit Allowance funds that have not been utilized at the end of the project will remain with the City, if the City Permit fees exceed the allowance indicated, the City will reimburse the contractor the actual amount of City Permit Fees required for project completion.

1.5 PROPOSAL REQUIREMENTS

The following documents will need to be completed, scanned and submitted through www.bidsync.com as part of the bidder's submittal. The proposer interested in responding to this solicitation must provide the information requested below. Submittals that do not respond completely too all requirements specified herein may be considered non-responsive and eliminated from the process.

1.5.1 Attachment A: Contact Information Form

a. Attached is contact information form (Attachment A) where the vendor will enter their contact information and complete the proposal checklist. The Contact information form shall be electronically signed by the contact person authorized to represent the contractor. This form must be completed and submitted through www.bidsync.com as part of the bidder's submittal.

b. The vendor must provide their pricing through the designated lines items listed on the BidSync website.

c. Please note vendors should be registered on BidSync under the name of the organization that they are operating as and it should match the organization name on the documents that they are submitting and utilizing when responding to the solicitation.

d. The contact information form should contain an electronic signature of the authorized representative of the Proposer along with the address and telephone number for communications regarding the Proposal.

e. Proposals by corporations should be executed in the corporate name by the President or other corporate officer accompanied by evidence of authority to sign. The corporate address and state of incorporation must also be shown.

f. Proposals by partnerships should be executed in the partnership name and signed by a partner whose title and the official address of the partnership must be shown.

1.5.2 Attachment B: Vendor Information Form and a W-9

a. In addition to the Vendor Information Form, please ensure that you provide the completed W-9 (Rev. November 2017), as previously dated versions of this form will delay the processing of any payments to the awarded vendor.

1.5.3 Attachment C: Non-Collusive Affidavit

1.5.4 Attachment D: Sworn Statement on Public Entity Crimes Form

1.5.5 Attachment E: Local Vendor Preference Certification

a. If claiming Local Pembroke Pines Vendor Preference, business must attach a current business tax receipt from the City of Pembroke Pines

b. If claiming Local Broward County Vendor Preference, business must attach a current business tax receipt from Broward County or the city within Broward County where the business resides.

c. The Local Vendor Preference Certification form must be completed by/for the proposer; the proposer **WILL NOT** qualify for Local Vendor Preference based on their sub-contractors' qualifications.

1.5.6 Attachment F: Veteran Owned Small Business Preference Certification

a. If claiming Veteran Owned Small Business Preference Certification, business must attach the "Determination Letter" from the United States Department of Veteran Affairs Center for Verification and Evaluation notifying the business that they have been approved as a Veteran Owned Small Business (VOSB).

b. The Veteran Owned Small Business Preference Certification form must be completed by/for the proposer; the proposer **WILL NOT** qualify for Veteran Owned Small Business Preference based on their sub-contractors' qualifications.

1.5.7 Attachment G: Equal Benefits Certification Form

1.5.8 Attachment H: Vendor Drug-Free Workplace Certification Form

1.5.9 Attachment I: Vendor Certification Regarding Scrutinized Companies List

1.5.9 Attachment J: Proposer's Completed Qualification Statement

1.5.10 Attachment M: References Form

a. Complete **Attachment M: References Form**, preferably where the team was the same. References should be from the last five years and should be capable of explaining and confirming your firm's capacity to successfully complete the scope of work outlined herein. As part of the proposal evaluation process, the City may conduct an investigation of references, including a record check or consumer affairs complaints. Proposers' submission of a proposal constitutes acknowledgment of the process and consent to investigate. The City is the sole judge in determining Proposers qualifications.

1.5.11 Attachment N: Mandatory Pre-Bid Meeting Form

1.5.12 Proposal Security (Bid Bond Form or Cashier's Check)

a. Each Proposal must be accompanied by a certified or cashier's check or by a Bid Bond made payable to the City of Pembroke Pines on an approved form, duly executed by the Proposer as principal and having as surety thereon a surety company acceptable to CITY and authorized to write such Bond under the laws of the State of Florida, in an amount not less than five percent (5%) of the amount of the base Proposal price.

b. Contingency is not to be counted in the total amount the proposal security is based on.

c. Proposers must submit a scanned copy of their bid security (bid bond form or cashier's check) with their bid submittal through BidSync.

d. Proposers must also submit their original bid security (bid bond form or cashier's check) at time of the bid due date, or they may be deemed as non-responsive.

e. The original Bid Bond or Cashier's Check should be in a sealed envelope, plainly marked "**BID SECURITY - IFB # PSUT-18-06 Utility Electrical Projects 2018**" and sent to the City of Pembroke Pines, City Clerk's Office, 4th Floor, 601 City Center Way, Pembroke Pines, Florida, 33025.

f. Please see SECTION 4 - SPECIAL TERMS & CONDITIONS of this IFB for additional information.

1.6 EVALUATION OF PROPOSALS & PROCESS OF SELECTION

A. Staff will evaluate all responsive proposals received from proposers who meet or exceed the bid requirements contained in the solicitation. Evaluations shall be based upon the information contained in the proposals as submitted.

B. Staff will make a recommendation to the City Commission for award of contract.

1.7 TENTATIVE SCHEDULE OF EVENTS

Event	Time &/or Date
Issuance of Solicitation (Posting Date)	**August 6, 2018**
Mandatory Pre-Bid Meeting at the Public Services Building Large Conference Room, 8300 S. Palm Drive, Pembroke Pines, FL 33025	**9:00 a.m. on August 23 2018**
Question Due Date	**August 27, 2018**
Anticipated Date of Issuance for the Addenda with Questions and Answers	**August 29, 2018**
Proposals will be accepted until	**2:00 p.m. on September 5, 2018**
Proposals will be opened at	**2:30 p.m. on September 5, 2018**
Evaluation of Proposals by Staff	**TBD**
Recommendation of Contractor to City Commission award	**September 17, 2018**
Issuance of Notice to Proceed	**TBD**
Project Commencement	**Estimated start date of November 1, 2018**
Project Completion	**120 days after NTP**

1.7.1 MANDATORY PRE-BID MEETING / SITE VISIT

There will be a mandatory scheduled pre-bid meeting on **August 23 2018 at 9:00 a.m.** Meeting location will be at the Public Services Building, Large Conference Room, located at 8300 S. Palm Drive, Pembroke Pines, FL 33025.

All vendors will be required to complete **Attachment N "Mandatory Pre-Bid Meeting Form"** at the meeting and submit it as part of their proposal to show proof of attendance to the mandatory meeting.

1.8 SUBMISSION REQUIREMENTS

Bids/proposals **must be submitted electronically** at www.bidsync.com **on or before 2:00 p.m. on September 5, 2018.**

Please note vendors should be registered on BidSync under the name of the organization that they are operating as and it should match the organization name on the documents that they are submitting and utilizing when responding to the solicitation.

The vendor must provide their pricing through the designated lines items listed on the BidSync website. In addition, the vendor must complete any webforms on the BidSync website and provide any additional information requested throughout this solicitation. Any additional information requested in the solicitation should be scanned and uploaded. **Unless otherwise specified, the City requests for vendors to upload their documents as one (1) PDF document in the order that is outline in the bid package.**

The City recommends for proposers to submit their proposals as soon as they are ready to do so. Please allow ample time to submit your proposals on the BidSync website. Proposals may be modified or withdrawn prior to the deadline for submitting Proposals. BidSync Support is happy to help you with submitting your proposal and to ensure that you are submitting your proposals correctly, but we ask that you contact their support line at 1-800-990-9339 with ample time before the bid closing date and time.

PLEASE DO NOT SUBMIT ANY PROPOSALS VIA MAIL, E-MAIL OR FAX.

However, please note that any required Bid Bond or Cashier's Check should be in a sealed envelope, plainly marked "**BID SECURITY - IFB #PSU-18-06 Utility Electrical Projects 2018**" and sent to the City of Pembroke Pines, City Clerk's Office, 4th Floor, 601 City Center Way, Pembroke Pines, Florida, 33025.

SECTION 2 - INSURANCE REQUIREMENTS

The CONTRACTOR shall indemnify and hold harmless the CITY and its officers, employees, agents and instrumentalities from any and all liability, losses or damages, including attorneys' fees and costs of defense, which the CITY or its officers, employees, agents or instrumentalities may incur as a result of claims, demands, suits, causes of actions or proceedings of any kind or nature arising out of, relating to or resulting from the performance of this Agreement by the CONTRACTOR or its employees, agents, servants, partners principals or subcontractors. The CONTRACTOR shall pay all claims and losses in connection therewith and shall investigate and defend all claims, suits or actions of any kind or nature in the name of the CITY, where applicable, including appellate proceedings, and shall pay all costs, judgments, and attorney's fees which may issue thereon. The CONTRACTOR expressly understands and agrees that any insurance protection required by this Agreement or otherwise provided by the CONTRACTOR shall in no way limit the responsibility to indemnify, keep and save harmless and defend the CITY or its officers, employees, agents and instrumentalities as herein provided.

CONTRACTOR shall not commence work under this Agreement until it has obtained all insurance required under this paragraph and such insurance has been approved by the Risk Manager of the CITY nor shall the CONTRACTOR allow any subcontractor to commence work on his subcontract until all similar such insurance required of the subcontractor has been obtained and similarly approved.

CERTIFICATES OF INSURANCE, reflecting evidence of the required insurance, shall be filed with the City's Risk Manager prior to the commencement of this Agreement. Policies shall be issued by companies authorized to do business under the laws of the State of Florida. The insurance company shall be rated no less than "A" as to management, and no less than "Class VI" as to financial strength according to the latest edition of Best's Insurance Guide published by A.M. Best Company.

Policies shall be endorsed to provide the CITY thirty (30) days notice of cancellation, material change or non-renewal of policies required under the contract. If the carrier will not agree to this notification, the CONTRACTOR or its insurance broker shall notify the CITY of any cancellation or reduction in coverage within seven days of receipt of insurer's notification of cancellation or reduction in coverage.

Insurance shall be in force until all obligations required to be fulfilled under the terms of the Agreement are satisfactorily completed as evidenced by the formal acceptance by the CITY. In the event the insurance certificate provided indicates that the insurance shall terminate and lapse during the period of this Agreement, then in that event, the CONTRACTOR shall furnish, at least fifteen (15) days prior to the expiration of the date of such insurance, a renewed certificate of insurance as proof that equal and like coverage for the balance of the period of the Agreement and extension thereunder is in effect. The CONTRACTOR shall not commence nor continue to provide any services pursuant to this Agreement unless all required insurance remains in full force and effect. CONTRACTOR shall be liable to CITY for any lapses in service resulting from a gap in insurance coverage.

The insurance requirements specified in this Agreement are minimum requirements and in no way reduce any liability the CONTRACTOR has assumed in the indemnification/hold harmless section(s) of this Agreement.

2.1 REQUIRED INSURANCE

A. **COMMERCIAL GENERAL LIABILITY INSURANCE** including, but not limited to: coverage for premises & operations, personal & advertising injury, products & completed operations, Liability assumed under an Insured Contract (including tort liability of another assumed in a business contract), and independent contractors. Coverage must be written on an occurrence basis, with limits of liability no less than:

1. Each Occurrence Limit - $1,000,000
2. Fire Damage Limit (Damage to rented premises) - $100,000
3. Personal & Advertising Injury Limit - $1,000,000
4. General Aggregate Limit - $2,000,000
5. Products & Completed Operations Aggregate Limit - $2,000,000 **(mostly for construction or equipment sold to the CITY)**

Products & Completed Operations Coverage shall be maintained for two (2) years after the final payment under this contract. (Increase to 10 years for construction projects) (For construction projects also include: Designated Construction Project(s) General Aggregate Limit)

The City of Pembroke Pines must be shown as an additional insured with respect to this coverage. City's Additional Insured status shall extend to any coverage beyond the minimum requirements for limits of liability found herein.

B. **WORKERS' COMPENSATION AND EMPLOYERS LIABILITY INSURANCE** covering all employees, and/or volunteers of the CONTRACTOR engaged in the performance of the scope of work associated with this Agreement. In the case any work is sublet, the CONTRACTOR shall require the subcontractors similarly to provide Workers Compensation Insurance for all the latter's employees unless such employees are covered by the protection afforded by the CONTRACTOR. Coverage for the CONTRACTOR and his subcontractors shall be in accordance with applicable state and/or federal laws that may apply to Workers' Compensation Insurance with limits of liability no less than:

1. Workers' Compensation : Coverage A – Statutory
2. Employers Liability: Coverage B $500,000 Each Accident
   $500,000 Disease – Policy Limit
   $500,000 Disease – Each Employee

If CONTRACTOR claims to be exempt from this requirement, CONTRACTOR shall provide CITY proof of such exemption along with a written request for CITY to exempt CONTRACTOR, written on CONTRACTOR letterhead.

Coverage shall be included for injuries or claims under the USL&H or Jones Act, when applicable.

C. **AUTO LIABILITY INSURANCE** covering all owned, leased, hired, non-owned and employee non-owned vehicles used in connection with the performance of work under this Agreement, with a combined single limit of liability for bodily injury and property damage no less than:

1. Any Auto (Symbol 1)
   Combined Single Limit (Each Accident) - $1,000,000
2. Hired Autos (Symbol 8)
   Combined Single Limit (Each Accident) - $1,000,000
3. Non-Owned Autos (Symbol 9)
   Combined Single Limit (Each Accident) - $1,000,000

If work under this Agreement includes transportation of hazardous materials, policy shall include pollution liability coverage equivalent to that provided by ISO pollution liability-broadened coverage for auto endorsement CA9948 and the Motor Carrier Act endorsement MCS90.

D. **PROFESSIONAL LIABILITY/ERRORS & OMISSIONS INSURANCE,** when applicable, with a limit of liability no less than $1,000,000 per wrongful act. This coverage shall be maintained for a period of no less than three (3) years after final payment of the contract. (Increase to 10 years for construction projects)

E. **ENVIRONMENTAL/POLLUTION LIABILITY** shall be required with a limit of no less than $1,000,000 per wrongful act whenever work under this Agreement involves potential losses caused by pollution conditions. Coverage shall include: Contractor's completed operations as well as sudden and gradual pollution conditions. If coverage is written on a claims-made basis, coverage shall be maintained for a period of no less than three (3) years after final payment of the contract. **The City of Pembroke Pines must be shown as an additional insured with respect to this coverage.** Furthermore, the CITY'S Additional Insured status shall extend to any coverage beyond the minimum requirements for limits of liability found herein.

F. **CYBER LIABILITY including Network Security and Privacy Liability** when applicable, with a limit of liability no less than $1,000,000 per loss. Coverage shall include liability arising from: theft, dissemination and/or use of confidential information stored or transmitted in electronic form, unauthorized access to, use of, or tampering with computer systems, including hacker attacks or inability of an authorized third party to gain access to your services, including denial of service, and the introduction of a computer virus into, or otherwise causing damage to, a customer's or third person's computer, computer system, network, or similar computer-related property and the data, software and programs thereon. This coverage shall be maintained for a period of no less than three (3) years after final payment of the contract. **The City of Pembroke Pines must be shown as an additional insured with respect to this coverage.** Furthermore, the CITY'S Additional Insured status shall extend to any coverage beyond the minimum requirements for limits of liability found herein.

G. **CRIME COVERAGE** when applicable, shall include employee dishonesty, forgery or alteration, and computer fraud in an amount of no less than $1,000,000 per loss. If Contractor is physically located on the City's premises, a third-party fidelity coverage extension shall apply.

H. **BUILDER'S RISK INSURANCE** shall be "All Risk" for one hundred percent (100%) of the completed value of the project with a deductible of not more than five percent (5%) for Named Windstorm and *$20,000* per claim for all other perils. The Builder's Risk Insurance

shall include interests of the CITY, the CONTRACTOR and subcontractors of the project. The CONTRACTOR shall include a separate line item for all costs associated with the Builder's Risk Insurance Coverage for the project. The CITY reserves the right at its sole discretion to utilize the CONTRACTOR'S Builder's Risk Insurance or for the CITY to purchase its own Builder's Risk Insurance for the Project. Prior to the CONTRACTOR purchasing the Builder's Risk insurance for the project, the CONTRACTOR shall allow the CITY the opportunity to analyze the CONTRACTOR'S coverage and determine who shall purchase the coverage. Should the CITY utilize the CONTRACTOR'S Builder's Risk Insurance, the CONTRACTOR shall be responsible for all deductibles. If the CITY chooses to purchase the Builder's Risk Coverage on the project, the CONTRACTOR shall provide the CITY with a change order deduct for all premiums and costs associated with the Builder's Risk insurance in their schedule. Should the CITY choose to utilize the CITY'S Builder's Risk Program, the CITY shall be responsible for the Named Windstorm Deductible and the CONTRACTOR shall be responsible for the All Other Perils Deductible.

I. **SEXUAL ABUSE** may not be excluded from any policy for Agreements involving any interaction with minors or seniors.

2.2 REQUIRED ENDORSEMENTS

1. The City of Pembroke Pines shall be named as an Additional Insured on each of the General Liability polices required herein
2. Waiver of all Rights of Subrogation against the CITY
3. 30 Day Notice of Cancellation or Non-Renewal to the CITY
4. CONTRACTORs' policies shall be Primary & Non-Contributory
5. All policies shall contain a "severability of interest" or "cross liability" liability clause without obligation for premium payment of the CITY
6. The City of Pembroke Pines shall be named as a Loss Payee on all Property and/or Inland Marine Policies as their interest may appear.

CONTRACTOR shall name the CITY, as an additional insured on each of the General Liability policies required herein and shall hold the CITY, its agents, officers and employees harmless on account of claims for damages to persons, property or premises arising out of the services provided hereunder. Any insurance required of the CONTRACTOR pursuant to this Agreement must also be required by any subcontractor in the same limits and with all requirements as provided herein, including naming the CITY as an additional insured, in any work is subcontracted unless such subcontractor is covered by the protection afforded by the CONTRACTOR and provided proof of such coverage is provided to CITY. The CONTRACTOR and any subcontractors shall maintain such policies during the term of this Agreement.

The CITY reserves the right to require any other additional types of insurance coverage and/or higher limits of liability it deems necessary based on the nature of work being performed under this Contract.

SECTION 3 - GENERAL TERMS & CONDITIONS

3.1 EXAMINATION OF CONTRACT DOCUMENTS

Before submitting a Proposal, each Proposer should (a) consider federal, state and local laws, ordinances, rules and regulations that may in any manner affect cost or performance of the work, (b) study and carefully correlate the Proposer's observations with the Proposal Documents; and (c) notify the Purchasing Manager of all conflicts, errors and discrepancies, if any, in the Proposal Documents.

The Proposer, by and through the submission of a Proposal, agrees that Proposer shall be held responsible for having familiarized themselves with the nature and extent of the work and any local conditions that may affect the work to be done and the services, equipment, materials, parts and labor required.

3.2 CONFLICT OF INSTRUCTIONS

If a conflict exists between the General Conditions and Instructions stated herein and specific conditions and instructions contained in specifications, the specifications shall govern.

3.3 ADDENDA or ADDENDUM

A formal solicitation may require an Addendum to be issued. An addendum in some way may clarify, correct or change the original solicitation (i.e. due date/time, specifications, terms, conditions, line item). Vendors submitting a proposal should check the BidSync website for any addenda issued. Vendors are cautioned not to consider verbal modifications to the solicitation, as the addendum issued through BidSync will be the only official method whereby changes will be made.

3.4 INTERPRETATIONS AND QUESTIONS

If the Proposer is in doubt as to the meaning of any of the Proposal Documents, is of the opinion that the Conditions and Specifications contain errors or contradictions or reflect omissions, or has any question concerning the conditions and specifications, the Proposer shall submit a question for interpretation or clarification. The City requires all questions relating to the solicitation be entered through the **"Ask a Question"** option tab available on the BidSync website. Responses to the questions will be provided online at www.bidsync.com. Such request must be received by the **"Question Due Date"** stated in the solicitation. Questions received after **"Question Due Date"** shall not be answered. Interpretations or clarifications in response to such questions will be issued via BidSync. The issuance of a response via BidSync is considered an Addendum and shall be the only official method whereby such an interpretation or clarification will be made.

BidSync Support is also available to assist proposers with submitting their proposal and to ensure that proposers are submitting their proposals correctly. Proposers should ensure that they contact they BidSync support line at 1-800-990-9339 with ample time before the bid closing date and time.

For all other questions related to this solicitation, please contact the Purchasing Division at purchasing@ppines.com.

3.5 RULES, REGULATIONS, LAWS, ORDINANCES and LICENSES

The awarded contractor shall observe and obey all laws, ordinances, rules, and regulations of the federal, state, and CITY, which may be applicable to the service being provided. The awarded firm shall have or be responsible for obtaining all necessary

permits or licenses required, if necessary, in order to provide this service.

Bidder warrants by submittal that prices quoted here are in conformity with the latest federal price guidelines, if any.

3.6 WARRANTIES FOR USAGE

Whenever a bid is sought, seeking a source of supply for a specified time for materials or service, the quantities or usage shown are estimated only. No guarantee or warranty is given or implied by the City as to the total amount that may or may not be purchased from any resulting contracts. These quantities are for bidders information only and will be used for tabulation and presentation of bid.

3.7 BRAND NAMES

If and wherever in the specifications a brand name, make, name of manufacturer, trade name, or vendor catalog number is mentioned, it is for the purpose of establishing a grade or quality of material only. Since the City does not wish to rule out other competition and equal brands or makes, the phrase "OR EQUAL" is added. However, if a product other than that specified is bid, Bidders shall indicate on their proposal and clearly state the proposed substitution and deviation. It is the **vendor's responsibility** to provide any necessary documentation and samples within their bid submittal to prove that the product is equal to that specified. Such samples are to be furnished before the date of bid opening, unless otherwise specified. Additional evidence in the form of documentation and samples may be requested if the proposed brand is other than that specified. The City retains the right to determine if the proposed brand shall be considered as an approved equivalent or not.

3.8 QUALITY

All materials used for the manufacture or construction of any supplies, materials, or equipment covered by this bid shall be new, the latest model, of the best quality, and highest grade workmanship, unless otherwise noted.

3.9 SAMPLES

Samples, when requested, must be furnished before, or at the bid opening, unless otherwise specified, and delivered free of expense to the City and if not used in testing or destroyed, will upon request within thirty (30) days of bid award be returned at the bidders expense.

3.10 DEVELOPMENT COSTS

Neither the City nor its representatives shall be liable for any expenses incurred in connection with the preparation, submission or presentation of a Bid in response to this solicitation. All information in the Bid shall be provided at no cost to the City.

3.11 PRICING

Prices should be stated in units of quantity specified in the bidding specifications. In case of discrepancy in computing the amount of the bid, the unit prices quoted will govern.

Bidder warrants by virtue of bidding that prices, terms, and conditions quoted in his bid will be firm for acceptance for a period of ninety (90) days from date of bid opening unless otherwise stated by the City or bidder.

3.12 DELIVERY POINT

All items shall be delivered F.O.B. destination, and delivery cost and charges included in the bid price. Failure to do so may be cause for rejection of bid.

3.13 TAX EXEMPT STATUS

The City is exempt from Florida Sales and Federal Excise taxes on direct purchase of tangible property.

3.14 CONTRACT TIME

By virtue of the submission of the Proposal, Proposer agrees and fully understands that the completion time of the work of the Contract is an essential and material condition of the Contract and that time is of the essence. The Successful Proposer agrees that all work shall be prosecuted regularly, diligently and uninterrupted at such rate of progress as will ensure full completion thereof within the time specified. Failure to complete the work within the time period specified shall be considered a default.

In addition, time will be of the essence for any orders placed as a result of this bid. Purchaser reserves the right to cancel such orders, or part thereof, without obligation if delivery is not made at the time(s) or place(s) specified.

3.15 COPYRIGHT OR PATENT RIGHTS

Bidder warrants that there have been no violations of copyrights or patent rights in manufacturing, producing, or selling other goods shipped or ordered as a result of this bid, and seller agrees to hold the purchaser harmless from any and all liability, loss or expense occasioned by such violation.

3.16 PUBLIC ENTITY CRIMES

"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 for a period of 36 months from the date of being placed on the convicted vendor list."

The Public Entity Crime Affidavit Form, attached to this solicitation, includes documentation that shall be executed by an individual authorized to bind the Proposer. The Proposer further understands and accepts that any contract issued as a result of this solicitation shall be either voidable or subject to immediate termination by the City. In the event there is any misrepresentation or lack of compliance with the mandates of Section 287.133 or Section 287.134, respectively, Florida Statutes. The City in the event in such termination, shall not incur any liability to the Bidder for any goods, services or materials furnished.

3.17 CONFLICT OF INTEREST

The award of any contract hereunder is subject to the provisions of Chapter 112, Florida Statutes. Proposers must disclose with their Proposal the name of any officer, director, partner, proprietor, associate or agent who is also an officer or employee of CITY or any of its agencies. Further, all Proposers must disclose the name of any officer or employee of CITY who owns, directly or indirectly, an interest of five percent (5%) or more in the Proposer 's firm or any of its branches or affiliate companies.

3.18 FACILITIES

The City reserves the right to inspect the Bidder's facilities at any time with prior notice.

3.19 ENVIRONMENTAL REGULATIONS

CITY reserves the right to consider Proposer's history of citations and/or violations of environmental regulations in determining a Proposer's responsibility, and

further reserves the right to declare a Proposer not responsible if the history of violations warrant such determination. Proposer shall submit with the Proposal, a complete history of all citations and/or violations, notices and dispositions thereof. The non-submission of any such documentation shall be deemed to be an affirmation by the Proposer that there are no citations or violations. Proposer shall notify CITY immediately of notice of any citation or violation that Proposer may receive after the Proposal opening date and during the time of performance of any contract awarded to Proposers.

3.20 SIGNATURE REQUIRED

All proposals must be signed with the firm name and by an officer or employee having authority to bind the company or firm by his signature. FAILURE TO PROPERLY SIGN PROPOSAL SHALL INVALIDATE SAME, AND IT MAY NOT BE CONSIDERED FOR AWARD.

The individual executing this Bid on behalf of the Company warrant to the City that the Company is authorized to do business in the State of Florida, is in good standing and that Company possesses all of the required licenses and certificates of competency required by the State of Florida and Broward County to provide the goods or perform the services herein described.

The signed bid shall be considered an offer on the part of the bidder or contractor, which offer shall be deemed accepted upon approval by the City Commission of the City of Pembroke Pines and in case of default on the part of the bidder or contractor after such acceptance, the City of Pembroke Pines may take such action as it deems appropriate including legal action for damages or specific performance.

3.21 MANUFACTURER'S CERTIFICATION

The City of Pembroke Pines reserves the right to request from bidder separate manufacturer certification of all statements made in the proposal.

3.22 MODIFICATION OR WITHDRAWAL OF PROPOSAL

The City recommends for proposers to submit their proposals as soon as they are ready to do so. Please allow ample time to submit your proposals on the BidSync website. Proposals may be modified or withdrawn prior to the deadline for submitting Proposals.

3.23 PUBLIC BID; BID OPENING AND GENERAL EXEMPTIONS

All submittals received by the deadline will be recorded, and will subsequently be publicly opened on the same business day at 2:30 p.m. at the office of the City Clerk, 4th Floor, 601 City Center Way, Pembroke Pines, Florida, 33025.

All Proposals received from Proposers in response to the solicitation will become the property of CITY and will not be returned to the Proposers. In the event of Contract award, all documentation produced as part of the Contract shall become the exclusive property of CITY. Proposers are requested to identify specifically any information contained in their Proposals which they consider confidential and/or proprietary and which they believe to be exempt from disclosure, citing specifically the applicable exempting law.

Pursuant to Section 119.071 of the Florida Statutes, sealed bids, proposals, or replies received by a Florida public agency shall remain exempt from disclosure until an intended decision is announced or until 30 days from the opening, whichever is earlier.

Therefore, bidders will not be able to procure a copy of their competitor's bids until an

intended decision is reached or 30 days has elapsed since the time of the bid opening.

However, pursuant to Section 255.0518 of the Florida Statutes, when opening sealed bids that are received pursuant to a competitive solicitation for **construction or repairs on a public building or public work**, the entity shall:

(a) Open the sealed bids at a public meeting.
(b) Announce at that meeting the name of each bidder and the price submitted in the bid.
(c) Make available upon request the name of each bidder and the price submitted in the bid.

For solicitations that are **not** for **"construction or repairs on a public building or public work"** the City shall not reveal the prices submitted in the bids until an intended decision is announced or until 30 days from the opening, whichever is earlier.

3.24 RESERVATIONS FOR REJECTION AND AWARD

The City of Pembroke Pines reserves the right to accept or reject any and all bids or parts of bids, to waive irregularities and technicalities, and to request rebids. The City also reserves the right to award a contract on such items(s) or service(s) the City deems will best serve its interests. All bids shall be awarded to the most responsive/responsible bidder, provided the (City) may for good cause reject any bid or part thereof. It further reserves the right to award a contract on a split order basis, or such combinations as shall best serve the interests of the City unless otherwise specified. No premiums, rebates or gratuities permitted, either with, prior to, or after award. This practice shall result in the cancellation of said award and/or return of items (as applicable) and the recommended removal of bidder from bid list(s).

3.25 BID PROTEST

Any protests or challenges to this competitive procurement shall be governed by Section 35.38 of the City's Code of Ordinances.

3.26 INDEMNIFICATION

The Successful Proposer shall pay all claims, losses, liens, settlements or judgments of any nature whatsoever in connection with the subsequent indemnifications including, but not limited to, reasonable attorney's fees (including appellate attorney's fees) and costs.

CITY reserves the right to select its own legal counsel to conduct any defense in any such proceeding and all costs and fees associated therewith shall be the responsibility of Successful Proposer under the indemnification agreement. Nothing contained herein is intended nor shall it be construed to waive City's rights and immunities under the common law or Florida Statute 768.28 as amended from time to time.

Additional indemnification requirements may be included under Special Terms and Conditions and/or as part of a specimen contract included in the solicitation package.

General Indemnification: To the fullest extent permitted by laws and regulations, Successful Proposer shall indemnify, defend, save and hold harmless the CITY, its officers, agents and employees, harmless from any and all claims, damages, losses, liabilities and expenses, direct, indirect or consequential arising out of or in consequential arising out of or alleged to have arisen out of or in consequence of the products, goods or services furnished by or operations of the Successful Proposer or his subcontractors, agents, officers, employees or independent contractors pursuant to or in the performance of the Contract.

Patent and Copyright Indemnification: Successful Proposer agrees to indemnify, defend, save and hold harmless the CITY, its officers, agents and employees, from all claims, damages, losses, liabilities and expenses arising out of any alleged infringement of copyrights, patent rights and/or the unauthorized or unlicensed use of any invention, process, material, property or other work manufactured or used in connection with the performance of the Contract, including its use by CITY.

3.27 DEFAULT PROVISION

In the case of default by the bidder or contractor, the City of Pembroke Pines may procure the articles or services from any other sources and hold the bidder or contractor responsible for any excess costs occasioned or incurred thereby.

The City shall be the sole judge of nonperformance, which shall include any failure on the part of the successful Bidder to accept the Award, to furnish required documents, and/or to fulfill any portion of the contract within the time stipulated. Upon default by the successful Bidder to meet any terms of this agreement, the City will notify the Bidder five (5) days (weekends and holidays excluded) to remedy the default. Failure on the Contractor's part to correct the default within the required five (5) days shall result in the contract being terminated and upon the City notifying in writing the Contractor of its intentions and the effective date of the termination. The following shall constitute default:

A. Failure to perform the Work required under the contract and/or within the time required or failing to use the subcontractor, entities and personnel as identified and set forth, and to the degree specified in the contract.

B. Failure to begin the Work under this Bid within the time specified.

C. Failure to perform the Work with sufficient Workers and equipment or with sufficient materials to ensure timely completion.

D. Neglecting or refusing to remove materials or perform new Work where prior Work has been rejected as non-conforming with the terms of the contract.

E. Becoming insolvent, being declared bankrupt, or committing act of bankruptcy or insolvency, or making an assignment renders the successful Bidder incapable of performing the Work in accordance with and as required by the contract.

F. Failure to comply with any of the terms of the contract in any material respect.

In the event of default of a contract, the successful Bidder shall pay all attorney's fees and court costs incurred in collecting any damages. The successful Bidder shall pay the City for any and all costs incurred in ensuing the completion of the project.

Additional provisions may be included in the specimen contract.

3.28 ACCEPTANCE OF MATERIAL

The material delivered under this proposal shall remain the property of the seller until a physical inspection and actual usage of this material and/or services is made and thereafter accepted to the satisfaction of the City and must comply with the terms herein, and be fully in accord with specifications and of the highest quality. In the event the material and/or services supplied to the City are found to be defective or do not conform to specifications, the City reserves the right to cancel the order upon written notice to the seller and return product to seller at the sellers expense.

3.29 LOCAL GOVERNMENT PROMPT PAYMENT ACT

The City complies with Florida Statute 218.70, Florida Prompt Payment Act.

3.30 SCRUTINIZED COMPANIES LIST

In accordance with Florida Statue 287.135, as amended, a company is ineligible to, and may not, bid on, submit a proposal for, or enter into or renew a contract with an agency or local governmental entity for goods or services if:

(a) Any amount of, at the time of bidding on, submitting a proposal for, or entering into or renewing such contract, the company is on the Scrutinized Companies that Boycott Israel List, created pursuant to s. 215.4725, or is engaged in a boycott of Israel; or

(b) One million dollars or more if, at the time of bidding on, submitting a proposal for, or entering into or renewing such contract, the company:

1. Is on the Scrutinized Companies with Activities in Sudan List or the Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List, created pursuant to s. 215.473; or

2. Is engaged in business operations in Syria.

By submitting a bid, proposal or response, the company, principals or owners certify that they are not listed on the Scrutinized Companies that boycott Israel List, Scrutinized Companies with activities in Sudan List, Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List, or is engaged in business operations in Syria.

SECTION 4 - SPECIAL TERMS & CONDITIONS

4.1 PROPOSAL SECURITY

Proposal Security Requirements: Each Proposal must be accompanied by a certified or cashier's check or by a Bid Bond made payable to the City of Pembroke Pines on an approved form, duly executed by the Proposer as principal and having as surety thereon a surety company acceptable to CITY and authorized to write such Bond under the laws of the State of Florida, in an amount not less than five percent (5%) of the amount of the base Proposal price. **Note: Contingency is not to be counted in the total amount the proposal security is based on.**

Proposers must submit a scanned copy of their bid security (bid bond form or cashier's check) with their bid submittal through BidSync. Proposers must also submit their original bid security (bid bond form or cashier's check) at time of the bid due date, or they may be deemed as non-responsive. The original Bid Bond or Cashier's Check should be in a sealed envelope, plainly marked **"BID SECURITY - IFB # PSUT-18-06 Utility Electrical Projects 2018"** and sent to the:

City of Pembroke Pines,
City Clerk's Office, 4th Floor,
601 City Center Way,
Pembroke Pines, Florida, 33025.

Successful Proposer: The Proposal Security of the Successful Proposer will be retained until such Proposer has executed the Contract and furnished the required insurance, payment and performance bonds, whereupon the Proposal Security will be returned. If the Successful Proposer fails to execute and deliver the Contract and furnish the required insurance and bonds within fifteen (15) calendar days of the Notice of Award, CITY may annul the Notice of Award and the entire sum of the Proposal Security shall be forfeited.

Three Lowest Proposers: The Proposal Security of the three (3) lowest Proposers will be returned within seven (7) calendar days after CITY and the Successful Proposer have executed the written Contract or if no such written Contract is executed within ninety (90) calendar days after the date of the Proposal opening, upon the demand of any Proposer at any time thereafter, provided that he has not been notified of the acceptance of his Proposal.

All Other Proposers: Proposal Security of all other Proposer will be returned within seven (7) calendar days after the proposal opening. The agent or attorney in fact or other officer who signs a Bid Bond for a surety company must file with such bond a certified copy of his power of attorney authorizing him to do so.

4.2 PAYMENT AND PERFORMANCE BONDS

Within fifteen (15) calendar days after Notice of Award and in any event prior to commencing work, the Contractor shall execute and furnish to City a performance bond and a payment bond, each written by a corporate surety, having a resident agent in the State of Florida and having been in business with a record of successful continuous operation for at least five (5) years. The surety shall hold a current certificate of authority from the Secretary of Treasury of the United States as an acceptable surety on federal bonds in accordance with United States Department of Treasury Circular No. 570. If the amount of the Bond exceeds the underwriting limitation set forth in the circular, in order to qualify, the net retention of the surety company shall not exceed the underwriting limitation in the circular and the excess risks must be protected by coinsurance, reinsurance, or other methods, in accordance with Treasury Circular 297,

revised September 1, 1978 (31DFR, Section 223.10, Section 223.11). Further, the surety company shall provide City with evidence satisfactory to City, that such excess risk has been protected in an acceptable manner. The surety company shall have at least the following minimum qualification in accordance with the latest edition of A.M. Best's Insurance Guide, published by Alfred M. Best Company, Inc., Ambest Road, Oldwick, New Jersey 08858:

B+ to A+

Two (2) separate bonds are required and both must be approved by the City. **The penal sum stated in each bond shall be 100% of the contract price, not including contingency.** The performance bond shall be conditioned that the Contractor performs the contract in the time and manner prescribed in the contract. The payment bond shall be conditioned that the Contractor promptly make payments to all persons who supply the Contractor with labor, materials and supplies used directly or indirectly by the Contractor in the prosecution of the work provided for in the Contract and shall provide that the surety shall pay the same in the amount not exceeding the sum provided in such bonds, together with interest at the maximum rate allowed by law; and that they shall indemnify and save harmless the City to the extent of any and all payments in connection with the carrying out of said Contract which the City may be required to make under the law.

Pursuant to the requirements of Section 255.05(1)(a), Florida Statutes, it shall be the duty of the Contractor to record the aforesaid payment and performance bonds in the public records of Broward County, with the Contractor to pay all recording costs.

4.3 OWNER'S CONTINGENCY

While the specifications contained in this solicitation and any ensuing Purchase Orders or contracts have incorporated all anticipated work to be accomplished, there may be unanticipated work required of the vendor in conjunction with a specific project. For this reason, the City Commission may award a project with an "Owner's Contingency". This contingency or allowance authorizes the City execute change orders up to the amount of the contingency without the need to obtain additional Commission approval. The Owner's Contingency is usually based on a specified percent of the proposed project amount and is established for the specific project being performed under the contract. This dollar amount shall be shown on the specific project purchase order as a distinct item from the vendor's overall offer to determine the total potential dollar value of the contract. It is hereby understood and agreed that the vendor shall not expend any dollars in connection with the Owner's Contingency without the expressed prior approval of the City's authorized representative. Any Owner's Contingency funds that have not been utilized at the end of the project will remain with the Owner, the contractor shall only be paid for the proposed project cost as approved by the City Commission along with any Owner Contingency expenses that were approved by the City's authorized representative.

4.4 TAX SAVER PROGRAM

The Contractor shall cooperate on certain projects to allow the City to avail itself of a sales tax savings program.

4.5 RELEASE OF LIEN

Contractor must provide an executed Partial/Final Release of Lien utilizing the City's standard Release of Lien Form in order for the City to release any payments to the Contractor.

4.6 SOLID WASTE CONSTRUCTION AND DEMOLITION DEBRIS COLLECTION AND DISPOSAL REQUIREMENTS

The City of Pembroke Pines has an exclusive solid waste franchise agreement with Waste Pro of Florida, Inc. for the collection and disposal of all solid waste including construction and demolition (C & D) debris. All applicants for bids to perform construction work for the City of Pembroke Pines shall be subject to the requirements found in the City's exclusive sold waste franchise agreement and must contract Waste Pro of Florida, Inc. for the collection and disposal of all construction and demolition debris generated at such construction job sites.

For the current applicable rates and fees for Waste Pro of Florida, Inc. dumpsters, roll-off containers, and other related solid waste service equipment needs, please contact Sixto Pepin, Waste Pro of Florida, Inc. Waste Pro's Pembroke Pines Sales Representative at (954) 967-4200 or spepin@wasteprousa.com.

For further information related to the solid waste franchise requirements, please contact Rose Colombo, Solid Waste Franchise Agreement Contract Manager, at (954) 518-9011 or rcolombo@ppines.com.

For solid waste franchise enforcement questions, please contact the City of Pembroke Pines Code Compliance Unit at (954) 431-4466.

CONTACT INFORMATION FORM

IN ACCORDANCE WITH "**IFB # PSUT-18-06"** titled "**Utility Electrical Projects 2018"** attached hereto as a part hereof, the undersigned submits the following:

A) Contact Information

The Contact information form shall be electronically signed by one duly authorized to do so, and in case signed by a deputy or subordinate, the principal's properly written authority to such deputy or subordinate must accompany the proposal. This form must be completed and submitted through www.bidsync.com as part of the bidder's submittal. The vendor must provide their pricing through the designated lines items listed on the BidSync website.

COMPANY INFORMATION:

COMPANY:

STREET ADDRESS:

CITY, STATE & ZIP CODE:

PRIMARY CONTACT FOR THE PROJECT:

NAME: TITLE:

E-MAIL:

TELEPHONE: FAX:

AUTHORIZED APPROVER:

NAME: TITLE:

E-MAIL:

TELEPHONE: FAX:

SIGNATURE:

B) Proposal Checklist

Are all materials, freight, labor and warranties included?	Yes ☐
Was the required 5% Proposal Security / Bid Bond and 100% Payment and Performance Bonds sent to the City of Pembroke Pines, to arrive prior to 2:00 p.m., September 5, 2018	Yes ☐

C) Sample Proposal Form

The following sample price proposal is for information only. The vendor must provide their pricing through the designated lines items listed on the BidSync website.

Base Pricing:

Item #	Location	Total Cost
1)	Total Cost for Utility Electrical Projects 2018 as per specifications.	**Price to be Submitted Via BidSync**

(OFFICE USE ONLY) Vendor number: _____

Please entirely complete this vendor information form along with the IRS Form W-9, and upload it to the BidSync website with your submittal.

Vendor Information Form

Operating Name (Payee)			
Legal Name (as filed with IRS)			
Remit-to Address (For Payments)			
Remit-to Contact Name:		**Title:**	
Email Address:			
Phone #:		**Fax #**	
Order-from Address (For purchase orders)			
Order-from Contact Name:		**Title:**	
Email Address:			
Phone #:		**Fax #**	
Return-to Address (For product returns)			
Return-to Contact Name		**Title:**	
Email Address:			
Phone #:		**Fax #**	
Payment Terms:			

Type of Business (please check one and provide Federal Tax identification or social security Number)

☐ **Corporation** — **Federal ID Number:** _____

☐ **Sole Proprietorship/Individual** — **Social Security No.:** _____

☐ **Partnership**

☐ **Health Care Service Provider**

☐ **LLC – C (C corporation) – S (S corporation) – P (partnership)**

☐ **Other (Specify):** _____

Name & Title of Applicant _____

Signature of Applicant _____ **Date** _____

Form **W-9**
(Rev. November 2017)
Department of the Treasury
Internal Revenue Service

Request for Taxpayer Identification Number and Certification

► **Go to *www.irs.gov/FormW9* for instructions and the latest information.**

Give Form to the requester. Do not send to the IRS.

Print or type. See **Specific Instructions** on page 3.

1 Name (as shown on your income tax return). Name is required on this line; do not leave this line blank.

2 Business name/disregarded entity name, if different from above

3 Check appropriate box for federal tax classification of the person whose name is entered on line 1. Check only **one** of the following seven boxes.

☐ Individual/sole proprietor or single-member LLC ☐ C Corporation ☐ S Corporation ☐ Partnership ☐ Trust/estate

☐ Limited liability company. Enter the tax classification (C=C corporation, S=S corporation, P=Partnership) ► _____

Note: Check the appropriate box in the line above for the tax classification of the single-member owner. Do not check LLC if the LLC is classified as a single-member LLC that is disregarded from the owner unless the owner of the LLC is another LLC that is **not** disregarded from the owner for U.S. federal tax purposes. Otherwise, a single-member LLC that is disregarded from the owner should check the appropriate box for the tax classification of its owner.

☐ Other (see instructions) ►

4 Exemptions (codes apply only to certain entities, not individuals; see instructions on page 3):

Exempt payee code (if any) _____

Exemption from FATCA reporting code (if any) _____

(Applies to accounts maintained outside the U.S.)

5 Address (number, street, and apt. or suite no.) See instructions.

Requester's name and address (optional)

6 City, state, and ZIP code

7 List account number(s) here (optional)

Part I Taxpayer Identification Number (TIN)

Enter your TIN in the appropriate box. The TIN provided must match the name given on line 1 to avoid backup withholding. For individuals, this is generally your social security number (SSN). However, for a resident alien, sole proprietor, or disregarded entity, see the instructions for Part I, later. For other entities, it is your employer identification number (EIN). If you do not have a number, see *How to get a TIN,* later.

Note: If the account is in more than one name, see the instructions for line 1. Also see *What Name and Number To Give the Requester* for guidelines on whose number to enter.

Social security number

			–			–				

or

Employer identification number

		–							

Part II Certification

Under penalties of perjury, I certify that:

1. The number shown on this form is my correct taxpayer identification number (or I am waiting for a number to be issued to me); and
2. I am not subject to backup withholding because: (a) I am exempt from backup withholding, or (b) I have not been notified by the Internal Revenue Service (IRS) that I am subject to backup withholding as a result of a failure to report all interest or dividends, or (c) the IRS has notified me that I am no longer subject to backup withholding; and
3. I am a U.S. citizen or other U.S. person (defined below); and
4. The FATCA code(s) entered on this form (if any) indicating that I am exempt from FATCA reporting is correct.

Certification instructions. You must cross out item 2 above if you have been notified by the IRS that you are currently subject to backup withholding because you have failed to report all interest and dividends on your tax return. For real estate transactions, item 2 does not apply. For mortgage interest paid, acquisition or abandonment of secured property, cancellation of debt, contributions to an individual retirement arrangement (IRA), and generally, payments other than interest and dividends, you are not required to sign the certification, but you must provide your correct TIN. See the instructions for Part II, later.

Sign Here **Signature of U.S. person** ► **Date** ►

General Instructions

Section references are to the Internal Revenue Code unless otherwise noted.

Future developments. For the latest information about developments related to Form W-9 and its instructions, such as legislation enacted after they were published, go to *www.irs.gov/FormW9.*

Purpose of Form

An individual or entity (Form W-9 requester) who is required to file an information return with the IRS must obtain your correct taxpayer identification number (TIN) which may be your social security number (SSN), individual taxpayer identification number (ITIN), adoption taxpayer identification number (ATIN), or employer identification number (EIN), to report on an information return the amount paid to you, or other amount reportable on an information return. Examples of information returns include, but are not limited to, the following.

- Form 1099-INT (interest earned or paid)
- Form 1099-DIV (dividends, including those from stocks or mutual funds)
- Form 1099-MISC (various types of income, prizes, awards, or gross proceeds)
- Form 1099-B (stock or mutual fund sales and certain other transactions by brokers)
- Form 1099-S (proceeds from real estate transactions)
- Form 1099-K (merchant card and third party network transactions)
- Form 1098 (home mortgage interest), 1098-E (student loan interest), 1098-T (tuition)
- Form 1099-C (canceled debt)
- Form 1099-A (acquisition or abandonment of secured property)

Use Form W-9 only if you are a U.S. person (including a resident alien), to provide your correct TIN.

If you do not return Form W-9 to the requester with a TIN, you might be subject to backup withholding. See What is backup withholding, *later.*

By signing the filled-out form, you:

1. Certify that the TIN you are giving is correct (or you are waiting for a number to be issued),

2. Certify that you are not subject to backup withholding, or

3. Claim exemption from backup withholding if you are a U.S. exempt payee. If applicable, you are also certifying that as a U.S. person, your allocable share of any partnership income from a U.S. trade or business is not subject to the withholding tax on foreign partners' share of effectively connected income, and

4. Certify that FATCA code(s) entered on this form (if any) indicating that you are exempt from the FATCA reporting, is correct. See *What is FATCA reporting,* later, for further information.

Note: If you are a U.S. person and a requester gives you a form other than Form W-9 to request your TIN, you must use the requester's form if it is substantially similar to this Form W-9.

Definition of a U.S. person. For federal tax purposes, you are considered a U.S. person if you are:

- An individual who is a U.S. citizen or U.S. resident alien;
- A partnership, corporation, company, or association created or organized in the United States or under the laws of the United States;
- An estate (other than a foreign estate); or
- A domestic trust (as defined in Regulations section 301.7701-7).

Special rules for partnerships. Partnerships that conduct a trade or business in the United States are generally required to pay a withholding tax under section 1446 on any foreign partners' share of effectively connected taxable income from such business. Further, in certain cases where a Form W-9 has not been received, the rules under section 1446 require a partnership to presume that a partner is a foreign person, and pay the section 1446 withholding tax. Therefore, if you are a U.S. person that is a partner in a partnership conducting a trade or business in the United States, provide Form W-9 to the partnership to establish your U.S. status and avoid section 1446 withholding on your share of partnership income.

In the cases below, the following person must give Form W-9 to the partnership for purposes of establishing its U.S. status and avoiding withholding on its allocable share of net income from the partnership conducting a trade or business in the United States.

- In the case of a disregarded entity with a U.S. owner, the U.S. owner of the disregarded entity and not the entity;
- In the case of a grantor trust with a U.S. grantor or other U.S. owner, generally, the U.S. grantor or other U.S. owner of the grantor trust and not the trust; and
- In the case of a U.S. trust (other than a grantor trust), the U.S. trust (other than a grantor trust) and not the beneficiaries of the trust.

Foreign person. If you are a foreign person or the U.S. branch of a foreign bank that has elected to be treated as a U.S. person, do not use Form W-9. Instead, use the appropriate Form W-8 or Form 8233 (see Pub. 515, Withholding of Tax on Nonresident Aliens and Foreign Entities).

Nonresident alien who becomes a resident alien. Generally, only a nonresident alien individual may use the terms of a tax treaty to reduce or eliminate U.S. tax on certain types of income. However, most tax treaties contain a provision known as a "saving clause." Exceptions specified in the saving clause may permit an exemption from tax to continue for certain types of income even after the payee has otherwise become a U.S. resident alien for tax purposes.

If you are a U.S. resident alien who is relying on an exception contained in the saving clause of a tax treaty to claim an exemption from U.S. tax on certain types of income, you must attach a statement to Form W-9 that specifies the following five items.

1. The treaty country. Generally, this must be the same treaty under which you claimed exemption from tax as a nonresident alien.

2. The treaty article addressing the income.

3. The article number (or location) in the tax treaty that contains the saving clause and its exceptions.

4. The type and amount of income that qualifies for the exemption from tax.

5. Sufficient facts to justify the exemption from tax under the terms of the treaty article.

Example. Article 20 of the U.S.-China income tax treaty allows an exemption from tax for scholarship income received by a Chinese student temporarily present in the United States. Under U.S. law, this student will become a resident alien for tax purposes if his or her stay in the United States exceeds 5 calendar years. However, paragraph 2 of the first Protocol to the U.S.-China treaty (dated April 30, 1984) allows the provisions of Article 20 to continue to apply even after the Chinese student becomes a resident alien of the United States. A Chinese student who qualifies for this exception (under paragraph 2 of the first protocol) and is relying on this exception to claim an exemption from tax on his or her scholarship or fellowship income would attach to Form W-9 a statement that includes the information described above to support that exemption.

If you are a nonresident alien or a foreign entity, give the requester the appropriate completed Form W-8 or Form 8233.

Backup Withholding

What is backup withholding? Persons making certain payments to you must under certain conditions withhold and pay to the IRS 28% of such payments. This is called "backup withholding." Payments that may be subject to backup withholding include interest, tax-exempt interest, dividends, broker and barter exchange transactions, rents, royalties, nonemployee pay, payments made in settlement of payment card and third party network transactions, and certain payments from fishing boat operators. Real estate transactions are not subject to backup withholding.

You will not be subject to backup withholding on payments you receive if you give the requester your correct TIN, make the proper certifications, and report all your taxable interest and dividends on your tax return.

Payments you receive will be subject to backup withholding if:

1. You do not furnish your TIN to the requester,

2. You do not certify your TIN when required (see the instructions for Part II for details),

3. The IRS tells the requester that you furnished an incorrect TIN,

4. The IRS tells you that you are subject to backup withholding because you did not report all your interest and dividends on your tax return (for reportable interest and dividends only), or

5. You do not certify to the requester that you are not subject to backup withholding under 4 above (for reportable interest and dividend accounts opened after 1983 only).

Certain payees and payments are exempt from backup withholding. See *Exempt payee code,* later, and the separate Instructions for the Requester of Form W-9 for more information.

Also see *Special rules for partnerships,* earlier.

What is FATCA Reporting?

The Foreign Account Tax Compliance Act (FATCA) requires a participating foreign financial institution to report all United States account holders that are specified United States persons. Certain payees are exempt from FATCA reporting. See *Exemption from FATCA reporting code,* later, and the Instructions for the Requester of Form W-9 for more information.

Updating Your Information

You must provide updated information to any person to whom you claimed to be an exempt payee if you are no longer an exempt payee and anticipate receiving reportable payments in the future from this person. For example, you may need to provide updated information if you are a C corporation that elects to be an S corporation, or if you no longer are tax exempt. In addition, you must furnish a new Form W-9 if the name or TIN changes for the account; for example, if the grantor of a grantor trust dies.

Penalties

Failure to furnish TIN. If you fail to furnish your correct TIN to a requester, you are subject to a penalty of $50 for each such failure unless your failure is due to reasonable cause and not to willful neglect.

Civil penalty for false information with respect to withholding. If you make a false statement with no reasonable basis that results in no backup withholding, you are subject to a $500 penalty.

Criminal penalty for falsifying information. Willfully falsifying certifications or affirmations may subject you to criminal penalties including fines and/or imprisonment.

Misuse of TINs. If the requester discloses or uses TINs in violation of federal law, the requester may be subject to civil and criminal penalties.

Specific Instructions

Line 1

You must enter one of the following on this line; **do not** leave this line blank. The name should match the name on your tax return.

If this Form W-9 is for a joint account (other than an account maintained by a foreign financial institution (FFI)), list first, and then circle, the name of the person or entity whose number you entered in Part I of Form W-9. If you are providing Form W-9 to an FFI to document a joint account, each holder of the account that is a U.S. person must provide a Form W-9.

a. **Individual.** Generally, enter the name shown on your tax return. If you have changed your last name without informing the Social Security Administration (SSA) of the name change, enter your first name, the last name as shown on your social security card, and your new last name.

Note: ITIN applicant: Enter your individual name as it was entered on your Form W-7 application, line 1a. This should also be the same as the name you entered on the Form 1040/1040A/1040EZ you filed with your application.

b. **Sole proprietor or single-member LLC.** Enter your individual name as shown on your 1040/1040A/1040EZ on line 1. You may enter your business, trade, or "doing business as" (DBA) name on line 2.

c. **Partnership, LLC that is not a single-member LLC, C corporation, or S corporation.** Enter the entity's name as shown on the entity's tax return on line 1 and any business, trade, or DBA name on line 2.

d. **Other entities.** Enter your name as shown on required U.S. federal tax documents on line 1. This name should match the name shown on the charter or other legal document creating the entity. You may enter any business, trade, or DBA name on line 2.

e. **Disregarded entity.** For U.S. federal tax purposes, an entity that is disregarded as an entity separate from its owner is treated as a "disregarded entity." See Regulations section 301.7701-2(c)(2)(iii). Enter the owner's name on line 1. The name of the entity entered on line 1 should never be a disregarded entity. The name on line 1 should be the name shown on the income tax return on which the income should be reported. For example, if a foreign LLC that is treated as a disregarded entity for U.S. federal tax purposes has a single owner that is a U.S. person, the U.S. owner's name is required to be provided on line 1. If the direct owner of the entity is also a disregarded entity, enter the first owner that is not disregarded for federal tax purposes. Enter the disregarded entity's name on line 2, "Business name/disregarded entity name." If the owner of the disregarded entity is a foreign person, the owner must complete an appropriate Form W-8 instead of a Form W-9. This is the case even if the foreign person has a U.S. TIN.

Line 2

If you have a business name, trade name, DBA name, or disregarded entity name, you may enter it on line 2.

Line 3

Check the appropriate box on line 3 for the U.S. federal tax classification of the person whose name is entered on line 1. Check only one box on line 3.

IF the entity/person on line 1 is a(n) . . .	THEN check the box for . . .
• Corporation	Corporation
• Individual • Sole proprietorship, or • Single-member limited liability company (LLC) owned by an individual and disregarded for U.S. federal tax purposes.	Individual/sole proprietor or single-member LLC
• LLC treated as a partnership for U.S. federal tax purposes, • LLC that has filed Form 8832 or 2553 to be taxed as a corporation, or • LLC that is disregarded as an entity separate from its owner but the owner is another LLC that is not disregarded for U.S. federal tax purposes.	Limited liability company and enter the appropriate tax classification. (P= Partnership; C= C corporation; or S= S corporation)
• Partnership	Partnership
• Trust/estate	Trust/estate

Line 4, Exemptions

If you are exempt from backup withholding and/or FATCA reporting, enter in the appropriate space on line 4 any code(s) that may apply to you.

Exempt payee code.

- Generally, individuals (including sole proprietors) are not exempt from backup withholding.
- Except as provided below, corporations are exempt from backup withholding for certain payments, including interest and dividends.
- Corporations are not exempt from backup withholding for payments made in settlement of payment card or third party network transactions.
- Corporations are not exempt from backup withholding with respect to attorneys' fees or gross proceeds paid to attorneys, and corporations that provide medical or health care services are not exempt with respect to payments reportable on Form 1099-MISC.

The following codes identify payees that are exempt from backup withholding. Enter the appropriate code in the space in line 4.

1—An organization exempt from tax under section 501(a), any IRA, or a custodial account under section 403(b)(7) if the account satisfies the requirements of section 401(f)(2)

2—The United States or any of its agencies or instrumentalities

3—A state, the District of Columbia, a U.S. commonwealth or possession, or any of their political subdivisions or instrumentalities

4—A foreign government or any of its political subdivisions, agencies, or instrumentalities

5—A corporation

6—A dealer in securities or commodities required to register in the United States, the District of Columbia, or a U.S. commonwealth or possession

7—A futures commission merchant registered with the Commodity Futures Trading Commission

8—A real estate investment trust

9—An entity registered at all times during the tax year under the Investment Company Act of 1940

10—A common trust fund operated by a bank under section 584(a)

11—A financial institution

12—A middleman known in the investment community as a nominee or custodian

13—A trust exempt from tax under section 664 or described in section 4947

The following chart shows types of payments that may be exempt from backup withholding. The chart applies to the exempt payees listed above, 1 through 13.

IF the payment is for . . .	THEN the payment is exempt for . . .
Interest and dividend payments	All exempt payees except for 7
Broker transactions	Exempt payees 1 through 4 and 6 through 11 and all C corporations. S corporations must not enter an exempt payee code because they are exempt only for sales of noncovered securities acquired prior to 2012.
Barter exchange transactions and patronage dividends	Exempt payees 1 through 4
Payments over $600 required to be reported and direct sales over $5,000[1]	Generally, exempt payees 1 through 5[2]
Payments made in settlement of payment card or third party network transactions	Exempt payees 1 through 4

[1] See Form 1099-MISC, Miscellaneous Income, and its instructions.

[2] However, the following payments made to a corporation and reportable on Form 1099-MISC are not exempt from backup withholding: medical and health care payments, attorneys' fees, gross proceeds paid to an attorney reportable under section 6045(f), and payments for services paid by a federal executive agency.

Exemption from FATCA reporting code. The following codes identify payees that are exempt from reporting under FATCA. These codes apply to persons submitting this form for accounts maintained outside of the United States by certain foreign financial institutions. Therefore, if you are only submitting this form for an account you hold in the United States, you may leave this field blank. Consult with the person requesting this form if you are uncertain if the financial institution is subject to these requirements. A requester may indicate that a code is not required by providing you with a Form W-9 with "Not Applicable" (or any similar indication) written or printed on the line for a FATCA exemption code.

A—An organization exempt from tax under section 501(a) or any individual retirement plan as defined in section 7701(a)(37)

B—The United States or any of its agencies or instrumentalities

C—A state, the District of Columbia, a U.S. commonwealth or possession, or any of their political subdivisions or instrumentalities

D—A corporation the stock of which is regularly traded on one or more established securities markets, as described in Regulations section 1.1472-1(c)(1)(i)

E—A corporation that is a member of the same expanded affiliated group as a corporation described in Regulations section 1.1472-1(c)(1)(i)

F—A dealer in securities, commodities, or derivative financial instruments (including notional principal contracts, futures, forwards, and options) that is registered as such under the laws of the United States or any state

G—A real estate investment trust

H—A regulated investment company as defined in section 851 or an entity registered at all times during the tax year under the Investment Company Act of 1940

I—A common trust fund as defined in section 584(a)

J—A bank as defined in section 581

K—A broker

L—A trust exempt from tax under section 664 or described in section 4947(a)(1)

M—A tax exempt trust under a section 403(b) plan or section 457(g) plan

Note: You may wish to consult with the financial institution requesting this form to determine whether the FATCA code and/or exempt payee code should be completed.

Line 5

Enter your address (number, street, and apartment or suite number). This is where the requester of this Form W-9 will mail your information returns. If this address differs from the one the requester already has on file, write NEW at the top. If a new address is provided, there is still a chance the old address will be used until the payor changes your address in their records.

Line 6

Enter your city, state, and ZIP code.

Part I. Taxpayer Identification Number (TIN)

Enter your TIN in the appropriate box. If you are a resident alien and you do not have and are not eligible to get an SSN, your TIN is your IRS individual taxpayer identification number (ITIN). Enter it in the social security number box. If you do not have an ITIN, see *How to get a TIN* below.

If you are a sole proprietor and you have an EIN, you may enter either your SSN or EIN.

If you are a single-member LLC that is disregarded as an entity separate from its owner, enter the owner's SSN (or EIN, if the owner has one). Do not enter the disregarded entity's EIN. If the LLC is classified as a corporation or partnership, enter the entity's EIN.

Note: See *What Name and Number To Give the Requester,* later, for further clarification of name and TIN combinations.

How to get a TIN. If you do not have a TIN, apply for one immediately. To apply for an SSN, get Form SS-5, Application for a Social Security Card, from your local SSA office or get this form online at *www.SSA.gov*. You may also get this form by calling 1-800-772-1213. Use Form W-7, Application for IRS Individual Taxpayer Identification Number, to apply for an ITIN, or Form SS-4, Application for Employer Identification Number, to apply for an EIN. You can apply for an EIN online by accessing the IRS website at *www.irs.gov/Businesses* and clicking on Employer Identification Number (EIN) under Starting a Business. Go to *www.irs.gov/Forms* to view, download, or print Form W-7 and/or Form SS-4. Or, you can go to *www.irs.gov/OrderForms* to place an order and have Form W-7 and/or SS-4 mailed to you within 10 business days.

If you are asked to complete Form W-9 but do not have a TIN, apply for a TIN and write "Applied For" in the space for the TIN, sign and date the form, and give it to the requester. For interest and dividend payments, and certain payments made with respect to readily tradable instruments, generally you will have 60 days to get a TIN and give it to the requester before you are subject to backup withholding on payments. The 60-day rule does not apply to other types of payments. You will be subject to backup withholding on all such payments until you provide your TIN to the requester.

Note: Entering "Applied For" means that you have already applied for a TIN or that you intend to apply for one soon.

Caution: A disregarded U.S. entity that has a foreign owner must use the appropriate Form W-8.

Part II. Certification

To establish to the withholding agent that you are a U.S. person, or resident alien, sign Form W-9. You may be requested to sign by the withholding agent even if item 1, 4, or 5 below indicates otherwise.

For a joint account, only the person whose TIN is shown in Part I should sign (when required). In the case of a disregarded entity, the person identified on line 1 must sign. Exempt payees, see *Exempt payee code,* earlier.

Signature requirements. Complete the certification as indicated in items 1 through 5 below.

1. Interest, dividend, and barter exchange accounts opened before 1984 and broker accounts considered active during 1983. You must give your correct TIN, but you do not have to sign the certification.

2. Interest, dividend, broker, and barter exchange accounts opened after 1983 and broker accounts considered inactive during 1983. You must sign the certification or backup withholding will apply. If you are subject to backup withholding and you are merely providing your correct TIN to the requester, you must cross out item 2 in the certification before signing the form.

3. Real estate transactions. You must sign the certification. You may cross out item 2 of the certification.

4. Other payments. You must give your correct TIN, but you do not have to sign the certification unless you have been notified that you have previously given an incorrect TIN. "Other payments" include payments made in the course of the requester's trade or business for rents, royalties, goods (other than bills for merchandise), medical and health care services (including payments to corporations), payments to a nonemployee for services, payments made in settlement of payment card and third party network transactions, payments to certain fishing boat crew members and fishermen, and gross proceeds paid to attorneys (including payments to corporations).

5. Mortgage interest paid by you, acquisition or abandonment of secured property, cancellation of debt, qualified tuition program payments (under section 529), ABLE accounts (under section 529A), IRA, Coverdell ESA, Archer MSA or HSA contributions or distributions, and pension distributions. You must give your correct TIN, but you do not have to sign the certification.

What Name and Number To Give the Requester

For this type of account:	Give name and SSN of:
1. Individual	The individual
2. Two or more individuals (joint account) other than an account maintained by an FFI	The actual owner of the account or, if combined funds, the first individual on the account[1]
3. Two or more U.S. persons (joint account maintained by an FFI)	Each holder of the account
4. Custodial account of a minor (Uniform Gift to Minors Act)	The minor[2]
5. a. The usual revocable savings trust (grantor is also trustee) b. So-called trust account that is not a legal or valid trust under state law	The grantor-trustee[1] The actual owner[1]
6. Sole proprietorship or disregarded entity owned by an individual	The owner[3]
7. Grantor trust filing under Optional Form 1099 Filing Method 1 (see Regulations section 1.671-4(b)(2)(i)(A))	The grantor*
For this type of account:	**Give name and EIN of:**
8. Disregarded entity not owned by an individual	The owner
9. A valid trust, estate, or pension trust	Legal entity[4]
10. Corporation or LLC electing corporate status on Form 8832 or Form 2553	The corporation
11. Association, club, religious, charitable, educational, or other tax-exempt organization	The organization
12. Partnership or multi-member LLC	The partnership
13. A broker or registered nominee	The broker or nominee
14. Account with the Department of Agriculture in the name of a public entity (such as a state or local government, school district, or prison) that receives agricultural program payments	The public entity
15. Grantor trust filing under the Form 1041 Filing Method or the Optional Form 1099 Filing Method 2 (see Regulations section 1.671-4(b)(2)(i)(B))	The trust

[1] List first and circle the name of the person whose number you furnish. If only one person on a joint account has an SSN, that person's number must be furnished.

[2] Circle the minor's name and furnish the minor's SSN.

[3] You must show your individual name and you may also enter your business or DBA name on the "Business name/disregarded entity" name line. You may use either your SSN or EIN (if you have one), but the IRS encourages you to use your SSN.

[4] List first and circle the name of the trust, estate, or pension trust. (Do not furnish the TIN of the personal representative or trustee unless the legal entity itself is not designated in the account title.) Also see *Special rules for partnerships,* earlier.

***Note:** The grantor also must provide a Form W-9 to trustee of trust.

Note: If no name is circled when more than one name is listed, the number will be considered to be that of the first name listed.

Secure Your Tax Records From Identity Theft

Identity theft occurs when someone uses your personal information such as your name, SSN, or other identifying information, without your permission, to commit fraud or other crimes. An identity thief may use your SSN to get a job or may file a tax return using your SSN to receive a refund.

To reduce your risk:

- Protect your SSN,
- Ensure your employer is protecting your SSN, and
- Be careful when choosing a tax preparer.

If your tax records are affected by identity theft and you receive a notice from the IRS, respond right away to the name and phone number printed on the IRS notice or letter.

If your tax records are not currently affected by identity theft but you think you are at risk due to a lost or stolen purse or wallet, questionable credit card activity or credit report, contact the IRS Identity Theft Hotline at 1-800-908-4490 or submit Form 14039.

For more information, see Pub. 5027, Identity Theft Information for Taxpayers.

Victims of identity theft who are experiencing economic harm or a systemic problem, or are seeking help in resolving tax problems that have not been resolved through normal channels, may be eligible for Taxpayer Advocate Service (TAS) assistance. You can reach TAS by calling the TAS toll-free case intake line at 1-877-777-4778 or TTY/TDD 1-800-829-4059.

Protect yourself from suspicious emails or phishing schemes. Phishing is the creation and use of email and websites designed to mimic legitimate business emails and websites. The most common act is sending an email to a user falsely claiming to be an established legitimate enterprise in an attempt to scam the user into surrendering private information that will be used for identity theft.

The IRS does not initiate contacts with taxpayers via emails. Also, the IRS does not request personal detailed information through email or ask taxpayers for the PIN numbers, passwords, or similar secret access information for their credit card, bank, or other financial accounts.

If you receive an unsolicited email claiming to be from the IRS, forward this message to *phishing@irs.gov.* You may also report misuse of the IRS name, logo, or other IRS property to the Treasury Inspector General for Tax Administration (TIGTA) at 1-800-366-4484. You can forward suspicious emails to the Federal Trade Commission at *spam@uce.gov* or report them at *www.ftc.gov/complaint.* You can contact the FTC at *www.ftc.gov/idtheft* or 877-IDTHEFT (877-438-4338). If you have been the victim of identity theft, see *www.IdentityTheft.gov* and Pub. 5027.

Visit *www.irs.gov/IdentityTheft* to learn more about identity theft and how to reduce your risk.

Privacy Act Notice

Section 6109 of the Internal Revenue Code requires you to provide your correct TIN to persons (including federal agencies) who are required to file information returns with the IRS to report interest, dividends, or certain other income paid to you; mortgage interest you paid; the acquisition or abandonment of secured property; the cancellation of debt; or contributions you made to an IRA, Archer MSA, or HSA. The person collecting this form uses the information on the form to file information returns with the IRS, reporting the above information. Routine uses of this information include giving it to the Department of Justice for civil and criminal litigation and to cities, states, the District of Columbia, and U.S. commonwealths and possessions for use in administering their laws. The information also may be disclosed to other countries under a treaty, to federal and state agencies to enforce civil and criminal laws, or to federal law enforcement and intelligence agencies to combat terrorism. You must provide your TIN whether or not you are required to file a tax return. Under section 3406, payers must generally withhold a percentage of taxable interest, dividend, and certain other payments to a payee who does not give a TIN to the payer. Certain penalties may also apply for providing false or fraudulent information.

City of Pembroke Pines

Attachment C

NON-COLLUSIVE AFFIDAVIT

BIDDER is the _____,
(Owner, Partner, Officer, Representative or Agent)

BIDDER is fully informed respecting the preparation and contents of the attached Bid and of all pertinent circumstances respecting such Bid;

Such Bid is genuine and is not a collusive or sham Bid;

Neither the said BIDDER nor any of its officers, partners, owners, agents, representative, employees or parties in interest, including this affidavit, have in any way colluded, conspired, connived or agreed, directly or indirectly, with any other BIDDER, firm or person to submit a collusive or sham Bid in connection with the Contract for which the attached Bid has been submitted; or to refrain from bidding in connection with such Contract; or have in any manner, directly or indirectly, sought by agreement or collusion, or communications, or conference with any BIDDER, firm, or person to fix the price or prices in the attached Bid or any other BIDDER, or to fix any overhead, profit, or cost element of the Bid Price or the Bid Price of any other BIDDER, or to secure through any collusion conspiracy, connivance, or unlawful agreement any advantage against (Recipient), or any person interested in the proposed Contract;

The price of items quoted in the attached Bid are fair and proper and are not tainted by collusion, conspiracy, connivance, or unlawful agreement on the part of the BIDDER or any other of its agents, representatives, owners, employees or parties in interest, including this affidavit.

Printed Name/Signature _____

Title _____

Name of Company _____

City of Pembroke Pines

Attachment D

SWORN STATEMENT
ON PUBLIC ENTITY CRIMES
UNDER FLORIDA STATUTES CHAPTER 287.133(3)(a).

1. This sworn statement is submitted _____ (name of entity submitting sworn statement) whose business address is _____ and (if applicable) its Federal Employer Identification Number (FEIN) is _____. (If the entity has no FEIN, include the Social Security Number of the individual signing this sworn statement: _____.)

2. My name is _____ and my
(Please print name of individual signing)

relationship to the entity named above is _____.

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

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

5. I understand that an "affiliate" as defined in Paragraph 287.133(1)(a), Florida Statutes, means:

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

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

6. I understand that a "person" as defined in Paragraph 287.133(1)(e), Florida Statutes, means any natural person or any entity organized under the laws of any state or of the United States with the legal power to enter into a binding contract and which bids or applies to bid on contracts let by a public entity, or which otherwise transacts or applies to transact business with a public entity, or which otherwise transacts or applies to transact business with a public entity. The term "person" includes those officers, directors, executives, partners, shareholders, employees, members, and agents who are active in management of an entity.

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

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

☐ B) The entity submitting this sworn statement, or one or more of the officers, directors, executives, partners, shareholders, employees, members, or agents who are active in management of the entity, or an affiliate of the entity has been charged with and convicted of a public entity crime subsequent to July 1, 1989, AND **(Please indicate which additional statement applies.)**

☐ B1) There has been a proceeding concerning the conviction before a hearing officer of the State of Florida, Division of Administrative Hearings. The final order entered by the hearing officer did not place the person or affiliate on the convicted vendor list. **(Please attach a copy of the final order.)**

☐ B2) The person or affiliate was placed on the convicted vendor list. There has been a subsequent proceeding before a hearing officer of the State of Florida, Division of Administrative Hearings. The final order entered by the hearing officer determined that it was in the public interest to remove the person or affiliate from the convicted vendor list. **(Please attach a copy of the final order.)**

☐ B3) The person or affiliate has not been placed on the convicted vendor list. **(Please describe any action taken by or pending with the Department of General Services.)**

Bidder's Name/Signature	Company	Date

City of Pembroke Pines

Attachment E

LOCAL VENDOR PREFERENCE CERTIFICATION

SECTION 1 GENERAL TERM

LOCAL PREFERENCE

The evaluation of competitive bids is subject to section 35.36 of the City's Procurement Procedures which, except where contrary to federal and state law, or any other funding source requirements, provides that preference be given to local businesses. To satisfy this requirement, the vendor shall affirm in writing its compliance with either of the following objective criteria as of the bid or proposal submission date stated in the solicitation. A local business shall be defined as:

1. "Local Pembroke Pines Vendor" shall mean a business entity which has maintained a permanent place of business with full-time employees within the City limits for a minimum of one (1) year prior to the date of issuance of a bid or proposal solicitation. The permanent place of business may not be a post office box. The business location must actually distribute goods or services from that location. In addition, the business must have a current business tax receipt from the City of Pembroke Pines.

OR;

2. "Local Broward County Vendor" shall mean or business entity which has maintained a permanent place of business with full-time employees within the Broward County limits for a minimum of one (1) year prior to the date of issuance of a bid or proposal solicitation. The permanent place of business may not be a post office box. The business location must actually distribute goods or services from that location. In addition, the business must have a current business tax receipt from the Broward County or the city within Broward County where the business resides.

A preference of five percent (5%) of the total evaluation point, or five percent (5%) of the total price, shall be given to the **Local Pembroke Pines Vendor(s);** A preference of two and a half percent (2.5%) of the total evaluation point for local, or two and a half percent (2.5%) of the total price, shall be given to the **Local Broward County Vendor(s)**.

COMPARISON OF QUALIFICATIONS

The preferences established in no way prohibit the right of the City to compare quality of supplies or services for purchase and to compare qualifications, character, responsibility and fitness of all persons, firms or corporations submitting bids or proposals. Further, the preference established in no way prohibit the right of the city from giving any other preference permitted by law instead of the preferences granted, nor prohibit the city to select the bid or proposal which is the most responsible and in the best interests of the city.

SECTION 2 AFFIRMATION

LOCAL PREFERENCE CERTIFICATION:

☐ Place a check mark here only if affirming bidder meets requirements above as a Local Pembroke Pines Vendor.
In addition, the business must attach a current business tax receipt from the City of Pembroke Pines along with any previous business tax receipts to indicate that the business entity has maintained a permanent place of business for a minimum of one (1) year.

☐ Place a check mark here only if affirming bidder meets requirements above as a Local Broward County Vendor.
In addition, the business must attach a current business tax receipt from the Broward County or the city within Broward County where the business resides along with any previous business tax receipts to indicate that the business entity has maintained a permanent place of business for a minimum of one (1) year.

☐ Place a check mark here only if affirming bidder does not meet the requirements above as a Local Vendor.

Failure to complete this certification at this time (by checking either of the boxes above) shall render the vendor ineligible for Local Preference. This form must be completed by/for the proposer; the proposer WILL NOT qualify for Local Vendor Preference based on their sub-contractors' qualifications.

COMPANY NAME: _____

PRINTED NAME / AUTHORIZED SIGNATURE: _____

City of Pembroke Pines

Attachment F

VETERAN OWNED SMALL BUSINESS (VOSB) PREFERENCE CERTIFICATION

SECTION 1 GENERAL TERM

VETERAN OWNED SMALL BUSINESS (VOSB) PREFEREENCE

The evaluation of competitive bids is subject to section 35.37 of the City's Procurement Procedures which, except where contrary to federal and state law, or any other funding source requirements, provides that preference be given to veteran owned small businesses. To satisfy this requirement, the vendor shall affirm in writing its compliance with the following objective criteria as of the bid or proposal submission date stated in the solicitation. A veteran owned small business shall be defined as:

1. "Veteran Owned Small Business" shall mean a business entity which has received a "Determination Letter" from the United States Department of Veteran Affairs Center for Verification and Evaluation notifying the business that they have been approved as a Veteran Owned Small Business (VOSB).

A preference of two and a half percent (2.5%) of the total evaluation point, or two and a half percent (2.5%) of the total price, shall be given to the **Veteran Owned Small Business (VOSB)**. This shall mean that if a **VOSB** submits a bid/quote that is within 2.5% of the lowest price submitted by any vendor, the **VOSB** shall have an option to submit another bid which is at least 1% lower than the lowest responsive bid/quote. If the **VOSB** submits a bid which is at least 1% lower than that lowest responsive bid/quote, then the award will go to the **VOSB**. If not, the award will be made to the vendor that submits the lowest responsive bid/quote. If the lowest responsive and responsible bidder IS a **"Local Pembroke Pines Vendor" (LPPV)** or a **"Local Broward County Vendor" (LBCV)** as established in Section 35.36 of the City's Code of Ordinances, entitled "Local Vendor Preference", then the award will be made to that vendor and no other bidders will be given an opportunity to submit additional bids as described herein.

If there is a **LPPV**, a **LBCV**, and a **VOSB** participating in the same bid solicitation and all three vendors qualify to submit a second bid, the **LPPV** will be given first option. If the **LPPV** cannot beat the lowest bid received by at least 1%, an opportunity will be given to the **LBCV**. If the **LBCV** cannot beat the lowest bid by at least 1%, an opportunity will be given to the **VOSB**. If the **VOSB** cannot beat the lowest bid by at least 1%, then the bid will be awarded to the lowest bidder.

If multiple **VOSBs** submit bids/quotes which are within 2.5% of the lowest bid/quote and there are no **LPPV** or **LBCV** as described in Section 35.36 of the City's Code of Ordinance, entitled "Local Vendor Preference", then all **VOSBs** will be asked to submit a **Best and Final Offer (BAFO)**. The award will be made to the **VOSB** submitting the lowest **BAFO** providing that that **BAFO** is at least 1% lower than the lowest bid/quote received in the original solicitation. If no **VOSB** can beat the lowest bid/quote by at least 1%, then the award will be made to the lowest responsive bidder.

COMPARISON OF QUALIFICATIONS

The preferences established in no way prohibit the right of the City to compare quality of supplies or services for purchase and to compare qualifications, character, responsibility and fitness of all persons, firms or corporations submitting bids or proposals. Further, the preference established in no way prohibit the right of the city from giving any other preference permitted by law instead of the preferences granted, nor prohibit the city to select the bid or proposal which is the most responsible and in the best interests of the city.

SECTION 2 AFFIRMATION

VETERAN OWNED SMALL BUSINESS (VOSB) PREFEREENCE CERTIFICATION:

☐ Place a check mark here only if affirming bidder meets requirements above as a Veteran Owned Small Business.
In addition, the bidder must attach the "Determination Letter" from the U.S. Dept. of Veteran Affairs Center.

☐ Place a check mark here only if affirming bidder does not meet the requirements above as a VOSB.

Failure to complete this certification at this time (by checking either of the boxes above) shall render the vendor ineligible for VOSB Preference. This form must be completed by/for the proposer; the proposer WILL NOT qualify for VOSB Preference based on their sub-contractors' qualifications.

COMPANY NAME: _____

PRINTED NAME / AUTHORIZED SIGNATURE: _____

City of Pembroke Pines

Attachment G

EQUAL BENEFITS CERTIFICATION FORM
FOR DOMESTIC PARTNERS AND ALL MARRIED COUPLES

Except where federal or state law mandates to the contrary, a Contractor awarded a Contract pursuant to a competitive solicitation shall provide benefits to Domestic Partners and spouses of its employees, irrespective of gender, on the same basis as it provides benefits to employees' spouses in traditional marriages.

The Contractor shall provide the City and/or the City Manager or his/her designee, access to its records for the purpose of audits and/or investigations to ascertain compliance with the provisions of this section, and upon request shall provide evidence that the Contractor is in compliance with the provisions of this section upon each new bid, contract renewal, or when the City Manager has received a complaint or has reason to believe the Contractor may not be in compliance with the provisions of this section. Records shall include but not be limited to providing the City and/or the City Manager or his/her designee with certified copies of the Contractor's records pertaining to its benefits policies and its employment policies and practices.

The Contractor must conspicuously make available to all employees and applicants for employment the following statement:

> **"During the performance of a contract with the City of Pembroke Pines, Florida, the Contractor will provide Equal Benefits to its employees with spouses, as defined by Section 35.39 of the City's Code of Ordinances, and its employees with Domestic Partners and all Married Couples".**

The posted statement must also include a City contact telephone number and email address which will be provided to each contractor when a covered contract is executed.

SECTION 1 DEFINITIONS

1. **Benefits** means the following plan, program or policy provided or offered by a contractor to its employees as part of the employer's total compensation package which may include but is not limited to sick leave, bereavement leave, family medical leave, and health benefits.

2. **Cash Equivalent** mean the amount of money paid to an employee with a domestic partner or spouse in lieu of providing benefits to the employee's domestic partner or spouse. The cash equivalent is equal to the employer's direct expense of providing benefits to an employee for his or her spouse from a traditional marriage.

3. **Covered Contract** means a contract between the City and a contractor awarded subsequent to the date when this section becomes effective valued at over $25,000 or the threshold amount required for competitive bids as required in section 35.18(A) of the Procurement Code.

4. **Domestic Partner** shall mean any two (2) adults of the same or different sex who have registered as domestic partners with a governmental body pursuant to state or local law authorizing such registration, or with an internal registry maintained by the employer of at least one of the domestic partners. A contractor may institute an internal registry to allow for the provision of equal benefits to employees with domestic partners who do not register their partnerships pursuant to a governmental body authorizing such registration, or who are located in a jurisdiction where no such governmental domestic partnership registry exists. A contractor that institutes such registry shall not impose criteria for registration that are more stringent than those required for domestic partnership registration by the City of Pembroke Pines.

5. **Equal benefits** means the equality of benefits between employees with spouses and/or dependents of spouses and employees with domestic partners and/or dependents of domestic partners, and/or between spouses of employees and/or dependents of spouses and domestic partners of employees and/or dependents of domestic partners.

6. **Spouse** means one member of a married pair legally married under the laws of any state within the United States of America or any other jurisdiction under which such marriage is legally recognized, irrespective of gender.

7. **Traditional marriage** means a marriage between one man and one woman.

SECTION 2 CERTIFICATION OF CONTRACTOR

The firm providing a response, by virtue of the signature below, certifies that it is aware of the requirements of Section 35.39 “City Contractors providing Equal Benefits for Domestic Partners and all Married Couples” of the City’s Code of Ordinances, and certifies the following (**Check only one box below)**:

☐ **A.** Contractor currently complies with the requirements of this section; or

☐ **B.** Contractor will comply with the conditions of this section at the time of contract award; or

☐ **C.** Contractor will not comply with the conditions of this section at the time of contract award: or

☐ **D.** Contractor does not comply with the conditions of this section because of the following allowable exemption **(Check only one box below):**

☐ **1.** The Contractor does not provide benefits to employees' spouses in traditional marriages;

☐ **2.** The Contractor provides an employee the cash equivalent of benefits because the Contractor is unable to provide benefits to employees' Domestic Partners or spouses despite making reasonable efforts to provide them. To meet this exception, the Contractor shall provide a notarized affidavit that it has made reasonable efforts to provide such benefits. The affidavit shall state the efforts taken to provide such benefits and the amount of the cash equivalent. Cash equivalent means the amount of money paid to an employee with a Domestic Partner or spouse rather than providing benefits to the employee's Domestic Partner or spouse. The cash equivalent is equal to the employer's direct expense of providing benefits to an employee's spouse;

☐ **3.** The Contractor is a religious organization, association, society, or any non-profit charitable or educational institution or organization operated supervised or controlled by or in conjunction with a religious organization, association, or society;

☐ **4.** The Contractor is a governmental agency;

The certification shall be signed by an authorized officer of the Contractor. Failure to provide such certification (by checking the appropriate boxes above along with completing the information below) shall result in a Contractor being deemed non-responsive.

COMPANY NAME: _____

AUTHORIZED OFFICER NAME / SIGNATURE: _____

City of Pembroke Pines

Attachment H

VENDOR DRUG-FREE WORKPLACE CERTIFICATION FORM

SECTION 1 GENERAL TERM

Preference may be given to vendors submitting a certification with their bid/proposal certifying they have a drug-free workplace in accordance with Section 287.087, Florida Statutes. This requirement affects all public entities of the State and becomes effective January 1, 1991. The special condition is as follows:

IDENTICAL TIE BIDS - Preference may be given to businesses with drug-free workplace programs. Whenever two or more bids that are equal with respect to price, quality, and service are received by the State or by any political subdivision for the procurement of commodities or contractual services, a bid received from a business that certifies that it has implemented a drugfree workplace program shall be given preference in the award process. Established procedures for processing tie bids will be followed if none of the tied vendors have a drug-free workplace program. In order to have a drug-free workplace program, a business shall:

1. Publish a statement notifying employees that the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance is prohibited in the workplace and specifying the actions that will be taken against employees for violations of such prohibition.

2. Inform employees about the dangers of drug abuse in the workplace, the business's policy of maintaining a drug-free workplace, any available drug counseling, rehabilitation, and employee assistance programs, and the penalties that may be imposed upon employees for drug abuse violations.

3. Give each employee engaged in providing the commodities or contractual services that are under 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 893 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 each 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.

SECTION 2 AFFIRMATION

☐ Place a check mark here only if affirming bidder **complies fully** with the above requirements for a Drug-Free Workplace.

☐ Place a check mark here only if affirming bidder **does not** meet the requirements for a Drug-Free Workplace.

Failure to complete this certification at this time (by checking either of the boxes above) shall render the vendor ineligible for Drug-Free Workplace Preference. This form must be completed by/for the proposer; the proposer WILL NOT qualify for Drug-Free Workplace Preference based on their sub-contractors' qualifications.

Authorized Signature	Authorized Signer Name	Company Name

Attachment I

City of Pembroke Pines

SCRUTINIZED COMPANY CERTIFICATION PURSUANT TO FLORIDA STATUTE § 287.135.

I, _____, on behalf of _____,
Print Name and Title — Company Name

certify that _____:
Company Name

1. Does not participate in a boycott of Israel; and
2. Is not on the Scrutinized Companies that Boycott Israel list; and
3. Is not on the Scrutinized Companies with Activities in Sudan List; and
4. Is not on the Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List; and
5. Has not engaged in business operations in Syria.

Submitting a false certification shall be deemed a material breach of contract. The City shall provide notice, in writing, to the Contractor of the City's determination concerning the false certification. The Contractor shall have ninety (90) days following receipt of the notice to respond in writing and demonstrate that the determination of false certification was made in error. If the Contractor does not demonstrate that the City's determination of false certification was made in error then the City shall have the right to terminate the contract and seek civil remedies pursuant to Florida Statute § 287.135.

Section 287.135, Florida Statutes, prohibits the City from: 1) Contracting with companies for goods or services in any amount if at the time of bidding on, submitting a proposal for, or entering into or renewing a contract if the company is on the Scrutinized Companies that Boycott Israel List, created pursuant to Section 215.4725, F.S. or is engaged in a boycott of Israel; and 2) Contracting with companies, for goods or services over $1,000,000.00 that are on either the Scrutinized Companies with activities in the Iran Petroleum Energy Sector list, created pursuant to s. 215.473, or are engaged in business operations in Syria.

As the person authorized to sign on behalf of the Contractor, I hereby certify that the company identified above in the section entitled "Contractor Name" does not participate in any boycott of Israel, is not listed on the Scrutinized Companies that Boycott Israel List, is not listed on either the Scrutinized Companies with activities in the Iran Petroleum Energy Sector List, and is not engaged in business operations in Syria. I understand that pursuant to section 287.135, Florida Statutes, the submission of a false certification may subject the company to civil penalties, attorney's fees, and/or costs. I further understand that any contract with the City for goods or services may be terminated at the option of the City if the company is found to have submitted a false certification or has been placed on the Scrutinized Companies with Activities in Sudan list or the Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List.

_____	_____	_____
Company Name	Print Name/Signature	Title

City of Pembroke Pines

Attachment J

PROPOSER'S QUALIFICATIONS STATEMENT

PROPOSER shall furnish the following information. Failure to comply with this requirement will render Bid non responsive and shall cause its rejection. Additional sheets shall be attached as required.

PROPOSER'S Name and Principal Address:

Contact Person's Name and Title:

Contact Person's E-mail Address:

PROPOSER'S Telephone and Fax Number:

PROPOSER'S License Number:

(Please attach certificate of status, competency, and/or state registration.)

PROPOSER'S Federal Identification Number:

Number of years your organization has been in business

State the number of years your firm has been in business under your present business name

State the number of years your firm has been in business in the work specific to this solicitation:

Names and titles of all officers, partners or individuals doing business under trade name:

The business is a: Sole Proprietorship ☐ Partnership ☐ Corporation ☐

IF USING A FICTITIOUS NAME, SUBMIT EVIDENCE OF COMPLIANCE WITH FLORIDA FICTITIOUS NAME STATUTE.

Under what former name has your business operated? Include a description of the business. Failure to include such information shall be deemed to be intentional misrepresentation by the City and shall render the proposer non-responsive.

At what address was that business located?

Name, address, and telephone number of surety company and agent who will provide the required bonds on this contract:

Have you ever failed to complete work awarded to you. If so, when, where and why?

Have you personally inspected the proposed WORK and do you have a complete plan for its performance?

Will you subcontract any part of this WORK? If so, give details including a list of each sub-contractor(s) that will perform work in excess of ten percent (10%) of the contract amount and the work that will be performed by each subcontractor(s).

The foregoing list of subcontractor(s) may not be amended after award of the contract without the prior written

approval of the Contract Administrator, whose approval shall not be reasonably withheld.

List and describe all bankruptcy petitions (voluntary or involuntary) which have been filed by or against the Proposer, its parent or subsidiaries or predecessor organizations during the past five (5) years. Include in the description the disposition of each such petition.

List and describe all successful Bond claims made to your surety (ies) during the last five (5) years. The list and descriptions should include claims against the bond of the Proposer and its predecessor organization(s).

List all claims, arbitrations, administrative hearings and lawsuits brought by or against the Proposer or its predecessor organizations(s) during the last (10) years. The list shall include all case names; case, arbitration or hearing identification numbers; the name of the project over which the dispute arose; and a description of the subject matter of the dispute.

List and describe all criminal proceedings or hearings concerning business related offenses in which the Proposer, its principals or officers or predecessor organization(s) were defendants.

Has the Proposer, its principals, officers or predecessor organization(s) been CONVICTED OF A Public Entity Crime, debarred or suspended from bidding by any government entity? If so, provide details.

Are you an Original provider sales representative distributor, broker, manufacturer other, of the commodities/services proposed upon? If other than the original provider, explain below.

Have you ever been debarred or suspended from doing business with any governmental agency? If yes, please explain:

Describe the firm's local experience/nature of service with contracts of similar size and complexity, it the previous three (3) years:

The PROPOSER acknowledges and understands that the information contained in response to this Qualification Statement shall be relied upon by CITY in awarding the contract and such information is warranted by PROPOSER to be true. The discovery of any omission or misstatement that materially affects the PROPOSER's qualifications to perform under the contract shall cause the CITY to reject the Bid, and if after the award, to cancel and terminate the award and/or contract.

(Company Name)

(Printed Name/Signature)

ACORD CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD[YY)

PRODUCER

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW.

INSURERS AFFORDING COVERAGE

INSURED

YOUR COMPANY NAME HERE

INSURER A:
INSURER B,
INSURER C,
INSURER D,
INSURER E,

Companies providing coverage

COVERAGES

THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. AG6REGATE LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	POLICY NUMBER	POLICY EFFECTIVE DATE (MM/DDIYY)	POLICY EXPIRATION DATE (MM/DDIYY)	LIMITS	
	GENERAL LIABILITY				EACH OCCURRENCE	$
	☐ COMMERCIAL GENERAL LIABILITY				FIRE DAMAGE (Any one fire)	$
	☐ CLAIMS MADE ☐ OCCUR				MED EXP (Any one person)	$
					PERSONAL & ADV INJURY	$
					GENERAL AGGREGATE	$
	GEN'L AGGREGATE LIMIT APPLIES PER:				PRODUCTS - COMP/OP AGG	$
	☐ policy ☐ project ☐ loc					
	AUTOMOBILE LIABILITY					
	☐ ANY AUTO					
	☐ ALL OWNED AUTOS					
	☐ SCHEDULED AUTOS					
	☐ HIRED AUTOS					
	☐ NON-OWNED AUTOS					
	☐					
	GARAGE LIABILITY				AUTO ONLY - EA ACCIDENT	$
	☐ ANY AUTO				OTHER THAN AUTO ONLY: EA ACC	$
	☐				AGG	$
	EXCESS LIABILITY				EACH OCCURRENCE	$
	OCCUR ☐ CLAIMS MADE				AGGREGATE	$
						$
	☐ DEDUCTIBLE					$
	☐ RETENTION $					$
	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY				☐ WC STATU-TORY LIMITS ☐ OTH-ER	
					E.L. EACH ACCIDENT	$
					E.L. DISEASE - EA EMPLOYEE	$
					E.L. DISEASE - POLICY LIMIT	$
	OTHER					

Must Include General Liability

SAMPLE CERTIFICATE

DESCRIPTION OF OPERATIONS/LOCATIONSIVEHICLES/EXCL

Certificate must contain wording similar to what appears below

"THE CERTIFICATE HOLDER IS NAMED AS ADDITIONALLY INSURED WITH REGARD TO GENERAL LIABILITY"

CERTIFICATE HOLDER

ADDITIONAL INSURED; INSURER LETTER:

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, THE ISSUING INSURER WILL MAIL 30 DAYS WRITTEN NOTICE TO THE CERTIFICATE HOLDER NAMED TO THE LEFT.

City of Pembroke Pines
601 City Center Way
Pembroke Pines FL 33025

City Must Be Named as Certificate Holder

AUTHORIZED REPRESENTATIVE

ACORD 25-S (7/97)

(DACORD CORPORATION 1988

CONSTRUCTION AGREEMENT

THIS IS AN AGREEMENT, dated the _____ day of _____, **«Contract_Signature_Year»**, by and between:

CITY OF PEMBROKE PINES, a municipal corporation of the State of Florida with a business address of **601 City Center Way, Pembroke Pines, Florida 33025** hereinafter referred to as "CITY",

and

«Vendor_Name_Upper_Case», a **«Vendor_Business_Type»**, authorized to do business in the State of Florida, with a business address of **«Vendor_Address_Line_1», «Vendor_Address_Line_2»** (hereinafter referred to as the "CONTRACTOR"). CITY and CONTRACTOR may hereinafter be referred to collectively as the "Parties."

W I T N E S S E T H:

In consideration of the mutual terms and conditions, promises, covenants and payments hereinafter set forth, CITY and CONTRACTOR agree as follows:

ARTICLE 1
PREAMBLE

In order to establish the background, context and form of reference for this Agreement, and to generally express the objectives and intentions of the respective parties herein, the following statements, representations, and explanations shall be accepted as predicates for the undertakings and commitments included within the provisions which follow, and may be relied upon by the parties as essential elements of the mutual considerations upon which this Agreement is based.

1.1 On **«Solicitation_Advertisement_Date»,** the CITY advertised its notice to bidders of the CITY's desire to hire a firm to **«Service_Description»** as more particularly described in **Exhibit "A"** attached hereto and by this reference made a part hereof, for the said bid entitled:

«Solicitation_Type_Abbreviation» # «Solicitation_Number»
"«Solicitation_Title»"

1.2 On **«Bid_Opening_Date»,** the bids were opened at the offices of the City Clerk.

1.3 On **«Commission_Award_Date»,** the CITY awarded the bid to CONTRACTOR and authorized the proper CITY officials to negotiate and enter into an agreement with CONTRACTOR to render the services more particularly described herein below.

1.4 Negotiations pertaining to the services to be performed by the CONTRACTOR were undertaken and this Agreement incorporates the results of such negotiation.

ARTICLE 2
SERVICES AND RESPONSIBILITIES

2.1 CONTRACTOR hereby agrees to perform the services for the **«Service_Description»,** as more particularly described in **Exhibit "A"** attached hereto and by this reference made a part hereof, ("Property") in accordance with the Scope of Services outlined in the specifications, **"«Solicitation_Type_Abbreviation» # «Solicitation_Number»",** attached hereto and made a part hereof as **Exhibit "A"** and CONTRACTOR's response thereto, attached hereto and made a part hereof as **Composite Exhibit "B"**. CONTRACTOR agrees to do everything required by this Agreement, the Sealed Bid Package, Addenda to this Agreement, and Commission award complete with proposal form.

2.2 CONTRACTOR shall furnish all services, labor, equipment, and materials necessary and as may be required in the performance of this Agreement, except as otherwise specifically provided for herein, and all work performed under this Agreement shall be done in a professional manner.

2.3 CONTRACTOR shall supervise the work force to ensure that all workers conduct themselves and perform their work in a safe and professional manner. CONTRACTOR shall comply with all OSHA safety rules and regulations in the operation of equipment and in the performance of the work. CONTRACTOR shall at all times have a competent field supervisor on the job site to enforce these policies and procedures at the CONTRACTOR’s expense.

2.4 CONTRACTOR shall provide CITY with seventy-two (72) hours written notice prior to the beginning of work under this Agreement and prior to any schedule change with the exception of changes caused by inclement weather.

2.5 CONTRACTOR hereby represents to CITY, with full knowledge that CITY is relying upon these representations when entering into this Agreement with CONTRACTOR, that CONTRACTOR has the professional expertise, experience and manpower to perform the services to be provided by CONTRACTOR pursuant to the terms of this Agreement.

2.6 CONTRACTOR hereby represents to CITY that CONTRACTOR is properly licensed by the applicable federal, state, and local agencies to provide the services under this Agreement. Furthermore, CONTRACTOR agrees to maintain such licenses during the term of this Agreement. If CONTRACTOR's license is revoked, suspended, or terminated for any reason by any governmental agency, CONTRACTOR shall notify the CITY immediately.

2.7 CONTRACTOR shall comply with any and all Federal, State, and local laws and regulations now in effect, or hereinafter enacted during the term of this Agreement, which are applicable to CONTRACTOR, its employees, agents or subcontractors, if any, with respect to the work and services described herein. A violation of any federal, state, or local law or regulation may be cause for breach, allowing the CITY to terminate this Agreement.

ARTICLE 3
TIME OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

3.1 The work to be performed under this Agreement shall be commenced after CITY execution of the Agreement and not later than ten (10) days after the date that CONTRACTOR receives CITY's Notice to Proceed. The work shall be completed within **«Number_of_Calendar_Days_from_NTP_to_Comm»** from issuance of CITY's Notice to Proceed, subject to any permitted extensions of time under the Contract Documents. For the purposes of this Agreement, completion shall mean the issuance of final permit.

3.2 During the pre-construction portion of the work hereunder, the parties agree to work diligently and in good faith in performing their obligations hereunder, so that all required permits for the construction portion of the work may be obtained. In the event that any delays in the pre-construction or construction portion of the work occur, despite the diligent efforts of the parties hereto, and such delays are the result of force majeure or are otherwise outside of the control of either party hereto, then the parties shall agree on an equitable extension of the time for substantial completion hereunder and any resulting increase in general condition costs.

3.3 In the event that CONTRACTOR abandons this Agreement or causes it to be terminated, he shall indemnify CITY against any loss pertaining to this termination up to a maximum of the full contracted fee amount. All finished or unfinished documents, data, studies, surveys, and reports prepared by CONTRACTOR shall become the property of CITY and shall be delivered by CONTRACTOR to CITY.

ARTICLE 4
COMPENSATION AND METHOD OF PAYMENT

4.1 CITY agrees to compensate CONTRACTOR for all services performed by CONTRACTOR upon issuance of final inspection approval / monthly for work that has been completed, inspected and properly invoiced **«Compensation_Type» «Compensation_Amount_Written» («Compensation_Amount_Numerical»),** which includes a **«Contingency_Fee_Percent»** owner's contingency fee of **«Contingency_Fee_Written» («Contingency_Fee_Numerical»)** and a **«Permit_Fee_Percent»** permit allowance of **«Permit_Fee_Written» («Permit_Fee_Numerical»).**

4.1.1 This contingency or allowance authorizes the City to execute change orders up to the amount of the contingency without the need to obtain additional Commission approval. **It is hereby understood and agreed that the vendor shall not expend any dollars in connection with the Owner's Contingency or Allowance without the expressed prior approval of the City's authorized representative.** Any Owner's Contingency funds or allowance that have not been utilized at the end of the project will remain with the Owner, the contractor shall only be paid for the proposed project cost as approved by the City Commission along with any Owner Contingency expenses or allowances that were approved by the City's authorized representative.

4.1.2 The total compensation amount may not be exceeded without a written amendment to this Agreement. A retainage of ten percent (10%) will be deducted from monthly payments until fifty percent (50%) of the project is complete. Retainage will be reduced to five percent (5%) thereafter. Retainage monies will be released upon satisfactory completion and final inspection of the work. Invoices must bear the project name, project number, bid number and purchase order number. CITY has up to thirty (30) days to review, approve and pay all invoices after receipt. CONTRACTOR shall invoice CITY and provide a written request to CITY to commence the one (1) year warranty period. All necessary Releases and Affidavits and approval of Final Payments shall be processed before the warranty period begins. All payments shall be governed by the Florida Prompt Payment Act, as set forth in Part VII, Chapter 218, Florida Statutes.

4.2 **Method of Billing and Payment.**

4.2.1 The CITY shall within thirty (30) days, from the date the City's Public Service Director approves the Application for Payment, pay the CONTRACTOR the amount approved by the City Public Services Director or his or her assignees.

4.2.2 Payment will be made to CONTRACTOR at:

«Vendor_Name»
«Vendor_Address_Line_1»
«Vendor_Address_Line_2»

ARTICLE 5
WAIVER OF LIENS

5.1 Prior to final payment of the Contract Sum, a final waiver of lien shall be submitted by all suppliers, subcontractors, and/or contractors who worked on the project that is the subject of this Agreement. Payment of the invoice and acceptance of such payment by CONTRACTOR shall release CITY from all claims of liability by CONTRACTOR in connection with this Agreement.

ARTICLE 6
WARRANTY

6.1 CONTRACTOR warrants the work against defect for a period of one (1) year from the date of completion of work. In the event that defect occurs during this time, CONTRACTOR shall perform such steps as required to remedy the defects. CONTRACTOR shall be responsible for any damages caused by defect to affected area or to interior structure. The one (1) year warranty period does not begin until substantial completion of the entire project, and the subsequent release of any Performance or Payment Bonds, which may be required by the original bid document.

ARTICLE 7
CHANGES IN SCOPE OF WORK

7.1 CITY or CONTRACTOR may request changes that would increase, decrease, or otherwise modify the Scope of Services, as described in **Exhibit "A,"** to be provided under this Agreement as

described in Article 2 of this Agreement. These changes will affect the monthly compensation accordingly. Such changes or additional services must be in accordance with the provisions of the Code of Ordinances of the CITY, and must be contained in a written amendment, executed by the parties hereto, with the same formality, equality and dignity herewith prior to any deviation from the terms of this Agreement, including the initiation of any additional or extra work.

7.2 In no event will the CONTRACTOR be compensated for any work which has not been described in a separate written agreement executed by the parties hereto.

ARTICLE 8
INDEMNIFICATION

8.1 Pursuant to 725.06, Florida Statutes, the parties agree that one hundred percent (100%) of the total compensation paid to CONTRACTOR for the Work under this Agreement shall constitute specific consideration to CONTRACTOR for the indemnification to be provided under this Agreement. CONTRACTOR shall indemnify and hold harmless the CITY, its trustees, elected and appointed officers, agents, servants, assigns, employees, consultants, separate contractors, any of their subcontractors, sub-subcontractors, agents and employees from and against claims, demands, or causes of action whatsoever, and the resulting losses, damages, costs and expenses, including but not limited to attorneys' fees, including paralegal expenses, liabilities, damages, orders, judgments, or decrees, sustained by the CITY arising out of or resulting from performance of the Work or the failure of the CONTRACTOR to take out and maintain insurance as required under this Agreement.

8.2 Upon completion of all Services, obligations and duties provided for in this Agreement, or in the event of termination of this Agreement for any reason, the terms and conditions of this Article shall survive indefinitely.

8.3 CITY reserves the right to select its own legal counsel to conduct any defense in any such proceeding and all costs and fees associated therewith shall be the responsibility of CONTRACTOR.

8.4 Nothing contained herein is intended nor shall be construed to waive City’s rights and immunities under the common law or §768.28, Florida Statutes, as may be amended from time to time.

ARTICLE 9
INSURANCE

9.1 The CONTRACTOR shall indemnify and hold harmless the CITY and its officers, employees, agents and instrumentalities from any and all liability, losses or damages, including attorneys' fees and costs of defense, which the CITY or its officers, employees, agents or instrumentalities may incur as a result of claims, demands, suits, causes of actions or proceedings of any kind or nature arising out of, relating to or resulting from the performance of this Agreement by the CONTRACTOR or its employees, agents, servants, partners principals or subcontractors.

The CONTRACTOR shall pay all claims and losses in connection therewith and shall investigate and defend all claims, suits or actions of any kind or nature in the name of the CITY, where applicable, including appellate proceedings, and shall pay all costs, judgments, and attorney's fees which may issue thereon. The CONTRACTOR expressly understands and agrees that any insurance protection required by this Agreement or otherwise provided by the CONTRACTOR shall in no way limit the responsibility to indemnify, keep and save harmless and defend the CITY or its officers, employees, agents and instrumentalities as herein provided.

9.2 CONTRACTOR shall not commence work under this Agreement until it has obtained all insurance required under this paragraph and such insurance has been approved by the Risk Manager of the CITY nor shall the CONTRACTOR allow any subcontractor to commence work on his subcontract until all similar such insurance required of the subcontractor has been obtained and similarly approved.

9.3 Certificates of Insurance, reflecting evidence of the required insurance, shall be filed with the City's Risk Manager prior to the commencement of this Agreement. Policies shall be issued by companies authorized to do business under the laws of the State of Florida. The insurance company shall be rated no less than "A" as to management, and no less than "Class VI" as to financial strength according to the latest edition of Best's Insurance Guide published by A.M. Best Company.

9.4 Policies shall be endorsed to provide the CITY thirty (30) days notice of cancellation or the CONTRACTOR shall obtain written agreement from its Agent to provide the CITY thirty (30) days notice of cancellation.

9.5 Insurance shall be in force until all obligations required to be fulfilled under the terms of the Agreement are satisfactorily completed as evidenced by the formal acceptance by the CITY. In the event the insurance certificate provided indicates that the insurance shall terminate and lapse during the period of this Agreement, then in that event, the CONTRACTOR shall furnish, at least forty-five (45) days prior to the expiration of the date of such insurance, a renewed certificate of insurance as proof that equal and like coverage for the balance of the period of the Agreement and extension thereunder is in effect. The CONTRACTOR shall not commence nor continue to provide any services pursuant to this Agreement unless all required insurance remains in full force and effect. CONTRACTOR shall be liable to CITY for any lapses in service resulting from a gap in insurance coverage.

9.6 REQUIRED INSURANCE

9.6.1 Comprehensive General Liability Insurance written on an occurrence basis including, but not limited to: coverage for bodily injury and property damage, personal & advertising injury, products & completed operations, and contractual liability. Coverage must be written on an occurrence basis, with limits of liability no less than:

1. Each Occurrence Limit - $1,000,000
2. Fire Damage Limit (Damage to rented premises) - $100,000

3. Personal & Advertising Injury Limit - $1,000,000
4. General Aggregate Limit - $2,000,000
5. Products & Completed Operations Aggregate Limit - $2,000,000

Products & Completed Operations Coverage shall be maintained for two (2) years after the final payment under this contract.

The City of Pembroke Pines must be shown as an additional insured with respect to this coverage.

9.6.2 Worker's Compensation and Employers Liability Insurance covering all employees, and/or volunteers of the CONTRACTOR engaged in the performance of the scope of work associated with this Agreement. In the case any work is sublet, the CONTRACTOR shall require the subcontractors similarly to provide Workers Compensation Insurance for all the latter's employees unless such employees are covered by the protection afforded by the CONTRACTOR. Coverage for the CONTRACTOR and his subcontractors shall be in accordance with applicable state and/or federal laws that may apply to Workers' Compensation Insurance with limits of liability no less than:

1. Workers' Compensation:	Coverage A –	Statutory
2. Employers Liability:	Coverage B	$500,000 Each Accident
		$500,000 Disease – Policy Limit
		$500,000 Disease – Each Employee

If CONTRACTOR claims to be exempt from this requirement, CONTRACTOR shall provide CITY proof of such exemption along with a written request for CITY to exempt CONTRACTOR, written on CONTRACTOR letterhead.

9.6.3 Comprehensive Auto Liability Insurance covering all owned, non-owned and hired vehicles used in connection with the performance of work under this Agreement, with a combined single limit of liability for bodily injury and property damage no less than:

1. Any Auto (Symbol 1)
   Combined Single Limit (Each Accident) - $1,000,000
2. Hired Autos (Symbol 8)
   Combined Single Limit (Each Accident) - $1,000,000
3. Non-Owned Autos (Symbol 9)
   Combined Single Limit (Each Accident) - $1,000,000

9.6.4 Professional Liability/Errors & Omissions Insurance, when applicable, with a limit of liability no less than $1,000,000 per wrongful act. This coverage shall be maintained for a period of no less than two (2) years after final payment of the contract.

9.6.5 Sexual Abuse may not be excluded from any policy.

9.7 REQUIRED ENDORSEMENTS

9.7.1 The City of Pembroke Pines shall be named as an Additional Insured on each of the General Liability policies required herein
9.7.2 Waiver of all Rights of Subrogation against the CITY
9.7.3 30 Day Notice of Cancellation or Non-Renewal to the CITY
9.7.4 CONTRACTORs' policies shall be Primary & Non-Contributory
9.7.5 All policies shall contain a "severability of interest" or "cross liability" liability clause without obligation for premium payment of the CITY
9.7.6 The City of Pembroke Pines shall be named as a Loss Payee on all Property and/or Inland Marine Policies as their interest may appear.

9.8 CONTRACTOR shall name the CITY, as an additional insured on each of the General Liability policies required herein and shall hold the CITY, its agents, officers and employees harmless on account of claims for damages to persons, property or premises arising out of the services provided hereunder.

9.9 Any insurance required of the CONTRACTOR pursuant to this Agreement must also be required by any subcontractor in the same limits and with all requirements as provided herein, including naming the CITY as an additional insured, in any work that is subcontracted unless such subcontractor is covered by the protection afforded by the CONTRACTOR and provided proof of such coverage is provided to CITY. The CONTRACTOR and any subcontractors shall maintain such policies during the term of this Agreement.

9.10 The City reserves the right to require any other additional types of insurance coverage and/or higher limits of liability it deems necessary based on the nature of work being performed under this Contract.

ARTICLE 10
NON-DISCRIMINATION & EQUAL OPPORTUNITY EMPLOYMENT

10.1 During the performance of the Agreement, neither CONTRACTOR nor its subcontractors shall discriminate against any employee or applicant for employment because of race, religion, color, gender, national origin, sex, age, marital status, political affiliation, familial status, sexual orientation, or disability if qualified. CONTRACTOR will take affirmative action to ensure that employees are treated during employment, without regard to their race, religion, color, gender, national origin, sex, age, marital status, political affiliation, familial status, sexual orientation, or disability if qualified. Such actions must include, but not be limited to, the following: employment, promotion; demotion or transfer; recruitment or recruitment advertising, layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. CONTRACTOR shall agree 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. CONTRACTOR further agrees that he/she/it will ensure that subcontractors, if any, will be made aware of and will comply with this nondiscrimination clause.

ARTICLE 11

INDEPENDENT CONTRACTOR

11.1 This Agreement does not create an employee/employer relationship between the parties. It is the intent of the parties that the CONTRACTOR is an independent contractor under this Agreement and not the CITY's employee for all purposes, including but not limited to, the application of the Fair Labor Standards Act minimum wage and overtime payments, Federal Insurance Contribution Act, the Social Security Act, the Federal Unemployment Tax Act, the provisions of the Internal Revenue Code, the State Workers' Compensation Act, and the State unemployment insurance law. The CONTRACTOR shall retain sole and absolute discretion in the judgment of the manner and means of carrying out CONTRACTOR's activities and responsibilities hereunder provided, further that administrative procedures applicable to services rendered under this Agreement shall be those of CONTRACTOR, which policies of CONTRACTOR shall not conflict with CITY, State, H.U.D., or United States policies, rules or regulations relating to the use of CONTRACTOR's Funds provided for herein. The CONTRACTOR agrees that it is a separate and independent enterprise from the CITY, that it has full opportunity to find other business, that it has made its own investment in its business, and that it will utilize a high level of skill necessary to perform the work. This Agreement shall not be construed as creating any joint employment relationship between the CONTRACTOR and the CITY and the CITY will not be liable for any obligation incurred by CONTRACTOR, including but not limited to unpaid minimum wages and/or overtime premiums.

ARTICLE 12
TERMINATION

12.1 *Termination for Convenience:* This Agreement may be terminated by CITY for convenience, upon **«Termination_for_Convenience»** of written notice by the terminating party to the other party for such termination in which event CONTRACTOR shall be paid its compensation for services performed to termination date, including services reasonably related to termination. In the event that CONTRACTOR abandons this Agreement or causes it to be terminated, CONTRACTOR shall indemnify CITY against loss pertaining to this termination.

12.2 *Default by CONTRACTOR*: In addition to all other remedies available to CITY, this Agreement shall be subject to cancellation by CITY for cause, should CONTRACTOR neglect or fail to perform or observe any of the terms, provisions, conditions, or requirements herein contained, if such neglect or failure shall continue for a period of thirty (30) days after receipt by CONTRACTOR of written notice of such neglect or failure.

ARTICLE 13
UNCONTROLLABLE FORCES

13.1 Neither CITY nor CONTRACTOR shall be considered to be in default of this Agreement if delays in or failure of performance shall be due to Uncontrollable Forces, the effect of which, by the exercise of reasonable diligence, the non-performing party could not avoid. The term "Uncontrollable Forces" shall mean any event which results in the prevention or delay of performance by a party of its obligations under this Agreement and which is beyond the reasonable control of the nonperforming party. It includes, but is not limited to fire, flood, earthquakes, storms, lightning, epidemic, war, riot, civil disturbance, sabotage, and governmental actions.

13.2 Neither party shall, however, be excused from performance if nonperformance is due to forces, which are preventable, removable, or remediable, and which the nonperforming party could have, with the exercise of reasonable diligence, prevented, removed, or remedied with reasonable dispatch. The nonperforming party shall, within a reasonable time of being prevented or delayed from performance by an uncontrollable force, give written notice to the other party describing the circumstances and uncontrollable forces preventing continued performance of the obligations of this Agreement.

ARTICLE 14
AGREEMENT SUBJECT TO FUNDING

14.1 This agreement shall remain in full force and effect only as long as the expenditures provided for in the Agreement have been appropriated by the City Commission of the City of Pembroke Pines in the annual budget for each fiscal year of this Agreement, and is subject to termination based on lack of funding.

ARTICLE 15
VENUE

15.1 This Agreement shall be governed by the laws of the State of Florida as now and hereafter in force. The venue for actions arising out of this agreement shall be in Broward County, Florida.

ARTICLE 16
SIGNATORY AUTHORITY

16.1 CONTRACTOR shall provide CITY with copies of requisite documentation evidencing that the signator for CONTRACTOR has the authority to enter into this Agreement.

ARTICLE 17
MERGER; AMENDMENT

17.1 This Agreement constitutes the entire Agreement between CONTRACTOR and CITY, and negotiations and oral understandings between the parties are merged herein. This Agreement can be supplemented or amended only by a written document executed by both CONTRACTOR and CITY with the same formality and equal dignity herewith.

ARTICLE 18
DEFAULT OF CONTRACT & REMEDIES

18.1.1 **Damages.** CITY reserves the right to recover any ascertainable actual damages incurred as a result of the failure of CONTRACTOR to perform in accordance with the requirements of this Agreement, or for losses sustained by CITY resultant from CONTRACTOR's failure to perform in accordance with the requirements of this Agreement.

18.1.2 **Liquidated Damages.** As a breach of the service provided by this Agreement would cause serious and substantial damage to CITY Property, and the nature of this Agreement would render it impracticable or extremely difficult to fix the actual damage sustained by CITY by such

breach, it is agreed that, in case of breach of service wherein CONTRACTOR fails to maintain the Property, leaving the said property in disrepair, CITY may elect to collect liquidated damages for each such breach, and CONTRACTOR will pay CITY as liquidated damages, and not as penalty, **«Liquidated_Damages_Per_Day_Written» («Liquidated_Damages_Per_Day_Numerical»)** for every day of such malfunction. This sum is the agreed upon amount by which CITY will be damaged by the breach of such service. An election to seek such remedies shall not be construed as a waiver of any legal remedies CITY may have as to any subsequent breach of service under this Agreement.

18.1.3 **Correction of Work.** If, in the judgment of CITY, work provided by CONTRACTOR does not conform to the requirements of this Agreement, or if the work exhibits poor workmanship, CITY reserves the right to require that CONTRACTOR correct all deficiencies in the work to bring the work into conformance without additional cost to CITY, and / or replace any personnel who fail to perform in accordance with the requirements of this Agreement. CITY shall be the sole judge of non-conformance and the quality of workmanship.

18.2 **Default of Contract.** The occurrence of any one or more of the following events shall constitute a default and breach of this Agreement by CONTRACTOR:

18.2.1. The abandonment of the Property by CONTRACTOR for a period of more than seven (7) business days.

18.2.2 The abandonment, unnecessary delay, refusal of, or failure to comply with any of the terms of this Agreement or neglect, or refusal to comply with the instructions of the Public Services Director relative thereto.

18.2.3. The failure by CONTRACTOR to observe or perform any of the terms, covenants, or conditions of this Agreement to be observed or performed by CONTRACTOR, where such failure shall continue for a period of seven (7) days after written notice thereof by CITY to CONTRACTOR; provided, however, that if the nature of CONTRACTOR's default is such that more than seven (7) days are reasonably required for its cure, then CONTRACTOR shall not be deemed to be in default if CONTRACTOR commences such cure within said seven (7) day period and thereafter diligently prosecutes such cure to completion.

18.2.4. The assignment and/or transfer of this Agreement or execution or attachment thereon by CONTRACTOR or any other party in a manner not expressly permitted hereunder.

18.2.5. The making by CONTRACTOR of any general assignment or general arrangement for the benefit of creditors, or the filing by or against CONTRACTOR of a petition to have CONTRACTOR adjudged a bankruptcy, or a petition for reorganization or arrangement under any law relating to bankruptcy (unless, in the case of a petition filed against CONTRACTOR, the same is dismissed within sixty (60) days); or the appointment of a trustee or a receiver to take possession of substantially all of CONTRACTOR's assets, or for CONTRACTOR's interest in this Agreement, where possession is not restored to CONTRACTOR within thirty (30) days; for attachment, execution or other judicial seizure of substantially all of CONTRACTOR's assets, or for CONTRACTOR's interest in this Agreement, where such seizure is not discharged within thirty (30) days.

18.3 **Remedies in Default.** In case of default by CONTRACTOR, CITY shall notify CONTRACTOR, in writing, of such abandonment, delay, refusal, failure, neglect, or default and direct him to comply with all provisions of the Agreement. If the abandonment, delay, refusal, failure, neglect or default is not cured within seven (7) days of when notice was sent by CITY, CITY may declare a default of the Agreement and notify CONTRACTOR of such declaration of default and terminate the Agreement.

18.3.1. Upon such declaration of default, all payments remaining due CONTRACTOR at the time of default, less all sums due CITY for damages suffered, or expenses incurred by reason of default, shall be due and payable to CITY.

18.3.2. CITY may complete the Agreement, or any part thereof, either by day labor or re-letting a contract for the same, and procure the equipment and the facilities necessary for the completion of the Agreement, and charge the cost of same to CONTRACTOR and/or the Surety together with the costs incident thereto to such default.

18.3.3. In the event CITY completes the Agreement at a lesser cost than would have been payable to CONTRACTOR under this Agreement, if the same had been fulfilled by CONTRACTOR, CITY shall retain such differences. Should such cost to CITY be greater, CONTRACTOR shall pay the amount of such excess to the CITY.

18.3.4 Notwithstanding the other provisions in this Section, CITY reserves the right to terminate the Agreement at any time, whenever the service provided by CONTRACTOR fails to meet reasonable standards of the trade after CITY gives written notice to the CONTRACTOR of the deficiencies as set forth in the written notice within fourteen calendar (14) days of the receipt by CONTRACTOR of such notice from CITY.

ARTICLE 19
BANKRUPTCY

19.1 It is agreed that if CONTRACTOR is adjudged bankrupt, either voluntarily or involuntarily, then this Agreement shall terminate effective on the date and at the time the bankruptcy petition is filed.

ARTICLE 20
DISPUTE RESOLUTION

20.1 **Arbitration.** In addition to any other remedy provided hereunder, CITY, at its option, may use arbitration to resolve any controversy or claim arising out of or relating to this Agreement if arbitration is elected by CITY. Any controversy or claim arising out of or relating to this Agreement, or breach thereof, may be settled by arbitration in accordance with the rules of the American Arbitration Association and judgment upon the award rendered by the arbitrators may be entered into by any court having jurisdiction thereof. In the event arbitration is elected by CITY, such controversy

or claim shall be submitted to one arbitrator selected from the National Panel of The American Arbitration Association.

20.2 **Operations During Dispute.**

20.2.1 In the event that a dispute, if any, arises between CITY and CONTRACTOR relating to this Agreement, performance or compensation hereunder, CONTRACTOR shall continue to render service in full compliance with all terms and conditions of this Agreement as interpreted by CITY regardless of such dispute.

20.2.2 CONTRACTOR expressly recognizes the paramount right and duty of CITY to provide adequate maintenance of CITY's Property, and further agrees, in consideration for the execution of this Agreement, that in the event of such a dispute, if any, it will not seek injunctive relief in any court, but will negotiate with CITY for an adjustment on the matter or matters in dispute and, upon failure of said negotiations to resolve the dispute, may present the matter to a court of competent jurisdiction in an appropriate suit therefore instituted by it or by CITY.

ARTICLE 21
PUBLIC RECORDS

21.1 The City of Pembroke Pines is public agency subject to Chapter 119, Florida Statutes. The CCONTRACTOR shall comply with Florida's Public Records Law. Specifically, the CONTRACTOR shall:

21.1.1 Keep and maintain public records required by the CITY to perform the service;

21.1.2 Upon request from the CITY's custodian of public records, provide the CITY 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, Fla. Stat., or as otherwise provided by law;

21.1.3 Ensure that public records that are exempt or that are confidential and exempt from public record disclosure requirements are not disclosed except as authorized by law for the duration of the contract term and, following completion of the contract, CONTRACTOR shall destroy all copies of such confidential and exempt records remaining in its possession after the CONTRACTOR transfers the records in its possession to the CITY; and

21.1.4 Upon completion of the contract, CONTRACTOR shall transfer to the CITY, at no cost to the CITY, all public records in CONTRACTOR's possession. All records stored electronically by the CONTRACTOR must be provided to the CITY, upon request from the CITY's custodian of public records, in a format that is compatible with the information technology systems of the CITY.

21.2 The failure of Contractor to comply with the provisions set forth in this Article shall constitute a Default and Breach of this Agreement and the CITY shall enforce the Default in accordance with the provisions set forth in **Article 18**.

IF THE CONTRACTOR HAS QUESTIONS REGARDING THE APPLICATION OF CHAPTER 119, FLORIDA STATUTES, TO THE CONTRACTOR'S DUTY TO PROVIDE PUBLIC RECORDS RELATING TO THIS CONTRACT, CONTACT THE CUSTODIAN OF PUBLIC RECORDS AT

CITY CLERK
601 CITY CENTER WAY, 4th FLOOR
PEMBROKE PINES, FL 33025
(954) 450-1050
mgraham@ppines.com

ARTICLE 22
MISCELLANEOUS

22.1 **Ownership of Documents.** Reports, surveys, studies, and other data provided in connection with this Agreement are and shall remain the property of CITY, whether or not the project for which they are made is completed.

22.2 **Legal Representation.** It is acknowledged that each party to this agreement had the opportunity to be represented by counsel in the preparation of this Agreement, and accordingly, the rule that a contract shall be interpreted strictly against the party preparing same shall not apply herein due to the joint contributions of both parties.

22.3 **Records.** CONTRACTOR shall keep such records and accounts and require any and all subcontractors to keep records and accounts as may be necessary in order to record complete and correct entries as to personnel hours charged to this engagement, and any expenses for which CONTRACTOR expects to be reimbursed. Such books and records will be available at all reasonable times for examination and audit by CITY and shall be kept for a period of ten (10) years after the completion of all work to be performed pursuant to this Agreement. Incomplete or incorrect entries in such books and records will be grounds for disallowance by CITY of any fees or expenses based upon such entries.

22.4 **Assignments; Amendments.** This Agreement, and any interests herein, shall not be assigned, transferred or otherwise encumbered, under any circumstances, by CONTRACTOR without the prior written consent of CITY. For purposes of this Agreement, any change of ownership of CONTRACTOR shall constitute an assignment which requires CITY approval. However, this Agreement shall run to the benefit of CITY and its successors and assigns.

22.5 **No Contingent Fees.** CONTRACTOR warrants that it has not employed or retained any company or person, other than a bona fide employee working solely for CONTRACTOR to solicit or secure this Agreement, and that it has not paid or agreed to pay any person, company, corporation, individual or firm, other than a bona fide employee working solely for CONTRACTOR any fee, commission, percentage, gift, or other consideration contingent upon or resulting from the award or making of this Agreement. For the breach or violation of this provision, CITY shall have the right to terminate the Agreement without liability at its discretion, to deduct from the contract price, or otherwise recover the full amount of such fee, commission, percentage, gift or consideration.

22.6 **Notice.** Whenever any party desires to give notice unto any other party, it must be given by written notice, sent by certified United States mail, with return receipt requested, addressed to the party for whom it is intended and the remaining party, at the places last specified, and the places for giving of notice shall remain such until they shall have been changed by written notice in compliance with the provisions of this section. For the present, CONTRACTOR and CITY designate the following as the respective places for giving of notice:

CITY
Charles F. Dodge, City Manager
City of Pembroke Pines
601 City Center Way
Pembroke Pines, Florida 33025
Telephone No. (954) 450-1040

Copy To:
Samuel S. Goren, City Attorney
Goren, Cherof, Doody & Ezrol, P.A.
3099 East Commercial Boulevard, Suite 200
Fort Lauderdale, Florida 33308
Telephone No. (954) 771-4500
Facsimile No. (954) 771-4923

Contractor
«Vendor_Contact_Title»
«Vendor_Name»
«Vendor_Address_Line_1»
«Vendor_Address_Line_2»
E-mail: **«Vendor_Email»**
Telephone No: **«Vendor_Phone_Number»**
Cell phone No: **«Vendor_Cell_Number»**
Facsimile No: **«Vendor_Fax_Number»**

22.7 **Binding Authority.** Each person signing this Agreement on behalf of either party individually warrants that he or she has full legal power to execute this Agreement on behalf of the party for whom he or she is signing, and to bind and obligate such party with respect to all provisions contained in this Agreement.

22.8 **Headings.** Headings herein are for the convenience of reference only and shall not be considered in any interpretation of this Agreement.

22.9 **Exhibits.** Each Exhibit referred to in this Agreement forms an essential part of this Agreement. The exhibits if not physically attached should be treated as part of this Agreement and are incorporated herein by reference.

22.10 **Severability.** If any provision of this Agreement or application thereof to any person or situation shall to any extent, be held invalid or unenforceable, the remainder of this Agreement, and the application of such provisions to persons or situations other than those as to which it shall have been held invalid or unenforceable, shall not be affected thereby, and shall continue in full force and effect, and be enforced to the fullest extent permitted by law.

22.11 **Extent of Agreement.** This Agreement represents the entire and integrated agreement between CITY and CONTRACTOR and supersedes all prior negotiations, representations or agreements, either written or oral.

22.12 **Waiver.** Failure of CITY to insist upon strict performance of any provision or condition of this Agreement, or to execute any right therein contained, shall not be constructed as a waiver or relinquishment for the future of any such provision, condition, or right, but the same shall remain in full force and effect.

22.13 **Attorney's Fees.** In the event that either party brings suit for enforcement of this Agreement, each party shall bear its own attorney's fees and court costs, except as otherwise provided under the indemnification provisions set forth herein above.

22.14 **Protection of City Property.** At all times during the performance of this Agreement, CONTRACTOR shall protect CITY's property from all damage whatsoever on account of the work being carried on under this Agreement.

22.15 **Counterparts and Execution.** This Agreement may be executed in multiple originals or counterparts, each of which shall be deemed to be an original and together shall constitute one and the same agreement. Execution and delivery of this Agreement by the Parties shall be legally binding, valid and effective upon delivery of the executed documents to the other party through facsimile transmission, email, or other electronic delivery.

THE REMAINDER OF THIS PAGE

HAS BEEN INTENTIONALLY LEFT BLANK

IN WITNESS OF THE FOREGOING, the parties have set their hands and seals the day and year first written above.

CITY:

CITY OF PEMBROKE PINES, FLORIDA

ATTEST:

_____ By: _____
MARLENE D. GRAHAM, CITY CLERK CHARLES F. DODGE, CITY MANAGER

APPROVED AS TO FORM:

_____
OFFICE OF THE CITY ATTORNEY

CONTRACTOR:

«Vendor_Name_Upper_Case»

By: _____
Name: _____
Title: _____

STATE OF _____)
COUNTY OF _____)

BEFORE ME, an officer duly authorized by law to administer oaths and take acknowledgments, personally appeared _____ as _____ of **«Vendor_Name»**, a company authorized to conduct business in the State of Florida, and acknowledged execution of the foregoing Agreement as the proper official of **«Vendor_Name»** for the use and purposes mentioned in it and affixed the official seal of the corporation, and that the instrument is the act and deed of that corporation.

IN WITNESS OF THE FOREGOING, I have set my hand and official seal at in the State and County aforesaid on this _____day of _____, **«Contract_Signature_Year»**.

_____
NOTARY PUBLIC

_____
(Name of Notary Typed, Printed or Stamped)

Attachment M

City of Pembroke Pines

REFERENCES FORM

Provide specific examples of similar contracts. References should be should be capable of explaining and confirming your firm's capacity to successfully complete the scope of work outlined herein. **This form should be duplicated for each reference and any additional information that would be helpful can be attached.**

Reference Contact Information:

Name of Firm, City, County or Agency:

Address:

City/State/Zip:

Contact Name: Title:

E-Mail Address:

Telephone: Fax:

Project Information:

Name of Contractor Performing the work:

Name and location of the project:

Nature of the firm's responsibility on the project:

Project duration: Completion (Anticipated) Date:

Size of project: Cost of project:

Work for which staff was responsible:

Contract Type:

The results/deliverables of the project:

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Name of Contractor Performing the work:

Name and location of the project:

Nature of the firm's responsibility on the project:

Project duration: Completion (Anticipated) Date:

Size of project: Cost of project:

Work for which staff was responsible:

Contract Type:

The results/deliverables of the project:

Mandatory Pre-Bid/Site Visit Confirmation Form

The scanned form, signed by both the Contractor and City Representatives must be uploaded in order for the bid to be considered complete.

_____, who is a representative of
(Printed name of Contractor's representative)

_____ PERSONALLY came and appeared
(Contractor's Company)

before me and affirms that they have completed the mandatory pre-bid/site visit on this the

_____ day of _____, 20_____ as required by:

Solicitation #: _____

Solicitation Title: _____

_____	_____
(Contractor Representative's Printed Name)	(City Representative's Printed Name)
_____	_____
(Contractor Representative's Signature)	(City Representative's Signature)
_____	_____
(Contractor's Company)	(City Representative's Department)
_____	_____
(Contractor's Phone Number)	(City Representative's Phone Number)
_____	_____
(Date)	(Date)

The City requires all questions to be submitted via the BidSync website. Such request must be received by the "Question Due Date," questions received after the "Question Due Date" shall not be answered. Interpretations or clarifications in response to such questions will be issued via BidSync. The issuance of a response via BidSync is considered an Addendum and shall be the only official method whereby such an interpretation or clarification will be made.

FINAL/PARTIAL RELEASE OF LIEN

KNOW ALL MEN BY THESE PRESENTS:

That the undersigned, for and in consideration of the payment of the sum of $**[Payment Amount]** and other valuable consideration, paid by **City of Pembroke Pines**, receipt of which is hereby acknowledge, hereby releases and quit claims to the said **[Contractor Name]** its successors and assigns, and

City of Pembroke Pines

The owner, all liens, lien rights, claims and demands of any kind whatsoever, which the undersigned now has or might have against the building on premises legally described as:

[Description]
PO #: [PO #] **Invoice #: [Invoice #]**

On account of labor performed and/or material furnished for the construction of any improvements thereon. That all labor and materials used by the undersigned in the erection of said improvements have been fully paid for:

Witnesses:

CONTRACTOR
[NAME OF CONTRACTOR]

_____ BY: _____

_____ Print Name: _____
Print Name

_____ Title: _____

_____
Print Name

STATE OF FLORIDA)
) ss:
COUNTY OF BROWARD)

ON THIS _____ day of _____, 20_____, before me, the undersigned notary public,

personally appeared **[Contractor's Representative]** as **[Job Title]** of

[Name of Contractor], personally known to me, or who has produced

_____ as identification, and is the person who subscribed to the foregoing instrument and who acknowledged that (s)he executed the same and that (s)he was duly authorized to do so.

IN WITNESS WHEREOF, I hereunto set my hand and official seal.

_____
NOTARY PUBLIC

_____
Print or Type Name

My Commission Expires:

ELECTRICAL LEGEND

SYMBOL	DESCRIPTION
	CONNECTION POINT TO EQUIPMENT SPECIFIED, FURNISHED AND INSTALLED UNDER OTHER SECTIONS. RACEWAY, CONDUCTOR AND CONNECTION IN THIS SECTION.
1"C,2#12,1#12G 1"C,1-25/C TYPE 1	INDICATES RACEWAY AND CIRCUIT CONDUCTORS. FIRST NUMBER IS RACEWAY SIZE. THE FOLLOWING NUMBERS ARE THE CONDUCTOR QUANTITIES, SIZES, AND TYPES.
5	MOTOR, SQUIRREL CAGE INDUCTION – HORSEPOWER INDICATED
X	LUMINAIRE AND POLE – SEE DRAWINGS FOR TYPE
X	WALL MOUNTED LUMINAIRE – SEE DRAWINGS FOR TYPE
	LIGHTING FIXTURE POWER AND SWITCHING LEGEND
X Y Z (TYP) Y Z X CRE	X=FIXTURE TYPE Y=PANEL-CIRCUIT BRKR Z=SWITCH CRE-CORROSION RESISTANT IF NO Z INDICATED, CONNECT DIRECTLY TO CIRCUIT BREAKER.
	GROUND ROD – 3/4" x 20' COPPER CLAD UNLESS OTHERWISE NOTED
	GROUND ROD WITH TEST WELL – 3/4" x 20' COPPER CLAD UNLESS OTHERWISE NOTED
S	WALL SWITCH: 2- DOUBLE POLE, 3- THREE WAY, 4- FOUR WAY, WP-WEATHERPROOF; P- PILOT LIGHT, K- KEY OPERATED, D- DIMMER, CRE-CORROSION RESISTANT
S_M	MANUAL MOTOR STARTER SWITCH, NEMA 4X UNLESS OTHERWISE NOTED. NUMBER OF POLES AS REQUIRED
G	GENERATOR
	CONVENIENCE RECEPTACLE 20A RATED- DUPLEX UNLESS SPECIFIED OTHERWISE WP-WEATHERPROOF, C- CLOCK HANGER, TL- TWIST LOCK, CRE-CORROSION RESISTANT GFI-GROUND FAULT INTERRUPTER
J	JUNCTION BOX NEMA 12 ENCLOSURE UNLESS INDICATED OTHERWISE. 4X = NEMA 4X SS
	TELEPHONE RECEPTACLE (OUTLET BOX, 18" AFF) W – WALL MOUNTED, 48" AFF
[B2] LPA-2	CONDUIT/CONDUCTOR – REFER TO CIRCUIT SCHEDULE HOME RUN – PANEL AND CIRCUIT NUMBER SHOWN
	EXPOSED CONDUIT AND CONDUCTORS*
	UNDERGROUND CONDUIT AND CONDUCTORS* NOTE: * ALL UNMARKED CONDUIT RUNS CONSIST OF 2#12, 1#12G IN 3/4"C.
YCX	YARD CONDUIT. REFER TO YARD CONDUIT SCHEDULE
	DIRECT BURIED CABLE
G	CONDUIT, STUBBED AND CAPPED AS SHOWN
	GROUND WIRE, #4 UNLESS OTHERWISE NOTED
30 4X	NONFUSED DISCONNECT SWITCH, SIZE INDICATED, 3 POLE UNLESS INDICATED OTHERWISE, NEMA 12 ENCLOSURE, 4X = NEMA 4X 316 STAINLESS STEEL
F 40 60 4X	FUSED DISCONNECT SWITCH, SIZE INDICATED (60 = SWITCH RATING: 40 = FUSE RATING) 3 POLE UNLESS INDICATED OTHERWISE, NEMA 12 ENCLOSURE, 4X = NEMA 4X 316 STAINLESS STEEL
LC 30 4X	LIGHTING CONTACTOR, CURRENT RATING INDICATED, NEMA 12 ENCLOSURE UNLESS INDICATED OTHERWISE. SEE CONTROL DIAGRAM FOR NUMBER OF POLES. 4X = NEMA 4X 316 STAINLESS STEEL
2 4X	MAGNETIC STARTER, NEMA SIZE INDICATED, NEMA 12 ENCLOSURE, UNLESS INDICATED OTHERWISE. SEE CONTROL DIAGRAM. 4X = NEMA 4X 316 STAINLESS STEEL
2 4X	COMBINATION (FUSE OR CIRCUIT BREAKER AS INDICATED). MAGNETIC STARTER, NEMA SIZE INDICATED, NEMA 12 ENCLOSURE UNLESS INDICATED OTHERWISE. SEE CONTROL SCHEMATIC DIAGRAM. 4X = NEMA 4X 316 STAINLESS STEEL
	GROUND ROD, 3/4" X 20'

SYMBOL	DESCRIPTION
120V or 480–120/208V 15 KVA, 3ø	TRANSFORMER, VOLTAGES, PHASE AND RATING INDICATED AS APPLICABLE
	PUSH–BUTTON SWITCH, MOMENTARY CONTACT, NORMALLY OPEN
	PUSH–BUTTON SWITCH, MOMENTARY CONTACT, NORMALLY CLOSED
	REMOTE DEVICE
H O A 1 XOO 2 OOX	SELECTOR SWITCH: MAINTAINED CONTACT WITH CONTACT POSITION INDICATED, CHART IDENTIFIES OPERATION

	POSITION		
CKT.	HAND	OFF	AUTO
1	X	O	O
2	O	O	X

X – CLOSED CONTACT
O – OPEN CONTACT

CRX	CONTACT – NORMALLY OPEN WITH COIL INDICATED
CRX	CONTACT – NORMALLY CLOSED WITH COIL INDICATED
	OVERLOAD RELAY HEATER
1 M	MAGNETIC STARTER WITH NEMA SIZE INDICATED
	MOTOR CIRCUIT PROTECTOR, MAGNETIC, 3 POLE UNLESS INDICATED OTHERWISE.
400	CIRCUIT BREAKER, THERMAL MAGNETIC TRIP SHOWN, 3 POLE UNLESS INDICATED OTHERWISE.
400 225	FUSED SWITCH, SWITCH AND FUSE CURRENT RATING INDICATED, 3 POLE UNLESS INDICATED OTHERWISE.
100	SWITCH – CURRENT RATING INDICATED, 3 POLE UNLESS INDICATED OTHERWISE.
TVSS	TRANSIENT VOLTAGE SURGE SUPPRESSION
	DEMOLITION TO BE REMOVED OR DELETED
	FUSE
CRX	CONTROL RELAY, X=SEQUENTIAL NUMBER
	CONNECTION POINT TO EQUIPMENT SPECIFIED, FURNISHED AND INSTALLED UNDER OTHER SECTIONS. RACEWAY, CONDUCTOR AND CONNECTION IN THIS SECTION.

ABBREVIATIONS

ABBREVIATIONS	DESCRIPTION	ABBREVIATIONS	DESCRIPTION
AFF	ABOVE FINISHED FLOOR	HVAC	HEATING, VENTILATING & AIR CONDITIONING
AFG	ABOVE FINISHED GRADE	IC	INTERRUPTING CAPACITY
AIT	ANALYTICAL INSTRUMENT TRANSMITTER	I & C	INSTRUMENTATION AND CONTROL
AE	ANALYTICAL ELEMENT	IP	INSTRUMENT PANEL (PANELBOARD)
C	CONDUIT, CONTACTOR	J, J–BOX	JUNCTION BOX
CB	CIRCUIT BREAKER	LC	LIGHTING CONTACTOR
CKT	CIRCUIT	LR	LOCAL/REMOTE
CPT	CONTROL POWER TRANSFORMER	LS	LIMIT SWITCH
CR	CONTROL RELAY	LTG	LIGHTING
CT	CURRENT TRANSFORMER	M	MAGNETIC CONTACTOR COIL OR MOTOR
DIV	DIVISION	MCC	MOTOR CONTROL CENTER
ETM	ELAPSED TIME METER	MDP	MAIN DISTRIBUTION PANEL
EXST	EXISTING	MH	MOTOR HEATER, MANHOLE
F, FU	FUSE	MLO	MAIN LUGS ONLY
FI	FLOW INDICATOR	MPZ	MINI POWER ZONE
FM	FLOW METER	MTD	MOTOR TEMPERATURE DETECTOR
FSO1	FLOW SWITCH 01	N	NEUTRAL
FT	FLOW TRANSMITTER	NC	NORMALLY CLOSED
FUT	FUTURE	NEMA	NATIONAL ELECTRIC MANUFACTURER'S ASSOCIATION
FVNR	FULL VOLTAGE NON–REVERSING STARTER	NO	NORMALLY OPEN
	GREEN, GROUND	NTS	NOT TO SCALE
GALV	GALVANIZED	OL	OVERLOAD RELAY
GEN	GENERATOR	SS	STAINLESS STEEL
GFI	GROUND FAULT INTERRUPTER		
GND	GROUND		
HH	HANDHOLE		
HOA	HAND/OFF/AUTO		
HOR	HAND/OFF/REMOTE		
MSC	MANUFACTURER SUPPLIED CABLE		
FRP	FIBERGLASS–REINFORCED POLYESTER		

ABBREVIATIONS

ABBREVIATIONS	DESCRIPTION	ABBREVIATIONS	DESCRIPTION
PB	PULL BOX	SST	STAINLESS STEEL
PG	PRESSURE GAUGE	SV	SOLENOID VALVE
PCM	EXISTING PLANT CONTROL PANEL	SW	SWITCH
PH	PHASE MONITOR	T	THERMOSTAT
PM	POWER MONITOR	TB	TERMINAL BOARD
PNL	PANEL	TC3S	TERMINAL CABINET 3 SIGNAL
PP	POWER PANEL (480VAC)	TJB	TERMINAL JUNCTION BOX
PS	PRESSURE SWITCH	TS	THERMAL SWITCH
PVC	POLYVINYL CHLORIDE CONDUIT	TSP	TWISTED SHIELDED PAIR
RTU	REMOTE TELEMETRY UNIT	TVSS	TRANSIENT VOLTAGE SURGE SUPPRESSION
RGS	RIGID GALVANIZED STEEL	TYP	TYPICAL
SF	SUPPLY FAN	V	VOLTMETER, VOLT
SH	SPACE HEATER	VD	VOLTAGE DROP
SSRVS	SOLID STATE REDUCED VOLTAGE STARTER	WP	WEATHERPROOF – NEMA 4X
		XFMR	TRANSFORMER

GENERAL NOTES AND SPECIFICATIONS:

1. THE SCOPE OF WORK SHALL BE AS SHOWN ON PLANS AND AS DESCRIBED IN SPECIFICATIONS.
2. THE CONTRACTOR SHALL PROVIDE ALL MATERIALS AND LABOR TO INSTALL THE ELECTRICAL SYSTEMS AS INDICATED PER PLANS AND SPECIFICATIONS. ITEMS NOT SHOWN BUT OBVIOUSLY NECESSARY FOR COMPLETION OF THE WORK SHALL BE INCLUDED.
3. THE INSTALLATION SHALL BE IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE, NATIONAL ELECTRICAL SAFETY CODE, LOCAL CITY CODES, LOCAL COUNTY CODES, AND FLORIDA BUILDING CODE WITH AMENDMENTS.
4. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS, INSPECTIONS AND APPROVALS AND TO INCLUDE ALL FEES AS PART OF HIS BID IF NOT OTHERWISE NOTED. THE CONTRACTOR SHALL COORDINATE HIS WORK WITH THE ENGINEER AND OWNER.
5. THE CONTRACTOR SHALL, BEFORE SUBMITTING HIS BID, VISIT THE SITE OF THE PROJECT AND BECOME FAMILIAR WITH THE EXISTING CONDITIONS. NO ALLOWANCE WILL BE MADE FOR EXISTING CONDITIONS OR FAILURE OF THE CONTRACTOR TO OBSERVE THEM.
6. IT IS THE CONTRACTOR'S RESPONSIBILITY TO COORDINATE WITH ALL LOCAL UTILITIES, INCLUDING THE POWER UTILITY TO MEET ALL OF THEIR INSTALLATION REQUIREMENTS. ALL FEES, LABOR, EQUIPMENT OR MATERIALS NECESSARY TO MEET THESE REQUIREMENTS IS TO BE INCLUDED IN THE BID. THE CONTRACTOR SHALL OBTAIN, DELIVER AND INSTALL ALL CONDUITS, PULL–BOXES AND EQUIPMENT AS REQUIRED BY THE UTILITIES TO THEIR SPECIFICATIONS.
7. ALL CONTRACTOR EQUIPMENT AND MATERIAL SHALL BE NEW, UNUSED AND U.L. LISTED.
8. THE CONTRACTOR IS RESPONSIBLE TO TEST ALL SYSTEMS INSTALLED OR MODIFIED UNDER THIS PROJECT AND REPAIR OR REPLACE ALL DEFECTIVE WORK TO THE SATISFACTION OF THE ENGINEER AND OWNER.
9. ALL EQUIPMENT FURNISHED AND INSTALLED BY THE CONTRACTOR SHALL BE GUARANTEED AGAINST DEFECTS IN MATERIAL AND WORKMANSHIP FOR A PERIOD OF ONE YEAR FROM DATE OF ACCEPTANCE.
10. COORDINATE ALL ELECTRICAL EQUIPMENT LOCATIONS AND VERIFY ALL OBSTRUCTIONS WITH ALL SUBCONTRACTORS AND EQUIPMENT SUPPLIERS PRIOR TO ANY INSTALLATION.
11. NOT ALL CONDUITS SHOWN ON RISER AND ONE–LINE DIAGRAMS ARE SHOWN ON BUILDING OR SITE LAYOUTS. CONTRACTOR SHALL SUPPLY ALL CONDUITS AND CABLES AS SHOWN ON RISER AND ONE–LINE DIAGRAMS.
12. THE DRAWINGS ARE NOT INTENDED TO SHOW THE EXACT LOCATION OF CONDUIT RUNS. THESE ARE TO BE COORDINATED WITH THE OTHER TRADES SO THAT CONFLICTS ARE AVOIDED PRIOR TO INSTALLATIONS. ALL LOCATIONS OF EQUIPMENT, PANELS ETC. ARE SHOWN FOR ILLUSTRATION PURPOSES. CONTRACTOR SHALL VERIFY EXACT LOCATION AND SIZE AND INSTALL AS SUCH WITH CORRESPONDING CONDUIT STUB–UPS. SEE OTHER DISCIPLINE DRAWINGS FOR COORDINATION OF ALL DRAWINGS. ANY CONFLICTS SHALL BE BROUGHT TO THE ENGINEER'S ATTENTION AND MOVEMENT OF CONDUITS OR OTHER ELECTRICAL EQUIPMENT SHALL BE ACCOMPLISHED WITHOUT ANY ADDITIONAL COST FOR THE OWNER. DRAWINGS ARE SCHEMATIC AND SHOWN FOR CLARITY.
13. ALL REFERENCES TO A PARTICULAR MANUFACTURER ARE GIVEN ON AN "APPROVED EQUAL" BASIS.
14. MINIMUM DEPTH FROM TOP OF DUCTBANKS OR CONDUITS TO FINISHED GRADE SHALL BE 24" UNLESS OTHERWISE NOTED.
15. ALL EXCAVATIONS FOR CONDUITS AND HANDHOLES, NEAR EXISTING PIPING, CONDUIT AND EQUIPMENT SHALL BE HAND EXCAVATED AND COORDINATED WITH PLANT ENGINEER.
16. CONDUCTOR PULLING TENSIONS SHALL NET EXCEED MANUFACTURER'S RECOMMENDATION. CONTRACTOR SHALL INSTALL PULL BOXES TO MEET MANUFACTURER'S REQUIREMENTS.
17. MINIMUM DISTANCE ALLOWED BETWEEN CROSSING POWER CONDUITS AND INSTRUMENTATION CONDUITS SHALL BE 6 INCHES SEPARATION. MINIMUM DISTANCE ALLOWED BETWEEN PARALLEL POWER CONDUITS AND INSTRUMENTATION CONDUITS SHALL BE:

VOLTAGE	DISTANCE
480V	2 FT
120V	1 FT

18. ALL YARD CONDUITS/ EXTERIOR UNDERGROUND CONDUITS SHALL BE INSTALLED DIRECT BURIED METHOD WITH CONCRETE SLAB ON TOP AS SHOWN ON DETAIL. PROVIDE WARNING TAP ABOVE THE CONCRETE SLAB. COUNTERPOISE OF THE DUCTBANK SHALL TIE TO THE NEAREST GROUND GRID OR TIE TO A NEW GROUND ROD, IF NO GROUND GRID IS NEARBY.
19. COLORED WARNING TAPE 6" WIDE SHALL BE INSTALLED 8" BELOW FINISHED GRADE DIRECTLY ABOVE ALL UNDERGROUND YARD CONDUITS ACCORDING TO THE FOLLOWING SCHEDULE AND SPECIFICATION 16110:
    POWER: RED
    ALL OTHER CONDUITS: GREEN
20. FLEXIBLE CONDUITS SHALL BE USED TO TERMINATE ALL MOTORS AND OTHER VIBRATING EQUIPMENT AND SHALL BE BETWEEN 18" AND 3' IN LENGTH.
21. ALL SPARE CONDUITS SHALL BE CAPPED WITH A PVC CAP AND A NYLON PULL STRING INSTALLED WITH IDENTIFICATION ON BOTH ENDS.
22. CONTRACTOR SHALL RESTORE SIDEWALKS, ROADWAYS, SOD AND SPRINKLER SYSTEM PIPING TO MATCH EXISTING, AFTER THE COMPLETION OF THE ELECTRICAL INSTALLATION, SUCH AS CONDUITS, PULLBOX, GROUNDING, ETC.
23. ALL MATERIAL IN DESIGNATED CORROSIVE AREAS SHALL BE NEMA 4X 316 STAINLESS STEEL.
24. ALL REFERENCES TO SS OR STAINLESS STEEL SHALL MEAN 316 STAINLESS STEEL.
25. ALL CONTROL PANELS SHALL BE CONSTRUCTED BY A UL 508A APPROVED PANEL VENDOR AND SHALL BEAR A UL 508A LABEL ON THE PANEL.
26. INSTRUMENTATION IS LOW VOLTAGE SIGNALS SUCH AS 4–20MA, TELEPHONE COMMUNICATION, FIRE ALARM COMMUNICATION. POWER CONDUIT SHALL ONLY CROSS INSTRUMENTATION CONDUIT PERPENDICULARLY AT RIGHT ANGLES WITH 6" SEPARATION.
27. CONTRACTOR SHALL PROVIDE RECORD DRAWINGS TO THE OWNER WITHIN 30 DAYS OF SYSTEM ACCEPTANCE.
28. CONTRACTOR SHALL PROVIDE OPERATION MANUALS TO THE OWNER.
29. THE MAXIMUM VOLTAGE DROP FOR BRANCH CIRCUIT CONDUCTORS IS 3% PER FLORIDA BUILDING CODE AND NEC.
30. ALL CONDUITS PENETRATING RATED FIRE WALLS OR RATED FIRE FLOORS SHALL BE INSTALLED WITH U.L. APPROVED DEVICES TO MAINTAIN THE FIRE RATING OF THE WALL OR FLOOR PENETRATED.

LINE WEIGHT LEGEND

NEW — EXISTING

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HILLERS ELECTRICAL ENGINEERING, INC.
23257 STATE ROAD 7, SUITE 100
BOCA RATON, FLORIDA 33428
(561) 451–9165
(561) 451–4886 FAX
LICENSE NO: EB 0006877

PEMBROKE PINE WWTP EAST PORTABLE GENERATOR CONNECTION IMPROVEMENTS
PEMPROKE PINE, FLORIDA

ELECTRICAL LEGEND AND NOTES

PAUL F. HILLERS, P.E.
STATE OF FLORIDA PROFESSIONAL ENGINEER
LICENSE No. 410022

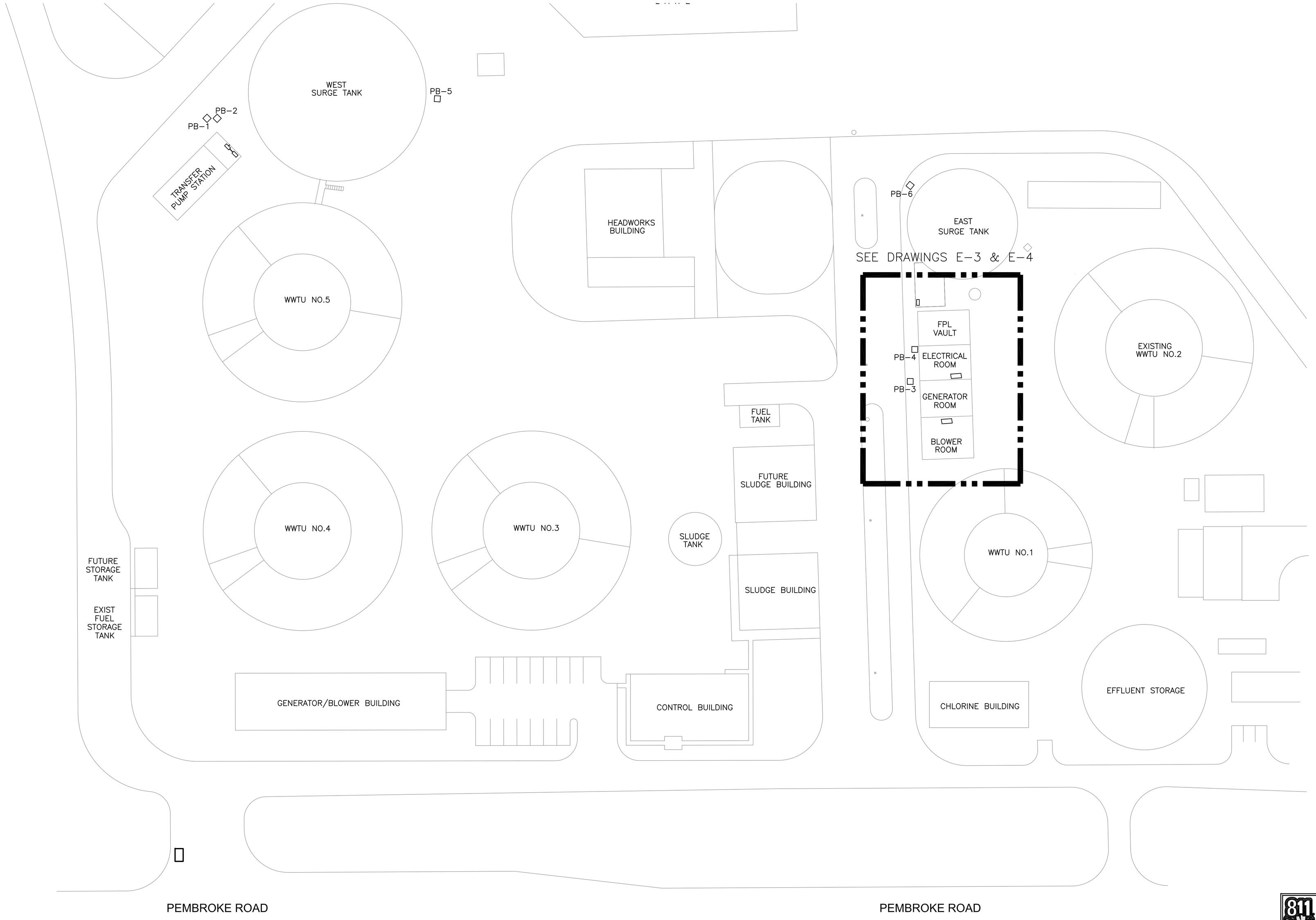
DATE: JULY 2018

SCALE: AS SHOWN
PROJECT No: PP03
SHEET: E-01

Attachment P – WWTP East Portable Generator Connection Improvements Drawings & Specifications

IFB #PSUT-18-06

Attachment P



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PEMBROKE PINE WWTP EAST PORTABLE GENERATOR CONNECTION IMPROVEMENTS
PEMPROKE PINE, FLORIDA

SITE PLAN

PAUL F. HILLERS, P.E.
STATE OF FLORIDA PROFESSIONAL ENGINEER
LICENSE No. 410022
DATE: JULY 2018

SCALE: AS SHOWN
PROJECT No: PP03
SHEET: E-02

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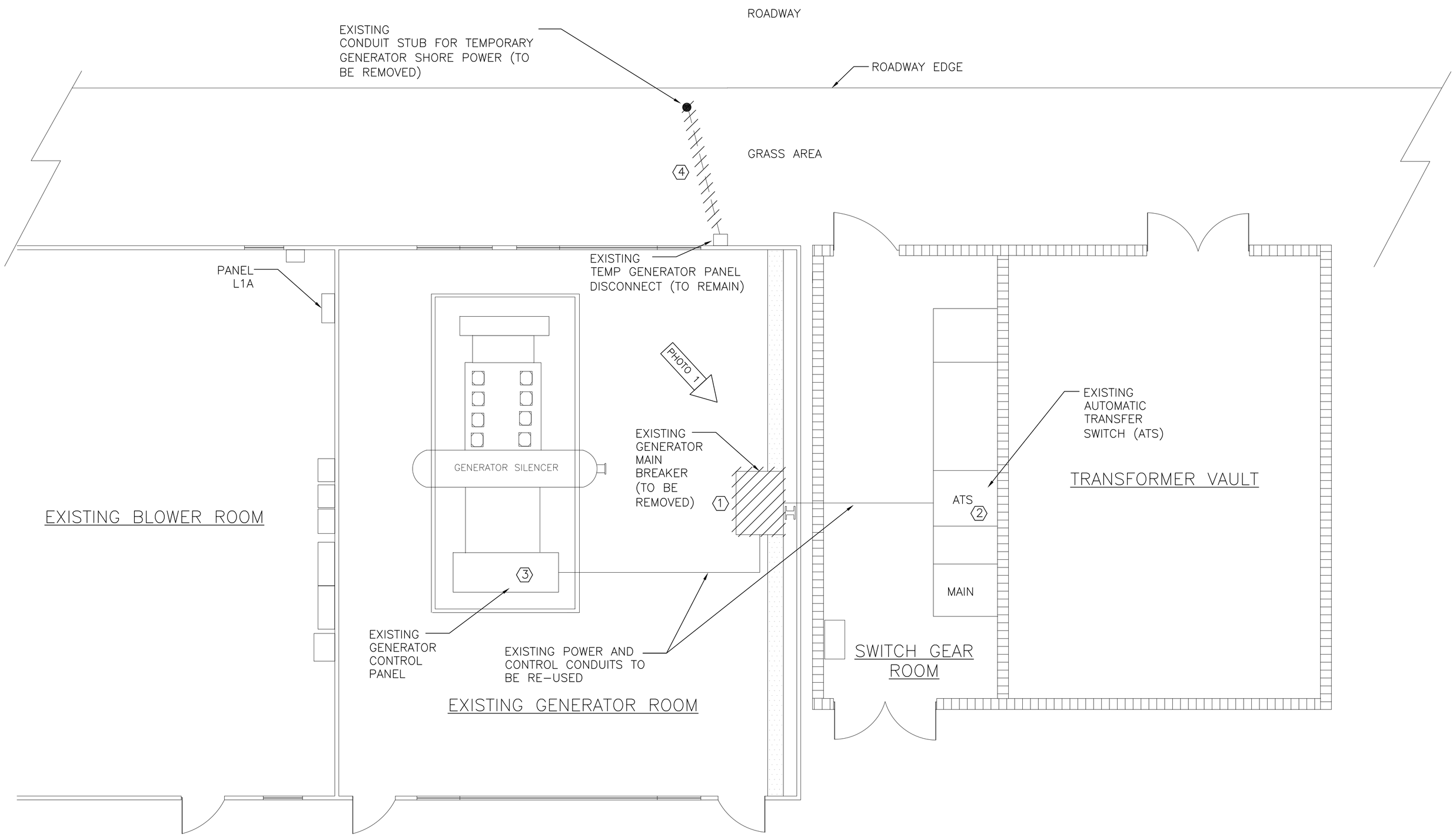
Attachment P – WWTP East Portable Generator Connection Improvements Drawings & Specifications

IFB #PSUT-18-06



NOTES:

1. THE EXISTING ELECTRICAL INFORMATION IS OBTAINED FROM "RECORD DRAWINGS" AND OTHER "AS-BUILT DRAWINGS". CONTRACTOR SHALL VERIFY THE INFORMATION PROVIDED IN THESE DRAWINGS AND ADJUST ACCORDINGLY. ANY CONFLICTS SHALL BE BROUGHT TO THE ENGINEER'S ATTENTION BEFORE SUBMITTING HIS BID.
2. DURING CONSTRUCTION EMERGENCY POWER TO THE FACILITY MUST REMAIN AVAILABLE. THE OWNER WILL PROVIDE A TEMPORARY GENERATOR AND CABLES FOR THE CONTRACTOR TO INSTALL ON THE EXISTING ATS WHILE CONSTRUCTION IS ONGOING.

KEYED NOTES:

(1) EXISTING GENERATOR BREAKER TO BE DEMOLISHED. ALL EXISTING CONDUIT AND CABLE IS TO BE REUSED AND EXTENDED AS NECESSARY TO INSTALL NEW GENERATOR MAIN / MANUAL TRANSFER SWITCH.

(2) CONTRACTOR SHALL FIELD INVESTIGATE AND LABEL EXISTING CONTROL WIRES BETWEEN EXISTING GENERATOR MAIN BREAKER AND EXISTING AUTOMATIC TRANSFER SWITCH BEFORE DEMOLITION. CONTRACTOR SHALL DISCONNECT EXISTING CONDUIT AND WIRE AND PROTECT DURING CONSTRUCTION. EXISTING CONDUIT AND WIRE TO BE RE-USED.

(3) CONTRACTOR SHALL FIELD INVESTIGATE AND LABEL EXISTING CONTROL WIRES BETWEEN EXISTING GENERATOR MAIN BREAKER AND EXISTING GENERATOR CONTROL PANEL BEFORE DEMOLITION. CONTRACTOR SHALL DISCONNECT EXISTING CONTROL WIRE AND PROTECT DURING CONSTRUCTION, EXISTING CONTROL WIRE TO BE RE-USED.

(4) CONTRACTOR SHALL DISCONNECT EXISTING LOAD WIRE AT THE EXISTING DISCONNECT SWITCH FOR TEMPORARY GENERATOR SHORE POWER AND REMOVE THE EXISTING CONDUIT AND WIRE. DISCONNECT SWITCH SHALL REMAIN AND BE RE-USED.

PHOTO 1 EXISTING GENERATOR MAIN BREAKER
NOT TO SCALE

HATCH AREA TO BE DEMOLISHED

PHOTO X — ARROW INDICATES PHOTO POINT OF VIEW

0 4 8 12
1/4"=1'-0" SCALE FEET

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(561) 451-4886 FAX
LICENSE NO: EB 0006877

PEMBROKE PINE WWTP EAST PORTABLE GENERATOR CONNECTION IMPROVEMENTS
PEMPROKE PINE, FLORIDA

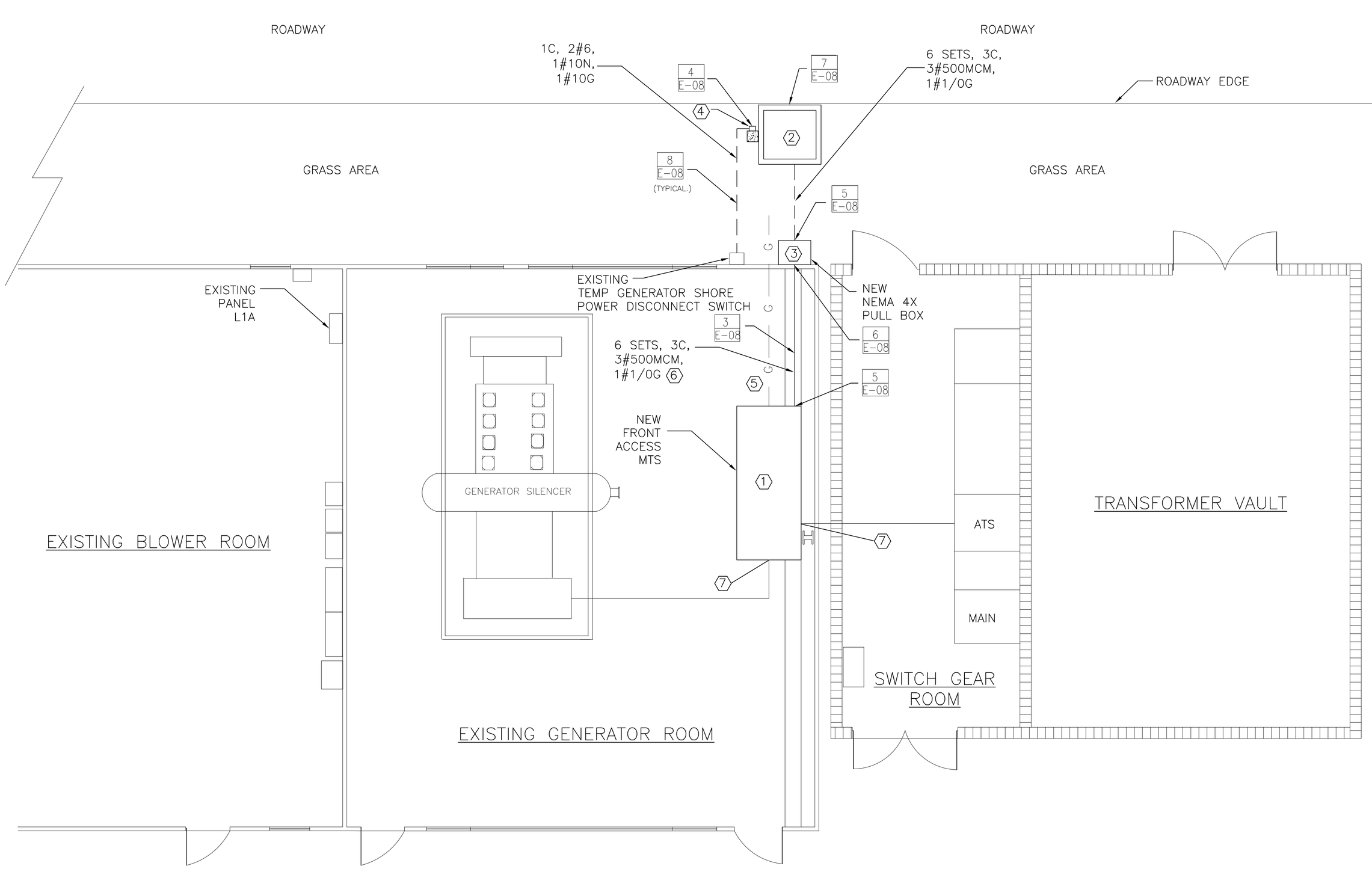
MAIN EAST ELECTRICAL ROOM AND BLOWER ROOM PLAN

PAUL F. HILLERS, P.E.
STATE OF FLORIDA PROFESSIONAL ENGINEER
LICENSE No. 410022

DATE: JULY 2018

SCALE: AS SHOWN
PROJECT No: PP03
SHEET: E-03

File Name: E:\PROJECTS\PP\PP03\DWG\PP03E003-MAIN ELEC ROOM.dwg - (Plotted by: Priya Duppati on Wednesday, July 11, 2018 3:54:03 PM)



NOTES:

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2. DURING CONSTRUCTION EMERGENCY POWER TO THE FACILITY MUST REMAIN AVAILABLE. THE OWNER WILL PROVIDE A TEMPORARY GENERATOR AND CABLES FOR THE CONTRACTOR TO INSTALL ON THE EXISTING ATS WHILE CONSTRUCTION IS ONGOING.

KEYED NOTES:

(1) NEW FRONT ACCESS MANUAL TRANSFER SWITCH BY EATON OR APPROVED EQUAL.

(2) NEW FREE STANDING GENERATOR TAP BOX BY LAKESHORE OR APPROVED EQUAL.

(3) NEW NEMA 4X 316 STAINLESS STEEL PULL BOX, MINIMUM 36"W X 18"D X 48"H, MOUNTED ON WALL. SIZE PER NATIONAL ELECTRIC CODE FOR ACTUAL CONDUIT ENTRY AND EXIT.

(4) NEW NEMA 3R 50 AMP RV RECEPTACLE BY MIDWEST ELECTRIC PRODUCTS INC. OR APPROVED EQUAL MOUNTED ON PEDESTAL. RUN NEW CONDUIT AND CABLE TO EXISTING GENERATOR SHORE POWER DISCONNECT SWITCH.

(5) CONTRACTOR SHALL RUN NEW #4/0 AWG BARE TINNED COPPER GROUND WIRE FROM NEW MTS AND CONNECT IT TO EXISTING GROUND GRID.

(6) CONTRACTOR SHALL FIELD ROUTE NEW POWER CONDUITS TO NEW GENERATOR TAP BOX OVERHEAD (ON WALL). PROVIDE ALL HARDWARE AND SUPPORT CHANNEL REQUIRED FOR A COMPLETE RACEWAY SYSTEM.

(7) CONTRACTOR SHALL CONNECT EXISTING CONDUITS TO NEW GENERATOR MAIN/MTS. CONTRACTOR SHALL EXTEND CONDUITS AS NECESSARY. PROVIDE AND INSTALL COMPRESSION TYPE BARREL SPLICE WITH HEAT SHRINK TO EXTEND WIRE AS NEEDED.

0 4 8 12
1/4"=1'-0" SCALE FEET

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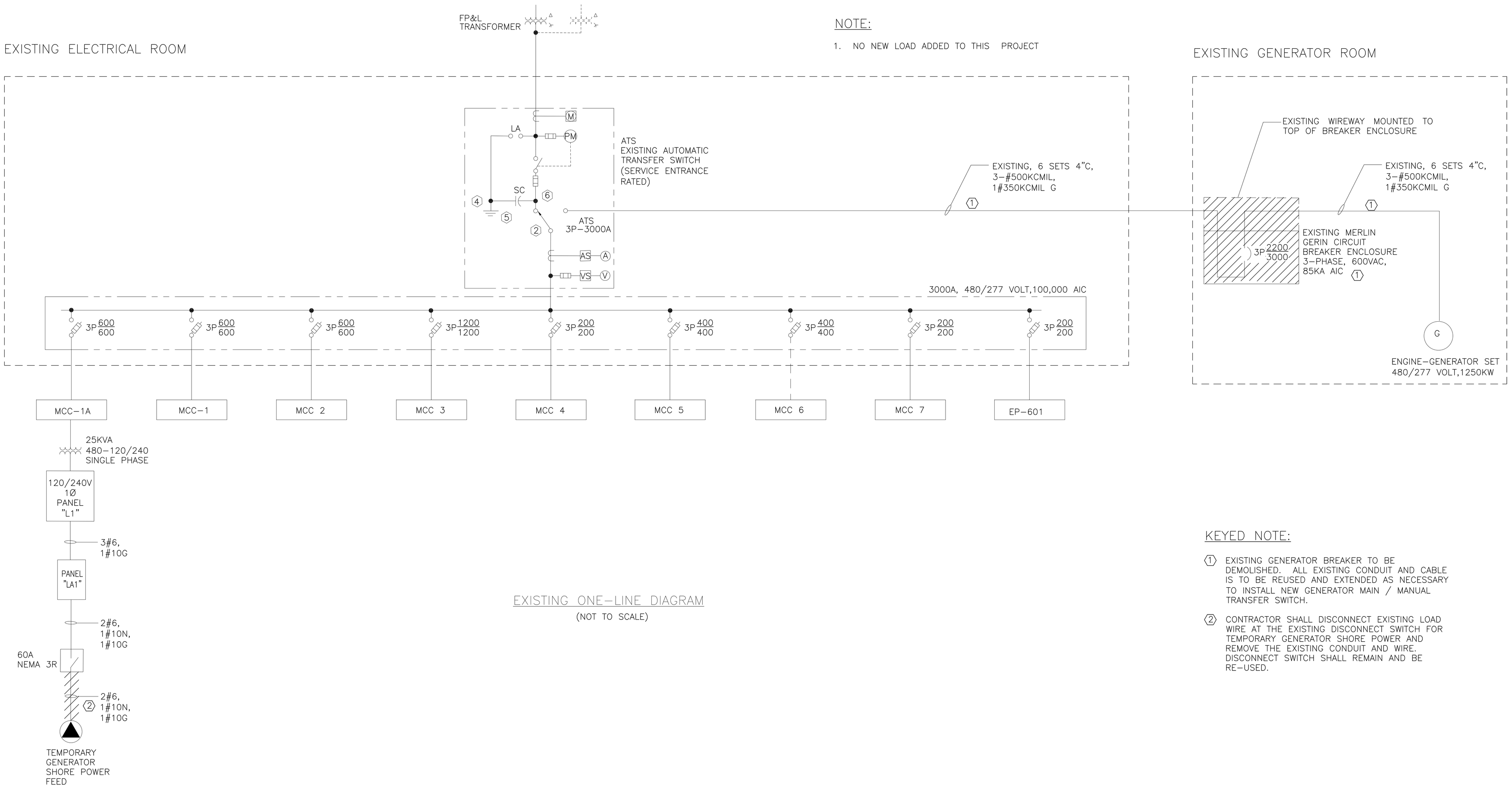
PEMBROKE PINE WWTP EAST PORTABLE GENERATOR CONNECTION IMPROVEMENTS
PEMPROKE PINE, FLORIDA

MODIFIED EAST ELECTRICAL GENERATOR AND BLOWER ROOM PLAN

PAUL F. HILLERS, P.E.
STATE OF FLORIDA-PROFESSIONAL ENGINEER
LICENSE No. 410022

DATE: JULY 2018

SCALE: AS SHOWN
PROJECT No: PP03
SHEET: E-04



NOTE:

1. NO NEW LOAD ADDED TO THIS PROJECT

EXISTING ONE–LINE DIAGRAM

(NOT TO SCALE)

KEYED NOTE:

1. EXISTING GENERATOR BREAKER TO BE DEMOLISHED. ALL EXISTING CONDUIT AND CABLE IS TO BE REUSED AND EXTENDED AS NECESSARY TO INSTALL NEW GENERATOR MAIN / MANUAL TRANSFER SWITCH.
2. CONTRACTOR SHALL DISCONNECT EXISTING LOAD WIRE AT THE EXISTING DISCONNECT SWITCH FOR TEMPORARY GENERATOR SHORE POWER AND REMOVE THE EXISTING CONDUIT AND WIRE. DISCONNECT SWITCH SHALL REMAIN AND BE RE–USED.

NO	DATE	REVISION	BY	NO	DATE	REVISION	BY

HILLERS ELECTRICAL ENGINEERING, INC.
23257 STATE ROAD 7, SUITE 100
BOCA RATON, FLORIDA 33428
(561) 451–9165
(561) 451–4886 FAX
LICENSE NO: EB 0006877

PEMBROKE PINE WWTP EAST PORTABLE GENERATOR CONNECTION IMPROVEMENTS
PEMPROKE PINE, FLORIDA

EXISTING ONE LINE DIAGRAM

PAUL F. HILLERS, P.E.
STATE OF FLORIDA PROFESSIONAL ENGINEER
LICENSE No. 410022

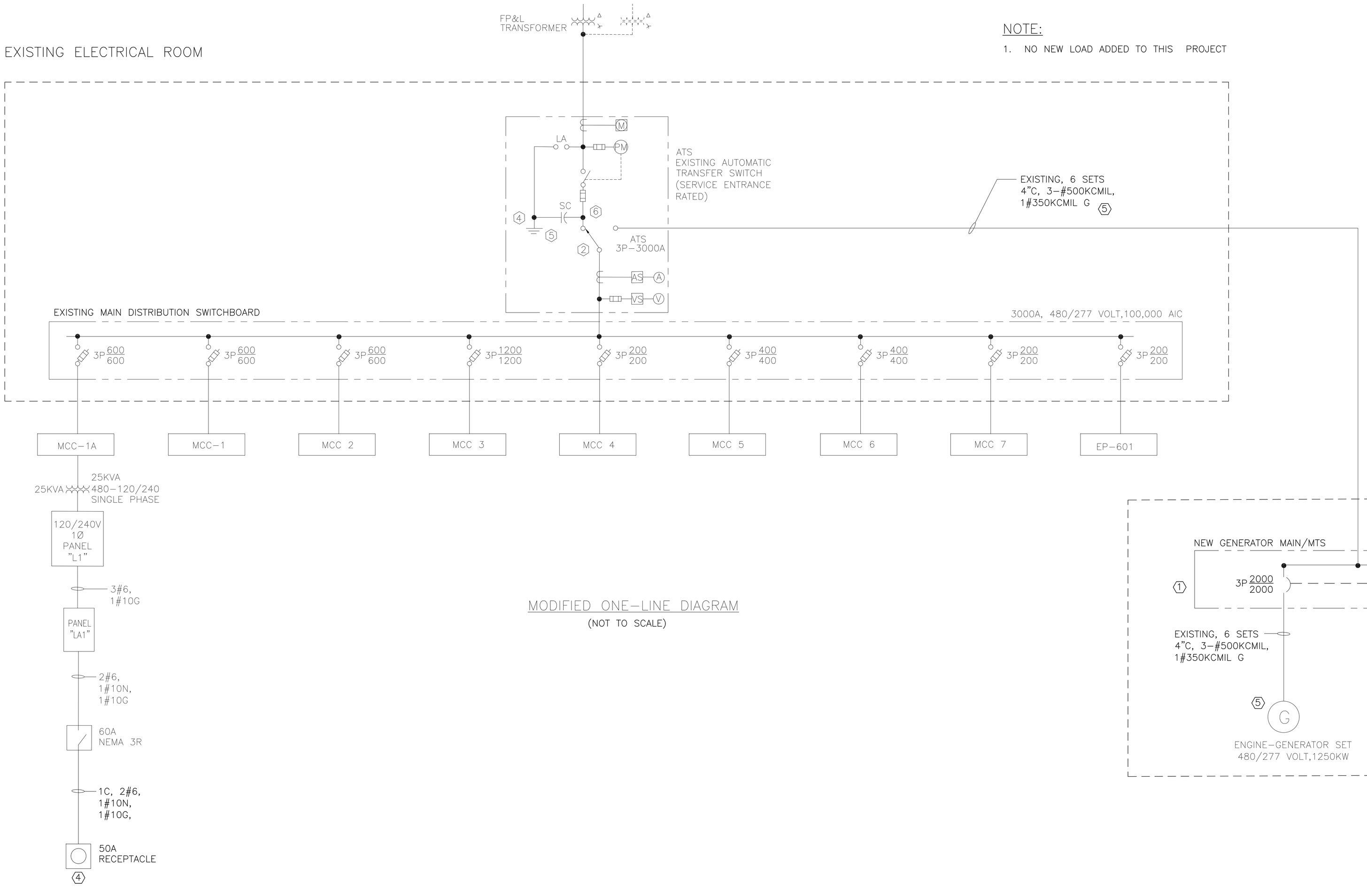
DATE: JULY 2018

SCALE: AS SHOWN

PROJECT No: PP03

SHEET: E-05

EXISTING ELECTRICAL ROOM



MODIFIED ONE–LINE DIAGRAM

(NOT TO SCALE)

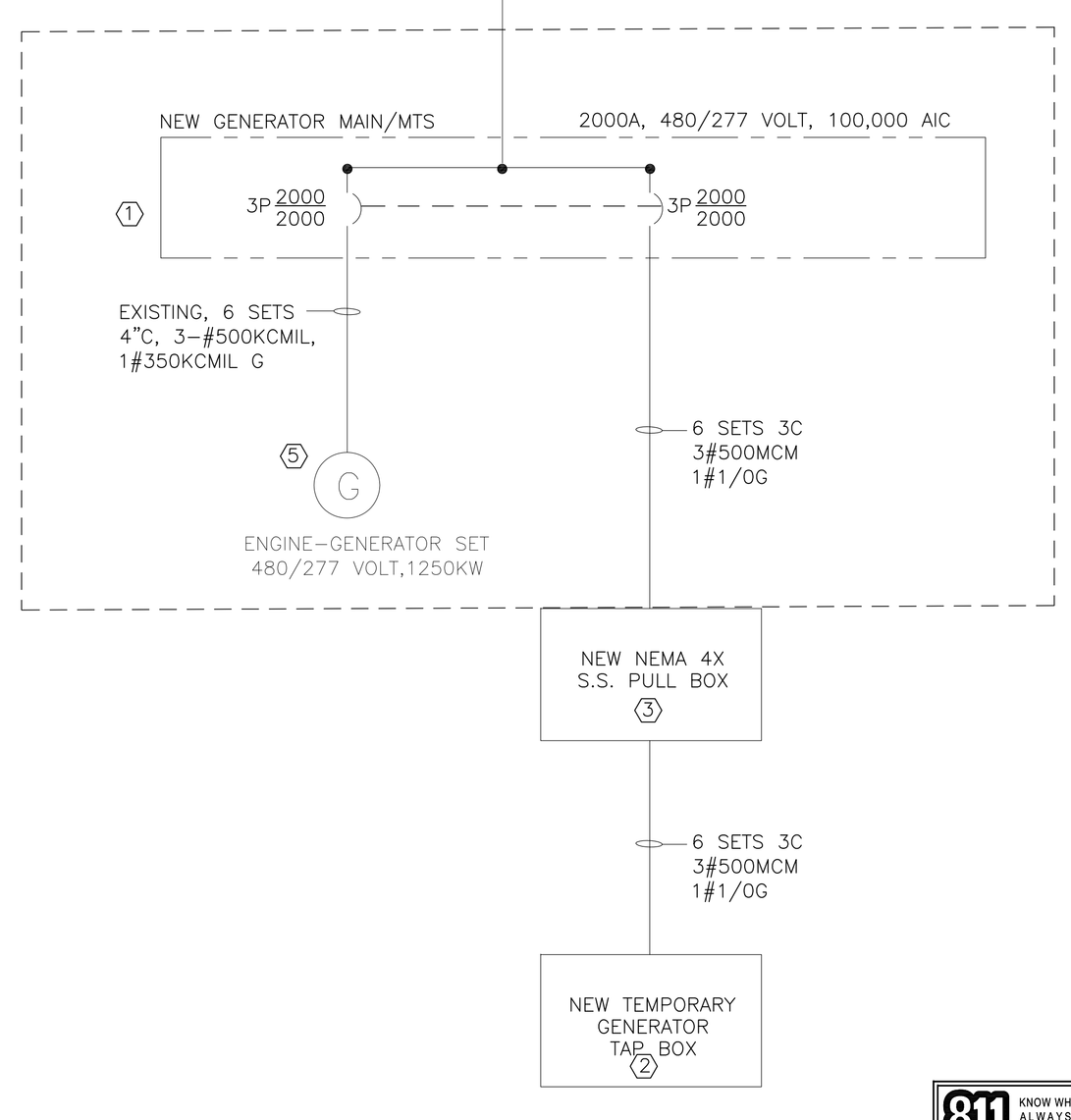
NOTE:

1. NO NEW LOAD ADDED TO THIS PROJECT

KEYED NOTES:

1. NEW FRONT ACCESS MANUAL TRANSFER SWITCH BY EATON OR APPROVED EQUAL.
2. NEW FREE STANDING GENERATOR TAP BOX BY LAKESHORE OR APPROVED EQUAL.
3. NEW NEMA 4X 316 STAINLESS STEEL PULL BOX, MINIMUM 36"W X 18"D X 48"H, MOUNTED ON WALL. CONTRACTOR SHALL SIZE PULL BOX PER NATIONAL ELECTRIC CODE FOR ACTUAL CONDUIT ENTRY AND EXIT.
4. NEW NEMA 3R 50 AMP RV RECEPTACLE MOUNTED ON PEDESTAL. RUN NEW CONDUIT AND CABLE TO EXISTING GENERATOR SHORE POWER DISCONNECT SWITCH.
5. CONTRACTOR SHALL CONNECT EXISTING CONDUITS TO NEW GENERATOR MAIN/MTS. CONTRACTOR SHALL EXTEND CONDUITS AS NECESSARY. PROVIDE AND INSTALL COMPRESSION TYPE BARREL SPLICE WITH HEAT SHRINK TO EXTEND WIRE AS NEEDED.

EXISTING GENERATOR ROOM



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PEMBROKE PINE WWTP EAST PORTABLE GENERATOR CONNECTION IMPROVEMENTS
PEMPROKE PINE, FLORIDA

MODIFIED ONE LINE DIAGRAM

PAUL F. HILLERS, P.E.
STATE OF FLORIDA PROFESSIONAL ENGINEER
LICENSE No. 410022

DATE: JULY 2018

SCALE: AS SHOWN

PROJECT No: PP03

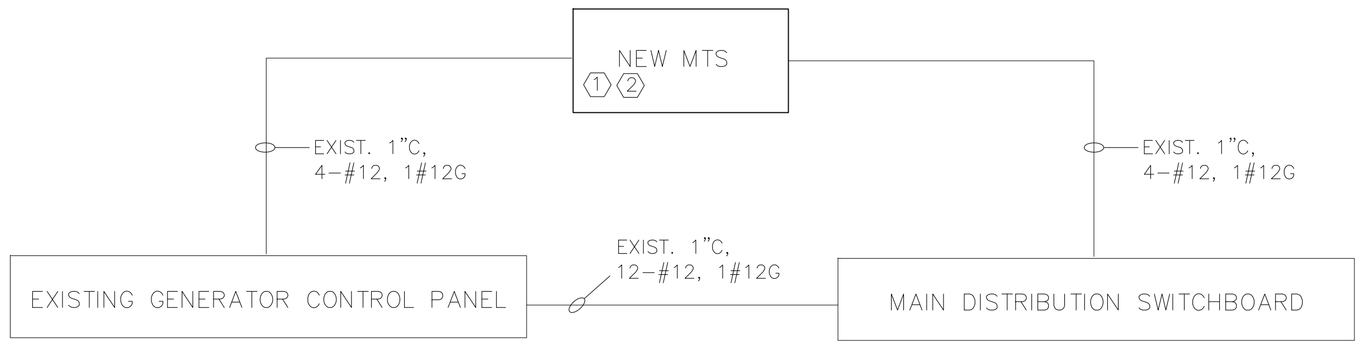
SHEET: **E-06**

EXISTING LIGHTING PANEL L1A

BUS AMPS A	BUS AMPS B	LOAD	POLES	AMPS	BUS A	BUS B	AMPS	POLES	LOAD	BUS AMPS A	BUS AMPS B
2.0		MOV VALVE	2	20	1	2	20	1	GEN ROOM RECEPTACLE	6.0	
	2.0				3	4	20	1	GEN ROOM EX FAN		7.2
2.0		FUEL SYSTEM	1	20	5	6	20	1	PLC #2	1.0	
	38	TEMP GENERATOR PANEL	2	60	7	8	20	1	EAST SWBD KWH METER PANEL		1.0
38					9	10	20	1	SPARE	0.0	
	0.0	SPACE	1	20	11	12	20	1	SPARE		0.0

TOTAL AMPS: BUS A 49 BUS B 48.2 CONNECTED KVA 11.76

RATED VOLTAGE: ■ 120/240 SINGLE PHASE, 3 WIRE			BRANCH POLES ■12 ☐ 20 ☐ 30 ☐ 42	
RATED AMPS: ■ 60 ☐ 225 ☐ 400 ☐ _____	CABINET: ■ SURFACE ☐ FLUSH			
NEUTRAL BUS ■ 100% ☐ 150% ☐ 200%	■ GROUND BUS	■ HINGED DOOR	■ KEYED DOOR LATCH	LOCATION: BLOWER ROOM
■ CIRCUIT BREAKER (BOLT-IN) BRANCH DEVICES	☐ SPD	ENCLOSURE TYPE ☐ NEMA 1 ■ NEMA 3R ☐ NEMA 4X	☐ _____	
☐ MAIN LUGS ONLY	MAIN 60 AMPS ■ BREAKER	☐ _____ TO BE GFI BREAKERS		
PANELBOARD MUST BE RATED TO INTERRUPT A SHORT CIRCUIT ISC OF __10,000__ AMPS SYMMETRICAL.				
MANUFACTURER: SQUARE D		COPPER BUSSES	MAIN LUGS _____ SETS SIZE: _____	



NEW GENERATOR MAIN/MANUAL TRANSFER SWITCH CONTROLS RISER DIAGRAM

NOT TO SCALE

KEYED NOTES:

1. CONTRACTOR SHALL FIELD INVESTIGATE AND LABEL EXISTING CONTROL WIRES BETWEEN EXISTING GENERATOR MAIN BREAKER AND EXISTING AUTOMATIC TRANSFER SWITCH BEFORE DEMOLITION. CONTRACTOR SHALL DISCONNECT EXISTING CONDUIT AND WIRE AND PROTECT DURING CONSTRUCTION. EXISTING CONDUIT AND WIRE TO BE RE-USED.
2. CONTRACTOR SHALL FIELD INVESTIGATE AND LABEL EXISTING CONTROL WIRES BETWEEN EXISTING GENERATOR MAIN BREAKER AND EXISTING GENERATOR CONTROL PANEL BEFORE DEMOLITION. CONTRACTOR SHALL DISCONNECT EXISTING CONTROL WIRE AND PROTECT DURING CONSTRUCTION, EXISTING CONTROL WIRE TO BE RE-USED.

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PEMBROKE PINE WWTP EAST PORTABLE GENERATOR CONNECTION IMPROVEMENTS
PEMPROKE PINE, FLORIDA

SCHEDULES AND RISER DIAGRAMS

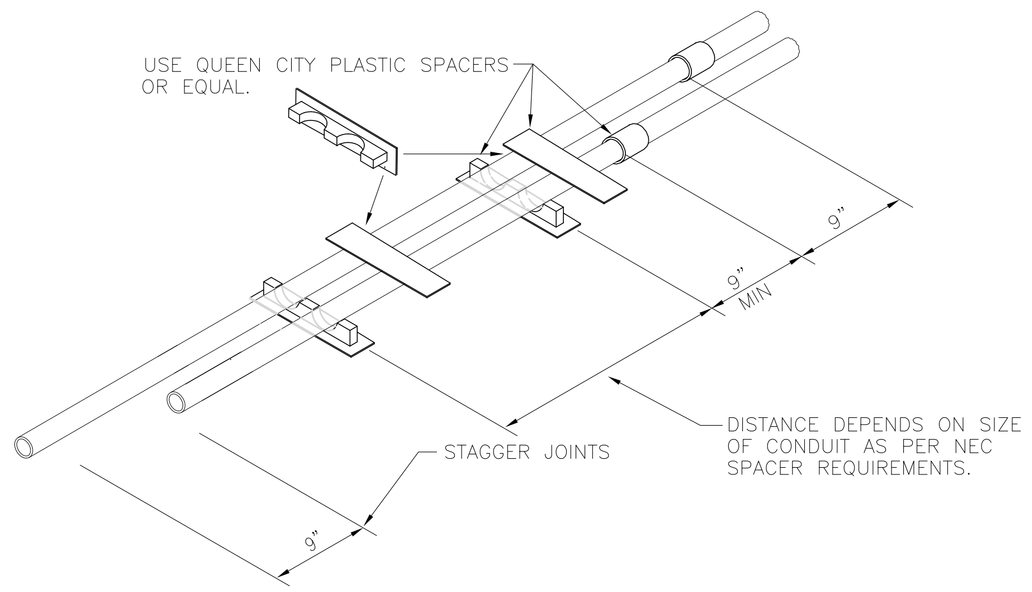
PAUL F. HILLERS, P.E.
STATE OF FLORIDA PROFESSIONAL ENGINEER
LICENSE No. 410022

DATE: JULY 2018

SCALE: AS SHOWN

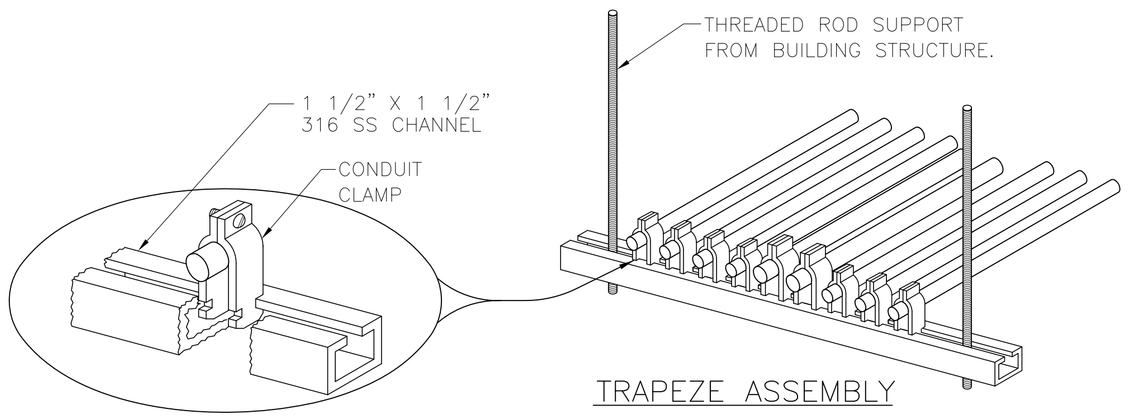
PROJECT No: PP03

SHEET: E-07



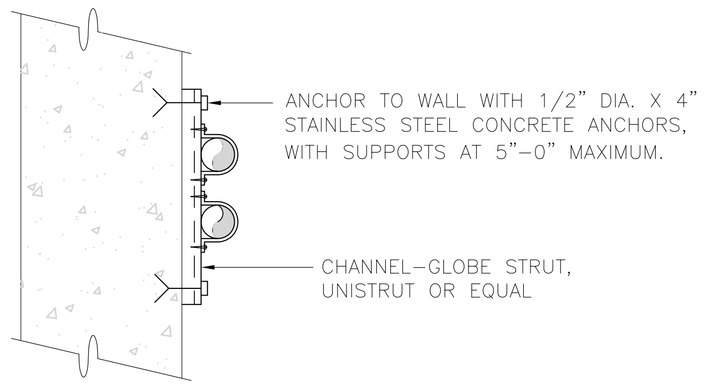
1 VAR. HORIZONTAL STAGGERING OF SPACERS AND JOINTS
NOT TO SCALE

NOTES:
1. THIS DETAIL TYPICAL FOR BOTH VERTICAL AND HORIZONTAL MOUNTING
2. CHANNEL AND ALL SUPPORT DEVICES TO BE 316 STAINLESS STEEL.
3. CHANNELS TO BE SPACED 5' MAXIMUM.

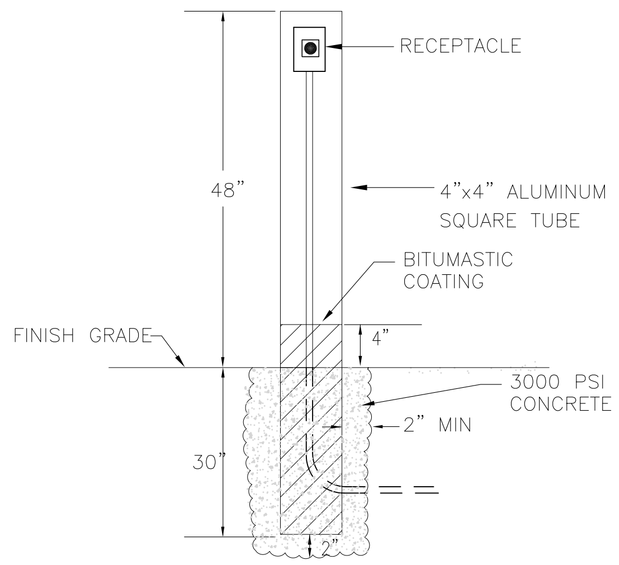


CONDUIT PIPE STRAP
MOUNTING DETAILS

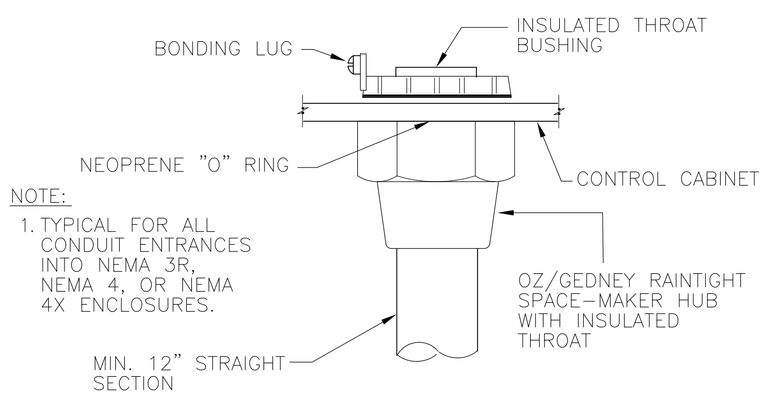
2 VAR. CONDUIT SUPPORT
NOT TO SCALE



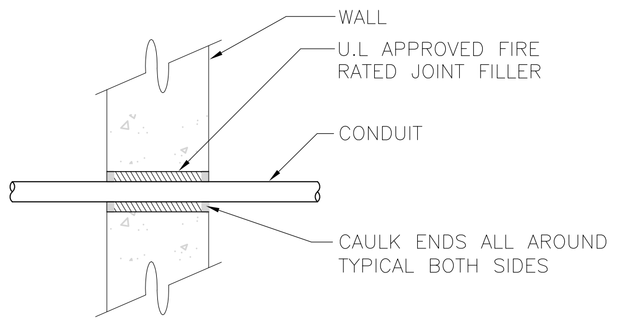
3 VAR. TYPICAL CONDUIT SUPPORT
NOT TO SCALE



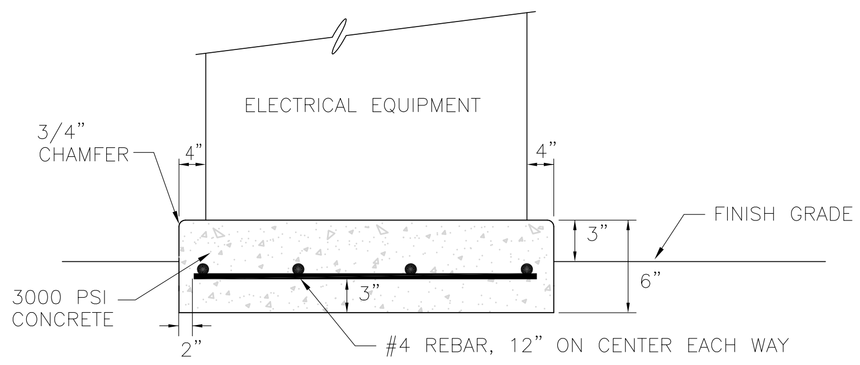
4 VAR. DEVICE PEDESTAL
NOT TO SCALE



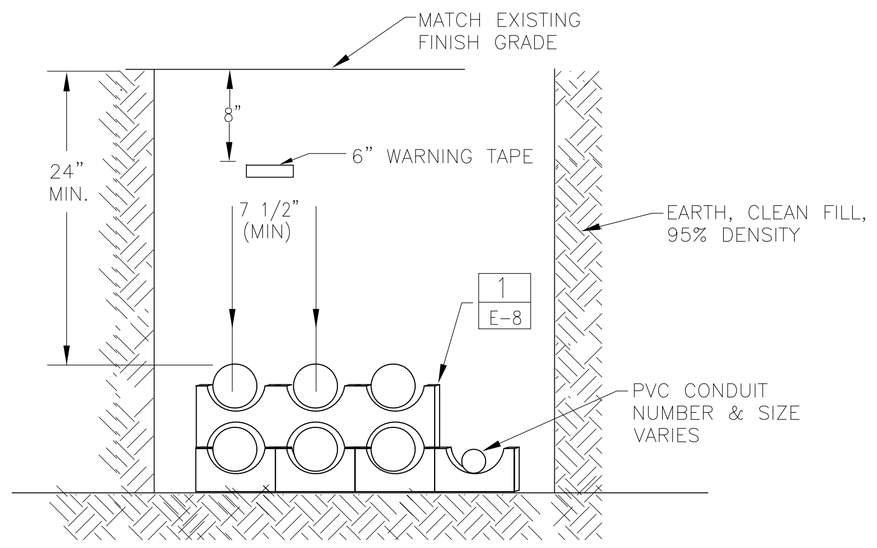
5 VAR. CONDUIT HUB
NOT TO SCALE



6 VAR. CONDUIT PENETRTION AT WALL
NOT TO SCALE



7 VAR. GENERATOR CONNECTION BOX FOUNDATION
NOT TO SCALE



8 VAR. BURIED CONDUIT
NOT TO SCALE

KNOW WHAT'S BELOW ALWAYS CALL 811 BEFORE YOU DIG
It's fast. It's free. It's the law.
www.callsunshine.com

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PEMBROKE PINE WWTP EAST PORTABLE GENERATOR CONNECTION IMPROVEMENTS
PEMPROKE PINE, FLORIDA

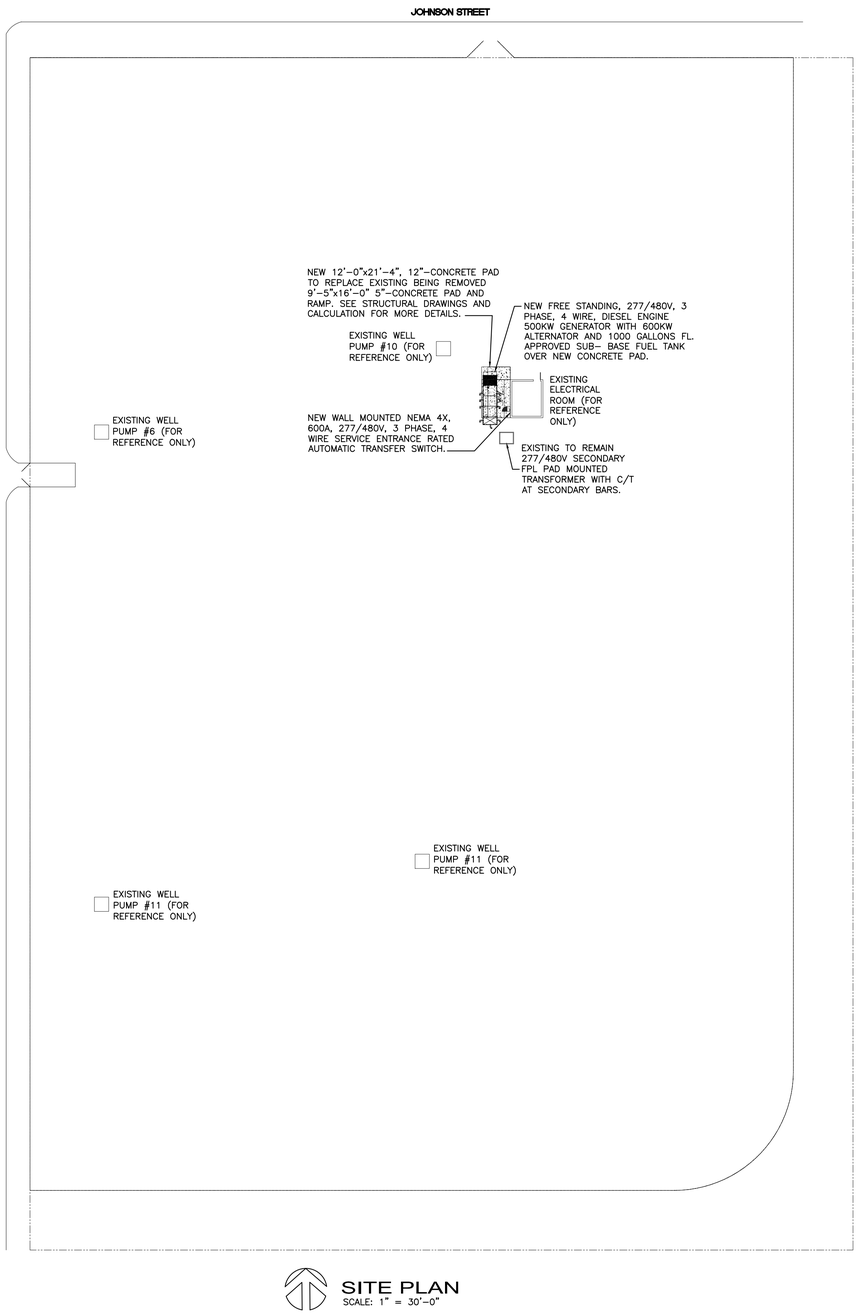
ELECTRICAL DETAILS

PAUL F. HILLERS, P.E.
STATE OF FLORIDA PROFESSIONAL ENGINEER
LICENSE No. 410022
DATE: JULY 2018

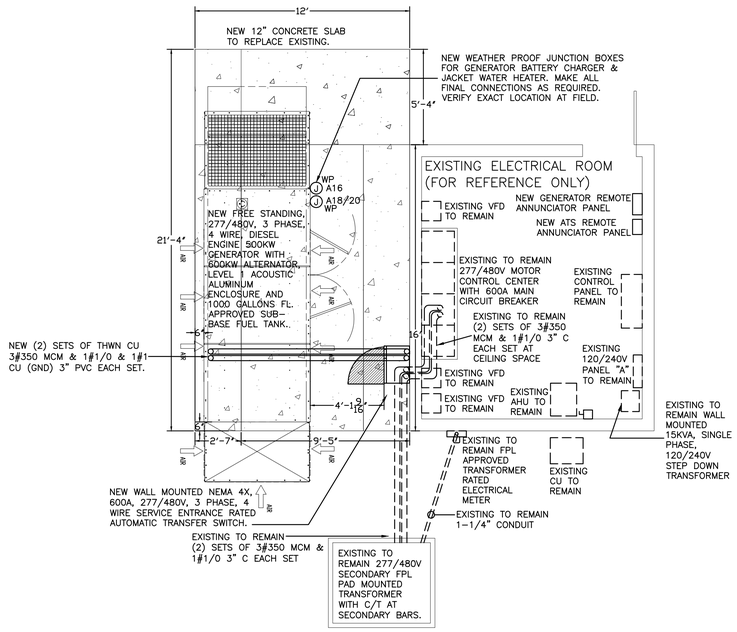
SCALE: AS SHOWN
PROJECT No: PP03
SHEET: E-08

Attachment P – WWTP East Portable Generator Connection Improvements Drawings & Specifications

IFB #PSUT-18-06



SITE PLAN
SCALE: 1" = 30'-0"



PARTIAL ELECTRICAL SITE PLAN
SCALE: 1/4" = 1'-0"

GENERATOR NOTES

ONE GENERAC SD500 OR EQUAL DIESEL ENGINE DRIVEN GENERATOR W/ UPSIZED 600KW ALTERNATOR FOR OPERATION AT 500KW, 625 KVA, 0.8 PF, 277/480 VOLTS, 3 PHASE, 4 WIRE, 60 HERTZ, 1800 RPM LIQUID COOLED UNIT MOUNTED RADIATOR, COMPLETE WITH ALL

STANDARD EQUIPMENT, OVERSIZED GENERATOR, INCLUDING THE FOLLOWING:

* COMPLETE A/C INSTRUMENT CONTROL PANEL
* MICROPROCESSOR ENGINE CONTROL MODULE WITH COOL DOWN TIMER
* FOUR ENGINE SHUTDOWNS WITH SIGNAL LIGHTS AND ALARMS PER NFPA 110, LEVEL 1
* ENGINE DRIVEN BATTERY CHARGING ALTERNATOR
* JACKET WATER HEATER 3000 WATTS 240 VOLTS
* FLOAT TYPE BATTERY CHARGER, 10 AMP, 120V WALL MOUNTED WITH ALARM CONTACTS PER NFPA
* LEAD ACID TYPE STARTING BATTERIES
* BATTERY RACK AND CABLES
* FLEXIBLE FUEL LINES, 18 INCH MINIMUM
* CRITICAL GRADE SILENCER
* STAINLESS STEEL FLEXIBLE EXHAUST CONNECTOR
* STEEL SUB-BASE WITH BUILT-IN VIBRATOR ISOLATION MOUNTS
* FACTORY CERTIFIED TEST
* TEST/ACCEPTANCE RUN BY FACTORY TRAINED SERVICE TECHNICIAN
* MAIN CKT. BKR. THERMAL MAGNETIC, GENERAL ELECTRIC, 600 AMPS, 3P, 277/480V, 65KAIC
* UL APPROVED 1000 GALLONS, DOUBLE WALL W/RUPTURE-BASIN, UL#142, SUB-BASE, FUEL TANK W/LEAK DETECTOR, FLA. DEP & DERM APPROVAL.
* LOW LEVEL ALARM
* FUEL LEVEL GAUGE
* REMOTE MOUNTED ANNUNCIATOR WITH SIXTEEN LIGHTS & AUDIBLE ALARM WITH SILENCE SWITCH
* REMOTE EMERGENCY STOP BREAK-GLASS SWITCH
* LEVEL 1 ACOUSTIC ALUMINUM ENCLOSURE
* EXTENDED 5 YEARS WARRANTY.
* A LOAD BANK TEST SHALL BE PERFORMED ONCE THE EQUIPMENT IS COMPLETELY INSTALLED AND PRIOR TO TCO.

AUTOMATIC TRANSFER SWITCH ATS

PROVIDE ONE 600 AMPERE, STYLE 3, UL 1008 LISTED; POWER SERIES SERIES ENTRANCE RATED AUTOMATIC TRANSFER SWITCH FOR OPERATION AT 277/480V VOLTS, 3 POLE, THREE PHASE, FOUR WIRE, 60 HERTZ, 65,000 AIC. THE TRANSFER SWITCH SHALL BE MECHANICALLY HELD, POSITIVELY INTERLOCKED, NEMA 4X ENCLOSURE, AND BE EQUIPPED WITH THE FOLLOWING:

* CLOSE DIFFERENTIAL UNDERVOLTAGE SENSORS, ADJUSTABLE
* TIME DELAY ENGINE START, ADJUSTABLE
* TIME DELAY TRANSFER TO EMERGENCY, ADJUSTABLE
* TIME DELAY NEUTRAL, ADJUSTABLE
* TIME DELAY RETURN TO NORMAL, ADJUSTABLE
* TIME DELAY ENGINE COOLDOWN, ADJUSTABLE
* OPERATIONAL MODE SELECTOR SWITCH (OFF, LOAD TEST, ENGINE CRANK, AUTOMATIC)
* MOMENTARY LOAD TEST SWITCH
* INTERNAL SECONDARY SURGE SUPRESSION FOR UTILITY SOURCE
* EXERCISER CLOCK
* SURGE SUPPRESSOR PROTECTION (TVSS).
* REMOTE ANNUNCIATOR PANEL WITH CONTROLLER

revisions:

CITY OF PEMBROKE PINES WATER SYSTEM FACILITY
UPGRADE EMERGENCY BACKUP ELECTRICAL SERVICE EQUIPMENT
7190 JOHNSON STREET
PEMBROKE PINES, FL. 33024

JOB NUMBER: 18027
ERNESTO R. TORRES
PE# 0049958 E.E.
EB0003862
FLORIDA ENGINEERING SERVICES
MECHANICAL AND ELECTRICAL ENGINEERS
34 N.W. 168TH STREET
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TELEPHONE: (305) 653-0212
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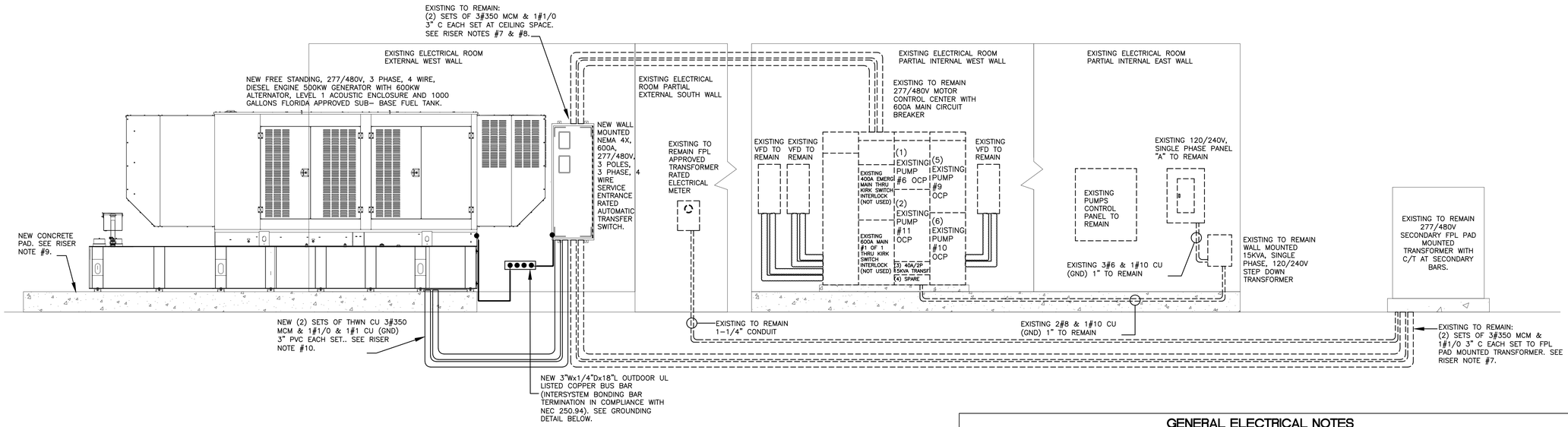
E-mail: ErnestoT@fesinc.biz

drawn by: ERT

date: JULY 6, 2018

sheet no: ES-1

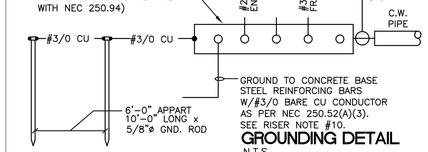
project:



PARTIAL ELECTRICAL RISER DIAGRAM

SCALE: 3/16" = 1'–0"

NOTE:
ALL TAP CONNECTIONS TO THE COMMON GROUNDING ELECTRODE CONDUCTOR SHALL BE MADE AT AN ACCESSIBLE LOCATION BY A CONNECTOR LISTED AS GROUNDING AND BONDING EQUIPMENT, LISTED CONNECTIONS TO COPPER BUSBARS NOT SMALLER THAN 1/4"x2" OR PERFORMED BY EXOTHERMIC WELDING PROCESS.



GROUNDING DETAIL

N.T.S.

EXISTING MOTOR CONTROL CENTER TO REMAIN (FOR REFERENCE ONLY)

PANEL	AMPS	PHASE	VOLTAGE	MAIN/AIC	MOUNTING	LOCATION	NEMA TYPE	CATALOG NUMBER
MCC	600	3	277/480	600A/65KAIC	SURFACE	ELECT. RM.	1	GENERAL ELECTRIC

CIRCUIT NUMBER	BREAKER POLE	BREAKER AMPS RATING	SERVING	WIRE THWN CU	CONDUIT INCH	CONNECTED LOAD AMPS L1	L2	L3	NEUTRAL
1	3	150	EXISTING 75HP PUMP #6	3#2/0 & 1#3 (GND)	3	96	96	96	0
2	3	200	EXISTING 100HP PUMP #11	3#4/0 & 1#3 (GND)	3	124	124	124	0
3	3	40	EXISTING 15KVA TRANSF. (PANEL A)	2#8 & 1#10 (GND)	1	31	31	–	0
4	–	–	SPACE	–	–	–	–	–	–
5	3	200	EXISTING 100HP PUMP #9	3#4/0 & 1#3 (GND)	3	124	124	124	0
6	3	200	EXISTING 100HP PUMP #10	3#4/0 & 1#3 (GND)	3	124	124	124	0
				TOTAL CONNECTED LOAD		499	499	468	0

CU THHN FEEDER EXISTING (2) SETS OF 3#350 MCM & 1#1/0 CU (GND) 3" EACH SET TO REMAIN

SIEMENS, GENERAL ELECTRIC OR SQUARE–D WILL BE APPROVED, CATALOG NUMBER SHOWN: GENERAL ELECTRIC

EXISTING PANEL TO REMAIN

PANEL	AMPS	VOLTAGE	CIRCUITS	WIRE	PHASE	MAIN/AIC	MOUNTING	LOCATION	CATALOG NUMBER
A	60	120/240	20	3	1	60A/22KAIC	SURFACE	ELECT. RM.	LOAD CENTER

CKT. NO.	WIRE	COND INCH	CKT BKR POLE	CKT BKR AMPS	SERVING	WATTS	CKT. NO.	WIRE	COND INCH	CKT BKR POLE	CKT BKR AMPS	SERVING	WATTS
1	12	1/2	1	20	EXISTING RECEPTACLE	180	2	12	1/2	1	20	EXISTING LIGHTS	300
3	12	1/2	1	20	EXISTING LIGHTS	300	4	12	1/2	1	20	EXISTING CONTROL PANEL	300
5	12	1/2	1	20	EXISTING LIGHTS	300	6	12	1/2	1	20	EXISTING LIGHTS	300
7	–	–	1	20	SPARE	–	8	12	1/2	1	20	EXIST. WELL #11 REC.	360
9	–	–	–	–	SPACE	–	10	12	1/2	1	20	EXIST. WELL #11 REC.	360
11							12	12	1/2	1	20	EXIST. WELL #11 REC.	360
13	12	1/2	2	20	EXISTING AHU	360	14	12	1/2	1	20	EXIST. WELL #11 REC.	360
15							16	10	3/4	1	20	NEW GENERATOR BATT. CHARGER	700
17	10	3/4	2	30	EXISTING COND. UNIT	2860	18						
19							20	10	3/4	2	30	NEW GENER. JACKET WTR. HTR.	3000
					TOTAL	4000						TOTAL	6040

EXISTING TO REMAIN. (FOR REFERENCE ONLY)

EXISTING TO REMAIN. (FOR REFERENCE ONLY)

FOR THIS PERMIT ONLY.

LINE CALCULATIONS	WATTS	TOTAL AMPS LINE	NEUTRAL CALCULATIONS	WATTS	TOTAL AMPS NEUTRAL
CONTINUOUS LOAD	1200		CONTINUOUS LOAD	1200	
+ 25 % OF CONTINUOUS LOAD	300		+ 25 % OF CONTINUOUS LOAD	300	
+ NON–CONTINUOUS LOAD	8840	43	+ NON–CONTINUOUS LOAD	2620	17
TOTAL	10340		TOTAL	4120	

FEEDER THHN CU: EXISTING 3#6 & 1#10 CU (GND) 1" TO REMAIN

SIEMENS, GENERAL ELECTRIC OR SQUARE–D WILL BE APPROVED, CATALOG NUMBER SHOWN: GENERAL ELECTRIC

GENERAL ELECTRICAL NOTES

1. ALL WORK SHALL CONFORM WITH ALL LOCAL, STATE, FEDERAL ORDINANCES AND BUILDING CODES GOVERNING THE INSTALLATION OF THE ELECTRICAL SYSTEM TO INCLUDE BUT NOT LIMITED TO FBC 2017, NEC 2014, NFPA 72 2013, FFPC 6TH EDITION (NFPA 101 2015). IF WORK AS LAID OUT, INDICATED OR SPECIFIED IS CONTRARY TO OR CONFLICTS WITH LOCAL ORDINANCES, BUILDING CODES & REGULATIONS, THE CONTRACTOR SHALL REPORT IN WRITING TO THE ARCHITECT/ ENGINEER BEFORE SUBMITTING A BID. THE ARCHITECT/ENGINEER WILL THEN ISSUE INSTRUCTIONS AS HOW TO PROCEED.
2. THE DRAWING ARE TO BE CONSIDERED DIAGRAMMATIC, NOT NECESSARILY SHOWING IN DETAIL OR TO SCALE ALL OF THE MINOR ITEMS. UNLESS SPECIFIC DIMENSIONS ARE SHOWN, THE STRUCTURAL AND SITE CONDITIONS SHALL GOVERN THE EXACT LOCATIONS. CONTRACTOR SHALL FOLLOW DRAWINGS IN LAYING OUT WORK, CHECK DRAWINGS OF ALL TRADES TO VERIFY SPACES IN WHICH WORK WILL BE INSTALLED AND MAINTAIN SPACE CONDITIONS AT ALL POINTS. WHERE SPACE CONDITIONS APPERAR INADEQUATE, OWNER REP./ENGINEER SHALL BE NOTIFIED BEFORE PROCEEDING WITH INSTALLATION. THIS CONTRACTOR SHALL, WITHOUT EXTRA CHARGE, MAKE FIELD MODIFICATION IN LAYOUT AS NEEDED TO PREVENT CONFLICT WITH WORK OF VARIOUS TRADES OR FOR PROPER EXECUTION OF THE WORK.
3. EXAMINE ALL DRAWINGS CAREFULLY PRIOR TO SUBMITTING A BID. CONTRACTOR WILL BE REQUIRED TO FURNISH, INSTALL AND/OR CONNECT WITH APPROPRIATE SERVICES ALL ELECTRICAL ITEMS SHOWN ON THESE DRAWINGS WITHOUT ADDITIONAL EXPENSE TO THE OWNER. IF DISCREPANCIES, CONFLICTS, INTERFERENCES OR OMISSIONS OCCUR BETWEEN DRAWINGS, NOTIFY IN WRITING THE OWNER REP./ ENGINEER IN AMPLE TIME TO PERMIT REVISIONS BEFORE THE BIDS ARE SUBMITTED.
4. VERIFY SERVICE CHARACTERISTICS, LOCATION AND CONNECTION WITH ELECTRIC UTILITY COMPANY. PERFORM ALL WORK RELATED TO SERVICE IN STRICT ACCORDANCE WITH UTILITY Co. STANDARDS AND REQUIREMENTS.
5. INSTALL MATERIALS AND EQUIPMENT IN A NEAT AND FIRST CLASS WORKMANLIKE MANNER. THE OWNER RESERVES THE RIGHT TO DIRECT REMOVAL AND REPLACEMENT OF ITEM WHICH, IN HIS OPINION, DO NOT PRESENT A NEAT AND WORKMANLIKE APPEARANCE. REMOVAL AND REPLACEMENT IS TO BE DONE IMMEDIATELY WHEN DIRECTED BY THE OWNER IN WRITING, AT THE SOLE EXPENSE OF CONTRACTOR.
6. START OF WORK BY CONTRACTOR SHALL BE CONSIDERED AS ACCEPTANCE BY HIM OF ALL CLAIMS OR QUESTIONS AS TO SUITABILITY OF THE WORK OF OTHER TRADES OR OTHER CONTRACTORS TO RECEIVE HIS WORK. THIS CONTRACTOR SHALL REMOVE AND REPLACE, AT HIS EXPENSE, ALL ELECTRICAL WORK WHICH MAY HAVE TO BE REMOVED BECAUSE OF INTERFERENCE WITH OTHER TRADES.
7. THIS CONTRACTOR SHALL OBTAIN AND PAY ALL INSURANCE, FEES, PERMITS ASSO– CIATION DUES, ROYALTIES, AND TAXES OF WHATEVER NATURE SHALL APPLY TO THIS WORK. HE SHALL ALSO PAY ALL INSPECTION FEES AS MAY BE REQUIRED BY LAW OR ORDINANCE AND SHALL KEEP THE OWNER HARMLESS FROM ANY DAMAGE AND EXPENSE ARISING FROM ANY VIOLATION OF THE LAWS, RULES OR ORDINANCES.
8. ALL WIRE SHALL BE COPPER TYPE THWN IN EMT RACEWAYS.
9. WIRE UP COMPLETE THE NEW SERVICE ENTRANCE RATED ATS AND GENERATOR AS DIRECTED BY EQUIPMENT MANUFACTURER. CONTROL WIRING SHALL BE SEPARATE RACEWAY FROM POWER WIRING.
10. PROVIDE RACEWAYS AND PREWIRE DATA OUTLETS COMPLETELY.
11. PROVIDE MEANS "FURNISH AND INSTALL".
12. COORDINATE WORK WITH WORK OF OTHER TRADES TO AVOID ALL CONFLICTS.
13. DO A COMPLETE JOB, EVERYTHING CONNECTED, READY FOR USE.
14. IDENTIFY CLEARLY ON A TYPE WRITTEN FORM ALL CIRCUITS AND EQUIPMENT TO CORRESPOND WITH THE PLANS AND PANELS SCHEDULE AND ATTACH INSIDE THE PERTAINING PANEL.
15. RACEWAYS: ALL RACEWAYS TO BE EMT.
20. SHOP DRAWINGS: THIS CONTRACTOR SHALL FURNISH THE ENGINEER WITH SHOP DRAWINGS OF EQUIPMENT PRIOR TO PURCHASE FOR APPROVAL.
21. TESTING: THE CONTRACTOR SHALL TEST ALL WORK AND EQUIPMENT AS DIRECTED BY THE ARCHITECT AND BY AUTHORITIES HAVING JURISDICTION, FURNISHING ALL EQUIPMENT AND NECESSARY PERSONNEL AND ELECTRIC POWER. THE ENTIRE INSTALLATION SHALL BE TESTED FOR SHORTS, GROUNDS AND OPEN CIRCUITS, AND ALL DEFECTS SHALL BE DEMONSTRATED TO BE IN PROPER WORKING AND OPERATING CONDITION TO THE COMPLETE SATISFACTION OF THE ENGINEER.
22. GUARANTEES: ALL EQUIPMENT AND MATERIALS SHALL BE GUARANTEED FOR ONE YEAR AFTER THE DATE OF ACCEPTANCE BY OWNER.
23. AT COMPLETION OF JOB THE ELECTRICAL CONTRACTOR SHALL GIVE THE OWNER AN AS–BUILT SET OF REPRODUCIBLE COPIES SHOWING THE EXACT ELECTRICAL INSTALLATION.
24. BEFORE BIDDING THE JOB THE ELECTRICAL CONTRACTOR SHALL VISIT THE SITE AND BECOME FAMILIAR WITH ALL EXISTING CONDITIONS.
25. CONTRACTOR SHALL PROVIDE TO THE BUILDING OWNER WITHIN 30 DAYS AFTER THE DATE OF ACCEPTANCE, RECORD DRAWINGS OF THE ACTUAL INSTALLATION INCLUDING A SINGLE–LINE DIAGRAM OF THE BUILDING ELECTRICAL DISTRIBUTION SYSTEM AND FLOOR PLANS INDICATING LOCATION AND AREA SERVED FOR ALL DISTRIBUTION IN FULL COMPLIANCE WITH FBC EC C405.6.4.1.
26. CONTRACTOR SHALL PROVIDE TO THE BUILDING OWNER AN OPERATING MANUAL AND MAINTENANCE MANUAL INCLUDING SUBMITTAL DATA STATING EQUIPMENT RATING AND SELECTED OPTIONS FOR EACH PIECE OF EQUIPMENT REQUIRING MAINTENANCE, OPERATION MANUALS AND MAINTENANCE MANUALS FOR EACH PIECE OF EQUIPMENT REQUIRING MAINTENANCE WITH CLEARLY IDENTIFIED REQUIRED ROUTINE MAINTENANCE ACTIONS AND NAMES AND ADDRESSES OF AT LEAST ONE QUALIFIED SERVICE AGENCY IN FULL COMPLIANCE WITH FBC EC C405.6.4.2.

RISER NOTES :

1. ALL WIRE SHALL BE COPPER THWN OR AS OTHERWISE NOTED ON THESE PLANS
2. NEW GROUND SYSTEM TO TWO 10'–0" LONG x 5/8" ø COPPER CLAD GROUND ROD 6'–0" APPART.
3. ALL EQUIPMENT INTERRUPTING CAPACITIES SHALL COMPLY WITH FPL PROVIDED FAULT CURRENT IN FULL COMPLIANCE WITH NEC 110.9. THE ELECTRICAL CONTRACTOR SHALL VERIFY AIC RATING OF THE EQUIPMENT WITH FAULT CURRENT INFORMATION PROVIDED BY THE POWER COMPANY BEFORE ORDER THE ELECTRICAL EQUIPMENT. ELECTRICAL CONTRACTOR SHALL PERMANENTLY MARK IN THE FIELD, WITH LEGIBLE LETTERS, THE MAXIMUM AVAILABLE FAULT CURRENT PROVIDED BY FPL AT THE NEW SERVICE ENTRANCE RATED AUTOMATIC TRANSFER SWITCH EQUIPMENT TO COMPLY WITH NEC 110.24.
4. PROVIDE PERMANENT PLAQUE AS PER NEC 230.2 FOR NEW SERVICE ENTRANCE RATED ATS LOCATION.
5. NEW SERVICE ENTRANCE RATED AUTOMATIC TRANSFER SWITCH SHALL BE INSTALLED ABOVE FLOOD CRITERIA.
6. EXISTING MOTOR CONTROL CENTER SHALL REMAIN. EXISTING MOTOR CONTROL CENTER 600A MAIN CIRCUIT BREAKER THRU KIRK KEY INTERLOCK SYSTEM SHALL REMAIN IN NORMAL POSITION. EXISTING MOTOR CONTROL CENTER 400A EMERGENCY MAIN CIRCUIT BREAKER THRU KIRK KEY INTERLOCK SYSTEM SERVING A 400A OUTDOOR RECEPTACLE FOR A PORTABLE GENERATOR SHALL REMAIN IN OFF POSITION AND NOT BE USED AFTER INSTALLATION OF NEW EMERGENCY BACKUP SYSTEM.
7. ELECTRICAL CONTRACTOR SHALL COORDINATE WITH FPL AND THE CITY OF PEMBROKE PINES REPRESENTATIVE THE TEMPORARY TURNING OFF OF THE EXISTING TRANSFORMER DURING THE INSTALLATION OF THE NEW EMERGENCY GENERATOR BACKUP SYSTEM. PROVIDE BACKUP POWER THRU PORTABLE GENERATOR TO OPERATE PUMPS AS NEEDED DURING FPL SERVICE IS TURNING OFF USING AVAILABLE KIRK KEY SWITCH SYSTEM EMERGENCY SIDE.
8. EXISTING UNDERGROUND CONDUITS COMING FROM FPL TRANSFORMER SHALL REMAIN. THE EXPOSED VERTICAL SECTION OF THESE SERVICE CONDUITS IN THE EXTERNAL WEST WALL OF THE ELECTRICAL ROOM SHALL BE CUT TO ALLOW THE INSTALLATION OF THE NEW WALL MOUNTED SERVICE ENTRANCE RATED AUTOMATIC TRANSFER SWITCH AS SHOWN ON THESE DRAWINGS. EXISTING SERVICE WIRING SHALL BE ALSO CUT AND CONNECTED INSIDE THE NEW SERVICE ENTRANCE RATED AUTOMATIC TRANSFER SWITCH TO THE PROPER FPL TERMINAL LUGS (NORMAL SIDE) AND MOTOR CONTROL CENTER SIDE (LOAD SIDE). EXTEND WIRING AND MAKE ALL FINAL CONNECTIONS AS REQUIRED.
9. EXISTING CONCRETE SLAB AND RAMP AT THE WEST SIDE OF THE ELECTRICAL ROOM SHALL BE REMOVED. CITY OF PEMBROKE PINES SHALL COORDINATE WITH DESIGNATED CONTRACTOR THE PROPER CONCRETE REMOVAL BEING CAREFUL NOT TO DAMAGE ALL EXISTING UNDERGROUND ELECTRICAL CONDUITS AND WATER PIPELINES INSTALLED BELOW THE SLAB. NEW 12" CONCRETE PAD SHALL BE POURED AS PER NEW STRUCTURAL DESIGN.
10. ELECTRICAL CONTRACTOR SHALL COORDINATE WITH NEW CONCRETE PAD CONTRACTOR THE PROPER INSTALLATION OF ALL NEW UNDERGROUND ELECTRICAL CONDUITS AND GROUNDING CONNECTIONS AS SHOWN ON THESE DRAWINGS.
11. BEFORE ORDERING THE EMERGENCY GENERATOR & AUTOMATIC TRANSFER SWITCH, THE EQUIPMENT MANUFACTURER WILL REQUEST TO THE OWNER REPRESENTATIVE THE OPERATIONAL DATA OF ALL PUMPS VFD'S AND PERFORM NEW GENERATOR CALCULATIONS TO VERIFY PROPER SIZE OF GENERATOR AND ALTERNATOR CONSIDERING THE ELECTRONIC TRANSIENT EFFECT PRODUCED BY THE VFD'S.

revisions:

CITY OF PEMBROKE PINES WATER SYSTEM FACILITY
UPGRADE EMERGENCY BACKUP ELECTRICAL SERVICE EQUIPMENT
7190 JOHNSON STREET
PEMBROKE PINES, FL. 33024

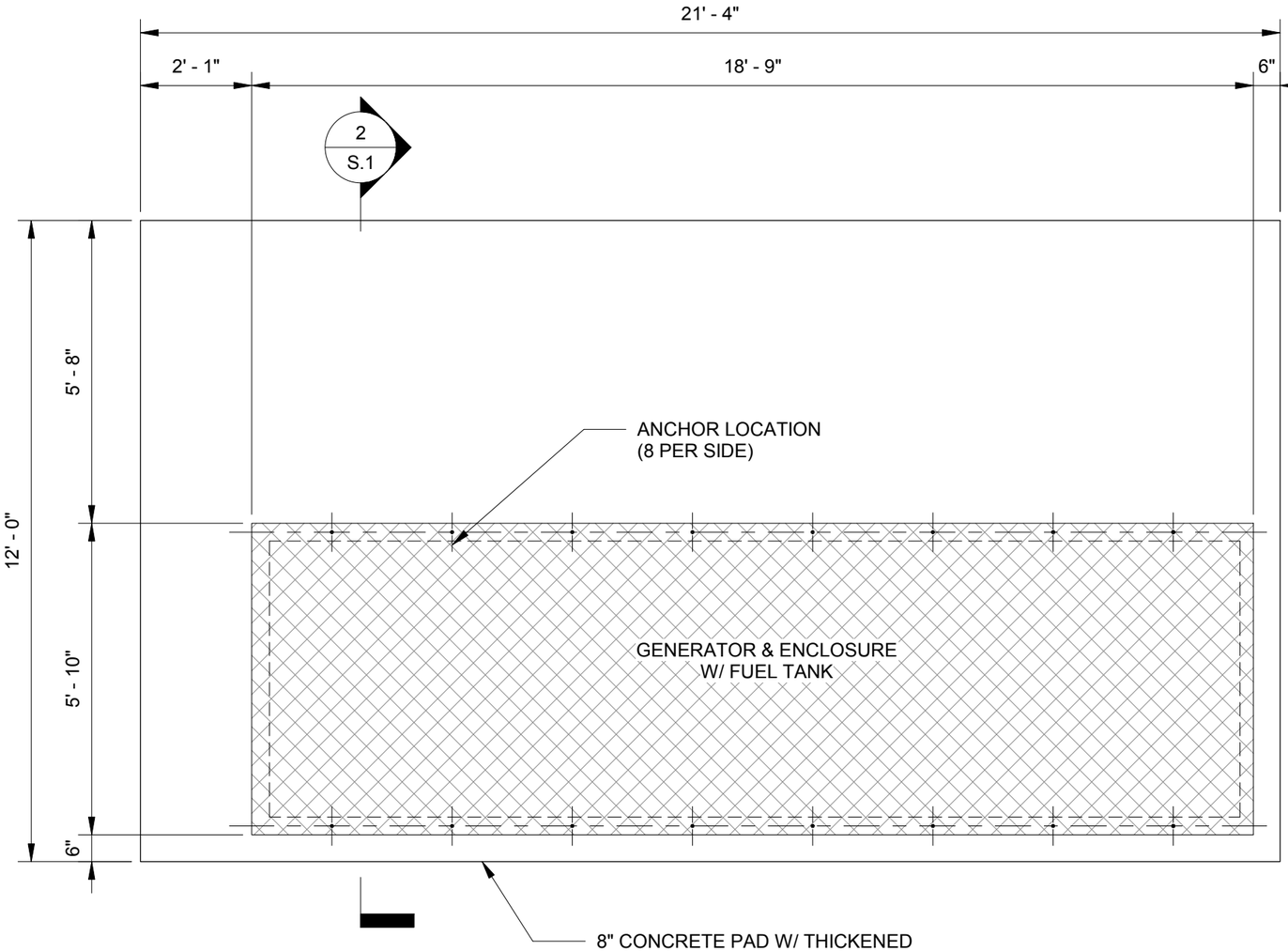
JOB NUMBER: 18027
ERNESTO R. TORRES
PE# 0049958 E.E.
EB0003862
FLORIDA ENGINEERING SERVICES
MECHANICAL AND ELECTRICAL
ENGINEERS
34 N.W. 168TH STREET
NORTH MIAMI BEACH, FL. 33169
TELEPHONE: (305) 653–0212
FAX: (305) 653–0232
E–mail: ErnestoT@fesinc.biz

drawn by: ERT

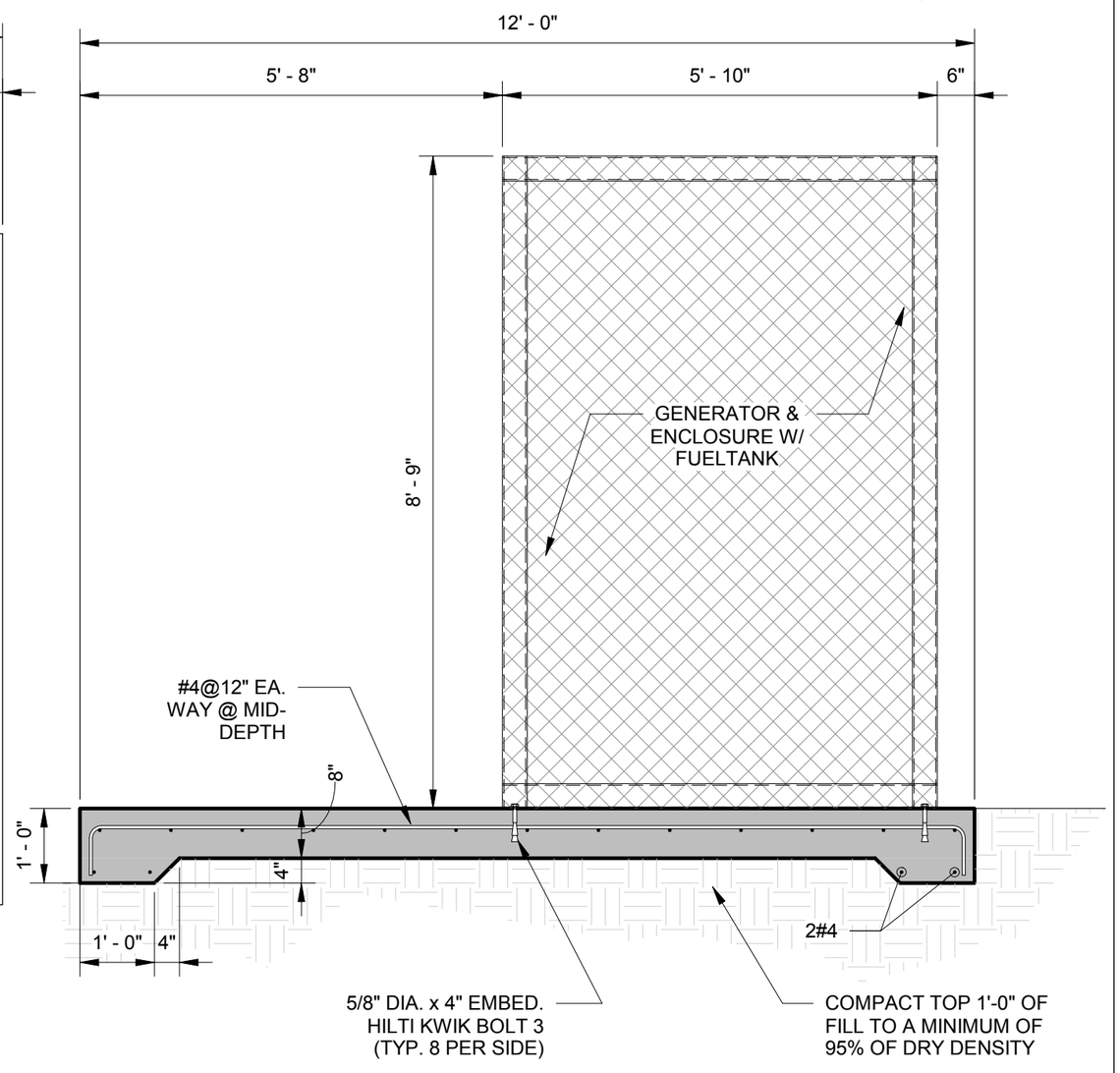
date: JULY 6, 2018

sheet no: ES–2

project:



1 GENERATOR PAD PLAN VIEW
3/8" = 1'-0"



2 SECTION
1/2" = 1'-0"

GMG
STRUCTURAL ENGINEERS
8181 NW 154TH STREET, STE 247
MIAMI LAKES, FLORIDA 33016
PH: 786-646-2344
PE #74028 CA #30882
WWW.GARCIAMULLIN.COM

CITY OF PEMBROKE PINES WATER SYSTEM FACILITY UPGRADE
EMERGENCY BACKUP ELECTRICAL SERVICE EQUIPMENT

7190 JOHNSON STREET
PEMBROKE PINES, FL 33024

No.	Description	Date

PLAN & DETAIL

Project number	18034	S.1
Date	07/26/2018	
Drawn by	JG	
Checked by	JG	Scale As indicated

7/26/2018 12:11:34 PM

Eastern Wellfield Electrical - Engineering Evaluation of Wells 6, 9, 10 & 11 and Wellfield Control Building Study

HILLERS ELECTRICAL ENGINEERING, INC.

Table of Contents

1.0 Purpose and Scope

The City of Pembroke Pines has contracted Hillers Electrical Engineering, Inc. (HEE) to provide an electrical engineering evaluation of the City's eastern wellfield consisting of Wells 6, 9, 10 and 11 along with a Wellfield Control Building. Also included as part of this study is an order of magnitude construction cost for the installation of a lightning protection system.

1.1 Executive Summary

In the aftermath of Hurricane Irma the wellfield experienced failures of the motors for Wells 9, 10 and 11. These failures prompted the below evaluation to ascertain the condition of the systems and to determine what improvements, if any, should be made. The recommendation within this study can be categorized in the following manner:

- Critical Code Compliance Issues $150K – This includes replacement of MCC; an Arc Flash Analysis; and removal of the extension cord routed through the wall.
- Surge, Grounding and Lighting Protection Systems $65K – This includes surge protective devices for all cabling at both the well and control building locations; upgraded grounding system for the wellfield and control building; and a lightning protection system for the wellfield and control building
- Other Recommendations $200K – This include replacement of the three VFDs; addition of harmonic mitigation systems; sealing/repair/relocation of conduit systems; removal of abandoned equipment/conduits; replacement of generator receptacle with a generator connection cabinet; and four new well disconnect switches.

2.0 Existing Conditions

The eastern wellfield is currently comprised of the four wells 6, 9, 10 and 11 and one wellfield control building. The initial wellfield design drawings could not be located; thus, the original layout and age of the system is unknown. A Water System Improvement Project completed in 1994, reflects that the original wellfield consisted of the three wells (6, 7 and 8) each containing a 30hp vertical pump along with a control building that contains a motor control center (MCC). The exact age of the MCC is unknown, however the model and type of the existing MCC typical of equipment installed in the mid-1980s.

The 1994 Improvement Project included several upgrades to the wellfield and control building. New wells 9, 10 and 11 each with a 75hp vertical pump were added, while the wells 7 and 8 were demolished and/or abandoned. The project also upgraded from a 300A to 600A electrical service to support the added electrical load, provided new across-the-line starters for wells 9, 10 and 11 within the MCC, and added a 400A generator receptacle to replace the original 200A generator receptacle.

Since the 1994 Improvement Project, there have been additional improvements that include:

- A remote telemetry unit (RTU),

- Air-conditioning system for the control building,
- Flow meters for monitoring the flow at each well, and
- The addition of variable frequency drives (VFD) for wells 9, 10 and 11.

2.1 Wellfield & Control Building Assessment

The following section is a summary of the field investigation performed by HEE for wells 6, 9, 10 & 11 along with the wellfield control building. The condition of electrical equipment was based on a visual inspection only. The equipment was reflected to be in either good, fair or poor condition as compared to industry standards.

- **Well 6**
  - Disconnect switch and supporting pedestal appear to be in poor condition and should be replaced. There is not a concrete maintenance pad below disconnect switch present. There are no arc flash labels, local surge protection, nor local ground rods/grounding system installed.
  - Light pole and fixture appear functional and in fair condition. The concrete pole appears to be from original well installation, however the light fixture appears newer. Unable to determine if light source is LED. There is not a lightning rod installed on pole.
  - A general use receptacle is mounted on the light pole and appears to be weathered, but in fair condition.
  - The flow meter and local control cabinet appear to be in good condition. The conduits are not sealed with duct seal to prevent moisture, critters and foreign objects from entering and/or exiting the conduit system.
  - The motor appears to be weathered but in fair condition. The name plate is illegible, but the record drawings indicate the motor is 30hp.

Figure 1a: Well 6 Site

Figure 1b: Well 6 Disconnect Switch

Figure 1c: Well 6 Flow Meter Enclosure

- **Well 9**
    - A junction box with an E-Stop button mounted in the enclosure door, serves as the local disconnect, and supporting pedestal appear to be in fair condition. The supporting pedestal appears to be rusting at concrete maintenance pad. In addition, water appears to be accumulating inside of the junction box which is causing rust within the enclosure. The conduits are not sealed with duct seal to prevent moisture, critters and foreign objects from entering and/or exiting the conduits. Two conductors are not terminated and have their copper ends exposed. A local grounding system appears to be present but no ground rod is visible for verification. There is no local surge protection present. A generic arc flash warning label is on junction box.
    - Light pole and fixture appear functional and in fair condition. The concrete pole appears to be from original well installation, however the light fixture appears newer. Unable to determine if light source is LED. There is not a lightning rod installed on pole.
    - A general use receptacle is mounted on the light pole and appears to be weathered, but in fair condition.
    - The flow meter and local control cabinet appear to be in good condition. The surge protective device appears to have been removed and should be replaced. The conduits are not sealed with duct seal to prevent moisture, critters and foreign objects from entering and/or exiting the conduit system.
    - The City indicated to HEE that the motor failed in the aftermath of Hurricane Irma. It is possible that the failure was due to either a lightning strike or electrical utility surge event. HEE has reviewed and provided comments on the replacement motor shop drawings.

Figure 2a: Well 9 Site

Figure 2b: Well 9 Junction Box with E-Stop

Figure 2c: Well 9 Flow Meter Enclosure

- **Well 10**

  - There is not a local disconnecting means to disconnect the power for the pump at this well. The junction box that facilitates the connection to the motor and underground conduit system along with its supporting pedestal appear to be in fair condition. The supporting pedestal appears to be rusting at concrete maintenance pad. The conduits are not sealed with duct seal to prevent moisture, critters and foreign objects from entering and/or exiting the conduits. There are spare/unused conductors laying in junction box, possibly for a future E-Stop button or On/Off switch. A local ground rod and grounding system is visible. There is no local surge protection present. A generic arc flash warning label is on junction box.
  - Light pole and fixture appear functional and in fair condition. The concrete pole appears to be from original well installation, however the light fixture appears newer. Unable to determine if light source is LED. There is not a lightning rod installed on pole.
  - A general use receptacle is mounted on the light pole and appears to be weathered, but in fair condition.
  - The flow meter and local control cabinet appear to be in good condition. The conduits are not sealed with duct seal to prevent moisture, critters and foreign objects from entering and/or exiting the conduit system.
  - The City indicated to HEE that the motor failed in the aftermath of Hurricane Irma. It is possible that the failure was due to either a lightning strike or electrical utility surge event. HEE has reviewed and provided comments on the replacement motor shop drawings.

Figure 3a: Well 10 Site

Figure 3b: Well 10 Junction Box

Figure 3c: Well 10 Flow Meter Enclosure

- **Well 11**

  - A junction box with an On/Off switch in the enclosure door, serves as the local disconnect, and supporting pedestal appear to be in fair condition. The conduits are not sealed with duct seal to prevent moisture, critters and foreign objects from entering and/or exiting the conduits. Two conductors are not terminated and have their copper ends exposed. A local ground rod and grounding system is visible. There is no local surge protection present. A generic arc flash warning label is on junction box.
  - Light pole and fixture appear functional and in fair condition. The concrete pole appears to be from original well installation, however the light fixture appears newer. Unable to determine if light source is LED. There is not a lightning rod installed on pole.
  - A general use receptacle is mounted on the light pole and appears to be weathered, but in fair condition.
  - The flow meter and local control cabinet appear to be in good condition. The surge protective device appears to have been removed and should be replaced. The conduits are not sealed with duct seal to prevent moisture, critters and foreign objects from entering and/or exiting the conduit system.
  - The City indicated to HEE that the motor failed in the aftermath of Hurricane Irma. It is possible that the failure was due to either a lightning strike or electrical utility surge event. HEE has reviewed and provided comments on the replacement motor shop drawings.

Figure 4a: Well 11 Site

Figure 4b: Well 11 Junction Box with On/Off Switch

Figure 4c: Well 11 Flow Meter Enclosure

- **Control Building**

  - The miscellaneous electrical equipment of the control building appears to be in poor condition. An abandoned service conduit and an abandoned 200A generator receptacle located on north side of building should be removed. The location of the concrete slab for portable generator causes water to pool up around condulet on west side of building allowing for water intrusion into building and conduit system. An extension cord, which appears to be providing power to the portable generator's battery charger, is routed through the control building concrete wall on southside of building and should be removed. One of the condulet on east side of building is missing a cover allowing moisture, critters and foreign objects access to the conduit system. There are no lighting rods and/or a lighting protection system installed on the building.
  - The control building exterior lighting appears to be in fair condition. Unable to determine if light source is LED.
  - Though currently on-site the portable generator was not evaluated as part of this study as it is not permanently connected to the wellfield electrical systems.
  - The Remote Telemetry Unit (RTU) appear to be in good condition. The conduits are not sealed with duct seal to prevent moisture, critters and foreign objects from entering and/or exiting the conduit systems.
  - The VFDs for wells 9, 10 and 11 appear to be in fair condition. The existing VFDs have no input line reactors and/or output filters installed for any of the VFDs nor were VFD cables utilized between the motors and the VFDs to mitigate the effects of harmonics. There is also a broken conduit between Well 11 VFD and MCC should be repaired.
  - The MCC appears to be in poor condition. A cubicle compartment door below the transformer breaker cubicle is missing creating a hazard by allowing access to the MCC bussing. Cubicles for Wells 9, 10 and 11 have been modified, bypassed and/or gutted. There are terminal lugs extending between the Well 9 cubicle and wireway making an unsafety condition as live parts are exposed within the wireway. Various cubicle and wireway doors are unable to be closed due to wiring conditions. The line and load side conductors for Wells 9 and 11 VFDs are routed through the low voltage control cabinet providing for an unsafe condition. Temporary generator cables are routed through MCC via a hole cut in side of MCC. Note: All modification to the MCC should be done by the manufacturer's approved representative to maintain the UL rating.
  - There are no arc flash warning labeling found on electrical equipment within Control Building.

Figure 5a: Control Building - North Side

Figure 5b: Control Building - South Side

Figure 5c: Control Building - West Side

Figure 5d: Control Building - West Side

Figure 5e: Control Building - East Side

Figure 5f: Control Building - RTU

Figure 5g: Control Building – VFDs Wells 9 & 11

Figure 5h: Control Building – Broken Conduit for Well 11 VFD

Figure 5i: Control Building – VFDs Well 10 and Generator Cables

Figure 5j: Control Building – MCC

Figure 5k: Control Building – Well 9 MCC Cubicle

Figure 5l: Control Building – Well 10 MCC Cubicle

Figure 5m: Control Building – Well 11 MCC Cubicle

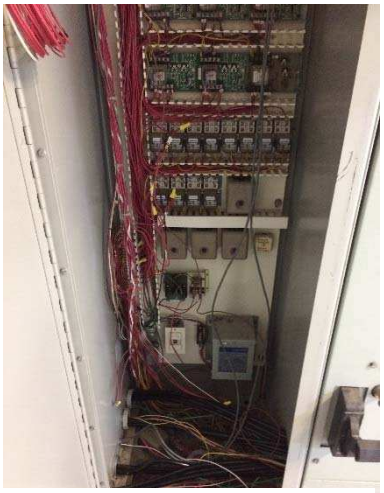


Figure 5n: Control Building – Control Cabinet

3.0 Proposed Modifications

HEE recommends an electrical rehabilitation project be designed for the wellfield and control building. The existing MCC should be replaced due to the issues noted in Section 2.1. The existing generator receptacle mounted to the building exterior along with the temporary generator cords connected to the MCC should be replaced with a new NEMA 3R, 316 stainless steel generator connection cabinet mounted to the building's exterior. The three existing VFDs should be replaced with new VFDs that include input line reactors, output filters and new VFD cabling installed between the VFDs and motors. All conduits should be sealed with duct seal within each enclosure. Any missing junction box and/or condulet covers should be replaced. All abandoned conduits and other electrical items should be removed. The condulet below the portable generator concrete slab should be relocated. The extension cord routed through the wall should be replaced with an exterior 120V receptacle to power the portable generator's battery charger. Recommend replacement of the existing local disconnect switch at well 6 and the local junction boxes at wells 9, 10 and 11 with NEMA 4X, 316 stainless steel, heavy duty, lockable disconnect switches. An Arc Flash Analysis will be required for code compliance with the National Fire Protection Association (NFPA) 70E "Electrical Safety in the Work Place", Occupational Safety and Health Administration (OSHA) and National Fire Protection Association (NFPA) 70 "National Electrical Code (NEC)."

The motor failures the City experienced in the aftermath of Hurricane Irma at wells 9, 10 and 11 were most likely caused by either a lightning strike and/or an electrical utility surge. In order to reduce and/or eliminate the damage from either of these two events, HEE recommends the installation of surge protective devices, grounding system upgrades and a new lightning protection system. Surge protective devices should be installed for all power, control and instrumentation cabling at each well location and at the control building. A new grounding system for the wellfield and control building that bonds all metal parts and electrical equipment is

recommended. A new lightning protection system with lightning rods on all the light poles as well as the control building should be installed and connect to the new grounding system.

4.0 Opinion of Probable Construction Cost

Table 4.0
Opinion of Probable Construction Cost
Eastern Wellfield Electrical Engineering Evaluation of Wells 6, 9, 10 & 11 and Wellfield Control Building

Item	Units	No. of Units	Cost Per Unit	Total Est. Cost
Critical Code Compliance Issues	LS	1	$155,000	$155,000
Surge, Grounding and Lighting Protection Systems	LS	1	$65,000	$65,000
Other Recommendations	LS	1	$200,000	$200,000
			Subtotal	**$420,000**
Permitting	%	3	-	$12,600
Misc. Electrical	%	15	-	$63,000
Structural	%	2	-	$8,400
Civil / Sitework	%	3	-	$12,600
Demolition	%	5	-	$21,000
		.	**Subtotal**	**$117,600**
			Subtotal	**$537,600**
Estimating Contingency	%	25	-	$134,400
Engineer's Opinion of Total Construction Cost				**$672,000**

Bid #PSUT-18-06 - Utility Electrical Projects 2018 IFB

Time Left	Bid has ended.		
Bid Started	Aug 6, 2018 7:09:57 PM EDT	**Notifications**	Report (Bidder Activity)
Bid Ended	This bid closed on Oct 16, 2018 2:00:00 PM EDT	**# of suppliers that viewed**	190 (View)
Agency Information	City of Pembroke Pines, FL (view agency's bids)	**Q & A**	Questions & Answers Questions: 3 Q&A Deadline: Sep 10, 2018 8:30:00 PM EDT
Bid Classifications	Classification Codes		
Bid Regions	Regions		
Bid Contact	see contact information		

Pre-Bid Conference(s) Aug 23, 2018 9:00:00 AM EDT

Attendance is mandatory

Location: There will be a mandatory scheduled pre-bid meeting on August 23 2018 at 9:00 a.m. Meeting location will be at the Public Services Building, Large Conference Room, located at 8300 S. Palm Drive, Pembroke Pines, FL 33025.

All vendors will be required to complete Attachment N "Mandatory Pre-Bid Meeting Form" at the meeting and submit it as part of their proposal to show proof of attendance to the mandatory meeting.

Transcript Attendance

Oct 9, 2018 7:00:00 AM EDT

Location: Pursuant to Addendum # 3, in an effort to increase participation and competition, the Public Services Department is extending an opportunity for vendors that could not attend the original Mandatory Pre-Bid Meeting on August 23, 2018.

Vendors interested in bidding this project who did not attend the mandatory pre-bid meeting may schedule a Mandatory Site Visit as a substitute. All vendors will be required to complete Attachment N "Mandatory Pre-Bid Meeting Form" and submit it as part of their proposal to show proof of attendance to the mandatory pre-bid meeting that was held on August 23, 2018 or proof of attendance to one of the Site Visits.

If you have already attended the August 23, 2018 pre-bid meeting, you will not need to schedule another site visit, however you may schedule a site visit if you like.

Any vendors interested may contact Jonathan Cooper at jcooper@ppines.com to schedule a site visit prior to October 2, 2018 at 5:00 p.m.

Transcript Attendance

Copy Bid Click here to copy the bid and relist it as a new bid

View Rules Click here to change the rules for this bid.

Bid Packet Packet for Bid PSUT-18-06 [download]

Best and Final Offer: Create

Approval

View Approval Flow View Approval Flow

Approval Status Approved

Bid Comments

Contract Duration	One Time Purchase
Contract Renewal	Not Applicable
Prices Good for	90 days
Budgeted Amount	$0.00 (change)
Expected Expenditure	$950,000.00
Standard Disclaimer	Bids/proposals must be submitted electronically

Please note vendors should be registered on BidSync under the name of the organization that they are operating as and it should match the organization name on the documents that they are submitting and utilizing when responding to the solicitation.
The vendor must provide the necessary information on the BidSync website and upload all of the requested documents listed in the PROPOSAL REQUIREMENTS section of this solicitation. Unless otherwise specified, the City requests for vendors to upload their documents as one (1) PDF document in the order that is outline in the bid package.

The City recommends for proposers to submit their proposals as soon as they are ready to do so. Please allow ample time to submit your proposals on the BidSync website. Proposals may be modified or withdrawn prior to the deadline for submitting Proposals. BidSync Support is happy to help you with submitting your proposal and to ensure that you are submitting your proposals correctly, but we ask that you contact their support line at 1-800-990-9339 with ample time before the bid closing date and time.

PLEASE DO NOT SUBMIT ANY PROPOSALS VIA MAIL, E-MAIL OR FAX.

However, please note that any required Bid Bond or Cashier's Check should be in a sealed envelope, plainly marked âBID SECURITYâ (with the Solicitation Number and Title) and sent to the City of Pembroke Pines, City Clerk's Office, 4th Floor, 601 City Center Way, Pembroke Pines, FL 33025.

Bid Comments The City of Pembroke Pines is seeking proposals from qualified firms to construct various utility electrical projects.

Documents

Select All | Select None | Download Selected

- 1. IFB PSUT-18-06 Utility Electrical Projects 2018.pdf [download]
- 2. Attachment A - Contact Information Form.docx [download]
- 3. Attachment B - Vendor Information Form and a W-9 Rev 2017-11.pdf [download]
- 4. Attachment C - Non-Collusive Affidavit [download]
- 5. Attachment D - Sworn Statement on Public Entity Crimes [download]
- 6. Attachment E - Local Vendor Preference Certification [download]
- 7. Attachment F - Veteran Owned Small Business (VOSB) Preference Certification [download]
- 8. Attachment G - Equal Benefits Certification Form [download]
- 9. Attachment H - Vendor Drug-Free Workplace Certification Form [download]
- 10. Attachment I - Scrutinized Company Certification [download]
- 11. Attachment J - Proposers Qualifications Statement [download]
- 12. Attachment K - Sample Insurance Certificate.pdf [download]
- 13. Attachment L - Specimen Contract - Construction Agreement 2017-07-22.pdf [download]
- 14. Attachment M - References Form [download]
- 15. Attachment N - Mandatory Pre-Bid Site Visit Confirmation.pdf [download]
- 16. Attachment O - Standard Release of Lien.pdf [download]
- 17. Attachment P – WWTP East Portable Generator Connection Improvements Drawings Specifications.pdf [download]
- 18. Attachment Q – Eastern Wellfield Generator and ATS Drawings Specifications.pdf [download]
- 19. Attachment R – Hillers Electrical Engineering, Inc. Evaluation of Eastern Wellfield.pdf [download]
- 20. PSUT-18-06 - Mandatory Pre-Bid Attendance Sheet - 08.23.2018.pdf [download]
- 21. Addendum 1.pdf [download]
- ⊞ Attachment Q REVISED (4 documents)
- ⊞ Attachment S (24 documents)
- ⊞ Addendum #2 (10 documents)
- 22. Addendum 3.pdf [download]
- 23. Addendum 4.pdf [download]

= Included in Bid Packet = Excluded from Bid Packet

Items

Item	Title	Offers	
PSUT-18-06--01-01	New manual transfer switch for the east stand-by Gen system at the City WWTP	Y	Info
PSUT-18-06--01-02	New stand-by Gen set and ATS at the City eastern wellfield BASED ON GENERAC	Y	Info
PSUT-18-06--01-03	Electrical upgrades to the eastern wellfield power supply and VFD systems	Y	Info
PSUT-18-06--01-04	Deductive Generator Alternative Option	Y	Info

Addendum #1 - Made On Aug 23, 2018 6:29:47 PM EDT

New Documents
Addendum 1.pdf
7190 - ES-1 SITE PLAN-ES-1.pdf
7190 - ES-2 RISER-NOTES-ES-2.pdf
7190 - P-1 SITE PLAN-P-1.pdf
18034-2180821-Johnson St Generator.pdf
16010 Baisc Electrical Requirments.pdf
16015 Electrical Systems Analysis.pdf
16050 Basic Electrical Materials and Methods.pdf
16110 Raceways.pdf
16120 Conductors.pdf
16450 Grounding.pdf
PP05E09 - VFD SCHEMATIC-Layout.pdf
PP05E10 E11 - DETAILS-Layout1.pdf
16485 Variable Frequency Drives.pdf
16490 Solid State Reduced Voltage Starter.pdf
16670 Lightning protection.pdf
16950 Electrical Testing.pdf
PP05E01 - LEGENDNOTES-Layout.pdf
PP05E02 - SITE PLAN DEMO-Layout.pdf
PP05E03 - SITE PLAN PROP-Layout.pdf
PP05E04 - ELECTRICAL BLDG PLAN DEMO-Layout.pdf
PP05E05 - ELECTRICAL BLDG PLAN PROPOSED-Layout.pdf
PP05E06 - ONE LINE DEMO-Layout.pdf
PP05E07 - ONE LINE PROPOSED-Layout.pdf
PP05E08 - RISER SCHEDULE-Layout.pdf
PP05E10 E11 - DETAILS-Layout2.pdf
PP05EE12 - PID-Layout.pdf
PP05EE13 - RTU MODIFICATION-Layout.pdf
13300 Process Control And Instrumentation System.pdf

Previous End Date	Sep 5, 2018 2:00:00 PM EDT	**New End Date**	Sep 18, 2018 2:00:00 PM EDT
Previous Q & A End Date	Aug 27, 2018 8:30:00 PM EDT	**New Q & A End Date**	Sep 10, 2018 8:30:00 PM EDT
Previous Add. Offer Fields		**New Add. Offer Fields**	Brand

Added Items
- New stand-by Gen set and ATS at the City eastern wellfield BASED ON GENERAC
- Electrical upgrades to the eastern wellfield power supply and VFD systems
- Deductive Generator Alternative Option

Changed Items
- New manual transfer switch for the east stand-by Gen system at the City WWTP

Addendum #2 - Made On Sep 17, 2018 4:18:13 PM EDT

New Documents
Attachment S Revised - PP05E03 - SITE PLAN PROP Layout.pdf
Addendum 2.pdf
Attachment Q Revised - 7190 - ES-1 SITE PLAN-ES-1.pdf
Attachment S Revised - PP05E01 - LEGENDNOTES Layout.pdf
Attachment S Revised - PP05E05 - ELECTRICAL BLDG PLAN PROPOSED Layout.pdf
Attachment S Revised - PP05E07 - ONE LINE PROPOSED Layout.pdf
Attachment S Revised - PP05E08 - RISER SCHEDULE Layout.pdf
Attachment S Revised - PP05E04 - ELECTRICAL BLDG PLAN DEMO Layout.pdf
Attachment S Revised - PP05E10 E11 - DETAILS Layout1.pdf
Attachment S Revised - PP05E10 E11 - DETAILS Layout2.pdf

Addendum #3 - Made On Sep 25, 2018 10:28:55 AM EDT

New Documents Addendum 3.pdf

Previous End Date Sep 25, 2018 2:00:00 PM EDT **New End Date** Oct 9, 2018 2:00:00 PM EDT

Conference on Oct 9, 2018 7:00:00 AM EDT as been added

Addendum #4 - Made On Oct 8, 2018 4:26:51 PM EDT

New Documents Addendum 4.pdf

Previous End Date Oct 9, 2018 2:00:00 PM EDT **New End Date** Oct 16, 2018 2:00:00 PM EDT

Change Made On Aug 23, 2018 11:55:40 AM EDT

New Documents PSUT-18-06 - Mandatory Pre-Bid Attendance Sheet - 08.23.2018.pdf

Change Made On Sep 17, 2018 2:52:54 PM EDT

Previous End Date Sep 18, 2018 2:00:00 PM EDT **New End Date** Sep 25, 2018 2:00:00 PM EDT

Contractor Advertisements View All Ads

There are no advertisements on this solicitation.

August 23, 2018 IFB # PSUT-18-06

Addendum # 1
City of Pembroke Pines
IFB # PSUT-18-06
Utility Electrical Projects 2018

A) <u>ADDITIONAL DOCUMENTS</u>

There are three utility electrical projects included:

1. A new manual transfer switch for the east stand-by generator system at the City WWTP. **(See Attachment P – WWTP East Portable Generator Connection Improvements Drawings & Specifications)**

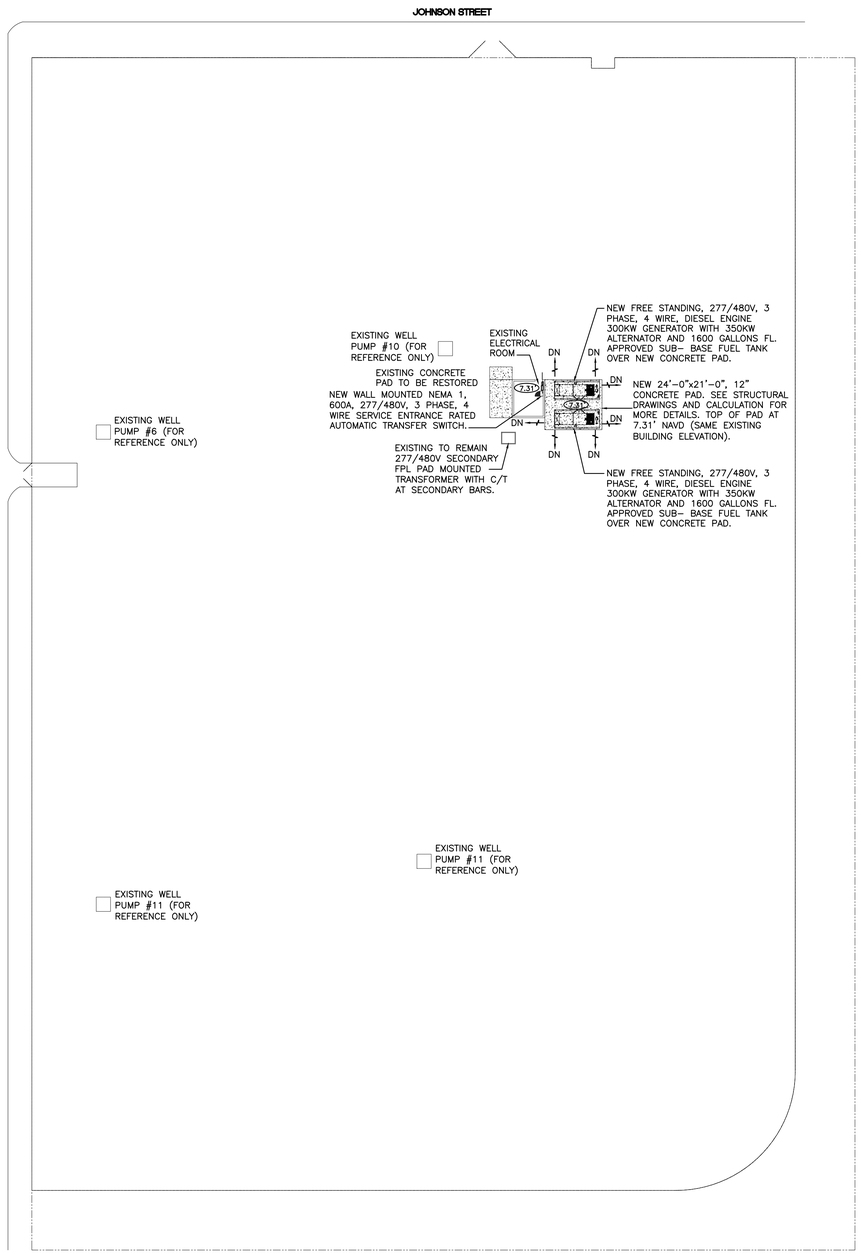
2. A new stand-by generator set and ATS at the City eastern wellfield. **(See Attachment Q – Eastern Wellfield Generator and ATS Drawings & Specifications)**

3. Electrical upgrades to the eastern wellfield power supply and VFD systems. **(See Attachment R – Hillers Electrical Engineering, Inc. Evaluation of Eastern Wellfield)**

The City is providing the additional following documents:

- **REVISED Attachment Q – Eastern Wellfield Generator and ATS Drawings & Specifications**

- **Attachment S – Electrical Upgrades to the Eastern Wellfield Power Supply and VFD Systems Plans & Specs**



SITE PLAN
SCALE: 1" = 30'–0"

GENERATORS "A" & "B" NOTES

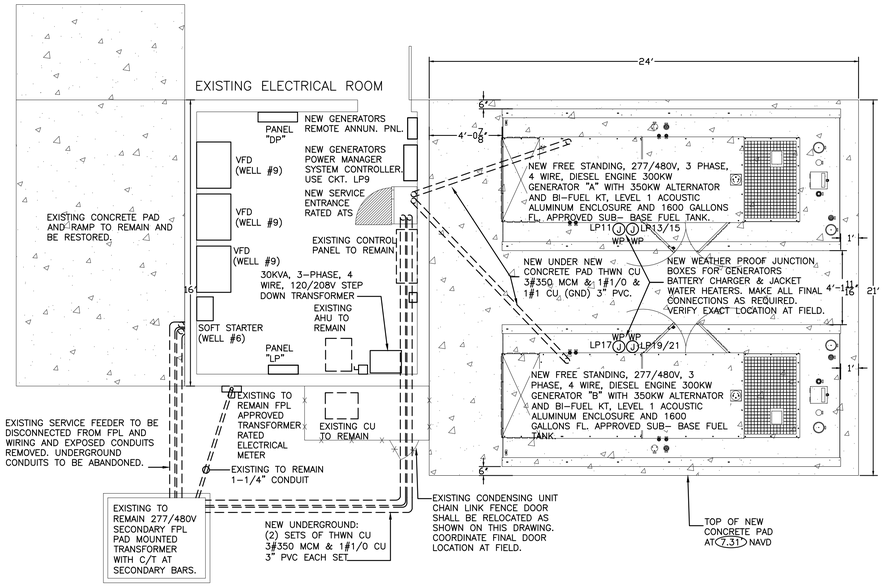
TWO GENERAC MD300 OR EQUAL DIESEL ENGINE DRIVEN GENERATOR W/ UPSIZED 350KW ALTERNATOR FOR OPERATION AT 375KW, 300 KVA, 0.8 PF, 277/480 VOLTS, 3 PHASE, 4 WIRE, 60 HERTZ, 1800 RPM, LIQUID COOLED UNIT MOUNTED RADIATOR, COMPLETE WITH ALL STANDARD EQUIPMENT, OVERSIZED GENERATORS, INCLUDING THE FOLLOWING:

* COMPLETE A/C INSTRUMENT CONTROL PANEL
* MICROPROCESSOR ENGINE CONTROL MODULE WITH COOL DOWN TIMER
* FOUR ENGINE SHUTDOWNS WITH SIGNAL LIGHTS AND ALARMS PER NFPA 110, LEVEL 1
* ENGINE DRIVEN BATTERY CHARGING ALTERNATOR
* JACKET WATER HEATER 3000 WATTS 240 VOLTS
* FLOAT TYPE BATTERY CHARGER, 10 AMP, 120V WALL MOUNTED WITH ALARM CONTACTS PER NFPA
* LEAD ACID TYPE STARTING BATTERIES
* BATTERY RACK AND CABLES
* FLEXIBLE FUEL LINES, 18 INCH MINIMUM
* CRITICAL GRADE SILENCER
* STAINLESS STEEL FLEXIBLE EXHAUST CONNECTOR
* STEEL SUB–BASE WITH BUILT–IN VIBRATOR ISOLATION MOUNTS
* FACTORY CERTIFIED TEST
* TEST/ACCEPTANCE RUN BY FACTORY TRAINED SERVICE TECHNICIAN
* MAIN CKT. BKR. THERMAL MAGNETIC, GENERAL ELECTRIC, 300 AMPS, 100% RATED, 3P, 277/480V, 65KAIC
* UL APPROVED 1600 GALLONS, DOUBLE WALL W/RUPTURE–BASIN, UL#142, SUB–BASE, FUEL TANK W/LEAK DETECTOR, FLA. DEP & DERM APPROVAL.
* LOW LEVEL ALARM
* FUEL LEVEL GAUGE
* REMOTE MOUNTED ANNUNCIATOR WITH SIXTEEN LIGHTS & AUDIBLE ALARM WITH SILENCE SWITCH
* GTI BI–FUEL KIT
* REMOTE EMERGENCY STOP BREAK–GLASS SWITCH
* LEVEL 1 ACOUSTIC ALUMINUM ENCLOSURE
* EXTENDED 5 YEARS WARRANTY.
* A LOAD BANK TEST SHALL BE PERFORMED ONCE THE EQUIPMENT IS COMPLETELY INSTALLED AND PRIOR TO TCO.

AUTOMATIC TRANSFER SWITCH ATS

PROVIDE ONE 600 AMPERE, STYLE 3, UL 1008 LISTED; POWER SERIES SERIES ENTRANCE RATED AUTOMATIC TRANSFER SWITCH BY GENERAC OR EQUAL FOR OPERATION AT 277/480V VOLTS, 3 POLE, THREE PHASE, FOUR WIRE, 60 HERTZ, 65,000 AIC. THE TRANSFER SWITCH SHALL BE MECHANICALLY HELD, POSITIVELY INTERLOCKED, NEMA 1 ENCLOSURE, 100% RATED MAIN CIRCUIT BREAKERS AND BE EQUIPPED WITH THE FOLLOWING:

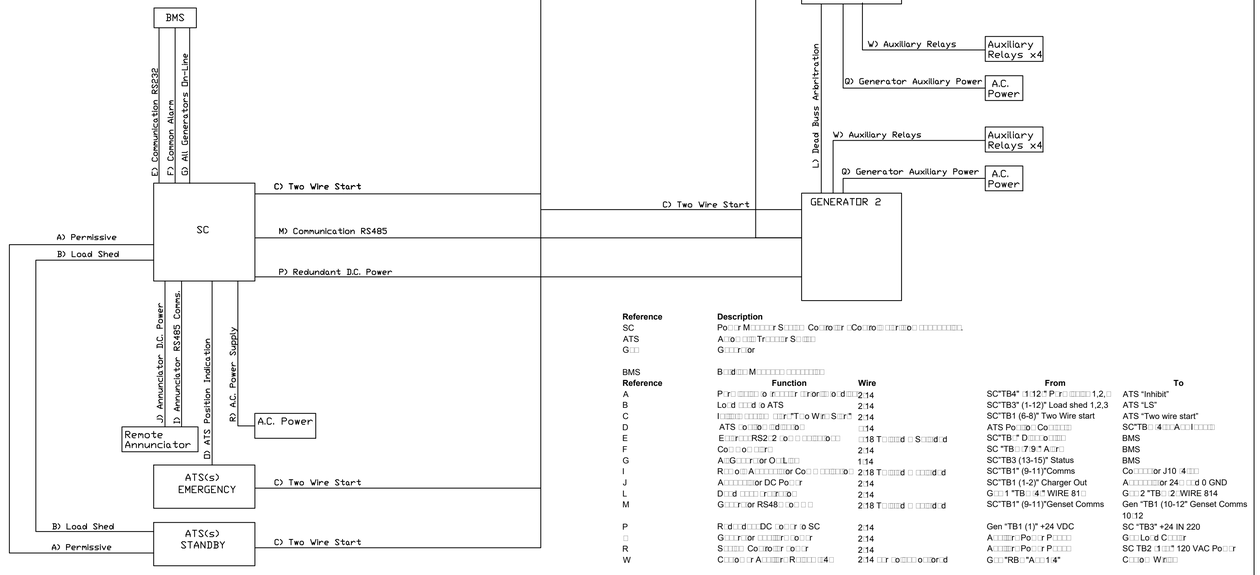
* CLOSE DIFFERENTIAL UNDERVOLTAGE SENSORS, ADJUSTABLE
* TIME DELAY ENGINE START, ADJUSTABLE
* TIME DELAY TRANSFER TO EMERGENCY, ADJUSTABLE
* TIME DELAY NEUTRAL, ADJUSTABLE
* TIME DELAY RETURN TO NORMAL, ADJUSTABLE
* TIME DELAY ENGINE COOLDOWN, ADJUSTABLE
* OPERATIONAL MODE SELECTOR SWITCH (OFF, LOAD TEST, ENGINE CRANK, AUTOMATIC)
* MOMENTARY LOAD TEST SWITCH
* INTERNAL SECONDARY SURGE SUPRESSION FOR UTILITY SOURCE
* EXERCISER CLOCK
* SURGE SUPPRESSOR PROTECTION (TVSS).
* REMOTE ANNUNCIATOR PANEL WITH CONTROLLER



PARTIAL ELECTRICAL SITE PLAN

SCALE: 1/4" = 1'–0"

GENERATORS NOTE:
THE GENERATOR SYSTEM SHALL BE COMPLIANT WITH NFPA 110 LEVEL 1 DESIGNATION. TO BE CONSIDERED EQUAL, ALL SPECIFICATIONS MUST BE MET AND THE MANUFACTURER MUST HAVE A MINIMUM OF 10 INSTALLATIONS IN SOUTH FLORIDA WITH THE NFPA 110 LEVEL 1 DESIGNATION WHICH HAVE BEEN IN OPERATION A MINIMUM OF FIVE (5) YEARS.



Reference	Description
SC	Po□r M□□□□r S□□□□ Co□ro□□r □Co□ro□□r□□o□ □□□□□□□□.
ATS	A□□o□□□□Tr□□□□r S□□□□
G□□	G□□□r□□or
BMS	B□□d□□M□□□□□ □□□□□□□□

Reference	Function	Wire	From	To
A	P□r□□□□□o r□□□□r □□ror□□o□d□□	2□14	SC"TB4" □1□12." P□r□□□□□1,2,□	ATS "Inhibit"
B	Lo□d □□□d □o ATS	2□14	SC"TB3" (1-12)" Load shed 1,2,3	ATS "LS"
C	I□□□□□□□□□ □□r."T□o Wr□S□r."	2□14	SC"TB1 (6-8)" Two Wire start	ATS "Two wire start"
D	ATS □o□□o□□d□□□o	□14	ATS Po□□p□Co□□□□	SC"TB□4□□A□□I□□□□
E	E□□r□□ RS2 2 □o□□ □□□□o□□	□18 T□□□d □□S□□d□d	SC"TB□" D□□□o□□□	BMS
F	Co□□o□□□r□	2□14	SC "TB□□7.9:" A□r□	BMS
G	A□G□□r□or O□L□□	1□14	SC"TB3 (13-15)" Status	BMS
I	R□□o□A□□□□□or Co□ □ □□□□o□	2□18 T□□□d □ □□d□d	SC"TB1" (9-11)"Comms	Co□□□□or J10 □4□□
J	A□□□□□or DC Po□r	2□14	SC"TB1 (1-2)" Charger Out	A□□□□□or 24□□d 0 GND
L	D□□d □□□□r□□□o□	2□14	G□□1 "TB□4:" WIRE 81□	G□□2 "TB□2□WIRE 814
M	G□□r□or RS48□□o□□	2□18 T□□□d □ □□d□d	SC"TB1" (9-11)"Genset Comms	Gen "TB1 (10-12" Genset Comms 10□12
P	R□d□d□□DC □o□r o SC	2□14	Gen "TB1 (1)" +24 VDC	SC "TB3" +24 IN 220
□	G□□r□or □□□□r□□o□r	2□14	A□□□r□Po□□r P□□□□	G□□Lo□d C□□□r
R	S□□□□ Co□ro□r□o□r	2□14	A□□□r□Po□□r P□□□□	SC TB2 □1□□"□120 VAC Po□□r
W	C□□o□□r A□□□r□R□□□□4□	2□14 □r□o□□□o□□or□d	G□□"RB□"A□□1/4"	C□□o□□ W□□□

CONTROL INTERCONNECT MODULAR POWER SYSTEMS STANDARD CONTROL WIRING CONFIGURATION

SCALE: N.T.S.

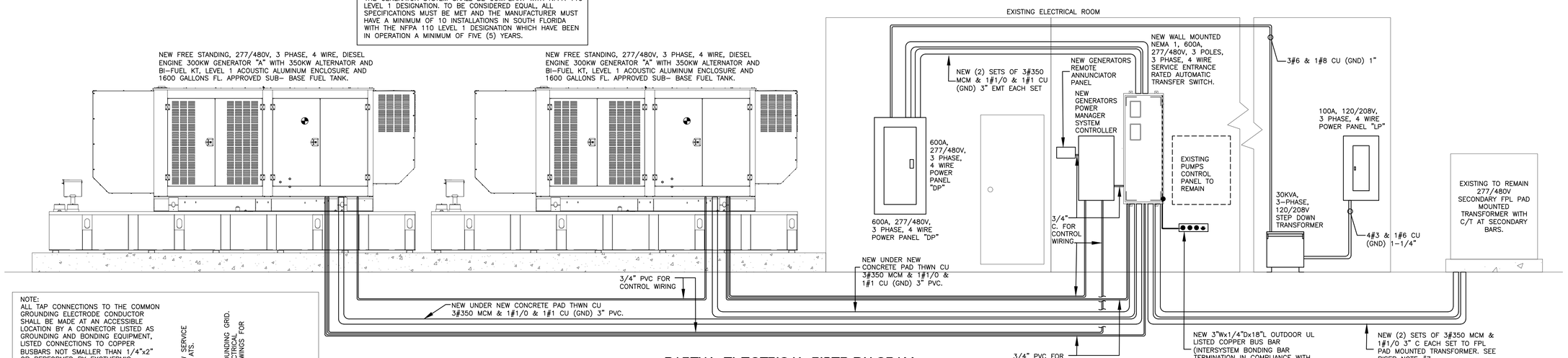
CITY OF PEMBROKE PINES WATER SYSTEM FACILITY
UPGRADE EMERGENCY BACKUP ELECTRICAL SERVICE EQUIPMENT
7190 JOHNSON STREET
PEMBROKE PINES, FL. 33024

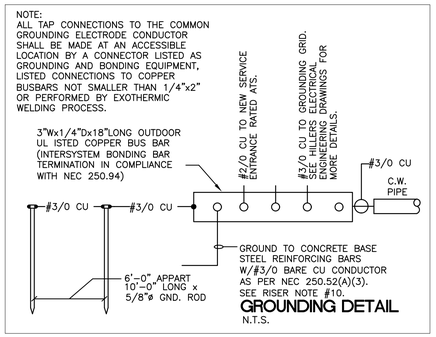
JOB NUMBER: 18027
ERNESTO R. TORRES
PE# 0049958 E.E.
EB0003862
FLORIDA ENGINEERING SERVICES
MECHANICAL AND ELECTRICAL ENGINEERS
34 N.W. 168TH STREET
NORTH MIAMI BEACH, FL. 33169
TELEPHONE: (305) 653–0212
FAX: (305) 653–0232
E–mail: Ernesto1@fesinc.biz

dr□□□□□: ERT

d□□: JULY 26, 2018

□□□□□o: ES-1





GENERATORS NOTE:
THE GENERATOR SYSTEM SHALL BE COMPLIANT WITH NFPA 110 LEVEL 1 DESIGNATION. TO BE CONSIDERED EQUAL, ALL SPECIFICATIONS MUST BE MET AND THE MANUFACTURER MUST HAVE A MINIMUM OF 10 INSTALLATIONS IN SOUTH FLORIDA WITH THE NFPA 110 LEVEL 1 DESIGNATION WHICH HAVE BEEN IN OPERATION A MINIMUM OF FIVE (5) YEARS.

PARTIAL ELECTRICAL RISER DIAGRAM
SCALE: 3/16" = 1'–0"

NOTE:
ALL TAP CONNECTIONS TO THE COMMON GROUNDING ELECTRODE CONDUCTOR SHALL BE MADE AT AN ACCESSIBLE LOCATION BY A CONNECTOR LISTED AS GROUNDING AND BONDING EQUIPMENT, LISTED CONNECTIONS TO COPPER BUSBARS NOT SMALLER THAN 1/4"x2" OR PERFORMED BY EXOTHERMIC WELDING PROCESS.

GROUNDING DETAIL
N.T.S.

MAIN DISTRIBUTION PANELBOARD. SEE HILLERS ELECTRICAL ENGINEERING INC. DRAWINGS FOR MORE DETAILS.

PANEL	AMPS	VOLTAGE	CIRCUITS	WIRE	PHASE	MAIN/AIC	MOUNTING	LOCATION	CATALOG NUMBER
LP	100	120/208	30	4	3	100A/10,000 AIC	SURFACE	BLDG. ELEC. RM.	PANELBOARD

FOR THIS PERMIT ONLY.

CKT. NO.	WIRE	COND INCH	CKT BKR POLE	CKT BKR AMPS	SERVING	WATTS	CKT. NO.	WIRE	COND INCH	CKT BKR POLE	CKT BKR AMPS	SERVING	WATTS
1	12	1/2	1	20	BLDG. INTERIOR RECEPT.	540	2	12	3/4	1	20	BUILDING INTERIOR LTS.	240
3	12	1/2	1	20	BLDG. EXTERIOR RECEPT.	360	4	12	3/4	1	20	BUILDING EXTERIOR LTS.	120
5	10	1	1	20	POLE RECEPT. WELLS 6/9	360	6	8	1	1	20	POLE LTS. (WELLS 6/9/10/11)	1150
7	12	1/2	1	20	NEW GENER. PWR. MGR. CONT.	360	8	12	3/4	1	20	LIGHTING CONTACTOR	120
9	12	1/2	1	20	BLDG. INTERIOR RECEPT.	540	10	12	3/4	1	20	EXISTING RTU PANEL	360
11	10	3/4	1	20	NEW GENERATOR A BATT. CHARG.	720	12	12	1	1	20	EXIST. WELL 6 FLOW MTR.	120
13	10	3/4	2	20	NEW GENERATOR A JACKET HTR.	3000	14	12	1	1	20	EXIST. WELL 6 FLOW MTR.	120
15							16	12	1	1	20	EXIST. WELL 6 FLOW MTR.	120
17	10	3/4	1	20	NEW GENERATOR A BATT. CHARG.	720	18	12	1	1	20	EXIST. WELL 6 FLOW MTR.	120
19	10	3/4	2	20	NEW GENERATOR A JACKET HTR.	3000	20	–	–	1	20	SPARE	–
21							22	–	–	1	20	SPARE	–
23	12	3/4	2	20	EXISTING AHU	400	24	–	–	1	20	SPARE	–
25							26	10	3/4	3	30	SURGE SUPPRESSOR DEVICE	120
27	10	3/4	2	30	EXISTING COND. UNIT	2500	28						
29							30						
					TOTAL	12500						TOTAL	2590

LINE CALCULATIONS	WATTS	TOTAL AMPS LINE	NEUTRAL CALCULATIONS	WATTS	TOTAL AMPS NEUTRAL
CONTINUOUS LOAD	1630		CONTINUOUS LOAD	1630	
+ 25 % OF CONTINUOUS LOAD	408		+ 25 % OF CONTINUOUS LOAD	408	
+ NON–CONTINUOUS LOAD	13460	43	+ NON–CONTINUOUS LOAD	4440	18
TOTAL	15498		TOTAL	6478	

FEEDER THHN CU: 4#3 & 1#6 (GND) 1–1/4" C

CONTROL INTERCONNECT MODULAR POWER SYSTEMS STANDARD CONTROL WIRING CONFIGURATION NOTES

Reference	Function
A "P[illegible]"	[illegible]
B "Load Shed"	[illegible]
C "Two Wire Start"	[illegible]
D "ATS Position"	[illegible]
E "RS232 Communication"	[illegible] Modbus RTU protocol. [illegible] RS485 or Ethernet. [illegible]
F "Common Alarm"	[illegible]
G "Generator On Line"	[illegible]
I "Annunciator Communication"	[illegible]
J "D.C. Power"	Feed 24 VDC to power the remote annunciator.
L "Dead Bus Arbitration"	[illegible]
M "RS485 Communication"	[illegible]
P "Redundant D.C. Power SC"	[illegible] 24 VDC [illegible]
"Generator Auxiliary Power"	[illegible] 240V [illegible]
R "SC A.C. Power"	[illegible] 120VAC [illegible] [illegible] 120V [illegible]
W "Generator Auxiliary Relays"	[illegible]

MAIN DISTRIBUTION PANELBOARD. SEE HILLERS ELECTRICAL ENGINEERING INC. DRAWINGS FOR MORE DETAILS.

PANEL	AMPS	PHASE	VOLTAGE	MAIN/AIC	MOUNTING	LOCATION	NEMA TYPE	CATALOG NUMBER
DP	600	3	277/480	600A/65KAIC 100% RATED MCB	SURFACE	ELECT. RM.	1	PANELBOARD

CIRCUIT NUMBER	BREAKER POLE	BREAKER AMPS RATING	SERVING	WIRE THWN CU	CONDUIT INCH	CONNECTED LOAD AMPS L1	L2	L3	NEUTRAL
1	3	30	SURGE SUPPRESSOR DEVICE	3#10 & 1#10 (GND)	3/4	1	1	1	0
2	3	60	30KVA TRANSF. (PANEL LP)	3#6 & 1#8 (GND)	1	36	36	36	0
3	3	175	100HP WELL PUMP #6	3#2/0 & 1#4 (GND)	3	124	124	124	0
4	3	175	100HP WELL PUMP #9	3#2/0 & 1#4 (GND)	3	124	124	124	0
5	3	175	100HP WELL PUMP #10	3#2/0 & 1#4 (GND)	3	124	124	124	0
6	3	175	100HP WELL PUMP #11	3#2/0 & 1#4 (GND)	3	124	124	124	0
7	3	175	SPARE	– –	–	–	–	–	–
8	3	30	SPARE	– –	–	–	–	–	–
			TOTAL CONNECTED LOAD			533	533	533	0

CU THWN FEEDER: (2) SETS OF 3#350 MCM & 1#1/0 & 1#1 CU (GND) 3" EACH SET TO NEW ATS

GENERAL ELECTRICAL NOTES

1. ALL WORK SHALL CONFORM WITH ALL LOCAL, STATE, FEDERAL ORDINANCES AND BUILDING CODES GOVERNING THE INSTALLATION OF THE ELECTRICAL SYSTEM TO INCLUDE BUT NOT LIMITED TO FBC 2017, NEC 2014, NFPA 72 2013, FFPC 6TH EDITION (NFPA 101 2015). IF WORK AS LAID OUT, INDICATED OR SPECIFIED IS CONTRARY TO OR CONFLICTS WITH LOCAL ORDINANCES, BUILDING CODES & REGULATIONS, THE CONTRACTOR SHALL REPORT IN WRITING TO THE ARCHITECT/ ENGINEER BEFORE SUBMITTING A BID. THE ARCHITECT/ENGINEER WILL THEN ISSUE INSTRUCTIONS AS HOW TO PROCEED.
2. THE DRAWING ARE TO BE CONSIDERED DIAGRAMMATIC, NOT NECESSARILY SHOWING IN DETAIL OR TO SCALE ALL OF THE MINOR ITEMS. UNLESS SPECIFIC DIMENSIONS ARE SHOWN, THE STRUCTURAL AND SITE CONDITIONS SHALL GOVERN THE EXACT LOCATIONS. CONTRACTOR SHALL FOLLOW DRAWINGS IN LAYING OUT WORK, CHECK DRAWINGS OF ALL TRADES TO VERIFY SPACES IN WHICH WORK WILL BE INSTALLED AND MAINTAIN SPACE CONDITIONS AT ALL POINTS. WHERE SPACE CONDITIONS APPERAR INADEQUATE, OWNER REP./ENGINEER SHALL BE NOTIFIED BEFORE PROCEEDING WITH INSTALLATION. THIS CONTRACTOR SHALL, WITHOUT EXTRA CHARGE, MAKE FIELD MODIFICATION IN LAYOUT AS NEEDED TO PREVENT CONFLICT WITH WORK OF VARIOUS TRADES OR FOR PROPER EXECUTION OF THE WORK.
3. EXAMINE ALL DRAWINGS CAREFULLY PRIOR TO SUBMITTING A BID. CONTRACTOR WILL BE REQUIRED TO FURNISH, INSTALL AND/OR CONNECT WITH APPROPRIATE SERVICES ALL ELECTRICAL ITEMS SHOWN ON THESE DRAWINGS WITHOUT ADDITIONAL EXPENSE TO THE OWNER. IF DISCREPANCIES, CONFLICTS, INTERFERENCES OR OMISSIONS OCCUR BETWEEN DRAWINGS, NOTIFY IN WRITING THE OWNER REP./ ENGINEER IN AMPLE TIME TO PERMIT REVISIONS BEFORE THE BIDS ARE SUBMITTED.
4. VERIFY SERVICE CHARACTERISTICS, LOCATION AND CONNECTION WITH ELECTRIC UTILITY COMPANY. PERFORM ALL WORK RELATED TO SERVICE IN STRICT ACCORDANCE WITH UTILITY Co. STANDARDS AND REQUIREMENTS.
5. INSTALL MATERIALS AND EQUIPMENT IN A NEAT AND FIRST CLASS WORKMANLIKE MANNER. THE OWNER RESERVES THE RIGHT TO DIRECT REMOVAL AND REPLACEMENT OF ITEM WHICH, IN HIS OPINION, DO NOT PRESENT A NEAT AND WORKMANLIKE APPEARANCE. REMOVAL AND REPLACEMENT IS TO BE DONE IMMEDIATELY WHEN DIRECTED BY THE OWNER IN WRITING, AT THE SOLE EXPENSE OF CONTRACTOR.
6. START OF WORK BY CONTRACTOR SHALL BE CONSIDERED AS ACCEPTANCE BY HIM OF ALL CLAIMS OR QUESTIONS AS TO SUITABILITY OF THE WORK OF OTHER TRADES OR OTHER CONTRACTORS TO RECEIVE HIS WORK. THIS CONTRACTOR SHALL REMOVE AND REPLACE, AT HIS EXPENSE, ALL ELECTRICAL WORK WHICH MAY HAVE TO BE REMOVED BECAUSE OF INTERFERENCE WITH OTHER TRADES.
7. THIS CONTRACTOR SHALL OBTAIN AND PAY ALL INSURANCE, FEES, PERMITS ASSOCIATION DUES, ROYALTIES, AND TAXES OF WHATEVER NATURE SHALL APPLY TO THIS WORK. HE SHALL ALSO PAY ALL INSPECTION FEES AS MAY BE REQUIRED BY LAW OR ORDINANCE AND SHALL KEEP THE OWNER HARMLESS FROM ANY DAMAGE AND EXPENSE ARISING FROM ANY VIOLATION OF THE LAWS, RULES OR ORDINANCES.
8. ALL WIRE SHALL BE COPPER TYPE THWN IN EMT RACEWAYS.
9. WIRE UP COMPLETE THE NEW SERVICE ENTRANCE RATED ATS AND GENERATOR AS DIRECTED BY EQUIPMENT MANUFACTURER. CONTROL WIRING SHALL BE SEPARATE RACEWAY FROM POWER WIRING.
10. PROVIDE RACEWAYS AND PREWIRE DATA OUTLETS COMPLETELY.
11. PROVIDE MEANS "FURNISH AND INSTALL".
12. COORDINATE WORK WITH WORK OF OTHER TRADES TO AVOID ALL CONFLICTS.
13. DO A COMPLETE JOB, EVERYTHING CONNECTED, READY FOR USE.
14. IDENTIFY CLEARLY ON A TYPE WRITTEN FORM ALL CIRCUITS AND EQUIPMENT TO CORRESPOND WITH THE PLANS AND PANELS SCHEDULE AND ATTACH INSIDE THE PERTAINING PANEL.
15. RACEWAYS: ALL RACEWAYS TO BE EMT.
20. SHOP DRAWINGS: THIS CONTRACTOR SHALL FURNISH THE ENGINEER WITH SHOP DRAWINGS OF EQUIPMENT PRIOR TO PURCHASE FOR APPROVAL.
21. TESTING: THE CONTRACTOR SHALL TEST ALL WORK AND EQUIPMENT AS DIRECTED BY THE ARCHITECT AND BY AUTHORITIES HAVING JURISDICTION, FURNISHING ALL EQUIPMENT AND NECESSARY PERSONNEL AND ELECTRIC POWER. THE ENTIRE INSTALLATION SHALL BE TESTED FOR SHORTS, GROUNDS AND OPEN CIRCUITS, AND ALL DEFECTS SHALL BE DEMONSTRATED TO BE IN PROPER WORKING AND OPERATING CONDITION TO THE COMPLETE SATISFACTION OF THE ENGINEER.
22. GUARANTEES: ALL EQUIPMENT AND MATERIALS SHALL BE GUARANTEED FOR ONE YEAR AFTER THE DATE OF ACCEPTANCE BY OWNER.
23. AT COMPLETION OF JOB THE ELECTRICAL CONTRACTOR SHALL GIVE THE OWNER AN AS–BUILT SET OF REPRODUCIBLE COPIES SHOWING THE EXACT ELECTRICAL INSTALLATION.
24. BEFORE BIDDING THE JOB THE ELECTRICAL CONTRACTOR SHALL VISIT THE SITE AND BECOME FAMILIAR WITH ALL EXISTING CONDITIONS.
25. CONTRACTOR SHALL PROVIDE TO THE BUILDING OWNER WITHIN 30 DAYS AFTER THE DATE OF ACCEPTANCE, RECORD DRAWINGS OF THE ACTUAL INSTALLATION INCLUDING A SINGLE–LINE DIAGRAM OF THE BUILDING ELECTRICAL DISTRIBUTION SYSTEM AND FLOOR PLANS INDICATING LOCATION AND AREA SERVED FOR ALL DISTRIBUTION IN FULL COMPLIANCE WITH FBC EC C405.6.4.1.
26. CONTRACTOR SHALL PROVIDE TO THE BUILDING OWNER AN OPERATING MANUAL AND MAINTENANCE MANUAL INCLUDING SUBMITTAL DATA STATING EQUIPMENT RATING AND SELECTED OPTIONS FOR EACH PIECE OF EQUIPMENT REQUIRING MAINTENANCE, OPERATION MANUALS AND MAINTENANCE MANUALS FOR EACH PIECE OF EQUIPMENT REQUIRING MAINTENANCE WITH CLEARLY IDENTIFIED REQUIRED ROUTINE MAINTENANCE ACTIONS AND NAMES AND ADDRESSES OF AT LEAST ONE QUALIFIED SERVICE AGENCY IN FULL COMPLIANCE WITH FBC EC C405.6.4.2.

RISER NOTES :

1. ALL WIRE SHALL BE COPPER THWN OR AS OTHERWISE NOTED ON THESE PLANS
2. NEW GROUND SYSTEM TO TWO 10'–0" LONG x 5/8" ø COPPER CLAD GROUND ROD 6'–0" APPART.
3. ALL EQUIPMENT INTERRUPTING CAPACITIES SHALL COMPLY WITH FPL PROVIDED FAULT CURRENT IN FULL COMPLIANCE WITH NEC 110.9. THE ELECTRICAL CONTRACTOR SHALL VERIFY AIC RATING OF THE EQUIPMENT WITH FAULT CURRENT INFORMATION PROVIDED BY THE POWER COMPANY BEFORE ORDER THE ELECTRICAL EQUIPMENT. ELECTRICAL CONTRACTOR SHALL PERMANENTLY MARK IN THE FIELD, WITH LEGIBLE LETTERS, THE MAXIMUM AVAILABLE FAULT CURRENT PROVIDED BY FPL AT THE NEW SERVICE ENTRANCE RATED AUTOMATIC TRANSFER SWITCH EQUIPMENT TO COMPLY WITH NEC 110.24.
4. PROVIDE PERMANENT PLAQUE AS PER NEC 230.2 FOR NEW SERVICE ENTRANCE RATED ATS LOCATION.
5. NEW SERVICE ENTRANCE RATED AUTOMATIC TRANSFER SWITCH SHALL BE INSTALLED ABOVE FLOOD CRITERIA.
6. DISTRIBUTION PANELBOARD DP, 30KVA TRANSFORMER, PANELBOARD LP, VFD's, SOFT STARTER AND LIGHTING CONTACTOR WITH ALL ASSOCIATED WIRING AND CONDUITS ARE PROVIDED UNDER CITY OF PEMBROKE PINES EASTERN WELLFIELD ELECTRICAL IMPROVEMENTS CONTRUCTION DOCUMENTS. CONTRACTOR SHALL COORDINATE THE GENERATOR UPGRADED WORK WITH THE SCOPE OF WORK DESCRIBED IN THESE DOCUMENTS.
7. ELECTRICAL CONTRACTOR SHALL COORDINATE WITH FPL, THE CITY OF PEMBROKE PINES REPRESENTATIVE & THE ELECTRICAL IMPROVEMENTS ENGINEER THE TEMPORARY TURNING OFF OF THE EXISTING TRANSFORMER DURING THE INSTALLATION OF THE NEW EMERGENCY GENERATOR BACKUP SYSTEM. PROVIDE BACKUP POWER THRU PORTABLE GENERATOR TO OPERATE PUMPS AS NEEDED DURING FPL SERVICE IS TURNING OFF USING AVAILABLE KIRK KEY SWITCH SYSTEM EMERGENCY SIDE.
8. EXISTING FPL SERVICE WIRES SHALL BE DISCONNECTED FROM FPL TRANSFORMER AND REMOVED. EXISTING UNDERGROUND CONDUITS COMING FROM FPL TRANSFORMER SHALL REMAIN AND BE ABANDONED. THE EXPOSED VERTICAL SECTION OF THESE SERVICE CONDUITS IN THE EXTERNAL WEST WALL AND THE CONDUITS INSIDE THE ELECTRICAL ROOM SHALL BE CUT AND REMOVED.
9. NEW GENERATORS CONCRETE PAD SHALL BE AT THE SAME ELEVATOR OF THE EXISTING ELECTRICAL ROOM (7.31' NAVD). NEW 12" CONCRETE PAD SHALL BE POURED AS PER NEW STRUCTURAL DESIGN. EXISTING BUILDING CONDENSING UNIT CHAIN LINK DOOR SHALL BE RELOCATED AS PROPOSED ON SHEET ES–1 TO AVOID CONFLICT WITH NEW SLAB.
10. ELECTRICAL CONTRACTOR SHALL COORDINATE WITH NEW CONCRETE PAD CONTRACTOR THE PROPER INSTALLATION OF ALL NEW UNDERGROUND ELECTRICAL AND LOW VOLTAGE CONDUITS AND GROUNDING CONNECTIONS AS SHOWN ON THESE DRAWINGS.
11. BEFORE ORDERING THE EMERGENCY GENERATOR & AUTOMATIC TRANSFER SWITCH, THE EQUIPMENT MANUFACTURER WILL REQUEST TO THE OWNER REPRESENTATIVE THE OPERATIONAL DATA OF ALL PUMPS VFD'S AND PERFORM NEW GENERATOR CALCULATIONS TO VERIFY PROPER SIZE OF GENERATOR AND ALTERNATOR CONSIDERING THE ELECTRONIC TRANSIENT EFFECT PRODUCED BY THE VFD'S.

revision:

CITY OF PEMBROKE PINES WATER SYSTEM FACILITY
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JOB NUMBER: 18027

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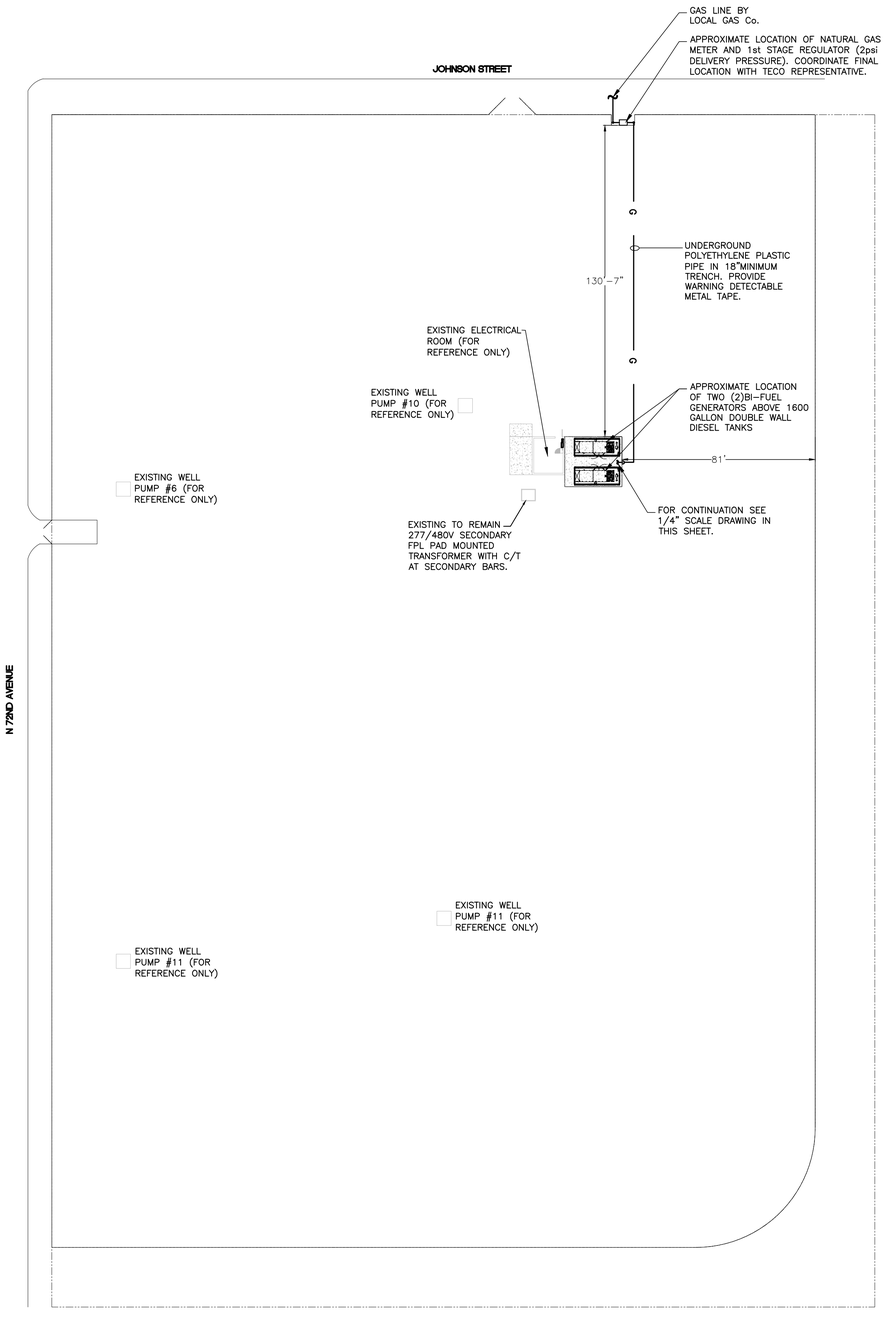
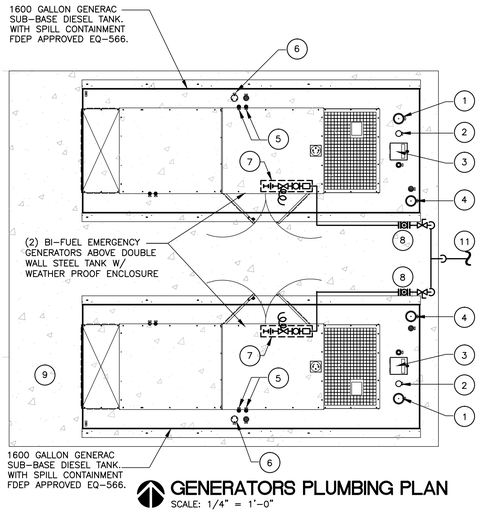
date: JULY 26, 2018

sheet no: ES-2

project:



SITE PLAN
SCALE: 1" = 30'-0"



GENERATORS PLUMBING PLAN
SCALE: 1/4" = 1'-0"

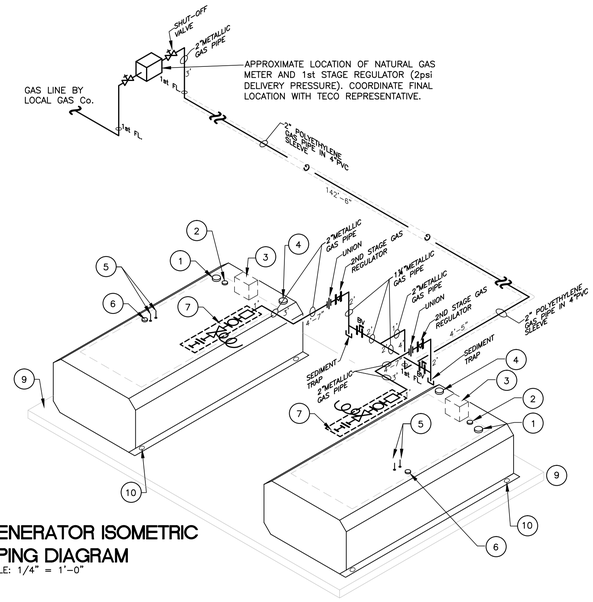
FUEL SYSTEM SPECIFICATIONS

TANK No.1 AND No.2
ABOVE GROUND, OUTDOOR DIESEL SUB-BASE FUEL TANK SERVING GENERATOR. TANK TO BE AS MANUFACTURED BY GENEREAC INDUSTRIAL POWER (FDEP FILE#EQ-566) OR APPROVED EQUAL EQUIPPED WITH ALL THE FOLLOWING:

- 1,600 GALLON CAPACITY.
- UL 142 FOR SECONDARY CONTAINMENT WITH BAFFLES
- MEETS NFPA 30, 37 AND 110
- RHINOCOATTM PAINT SYSTEM
- 5 PSI LEAK TEST FOR PRIMARY AND SECONDARY TANK
- 2" NORMAL (ATMOSPHERIC) SCREENED CAP VENT
- 3/8" PRIMARY AND SECONDARY DRAIN
- FUEL LEVEL SITE GAUGE / SWING ARM SENDER
- 2" METAL RAISED FILL PIPE IN LOCKABLE ENCLOSURE
- LEAK DETECTION ALARM SWITCH
- LOW/HIGH FUEL LEVEL ALARM SWITCHES
- STRUCTURALLY DESIGNED GENERATOR SUPPORT RAILS
- TILTED INNER TANK FOR EFFICIENT FUEL DRAW
- SLOPED TOP FOR WATER RUN OFF
- LARGE ELECTRICAL STUB-UP CAVITY W/ ACCESS PLATE
- 8 96 HOUR RUN TIMES AVAILABLE
- CRITICALLY HIGH/LOW FUEL RELAY
- UNDER TANK SUPPORTS/RISERS
- DIRECT SEALED FILL HOSE CONNECTOR
- 12' ABOVE GRADE VENT EXTENSIONS
- 120dB HIGH FUEL ALARM WITH SILENCE
- ULC LISTED OVERFILL PREVENTION VALVE
- NON COMBUSTIBLE, LOCKING 5 GALLON SPILL BOX
- FLORIDA D.E.R.M. PACKAGE
- DOUBLE WALL ELECTRONIC LEAK DETECTOR SHALL BE CONNECTED TO GENERATOR CONTROL PANEL AND ANNUNCIATE AT GENERATOR ANNUNCIATOR.

(X) DRAWING LEGEND

1. 6"Ø EMERGENCY VENT. (FOR MAIN TANK)
2. 2"Ø TANK VENT.
3. FILL/SPILL CONTAINMENT.
4. 6"Ø EMERGENCY VENT. (FOR SECOND CONTAINMENT TANK)
5. 3/8"Ø SUPPLY/RETURN LINES FROM TANK TO E. GENERATOR
6. FUEL LEVEL SENSOR
7. GAS SERVICE TO BI-FUEL SYSTEM GAS TRAIN. (2400cfh). INSIDE GENERATOR ENCLOSURE.
8. GAS REGULATOR (14iwc DELIVERY PRESSURE)
9. CONCRETE PAD
10. ALL PAD MOUNTED EQUIPMENT SHALL BE SECURELY FASTENED/BOLTED TO CONC. PAD.
11. FOR CONTINUATION SEE SITE PLAN IN THIS SHEET.



GENERATOR ISOMETRIC PIPING DIAGRAM
SCALE: 1/4" = 1'-0"

MAIN REGULATOR (1st STAGE)

-FUEL TYPE: NATURAL GAS (SG=0.6)
-DELIVERY PRESSURE = 2 PSI
-PIPE MATERIAL: SCH 40 GALVANIZED BLACK STEEL PIPE WITH THREADED FITTINGS ABOVE GROUND AND POLYETHYLENE PLASTIC PIPE UNDERGROUND.
-TOTAL PRESSURE DROP (pΔ)= 1 PSI PER FUEL GAS FBC 2017, TABLE 402.4(5) AND TABLE 402.4(22).
-DISTANCE TO MOST REMOTE OUTLET (PIPE LENGTH) = 160 FT
-TOTAL SYSTEM LOAD:
BI-FUEL SYSTEM LOAD= 8 CFH/KW * 300KW= 2400 CFH
TWO BI-FUEL SYSTEM FOR EACH GENERATOR= 4800 CFH

2nd. STAGE REGULATOR

-FUEL TYPE: NATURAL GAS (SG=0.6)
-DELIVERY PRESSURE = 14iwc
-PIPE MATERIAL: SCH 40 GALVANIZED BLACK STEEL PIPE WITH THREADED FITTINGS ABOVE GROUND.
-TOTAL PRESSURE DROP (pΔ)= 0.5 in. w.c PER FUEL GAS FBC 2017, TABLE 402.4(2).
-DISTANCE TO MOST REMOTE OUTLET (PIPE LENGTH) = 10 FT
-TOTAL SYSTEM LOAD:
BI-FUEL SYSTEM LOAD= 8 CFH/KW * 300KW = 2400 CFH
-MAX. PRESSURE AT GENERATOR CONNECTION
ALLOWED/REQUIRED = 14iwc

GENERAL PLUMBING NOTES

1. THE DRAWINGS ARE TO BE CONSIDERED DIAGRAMMATIC, NOT NECESSARILY SHOWING IN DETAIL OR TO SCALE ALL OF THE MINOR ITEMS. UNLESS SPECIFIC DIMENSIONS ARE SHOWN, THE STRUCTURAL, ARCHITECTURAL AND SITE CONDITIONS SHALL GOVERN THE EXACT LOCATIONS. CONTRACTOR SHALL FOLLOW DRAWINGS IN LAYING OUT WORK, CHECK DRAWINGS OF ALL TRADES TO VERIFY SPACES IN WHICH WORK WILL BE INSTALLED AND MAINTAIN MAXIMUM HEAD ROOM, AND SPACE CONDITIONS AT ALL POINTS. WHERE HEAD ROOM, OR SPACE CONDITIONS APPEAR INADEQUATE, ARCHITECT/ENGINEER SHALL BE NOTIFIED BEFORE PROCEEDING WITH INSTALLATION. THIS CONTRACTOR SHALL, WITHOUT EXTRA CHARGE, MAKE FIELD MODIFICATIONS IN LAYOUT AS NEEDED TO PREVENT CONFLICT WITH WORK OF VARIOUS TRADES OR FOR PROPER EXECUTION OF THE WORK.

2. EXAMINE ALL DRAWINGS CAREFULLY PRIOR TO SUBMITTING A BID. CONTRACTOR WILL BE REQUIRED TO FURNISH, INSTALL AND/OR CONNECT WITH APPROPRIATE SERVICES ALL PLUMBING ITEMS SHOWN ON ANY OF THE ARCHITECTURAL, AIR CONDITIONING, ELECTRICAL AND SPRINKLER DRAWINGS WITHOUT ADDITIONAL EXPENSE TO THE OWNER. IF DISCREPANCIES, CONFLICTS, INTERFERENCES OR OMISSIONS OCCUR BETWEEN DRAWINGS, NOTIFY IN WRITING THE ARCHITECT/ENGINEER IN AMPLE TIME TO PERMIT REVISIONS BEFORE THE BIDS ARE SUBMITTED.

3. INSTALL MATERIALS AND EQUIPMENT IN A NEAT AND FIRST CLASS WORKMANLIKE MANNER. THE OWNER RESERVES THE RIGHT TO DIRECT REMOVAL AND REPLACEMENT OF ITEMS OF WHICH, IN HIS OPINION, DO NOT PRESENT A NEAT AND WORKMANLIKE APPEARANCE. REMOVAL AND REPLACEMENT IS TO BE DONE IMMEDIATELY WHEN DIRECTED BY THE OWNER IN WRITING, AT THE SOLE EXPENSE OF THE CONTRACTOR.

4. START OF WORK BY CONTRACTOR SHALL BE CONSIDERED AS ACCEPTANCE BY HIM OF ALL CLAIMS OR QUESTIONS AS TO SUITABILITY OF THE WORK OF OTHER TRADES OR OTHER CONTRACTORS TO RECEIVE HIS WORK. THIS CONTRACTOR SHALL REMOVE AND REPLACE, AT HIS EXPENSE, ALL PLUMBING WORK WHICH MAY HAVE TO BE REMOVED BECAUSE OF INTERFERENCES WITH OTHER TRADES.

5. THIS CONTRACTOR SHALL OBTAIN AND PAY ALL INSURANCE, FEES, PERMITS ASSOCIATION DUES, ROYALTIES, AND TAXES OF WHATEVER NATURE SHALL APPLY TO THIS WORK. HE SHALL ALSO PAY ALL INSPECTION FEES AS MAY BE REQUIRED BY LAW OR ORDINANCE AND SHALL KEEP THE OWNER HARMLESS FROM ANY DAMAGE AND EXPENSE ARISING FROM ANY VIOLATION OF THE LAWS, RULES OR ORDINANCES.

6. PROVIDE MEANS "FURNISHED AND INSTALL".

7. DO A COMPLETE JOB, EVERYTHING CONNECTED, READY FOR USE.

8. AT COMPLETION OF JOB THE PLUMBING CONTRACTOR SHALL GIVE THE OWNER AN AS-BUILT SET OF REPRODUCIBLE SEPIAS SHOWING THE EXACT INSTALLATION.

9. PLUMBING CONTRACTOR SHALL PRESSURE TEST ALL PIPING AS REQUIRED BY CODE. TEST SHALL BE WITNESSED AND APPROVED BY PROPER AUTHORITIES.

10. THE PLUMBING CONTRACTOR SHALL WARRANT ALL WORKMANSHIP AND MATERIALS FOR ONE YEAR FROM THE DATE OF SUBSTANTIAL COMPLETION. ANY BREAKDOWN OCCURRING IN FIRST YEAR SHALL BE REPAIRED AT NO EXPENSE TO THE OWNER.

ADDITIONAL COMPLIANCE NOTES

1. THESE ENGINEERING DOCUMENTS AND THE RESULTING INSTALLATION OF THE DEPICTED PLUMBING SYSTEMS FOR THIS PROJECT ARE INTENDED TO CONFORM TO THE FOLLOWING CODES AND STANDARDS:

- FLORIDA BUILDING CODE PLUMBING 6TH EDITION 2017
- FLORIDA BUILDING CODE FUEL GAS 6TH EDITION 2017
- FLORIDA BUILDING CODE 5TH EDITION 2014
- FLORIDA BUILDING CODE RESIDENTIAL 5TH EDITION 2014
- FLORIDA BUILDING CODE PLUMBING 5TH EDITION 2014 AND ALL REFERENCED STANDARDS LISTED IN CHAPTER 14 AS APPLICABLE TO PIPING, FITTINGS, JOINING METHODS/MATERIALS, PLUMBING FIXTURES, AND EQUIPMENT.
- FLORIDA ENERGY CONSERVATION CODE 5TH EDITION 2014
- FLORIDA FIRE PREVENTION CODE 5TH EDITION 2014
- AMERICAN SOCIETY OF PLUMBING ENGINEERS DESIGN HANDBOOKS
- AMERICANS WITH DISABILITIES ACT 2010.
- FAIR HOUSING ACT.

2. IF WORK AS LAID OUT, INDICATED OR SPECIFIED IS CONTRARY TO OR CONFLICTS WITH LOCAL ORDINANCES, BUILDING CODES AND REGULATIONS, THE CONTRACTOR SHALL REPORT IN WRITING TO THE ARCHITECT/ENGINEER BEFORE SUBMITTING A BID. THE ARCHITECT/ENGINEER WILL THEN ISSUE INSTRUCTIONS AS HOW TO PROCEED.

3. ALL EQUIPMENT IS TO BE INSTALLED PER THE MANUFACTURER'S INSTRUCTIONS, SPECIFICATIONS, AND RECOMMENDATIONS FOR SAFE AND EFFICIENT OPERATIONS. ALL MANUFACTURER OPERATION AND MAINTENANCE GUIDES SHALL BE ISSUED TO THE BUILDING OPERATOR AFTER SUCCESSFUL COMPLETION OF MAINTENANCE AND/OR PREVENTATIVE MAINTENANCE PROCEDURES TRAINING OF THE BUILDING OPERATORS.

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UPGRADE EMERGENCY BACKUP ELECTRICAL SERVICE EQUIPMENT
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JOB NUMBER: 18027

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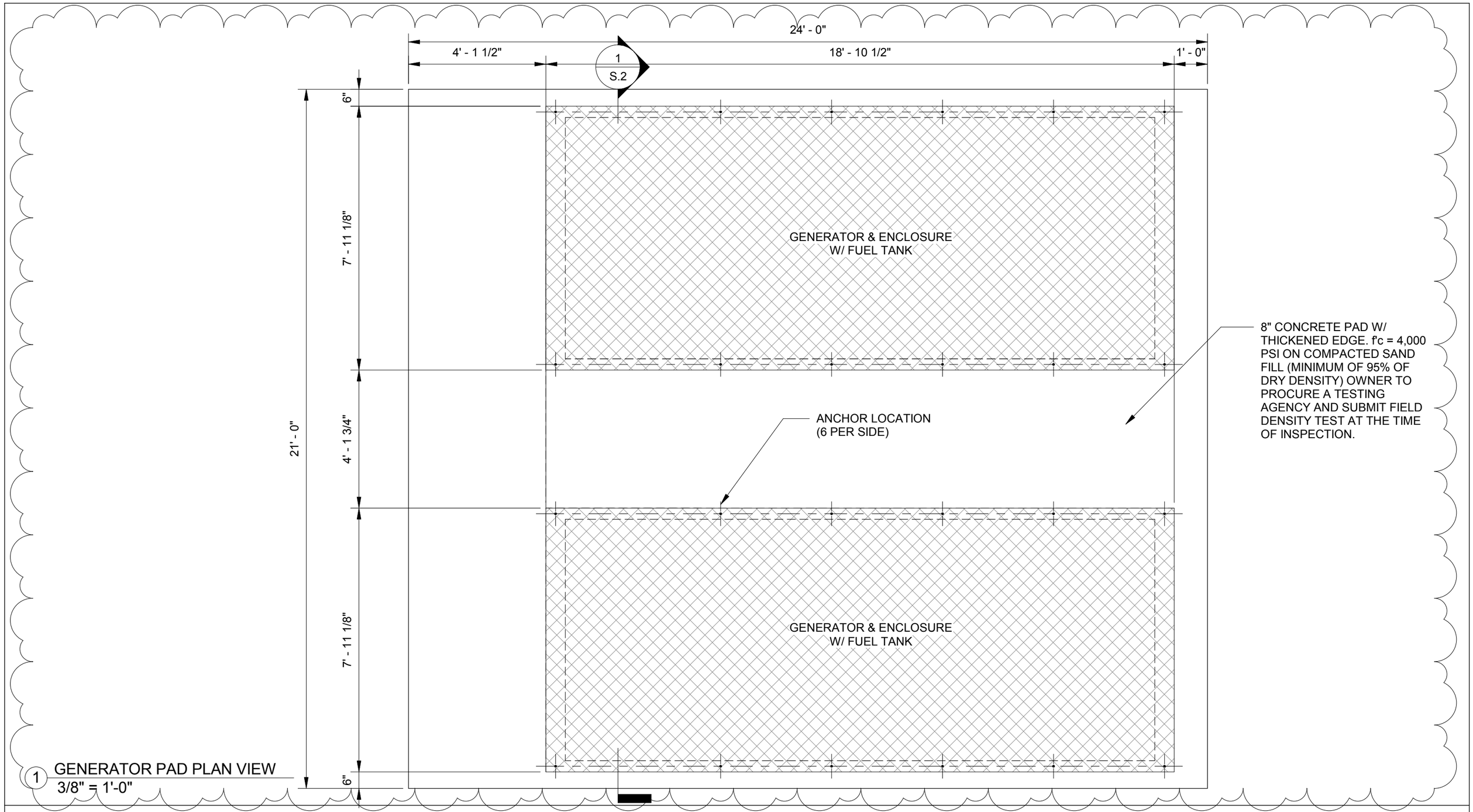

1 GENERATOR PAD PLAN VIEW
3/8" = 1'-0"

GMG
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MIAMI LAKES, FLORIDA 33016
PH: 786-646-2344
PE #74028 CA #30882
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EMERGENCY BACKUP ELECTRICAL SERVICE EQUIPMENT

7190 JOHNSON STREET
PEMBROKE PINES, FL 33024

No.	Description	Date
1	Revision 1	08/22/2018

GENERATOR PLAN

Project number	18034	S.1
Date	07/26/2018	
Drawn by	JG	
Checked by	JG	Scale 3/8" = 1'-0"

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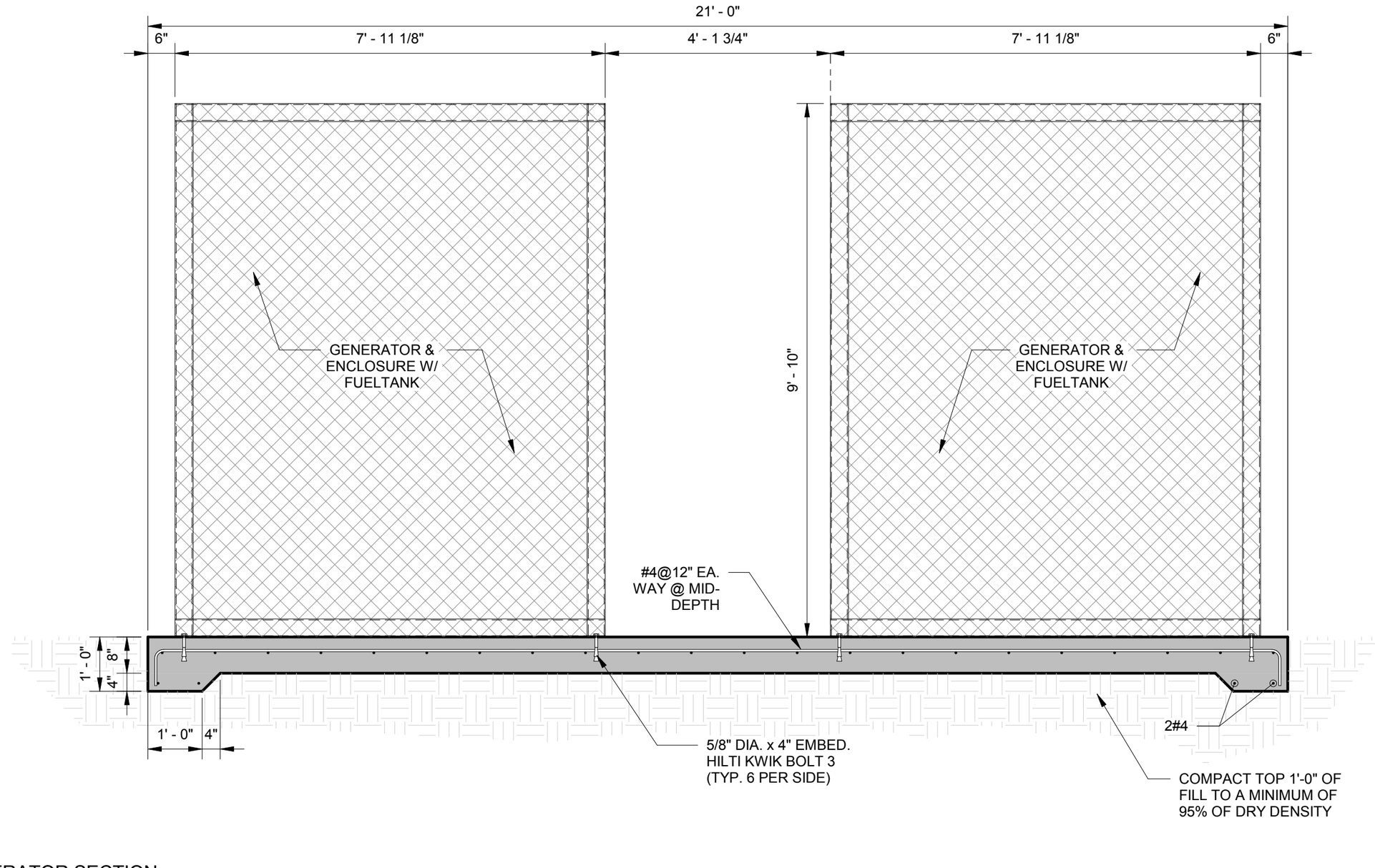

1 GENERATOR SECTION
1/2" = 1'-0"

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No.	Description	Date
1	Revision 1	08/22/2018

GENERATOR SECTION

Project number	18034
Date	07/26/2018
Drawn by	Author
Checked by	Checker

S.2

Scale 1/2" = 1'-0"

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SECTION 13300

PROCESS CONTROL AND INSTRUMENTATION SYSTEM

PART 1 -- GENERAL

1.01 SUMMARY

A. The Contractor shall furnish, install and place into service operating process instrumentation, control systems and panels including accessories, related to this facility, all as shown on plans and specified herein.

B. Work Includes: Engineering, furnishing, installing, calibrating, adjusting, testing, documenting, starting up, and OWNER training for a complete Instrumentation and Control System.

Major works are:

1. Modifications of the existing RTU at Eastern Wellfield.

2. Programming of the existing RTU for new I/O points as shown on the drawing.

3. Programming of the plant SCADA system.

C. Instrument and Control (I&C) Supplier work scope:

1. For I&C equipment and ancillaries provide the following:

a. Completing detail design.
b. Required Submittals.
c. Equipment and ancillaries.
d. Instructions, details, and recommendations to, and coordination with, Contractor for proper installation.
e. Technical assistance in the demolition of equipment tied into instrumentation and control (I&C).
f. Verify readiness for operation.
g. Verify the correctness of final power and signal connections.
h. Adjusting and calibrating.
i. Starting up.
j. Testing and coordination of testing.
k. Training.

2. Verify following work not by I&C Supplier is provided:

a. Correct type, size, and number of signal wires with their raceways.
b. Correct electrical power circuits and raceways.
c. Correct size, type, and number of I&C related pipes, valves, fittings, and tubes.
d. Correct size, type, materials, and connection of process mechanical

piping for in-line primary elements.

3. For equipment not provided under I&C Supplier, but directly connected to equipment required by I&C Supplier:

   a. Obtain from Contractor, manufacturer's information on installation, interface, function, and adjustment.
   b. Coordinate with Contractor to allow required interface and operation with I&C System.
   c. For operation and control, verify that installations, interfacing signal terminations, and adjustments have been completed with manufacturer's recommendations.
   d. Test to demonstrate required interface and operation with I&C System.
   e. Examples of items in this category, but not limited to the following:
      1) Valve operators, position switches, and controls.
      2) Chemical feed pump and feeder speed/stroke controls.
      3) Automatic samplers.
      4) Motor control centers.
      5) Variable Frequency drive systems.
   f. Examples of items not in this category:
      1) Internal portions of equipment provided under Division 16, Electrical, that are not directly connected to equipment under I&C System.
      2) Internal portions of I&C Systems provided as part of package systems and that are not directly connected to equipment provided under I&C System.

4. Wiring external to equipment provided by I&C Supplier:
   a. Special control and communications cable: Provided by I&C Supplier. Modbus cable shall be provided by I&C supplier.

D. Software Engineering work scope:

1. Programming of the Eastern Wellfield RTU's PLC.

2. Plant HMI/SCADA programming for the Eastern Wellfield.

1.02 SINGLE INSTRUMENT SUPPLIER

A. The Contractor shall assign to the Single Instrument and Control (I&C) supplier full responsibility for the functional operation of all new instrumentation systems. The Contractor shall have said supplier perform all engineering necessary in order to select, to furnish, to program, to supervise installation, connection, to calibrate, to place into operation of all sensors, instruments, alarm equipment, control panels, accessories, and all other equipment as specified herein.

B. The single instrument and controls supplier shall demonstrate his ability to successfully complete projects of similar sizes and nature. Provide references (including phone number and contact name) for at least three projects successfully completed in which

the following tasks were performed: system engineering, documentation including panel assembly, schematics and wiring diagram, loop sheets, field testing, calibration and start-up, operator instruction and maintenance training.

C. The foregoing shall enable the Contractor and the Owner to be assured that the full responsibility for the requirements of this Section shall reside in an organization which is qualified and experienced in the water management field and its process technology on a functional systems basis.

D. The single I&C supplier shall have a UL approved shop and shall build all panels according to UL 508A.

E. The single I&C supplier shall be C.C. Control Corp.

1.03 INSTALLATION WORK

A. Nothing in this part of the Specifications shall be construed as requiring the Contractor to utilize personnel supplied by their assigned instrument manufacturer's organization, or any division thereof, to accomplish the physical installation of any elements, instruments, accessories or assemblies specified herein. However, the Contractor shall employ installers who are skilled and experienced in the installation and connection of all elements, instruments, accessories and assemblies; portions of their work shall be supervised or checked as specified in Part 3, herein.

1.04 PREPARATION OF SUBMITTAL OF DRAWINGS AND DATA

A. It is incumbent upon the Contractor to coordinate the work specified in these Sections so that a complete I&C system for the facility shall be provided and shall be supported by accurate Shop and record Drawings. As a part of the responsibility as assigned by the Contractor, the Single I&C supplier shall prepare and submit through the Contractor, complete organized Shop Drawings, as specified in Part 2.02, herein. Interface between instruments, motor starters, etc. shall be included in his Shop Drawing submittal.

B. During the period of preparation of this submittal, the Contractor shall authorize direct, informal liaison between his Single I&C supplier and the Engineer for exchange of technical information. As a result of this liaison, certain minor refinements and revisions in the systems as specified may be authorized informally by the Engineer, but these shall not alter the scope of work or cause increase or decrease in the Contract Price. During this informal exchange, no oral statement by the Engineer shall be construed to give formal approval of any component or method, nor shall any statement be construed to grant formal exception to, or variation from these Specifications.

1.05 ADDITIONAL TECHNICAL SERVICES

A. At no separate additional cost to the Owner, the Contractor shall provide the following services of qualified technical representatives of the Single I&C supplier (See Part 3, herein).

1. To supervise installation and connection of all instruments, elements, and components of every system, including connection of instrument signals to

primary measurement elements and to final control elements such as pumps, valves, and chemical feeders;

2. To make all necessary adjustments, calibrations and tests; and

3. To instruct plant operating and maintenance personnel on instrumentation. This time shall be in addition to whatever time is required for other facets of work at the site, and shall be during the Owner's normal working days and hours.

1.06 GUARANTEE

A. The Contractor shall guarantee all equipment and installation, as specified herein, for a period of one (1) year following the date of completion of the work. To fulfill this obligation, the Contractor shall utilize technical service personnel designated by the Single I&C supplier to which the Contractor originally assigned project responsibility for instrumentation. Services shall be performed within two (2) calendar days after notification by the Owner.

1.07 ADDITIONAL PROVISIONS

A. The applicable provisions of the following Sections under Electrical Work shall apply to work and equipment specified herein, the same as if stated in full, herein:
1. Codes and Standards
2. Equipment, Materials and Workmanship
3. Testing
4. Grounding
5. Equipment Anchoring
6. Conductor and Equipment Identification
7. Terminal Cabinets and Control Compartments
8. Process Control Devices

1.08 NEWEST MODEL COMPONENTS

A. All meters, instruments, and other components shall be the most recent field proven models marketed by their manufacturers at the time of submittal of Shop Drawings unless otherwise specified to match existing equipment. All technical data publications included with submittals shall be the most recent issue.

1.09 INSPECTION OF THE SITE CONDITIONS

A. The instrumentation drawings were developed from past record drawings and information supplied by the OWNER.

1.10 RELATED WORK

A. Division 16 - Electrical

1.11 SCADA TAG NAMING

A. The tag name shall be similar to the existing naming system. Coordinate with the Owner

at the time of construction.

PART 2 -- PRODUCTS

2.01 INSTRUMENTATION CRITERIA

A. DESIGNATION OF COMPONENTS:

In these Specifications and on the Drawings, all systems, meters, instruments, and other elements are represented schematically, and are designated by numbers, as derived from criteria in Instrument Society of American Standard ANSI/ISA S5.1-1973. The nomenclature and numbers designated herein and on the Drawings shall be employed exclusively throughout Shop Drawings, data sheets, and similar materials. Any other symbols, designations, and nomenclature unique to the manufacturer's standard methods shall not replace these prescribed above, used, herein and on the Drawings.

B. SIGNAL CHARACTERISTICS:

Signals shall be electrical, as indicated herein, and shall vary in direct linear proportion to the measured variable, except as noted. Electrical signals outside control panel(s) shall be 4 to 20 milliamperes DC, except as noted. Signals within enclosures may be 1-5 volts DC.

C. MATCHING STYLE, APPEARANCE AND TYPE:

All instruments to be panel mounted at the control panels shall have matching style and general appearance. Instruments performing similar functions shall be of the same type, model, or class, and shall be of one (1) manufacturer.

D. ACCURACY AND REPEATABILITY:

The overall accuracy of each instrumentation system or loop shall be as prescribed in the Specifications for that system or loop. Each system's accuracy shall be determined as a probable maximum error; this shall be the square-root of the sum of the squares of certified "accuracy s" of certain designated components in each system, expressed as a percentage of the actual span or value of the measured variable. Each individual electronic instrument shall have a minimum accuracy of $\pm$0.7 percent of full scale and a minimum repeatability of $\pm$0.4 percent of full scale unless otherwise specified. Instruments which do not conform to or improve upon these criteria are not acceptable.

E. SIGNAL ISOLATORS, CONVERTERS AND POWER SUPPLIES:

Signal isolators shall be furnished and installed in each measurement and control loop, wherever required, to insure adjacent component impedance match or where feedback paths may be generated. Signal converters shall be included where required to resolve any signal level incompatibilities. Power supplies shall be furnished and installed, as required, by the manufacturer's instrument load characteristics, to insure sufficient power to each loop component. If required, the I&C subcontractor shall furnish and install a 120 VAC feed circuit from pump control panel to power supply through a 5-amp slow-blow fuse, using materials of construction as specified under Section 16050.

F. ALTERNATIVE EQUIPMENT OR METHODS:

Equipment or methods requiring redesign of any project details are not acceptable without prior approval of the Engineer. Any changes inherent to a proposal alternative shall be at no additional cost to the Owner. The required approval shall be obtained in writing by the I&C Subcontractor through the Contractor prior to submittal of Shop Drawings and data. Any proposal for approval of alternative equipment or methods shall include evidence of improved performance, operational advantage and maintenance enhancement over the equipment or method specified, or shall include evidence that a specified component is not available. Otherwise, alternative equipment (other than direct, equivalent substitutions) and alternative methods shall not be proposed.

2.02 DETAILED SYSTEMS DRAWINGS AND DATA

A. CONTENT:

The Contractor shall submit detailed Shop Drawings and data prepared and organized by the Single I&C supplier designated at the time of bidding. The quantity of submittal sets required shall be six (6). These Drawings and data shall be submitted as a complete bound package at one time within 80 calendar days after date of Notice to Proceed and shall include:

1. Drawings showing definite diagrams for every instrumentation loop system. These diagrams shall show and identify each component of each loop or system using legend and symbols from ISA Standard S5.4, each having the format of ISA Standard S5.1 as used on the Project Drawing. (Each system or loop diagram shall be drawn on a separate Drawing sheet.)

2. Data sheets for each component, together with a technical product brochure or bulletin. The data sheets shall show:

    a. Component function description used herein and on the Drawings;
    b. Manufacturer's model number or other product designation;
    c. Project tag number used herein and on the Drawings;
    d. Project system loop of which the component is a part;
    e. Project location or assembly at which the component is to be installed;
    f. Input and output characteristics;
    g. Scale range and units (if any) and multiplier (if any);
    h. Requirements for electric supply (if any);
    i. Requirements for air supply (if any);
    j. Materials of component parts to be in contact with, or otherwise exposed to, process media;
    k. Calibration curves as required.
    l. Special requirements or features.

    A complete index shall appear in the front of each bound submittal volume. A separate technical brochure or bulletin shall be included with each instrument data sheet. The data sheets shall be indexed in the submittal by systems or loops, as a separate group for each system or loop. If, within a single system or

loop, a single instrument is employed more than once, one data sheet with one brochure or bulletin may cover all identical uses of that instrument in that system. Each brochure or bulletin shall include a list of tag numbers for which it applies. System groups shall be separated by labeled tags.

3. Drawings showing both schematic and wiring diagrams for control circuits. Complete details on the circuit interrelationship of all devices within and outside each control panel shall be submitted first, using schematic control diagrams. Subsequent to return of this first submittal by the Engineer, piping and wiring diagrams shall be prepared and submitted for review by the Engineer; the diagrams shall consist of component layout Drawings to scale, showing numbered terminals on components together with the unique number of the wire to be connected to each terminal. Piping and wiring diagrams shall show terminal assignments from all primary measurement devices, such as flow meters, and to all final control devices, such as samplers, pumps, valves, and chemical feeders. The Contractor shall furnish all necessary equipment supplier's Shop Drawings to facilitate inclusion of this information by the I&C system supplier.

   Schematic and wiring diagram criteria shall be followed as established in NEMA Standards Publication ANSI/NEMA 1CS-1-1978, "Industrial Control and Systems."

4. Assembly and construction Drawings for each control panel and for other special enclosed assemblies for field installation. These Drawings shall include dimensions, identification of all components, surface preparation and finish data, nameplates, and the like. These Drawings also shall include enough other details, including prototype photographs, to define exactly the style and overall appearance of the assembly; a finish treatment sample shall be included.

5. Installation, mounting and anchoring details for all components and assemblies to be field-mounted, including conduit connection or entry details.

6. Complete and detailed bills of materials. A master Bill of Materials listing all field mounted devices, control panels and other equipment that shall be shipped to the job site. A Bill of Materials for each control panel listing all devices within the panel.

B. ORGANIZATION AND BINDING:

The organization of initial Shop Drawing submittal required above shall be compatible to eventual inclusion with the Technical Manuals submittal and shall include final alterations reflecting "as built" conditions. Accordingly, the initial multiple copy Shop Drawing submittal shall be separately bound in 3-ring binders of the type specified under Part 2.03, herein, for the Technical Manuals.

2.03 TECHNICAL MANUALS

A. Five (5) final sets of technical manuals shall be supplied for the Owner, and one (1) final set shall be supplied for the Engineer, as a condition of acceptance of the project. Each set shall consist of one (1) or more volumes, each of which shall be bound in a standard size, three-ring, loose-leaf, vinyl plastic hard cover binder suitable for bookshelf storage. Binder ring size shall not exceed 3.0 inches.

B. Initially, two (2) sets of these manuals shall be submitted to the Engineer for favorable review after return of favorably reviewed Shop Drawings and data required under Part 3, herein. Following the Engineer's review, one (1) set shall be returned to the Contractor with comments. The sets shall be revised and/or amended as required and the requisite final sets shall be submitted to the Engineer fifteen (15) days prior to start-up of systems. The Engineer shall distribute the copies.

C. In addition to updated Shop Drawing information to reflect actual existing conditions, each set of technical manuals shall include installation, connection, operating, trouble-shooting, maintenance, and overhaul instructions in complete detail. This shall provide the Owner with comprehensive information on all systems and components to enable operation, service, maintenance, and repair. Exploded or other detailed views of all instruments, assemblies, and accessory components shall be included together with complete parts lists and ordering instructions.

2.04 CONTROL PANEL SIGNAL AND CONTROL CIRCUIT WIRING:

1. WIRE TYPE AND SIZES

Conductors shall be flexible stranded copper wire; these shall be U.L. listed Type THHN and shall be rated 600 volts. Wire for control signal circuits and alarm input circuits shall be 16 AWG. All instrumentation cables shall be shielded No. 20 AWG with a copper drain wire. All special instrumentation cable such as between sensor and transmitter shall be supplied by the I&C supplier.

2. WIRE INSULATION COLORS

Conductors supplying 120 volt AC power on the line side of a disconnecting switch shall have a black insulation for the ungrounded conductor. Grounded circuit conductors shall have white insulation. Insulation for ungrounded 120 volt AC control circuit conductors shall be red. All wires energized by a voltage source external to the control board(s) shall have yellow insulation. Insulation for all DC conductors shall be blue.

3. WIRING INSTALLATION

All wires shall be run in plastic wireways except (1) field wiring, (2) wiring run between mating blocks in adjacent sections, (3) wiring run from components on a swing-out panel to components on a part of the fixed structure, and (4) wiring run to panel mounted components. Wiring run from components on a swing-out panels to other components on a fixed panel shall be made up in tied bundles. These shall be tied with nylon wire ties, and shall be secured to panels at both

sides of the "hinge loop" so that conductors are not strained at terminals.

Wiring run to control devices on the front panels shall be tied together at short intervals with nylon wire ties and secured to the inside face of the panel using adhesive mounts.

Wiring to rear terminals on panel mount instruments shall be run in plastic wireways secured to horizontal brackets run above or below the instruments in about the same plane as the rear of the instruments.

Shields of shielded instrument cable shall only be grounded on one side of each cable run. The side to be grounded shall always be in the field as applicable.

Care shall be exercised to properly insulate the ungrounded side, to prevent ground loops from occurring.

Conformance to the above wiring installation requirements shall be reflected by details shown on the Shop Drawings for the Engineer's review.

4. WIRE MARKING

Each signal, control, alarm, and indicating circuit conductor connected to a given electrical point shall be designated by a single unique number which shall be shown on all Shop Drawings. These numbers shall be marked on all conductors at every terminal using permanently marked heat-shrink plastic. Instrument signal circuit conductors shall be tagged with unique multiple digit numbers. Black and white wires from the circuit breaker panelboard shall be tagged including the one (1) or two (2) digit number of the branch circuit breaker.

5. TERMINAL BLOCKS

Terminal blocks shall be molded plastic with barriers and box lug terminals, and shall be rated 15 amperes at 600 volts. White marking strips, fastened securely to the molded sections, shall be provided and wire numbers or circuit identifications shall be marked thereon with permanent marking fluid. Terminal blocks shall be General Electric Type CR 151A1 with mounting rack, equivalent by Cinch-Jones or equal.

2.05 ACCESSORIES

A. General purpose relays in the control panels shall be plug in type with contacts rated 10 amperes at 120 volts AC. The quantity and type of contacts shall be as shown on the Drawings. Each relay shall be enclosed in a clear plastic heat and shock resistant dust cover. Sockets for relays shall have screw type terminals. Relays shall be Potter and Brumfield Type KRP or KUP, Square-D Type K, or equal.

B. Time delay relays shall be solid state on-delay or off-delay type with contacts rated 10 amperes at 120VAC. Units shall include adjustable dial with graduated scale or digital switch setting covering the time range in each case. Time delay relays shall be Agastat Series 7000, Omron series H3, SSAC type TDM or TDRU or approved equal.

C. Additional slave relays shall be installed when the number or type of contacts shown exceed the contact capacity of the specified relays and timers.

D. Switches and indicating lights shall be round 30.5mm configuration, heavy duty and corrosion resistant. Legend plate shall be standard size square style laminate with white field and black markings as shown.

Indicating lights shall LED. Lens color shall be as noted. All indicating lights shall be push-to-test type. Pushbuttons shall include full guard with flush button and selector switches shall include a black non-illuminated knob on switch, unless otherwise noted. Contact arrangement and configuration shall be as shown.

Devices shall be Cutler Hammer Type E-30, General Electric Type CR104, Square D class 9001 type Sk, Allen Bradley Bulletin 800 or equal.

E. Selector switches shall be of the rotary type with the number of positions as shown on the Drawings. Color, escutcheon engravings, contact configurations and the like shall be as shown. Devices shall be Cutler Hammer Type E-24, General Electric Type CR104, or equal.

F. Circuit breakers shall be thermal-magnetic, molded case, permanent trip. Voltage, current, interrupting ratings, and number of poles required shall be as shown on the Drawings. Circuit breakers used in 120/240 volt control panels shall be UL listed and have an interrupting capacity of not less than 18,000 amperes, RMS, symmetrical. Circuit breakers shall be as manufactured by Square-D, Class 650, Type FAL, unless otherwise noted on the drawings, or engineer approved equal.

G. Nameplates shall be supplied for identification of all field-mounted elements, including flow meters and their transmitters. These nameplates shall identify the instrument, or meter, descriptively, as to function and system. These nameplates shall be fabricated from black-face, white-center, laminated engraving plastic. A nameplate shall be provided for each signal transducer, signal converter, signal isolator, each electronic trip, and the like, mounted inside the control panels. These shall be descriptive, to define the function and system of such element. Adhesives shall be acceptable for attaching nameplates. Painted surfaces must be prepared to allow permanent bonding of adhesives. Nameplates shall be provided for instruments, function titles for each group of instruments and other components mounted on the front of the control panels as shown. These nameplates and/or individual letters shall be fabricated from VI-LAM, Catalog No. 200, manufactured by N/P Company, or equivalent by Formica, or equal. Colors, lettering, style and sizes shall be as shown or as selected by the Engineer.

H. Solenoid Valves if not otherwise noted shall be globe valve directly actuated by solenoid and not requiring minimum pressure differential for operation. Materials shall be brass globe valved bodies and Buna-N valve seats. The size shall be 1/4" normally closed. The coil shall be 115 VAC coil, Nema 4 solenoid enclosure. Manufacturer shall be ASCO; Red Hat, or equal.

I. Push buttons shall be heavy-duty, oil tight, with momentary contacts. Switches shall be supplied with the number of poles required for the application, an escutcheon plate, and contacts rated for 10 amperes at 120 volts AC. Push buttons shall be as manufactured by

Square-D, Class 9001, Type K or approved equal.

J. Phase monitor shall be a three phase solid state device with voltage sensing capabilities. Phase monitor shall have undervoltage capabilities with a UL listed relay. The monitor shall protect the motor against phase loss, phase unbalance, phase reversal, and undervoltage. Phase monitor shall be Square D Class 8430 Type MPS V29, or engineer approved equal.

K. The motor starter shall be a full voltage non reversing three phase starter with thermal motor overload units. Overload units shall have manual resets. Motor starter shall be Square D 8536, or engineer approved equal.

L. Control power transformer shall be rated for 240x480V/120V A.C. and shall be rated with the appropriate kVA rating as called out in drawings. Control power transformer shall be Square D Class 9070, Type K, or engineer approved equal.

M. A 20A duplex receptacle shall be installed within the control panel. Receptacle shall be GFCI Type and shall be manufactured by Leviton Company Type 6599-I, unless otherwise noted on the drawings, or engineer approved equal.

N. Elapsed time meter shall be as manufactured by Yokogawa Type 240, unless otherwise noted on the drawings, or engineer approved equal.

O. Terminal blocks with LED indicator shall be as manufactured by Square D or engineer approved equal.

P. Lightning arrester shall be suitable for use in service entrance locations and meet NEC Article 280. Lightning arrester shall meet ANSI/IEEE C62.11-1987 and be suitable for indoor and outdoor applications. Lightning arrester shall be Square D 5DSA3650, or engineer approved equal.

Q. Power supply shall be 24 VDC, minimum 100 Watt manufactured by Allen Bradley model: 1606-XLP (or) Approved Equal. Size power supply as required.

R. DC Uninterruptible Power Supply (UPS) shall be minimum 10A, 24 VDC rated manufactured by Allen Bradley model: 1606-XLS (or) Approved equal.

S. Led light fixture for enclosure shall be 24” long, 120VAC, LED, daylight color.

T. Refer to specification 16050 for items not specified here, such as industrial capacitors, thermostat, etc.

2.06 SURGE PROTECTIVE DEVICE (SPD)

A. GENERAL:

SPD protection shall be provided to protect the electronic instrumentation system from induced surges propagating along the signal and power supply lines. The protection systems shall be such that the protective level shall not interfere with normal operation, but shall be lower than the instrument surge withstand level, and be maintenance free and self-restoring.

Instruments shall be housed in a suitable case, properly grounded. Ground wires for all SPD shall be connected to a good earth ground and where practical, each ground wire run individually and insulated from each other. These protectors shall be mounted within the instrument enclosure or a separate NEMA 4X junction box coupled to the enclosure.

B. POWER SUPPLY:

Protection of all 120 VAC instrument power supply lines shall be provided. Control panels shall be protected by line noise suppressing isolation transformers and SPD. Field instruments shall be protected by SPD. For control panels, the line noise suppressing isolation transformer shall be Topaz Series 30 Ultra isolators or approved equal. The suppressor shall be Edco HSP-121 or Atlantic Scientific MA15.

C. ANALOG SIGNALS:

Protection of analog signal lines originating and terminating not in the same building shall be provided by SPD. For analog signal lines the SPD shall be Edco PC-642. For field mounted two-wire instruments the SPD shall be encapsulated in stainless steel pipe nipples, and shall be Edco SS64 series.

For field mounted four-wire 120VAC instruments, the SPD shall be in a NEMA 4X polycarbonate enclosure, Edco SLAC series.

PART 3 -- EXECUTION

3.01 INSTALLATION, CALIBRATION, TESTING, START-UP AND INSTRUCTION

A. GENERAL:

Under the supervision of the Single I&C supplier, all systems specified in this Section shall be installed, connected, calibrated and tested, and in coordination with the Engineer and the Owner, shall be started to place the processes in operation. This shall include final calibration in concert with equipment specified elsewhere in these Specifications, including pumps, valves, as well as certain existing equipment.

B. INSTALLATION AND CONNECTION:

1. The Contractor shall install and connect all field mounted components and assemblies under the criteria imposed in Part 1, 1.03, herein. The installation personnel shall be provided with a final reviewed copy of the Shop Drawings and data.

2. The instrument process sensing lines and air signal tubing shall, in general, be installed in a similar manner to the installation of conduit specified under Section 16050. Individual tubes shall be run parallel and near the surfaces from which they are supported.

Supports shall be used at intervals of not more than 3 feet of rigid tubing.

Bends shall be formed with the proper tool and to uniform radii and shall be

made without deforming or thinning the walls of the tubing. Plastic clips shall be used to hold individual plastic tubes parallel. Ends of tubing shall be square cut and cleaned before being inserted in the fittings. Bulkhead fittings shall be provided at all panels.

3. The Contractor shall have a technical field representative of the I&C supplier to instruct these installation personnel on any and all installation requirements; thereafter, the technical field representative shall be readily available by telephone to answer questions and supply clarification when needed by the installation personnel.

   Where primary elements (supplied by I&C supplier) shall be part of a mechanical system, the I&C supplier shall coordinate the installation of the primary elements with the mechanical system manufacturer.

4. Finally, after all installation and connection work has been completed, the technical field representative shall check it all for correctness, verifying polarity of electric power and signal connections, making sure all process connections are free of leaks, and all such similar details. The technical field representative shall certify in writing to the Contractor that for each loop or system he has completed such check out and that any discrepancies have been corrected by the installation personnel.

5. The field representative of the Single I&C supplier shall coordinate all work required to interface the new equipment and control devices with the existing equipment, including all required modifications to existing equipment and related devices.

C. CALIBRATION

1. All instruments and systems shall be calibrated after installation, in conformance with the component manufacturer's written instructions. This shall provide that those components having adjustable features are set carefully for the specific conditions and applications of this installation, and that the components and/or systems are within the specified limits of accuracy. Defective elements which cannot achieve proper calibration or accuracy, either individually or within a system, shall be replaced. This calibration work shall be accomplished by the technical field representatives of the I&C system supplier who shall certify in writing to the Contractor that for each loop or system all calibrations have been made and that all instruments are ready to operate. See section 3.02 supplements for sample "Instrumentation Calibration Sheet".

2. Proof of Conformance - The burden of proof of conformance to specified accuracy and performance is on the Contractor using its designated Single I&C supplier. The Contractor's designer shall supply necessary test equipment and technical personnel if called upon to prove accuracy and/or performance, at no separate additional cost to the Owner, wherever reasonable doubt or evidence of malfunction or poor performance may appear within the guarantee period.

D. TESTING

All systems shall be exercised through operational tests in the presence of the Engineer in order to demonstrate achievement of the specified performance. Operational tests depend upon completion of work specified elsewhere in these Specifications. The scheduling of tests shall be coordinated by the Contractor among all parties involved so that the tests may proceed without delays or disruption by incomplete work.

1. Factory Demonstration Tests: Test all non-loop-specific functions including, but not limited to the following:

   a. Failure Mode and Backup Procedures: Power failure, auto restart, disk backup and reload, retentive outputs.
   b. Communication with the computer system.
   c. Programming and documentation methods and features.

2. I/O Checkout

   The Contractor is responsible for testing all I/O connections to the PLC/RTU and verifying proper contact status and scaling in the PLC. An I/O checkout sign-off sheet will be provided by the Contractor to document each point as it is tested and accepted by the OWNER.

   See section 3.02 supplements for sample "Loop Status Report" and "Functional Acceptance Test Sheet".

E. START-UP AND INSTRUCTION

When all systems are assessed by the Contractor to have been successfully carried through complete operational tests with a minimum of simulation, and the Engineer concurs in this assessment, plant start-up by the Owner's operating personnel can follow. For a minimum of (8) hours prior to start-up, operating and maintenance personnel shall be instructed in the functions and operation of each system and shall be shown the various adjustable and set point features which may require readjustment, resetting or checking, re-calibration or maintenance by them from time to time. This instruction shall be scheduled at a time arranged with the Owner at least two (2) weeks in advance. Instruction shall be given by qualified persons who have been made familiar in advance with the systems. All equipment shall be checked during the first year of operation at intervals of three months for a period of not less than one day or as may be required to correct any defects to the satisfaction of the Owner.

F. MODIFICATIONS TO EXISTING FACILITIES

The Contractor shall make all modifications to existing equipment and control devices which are required to successfully install and integrate all new instrumentation equipment. All costs for any required modification and rehabilitation effort shall be included in the Contractor's original bid amount and no additional payment shall be allowed.

G. PLANT SHUTDOWNS

The Single I&C supplier shall carefully examine all work to be performed relative to

existing I&C equipment and the installation of new equipment and control devices. Plant shutdowns shall not be permitted.

H. COORDINATION WITH OTHER CONCURRENT PROJECTS

The single I&C supplier shall coordinate extensively with other I&C suppliers of concurrent projects. Some of the equipment shown in this contract as existing might be installed while this contract is underway.

3.02 SUPPLEMENTS

A. Supplements listed below, following "END OF SECTION" are part of this Specification.
1. Instrumentation Calibration Sheet

2. Loop Status Report

3. Functional Acceptance Test Sheet

END OF SECTION

LOOP STATUS REPORT

PROJECT NAME:_____
PROJECT NO.:_____

FUNCTIONAL REQUIREMENTS

COMPONENT STATUS

TAG NO.	DELIVERED*	TAG/IDENTIFI-CATION CHECK*	INSTALLATION CHECK	TERMINATION WIRING*	TERMINATION TUBING*	CALIBRATED*

REMARKS	LOOP READY FOR START-UP
	BY
	DATE

* INITIAL AND DATE WHEN COMPLETE

FUNCTIONAL ACCEPTANCE TEST SHEET

PROJECT NAME: _____

PROJECT NO. :

FUNCTIONAL REQUIREMENTS AND
SUMMARY OF COMPONENTS:
(ATTACH XEROX OF LOOP SPECIFICATION FROM THE CONTRACT DOCUMENTS)

VERIFICATION OF LOOP STATUS REPORT AND BY:_____

INSTRUMENT AND VALVE CALIBRATION SHEETS DATE:_____

DEMONSTRATION TEST(S): FOR EACH FUNCTIONAL REQUIREMENT OF THE LOOP:

REQUIRED PERFORMANCE

(a) LIST AND NUMBER THE REQUIREMENT

(b) BRIEFLY DESCRIBE THE DEMONSTRATION TEST

(c) CITE THE RESULTS THAT WILL VERIFY THE

(d) PROVIDE SPACES FOR INITIAL AND DATE OF TEST WITNESS.

PERFORMED BY: WITNESSED BY: COMPLETED DATE:	LOOP ACCEPTED BY (OWNER) BY DATE
CHECK IF REMARKS ON REVERSE SIDE	LOOP NO.

INSTRUMENTATION CALIBRATION SHEET

COMPONENT CODE: NAME:	MANUFACTURER: MODEL: SERIAL:	PROJECT NUMBER: NAME:

	RANGE	VALUE	UNITS	□ COMPUTE
□INDIATE/ RECORD	CHART	_____	_____	FUNCTIONS
	SCALE	_____	_____	
□TRANS/ CONVERT	INPUT	_____	_____	
	OUTPUT	_____	_____	

□ CONTROL
ACTION (DIRECT/REVERSE)
MODES (P/I/D)

□ SWITCH
UNIT RANGE (VALUE/UNITS)

DIFFERENTIAL (FIXED/ADJUSTABLE)
RESET (AUTOMATIC/MANUAL)

ANALOG							DISCRETE					
REQUIRED			AS CALIBRATED				REQUIRED			AS CALIBRATED		REMARKS CODE
IN	SCALE	OUT	SCALE	OUT	SCALE	OUT	NUMBER	TRIP PT	RESET PT	TRIP PT	RESET PT	
C. MODE SETTINGS: P			I		D							

	COMPONENT CALIBRATED AND READY FOR START-UP BY DATE
	TAG NO.

SECTION 16010

BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.01 RELATED SECTIONS

A. Requirements specified within this section apply to all sections in Division 16, ELECTRICAL. Work specified herein shall be performed as if specified in the individual sections.

1.02 ELECTRICAL SUBCONTRACTOR QUALIFICATIONS

A. The electrical subcontractor shall meet or exceed the criteria described below:

1. The electrical subcontractor shall be licensed in the State of Florida.

2. The electrical subcontractor shall have, in their employ, the following full-time employees that will be assigned to perform the electrical work of this contract:

a) A minimum of (1) Licensed Master Electrician who is overall responsible for the supervision of personnel performing the construction, installation startup and testing of all electrical related facilities and systems.

b) A minimum of (1) Licensed Journeyman Electrician responsible for the daily construction activities and guidance of the electrical contractor's on-site employees. The Licensed Journeyman's primary assignment will be the construction of the electrical facilities of this project until project completion.

3. The electrical subcontractor shall not be involved in any current or pending litigation which may have a material negative impact on the ability to complete the project. The electrical subcontractor shall provide a statement advising all current or pending litigations.

1.03 DESIGN REQUIREMENTS

A. All electronic boards as part of electrical equipment shall meet the atmospheric conditions of the space the equipment is installed in. All electronic boards which are not installed in a conditioned environment shall be fungus-resistant.

B. All electrical equipment shall be rated for the conditions the equipment is installed in.

1.04 STANDARDS, CODES, PERMITS, AND REGULATIONS

A. Perform all work; furnish and install all materials and equipment in full accordance with the latest applicable rules, regulations, requirements, and specifications of the following:

1. Local Laws and Ordinances.

2. State and Federal Laws.

3. National Electrical Code (NEC).

4. State Fire Marshal.

5. Underwriters' Laboratories (UL).

6. National Electrical Safety Code (NESC).

7. American National Standards Institute (ANSI).

8. National Electrical Manufacturer's Association (NEMA).

9. National Electrical Contractor's Association (NECA) Standard of Installation.

10. Institute of Electrical and Electronics Engineers (IEEE).

11. Insulated Cable Engineers Association (ICEA).

12. Occupational Safety and Health Act (OSHA).

13. National Electrical Testing Association (NETA).

14. American Society for Testing and Materials (ASTM).

15. Florida Building Code, including Broward County amendments.

B. Conflicts, if any, which may exist between the above items, will be resolved at the discretion of the Engineer.

C. Wherever the requirements of the Specifications or Drawings exceed those of the above items, the requirements of the Specifications or Drawings govern. Code compliance is mandatory. Construe nothing in the Contract Documents as permitting work not in compliance with these codes.

D. Obtain all permits and pay all fees required by any governmental agency having jurisdiction over the work. Arrange all inspections required by these agencies. On completion of the work, furnish satisfactory evidence to the Engineer that the work is acceptable to the regulatory authorities having jurisdiction.

1.05 ELECTRICAL COORDINATION

A. Work Provided Under this Contract:

1. Provide and install new electrical and control distribution systems, lighting systems, grounding systems, and variable frequency drives (VFDs) as described in the drawings and specifications complete in place.

2. Provide and install all conductors, wires, cables and raceways as described in the drawings and specifications for a complete working system in place.

3. Provide all miscellaneous electrical including lighting fixtures, switches, terminations, fittings, splice kits, wiring, conduit, grounding, junction box, etc., not specified but obviously necessary for a complete working system in place.

4. Provide and install an Electrical Systems Analysis per Specification 16015.

5. Provide and install a Lightning Protection Systems per Specification 16670.

6. Demolish and remove existing motor control center, VFDs, conduits, conductors, lighting and electrical/control distribution systems complete as described in the drawings and specifications.

7. Coordinate with work provided under Specification 13300, Process Control and Instrumentation System.

B. Temporary Power:

1. Provide temporary power for all office trailers and for all construction areas. Coordinate with local power and telephone utility for temporary construction power and telephone service during construction.

C. Emergency Power:

1. Coordinate with “Upgrade Emergency Backup Electrical Service Equipment” contract documents.

1.06 SUBMITTALS

A. Quality Control Submittals:

1. Voltage Field Test Results.

2. Voltage Balance Report.

3. Equipment Line Current Report.

4. Factory test certification and reports for all major electrical equipment.

5. Site test certification and reports as specified in other Division 16, ELECTRICAL sections.

6. As part of the electrical submittal, the contractor shall provide a minimum of 1/2”=1’-0” scaled layout of the electrical equipment in the electrical room or major electrical equipment in a mechanical room showing sizes of all equipment and their spatial relationship. Non-electrical equipment shall be approved before finalizing the electrical layout in mechanical rooms.

B. The following information shall be provided for all electrical equipment:

1. A copy of each specification section, with addendum updates included, and all referenced and applicable sections, with addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements. Check-marks (√) shall denote full compliance with a paragraph as a whole. If deviations from the specifications are indicated, and therefore requested by the Contractor, each deviation shall be underlined and denoted by a number in the margin to the right of the identified paragraph. The remaining portions of the paragraph not underlined shall signify compliance on the part of the Contractor with the specifications. The submittal shall be accompanied by a detailed, written justification for each deviation.

C. Electrical equipment submittals shall be made by specification section. Submit one package per specification section and do not group multiple specification sections under one submittal package.

D. Provide complete conduit and equipment layouts: a scaled plan layout of the electrical room(s) showing spatial relationships of all equipment as well as the overall size of the room. Minimum scale shall be 1/2”=1’-0”.

E. Provide a conduit plan for major power, instrumentation and control conduits, both interior and exterior, showing routing, size and stub up locations for buried or in slab conduits.

1.07 ENVIRONMENTAL CONDITIONS

A. All chemical rooms and areas shall be designated as corrosive.

B. All indoor chemical and process equipment areas shall be considered wet locations.

C. Electrical equipment in rooms or areas designated as Classified by NFPA 70 (national electrical code) as Division 1 or Division 2 shall meet all requirements set forth for that classification as described in NEC article 500.

1.08 INSPECTION OF THE SITE AND EXISTING CONDITIONS

A. The Electrical Drawings were developed from past record drawings and information supplied by the Owner. Verify all scaled dimensions prior to submitting bids.

B. Before submitting a bid, visit the site and determine conditions at the site and at all existing structures in order to become familiar with all existing conditions and electrical system which will, in any way or manner, affect the work required under this Contract. No subsequent increase in Contract cost will be allowed for additional work required because of the Contractor's failure to fulfill this requirement.

C. Submit a request for shut down to the Owner for 5 working days in advance and for review and approval. Carry out any work involving the shutdown of the existing services to any piece of equipment now functioning in existing areas at such time as to provide the least amount of inconvenience to the Owner. Do such work when directed by the Engineer.

D. After award of Contract, locate all existing underground utilities at each area of construction activity. Protect all existing underground utilities during construction. Pay for all required repairs without increase in Contract cost, should damage to underground utilities occur during construction.

1.09 RESPONSIBILITY

A. The Contractor shall be responsible for:

1. Complete systems in accordance with the intent of these Contract Documents.

2. Coordinating the details of facility equipment and construction for all Specification Divisions which affect the work covered under Division 16, ELECTRICAL.

3. Furnishing and installing all incidental items not actually shown or specified, but which are required by good practice to provide complete functional systems.

1.10 INTENT OF DRAWINGS

A. Electrical plan Drawings show only general location of equipment, devices, and raceway, unless specifically dimensioned. The Contractor shall be responsible for the proper routing of raceway, subject to the approval of the Engineer.

B. All electrical equipment sizes and characteristics have been based on manufacturer EATON. If the Contractor chooses to and is allowed to substitute, the Contractor shall be responsible for fitting all the equipment in the available space as shown on the Drawings.

PART 2 - PRODUCTS

2.01 GENERAL

A. Provide materials and equipment listed by UL wherever standards have been established by that agency.

B. Equipment Finish:

1. Provide manufacturers' standard finish and color, except where specific color is indicated.

2. If manufacturer has no standard color, provide equipment with ANSI No. 61, light gray color.

PART 3 - EXECUTION

3.01 GENERAL

A. Electrical Drawings show general locations of equipment, devices, and raceway, unless specifically dimensioned.

B. Install work in accordance with NECA Standard of Installation, unless otherwise specified.

3.02 LOAD BALANCE

A. Drawings and Specifications indicate circuiting to electrical loads and distribution equipment.

B. Balance electrical load between phases as nearly as possible on switchboards, panel boards, motor control centers, and other equipment where balancing is required.

C. When loads must be reconnected to different circuits to balance phase loads, maintain accurate record of changes made, and provide circuit directory that lists final circuit arrangement.

3.03 CHECKOUT AND STARTUP

A. Voltage Field Test:

1. Check voltage at point of termination of power company supply system to project when installation is essentially complete and is in operation.

2. Check voltage amplitude and balance between phases for loaded and unloaded conditions.

a. Submit Voltage Field Test Report within 5 days of test.

B. Equipment Line Current Tests:

1. Check line current in each phase for each piece of equipment.

2. Make line current check after equipment start up and is in service.

3. If any phase current for any piece of equipment is above rated nameplate current, prepare Equipment Line Phase Current Report that identifies cause of problem and corrective action taken.

C. Startup:

1. Demonstrate satisfactory operation of all 480V electrical equipment. Participate with other trades in all startup activities.

- END OF SECTION -

SECTION 16015

ELECTRICAL SYSTEMS ANALYSIS

PART 1 – GENERAL

1.01 SCOPE OF WORK

A. The requirements of this specification shall apply to the new electrical distribution system installed under the City of Pembroke Pines Eastern Wellfield Electrical Improvements Project. The end result shall be a fully protected, and properly coordinated, system with proper arc flash safety labels and personal protective equipment recommendations.

B. Contractor shall furnish short-circuit and protective device coordination studies as described herein. Contractor shall obtain a copy of the most recent short circuit, device coordination and arc flash study performed in SKM Power Tools for Windows© from the City and perform the analysis and update the existing study with the work of this contract. The study results shall be presented in a draft study that shall be submitted for review prior to submittal of power distribution equipment for this project. The final study document shall be submitted after start up and shall include all adjustments made during start-up.

C. The contractor shall furnish an Arc Flash Hazard Analysis Study with Arc Flash Labels per NFPA 70E - Standard for Electrical Safety in the Workplace, reference Article 130.3 and Annex D. Match Arc Flash labels format similar to existing. Contractor shall apply arc flash labels to power distribution system equipment prior to substantial completion.

1.02 REFERENCES

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

1. Institute of Electrical and Electronics Engineers, Inc. (IEEE):

a. IEEE 141 – Recommended Practice for Electric Power Distribution and Coordination of Industrial and Commercial Power Systems

b. IEEE 241 – Recommended Practice for Electric Power Systems in Commercial Buildings

c. IEEE 242: Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems.

d. IEEE 399: Recommended Practice for Industrial and Commercial Power System Analysis.

e. IEEE 1015 – Recommended Practice for Applying Low-Voltage Circuit Breakers Used in Industrial and Commercial Power Systems

f. IEEE 1584-2002: Guide for Performing Arc Flash Hazard Calculations.

2. American National Standards Institute (ANSI):

    a. C57.12.00, Standard General Requirements for Liquid-immersed Distribution, Power, and Regulating Transformers.

    b. ANSI C37.13 – Standard for Low Voltage AC Power Circuit Breakers Used in Enclosures

    c. ANSI C37.010 – Standard Application Guide for AC High Voltage Circuit Breakers Rated on a Symmetrical Current Basis

    d. ANSI C 37.41 – Standard Design Tests for High Voltage Fuses, Distribution Enclosed Single-Pole Air Switches, Fuse Disconnecting Switches and Accessories

    e. ANSI C37.5 – Methods for Determining the RMS Value of a Sinusoidal Current Wave and Normal-Frequency Recovery Voltage, and for Simplified Calculation of Fault Currents

3. National Fire Protection Association:

    a. NFPA 70E: Electrical Safety In The Workplace, Chapter 1.

    b. NFPA 70: National Electrical Code.

4. Occupational Safety & Health Administration (OSHA):

    a. 29-CFR, Part 1910, sub part S.

1.03 SUBMITTALS

A. Shop drawings: the results of the short circuit, protective device coordination and arc flash hazard analysis studies shall be summarized in a preliminary and final summary report. Submit an electronic copy of the complete preliminary and final study reports. The preliminary short circuit and device coordination study report shall be submitted within 30 days of notice to proceed and shall be a basis for approval of all other electrical equipment in the power distribution system. The contractor is expected to review the results of the preliminary short circuit and device coordination study report against all other applicable shop drawings, including industrial control panels, prior to shop drawing submittal to coordinate appropriate fault duty ratings of all electrical equipment. The final short circuit and device coordination study report shall incorporate all comments from shop drawing submittals, all adjustments made during start-up and include the arc-flash hazard analysis. The contractor shall ensure proper arc-flash warning labels are applied to all appropriate electrical equipment installed under this contract when the final study has been approved. The new arc-flash warning labels shall be similar format to the existing label as much as possible. Provide two electronic copies in CD, or DVD, media in additional to the hard copies in the final report. Provide in CD, or DVD, copies of the native study files used to perform the study analysis, including all applicable databases, one line diagrams, TCC curves and results files.

1.04 QUALITY ASSURANCE

A. Short circuit, protective device coordination, and arc flash studies shall be prepared by the manufacturer furnishing the electrical power distribution equipment or a professional electrical engineer registered in the State of Florida, hired by the manufacturer, in accordance with IEEE 242 and IEEE 399.

B. Manufacturer shall have unit responsibility for the equipment and protective device coordination.

1.05 SEQUENCING AND SCHEDULING

A. An initial, complete short circuit and arc flash study must be submitted and reviewed before Engineer will approve Shop Drawings for distribution panelboards, breakers, MCC'S, switchboard, VFD'S, SSRVS'S, manufactured industrial control panels and circuit breaker panelboard equipment. Failure to do so will delay the approval of major equipment submittals.

B. The short circuit, protective device coordination and arc flash studies shall be updated prior to Project Substantial Completion. Utilize characteristics of as-installed equipment actual wire run lengths and materials.

PART 2 – PRODUCTS

2.01 GENERAL

A. Contractor shall furnish all field data as required for the power system studies. The Engineer performing the short-circuit, protective device coordination and arc flash hazard analysis studies shall furnish the Contractor with a listing of required data immediately after award of the contract. The Contractor shall expedite collection of the data to eliminate unnecessary delays and assure completion of the studies as required for final approval of the distribution equipment shop drawings and/or prior to the release of the equipment for manufacturing.

B. Source combination may include present and future utility supplies, motors, and generators.

C. Load data utilized may include existing and proposed loads obtained from Contract Documents provided by Owner or Contractor.

D. Equipment and component titles used in the studies shall be identical to the equipment and component titles shown on the Drawings.

E. Perform studies using digital computer with a software package such as SKM Power*Tools for Windows™ DAPPER™, CAPTOR™ and ARC FLASH™, or approved equal.

F. Perform complete fault calculations for all busses on utility and generator power sources. Perform load flow and voltage drop studies for major feeders and loads with long feeder runs. Analysis shall include expected fault currents at industrial control panels manufactured in accordance with UL 508A and NEC article 409.

G. Fault source combinations shall include large motors, large transformers, utility and generator.

H. Utilize proposed and existing load data for the study obtained from Contract Documents and field survey. Coordinate with local power utility for available fault currents from utility services.

I. Existing Equipment:

1. Include fault contribution of existing motors, services, generators and equipment, as appropriate, in the study.

2. Obtain required existing equipment data from the field and FPL.

J. Provide a comprehensive report document containing the short circuit, device coordination and arc flash studies. As a minimum the report structure shall contain the following:

1. Executive Summary.

2. Methodology.

3. One Line Diagram(s).

4. Short Circuit Analysis.

5. Short Circuit Analysis Results/Conclusions/Recommendations.

6. Device Coordination Analysis.

7. Recommended protective devices settings.

8. Arc Flash Analysis.

9. Arc Flash PPE recommendations.

2.02 SHORT CIRCUIT STUDY

A. General:

1. Use cable impedances based on copper conductors. Use actual conductor impedances if know. If unknown, use typical conductor impedances based on IEEE Standards 141, latest edition.

2. Use bus impedances based on copper bus bars.

3. Use cable and bus resistances calculated at 25 degrees C.

4. Use 600-volt cable reactances based on use of typical data of conductors to be used in this project.

5. Use transformer impedances 92.5 percent of "nominal" impedance based on tolerances specified in ANSI C57.12.00.

B. Provide:

1. Calculation methods and assumptions.

2. Selected base per unit quantities.

3. One-line diagrams annotated with results of short circuit analysis including:

a. Three phase, line-to-line and single line to ground faults.

b. Equipment Short Circuit Rating.

4. Source impedance data, including electric utility system and motor fault contribution characteristics.

5. DAPPER™ Short circuit report, demand load report, load flow report and input data reports.

6. Results, conclusions, and recommendations.

C. Calculate short circuit interrupting and momentary (when applicable) duties for an assumed symmetrical three-phase bolted fault, bolted line-to-ground fault, and bolted line-to-line fault at each:

1. Electric utility's supply termination point.

2. Main breakers, generator breakers and feeder breakers.

3. Low voltage switchgear, switchboard and/or distribution panelboard.

4. Unit substations.

5. Motor control centers.

6. Standby generator.

7. Automatic Transfer Switch (if applicable).

8. All branch circuit panelboards.

9. Variable Frequency Drives and Solid State Reduced Voltage Starters.

10. Industrial control panels manufactured in accordance with UL 508A and NEC article 409.

11. Other significant locations throughout the system.

12. Future load contributions as shown on one-line diagram.

D. Protective Device Evaluation:

1. Evaluate equipment and protective devices and compare to short circuit ratings Verify all equipment, main breakers, ATS, and protective devices are applied within their ratings.

2. Adequacy of switchgear, switchboards, motor control centers, unit substations and panelboard bus bar bracing to withstand short-circuit stresses

3. Adequacy of transformer windings to withstand short-circuit stresses

4. Cable and busway sizes for ability to withstand short-circuit heating besides normal load currents.

5. Notify Owner in writing, of existing, circuit protective devices improperly rated for the calculated available fault current

E. Through the General Contractor, furnish expected fault currents for industrial control panels, constructed and installed under other divisions and specifications of this contract, to the panel builder for his coordination with meeting the requirements of UL 508A and NEC article 409.

2.03 PROTECTIVE DEVICE COORDINATION STUDY

A. Proposed protective device coordination time-current curves for distribution system, graphically displayed on log-log scale paper. Time Current Curve plots from SKM CAPTOR™ program are acceptable.

B. Each curve sheet to have title and one-line diagram with legend identifying the specific portion of system associated with time-current curves on that sheet.

C. Terminate device characteristic curves at a point reflecting maximum symmetrical or asymmetrical fault current to which device is exposed.

D. Identify device associated with each curve by manufacturer type, function, and, if applicable, tap, time delay, and instantaneous settings recommended.

E. Perform device coordination on time-current curves for low voltage distribution system(s).

F. Provide Individual protective device time-current characteristics on log-log paper or software generated graphs.

G. Plot Characteristics on Curve Sheets:

1. Electric utility's relays or protective device (if applicable).

2. Electric utility's fuses including manufacturer's minimum melt, total clearing, tolerance, and damage bands (if applicable).

3. Medium voltage equipment relays (if applicable).

4. Medium and low voltage fuses including manufacturer's minimum melt, total clearing, tolerance, and damage bands.

5. Low voltage equipment circuit breaker trip devices, including manufacturer's tolerance bands.

6. Transformer full-load current, magnetizing inrush current, and ANSI transformer withstand parameters.

7. Transformer damage curves.

8. Conductor damage curves.

9. ANSI transformer with stand parameters.

10. Significant symmetrical and asymmetrical fault currents.

11. Ground fault protective devices and settings (if applicable).

12. Pertinent motor starting characteristics and motor damage points.

13. Pertinent generator short circuit decrement curve and generator damage point.

14. Circuit breaker panelboard main breakers, where appropriate.

15. Motor circuit protectors for major motors

H. Provide adequate time margins between device characteristics such that selective operation is provided, while providing proper protection.

I. Primary Protective Device Settings for Delta-Wye Connected Transformer:

1. Secondary Line-to-Ground Fault Protection: Primary protective device operating band within the transformer's characteristics curve, including a point equal to 58 percent of ANSI C57.12.00 withstand point.

2. Secondary Line-To-Line Faults: 16 percent current margin between primary protective device and associated secondary device characteristic curves.

J. Separate medium voltage relay characteristics curves from curves for other devices by at least 0.4-second time margin.

2.04 ARC FLASH ANALYSIS

A. Perform incident energy calculations in accordance with IEEE 1584-2002 Guide for Performing Arc Flash Hazard Calculations for all equipment analyzed in the short circuit study. Tabular results and recommended labels from SKM ARC FLASH™ are acceptable.

B. When appropriate, the short circuit calculations and the clearing times of the phase overcurrent devices will be retrieved from the short-circuit and coordination study model.

C. The flash protection boundary and the incident energy shall be calculated at all significant locations in the electrical distribution system (switchboards, switchgear, motor-control centers, panelboards, bussway and unit substations, variable frequency drives, and industrial control panels) where work could be performed on energized parts.

D. The Arc-Flash Hazard Analysis shall include all medium voltage, low voltage and significant locations in 240 volt and 208 volt systems fed from transformers equal to or greater than 125 kVA. Arc-Flash Hazard Analysis on low voltage systems 120V and below is not required.

E. Safe working distances shall be specified for calculated fault locations based upon the calculated arc flash boundary considering incident energy value of 1.2 cal/cm2.

F. The Arc Flash Hazard analysis shall include calculations for maximum and minimum contributions of fault current magnitude. The minimum calculation shall assume that the utility contribution is at a minimum and shall assume a minimum motor load. Conversely, the maximum calculation shall assume a maximum contribution from the utility and shall assume motors to be operating under full-load conditions.

G. Arc flash computation shall include both line and load side of main breaker calculations, where necessary.

H. Arc Flash calculations shall be based on actual overcurrent protective device clearing time. Maximum clearing time will be capped at 2 seconds based on IEEE 1584-2002 section B.1.2.

I. Furnish recommendations for Personal Protective Equipment, in accordance with OSHA standards, and proper labels to be located on the electrical equipment in accordance with NEC Article 110.16.

J. Use manufacturer data for: enclosure type; gap between exposed conductors or buss way; grounding type; number of phases and connection; and working distance.

2.05 TABULATIONS

A. Input Data:

1. Utility three-phase and line-to-ground available contribution with associated X/R ratios.

2. Short circuit reactances of rotating machines and associated X/R ratios.

3. Cable type, construction, size, quantity per phase, length, impedance and conduit type.

4. Bus data, including impedance.

5. Transformer primary & secondary voltages, winding configurations, kVA rating, impedance, and X/R ratio.

B. Short Circuit Data:

1. Source fault impedance and generator contributions.

2. X to R ratios.

3. Asymmetry factors.

4. Motor contributions.

5. Short circuit kVA.

6. Symmetrical and asymmetrical fault currents.

C. Recommended Protective Device Settings:

1. Phase and ground relays:

a. Relay name.

b. Device number.

c. Description.

d. TCC catalog number.

e. Short circuit ratings.

f. Current transformer ratio.

g. Current tap.

h. Time dial setting (as applicable).

i. Instantaneous pickup setting (as applicable).

j. Ground fault setting (as applicable).

k. Specialty, non-overcurrent device settings.

l. Recommendations on improved relaying systems, if applicable

2. Circuit Breakers:

a. Breaker name.

b. Breaker Description.

c. Model number.

d. TCC catalog number.

e. Short circuit rating.

f. Frame/Sensor rating.

g. Adjustable pickups and time delays (long time, short time, ground).

h. Adjustable time-current characteristic.

i. Adjustable instantaneous pickup.

j. Recommendations on improved trip systems, if applicable

3. Motor Circuit Protectors (MCP):

a. MCP name.

b. MCP Description.

c. Model number.

d. TCC catalog number.

e. Short circuit rating.

f. Frame/Sensor rating.

g. Instantaneous settings.

4. Fuses:

a. Fuse name.

b. Fuse Description.

c. Model number.

d. TCC catalog number.

e. Short circuit rating.

f. Fuse rating.

D. Incident energy and flash protection boundary calculations.

1. Arcing fault magnitude

2. Device clearing time

3. Duration of arc

4. Arc flash boundary

5. Working distance

6. Incident energy

7. Hazard Risk Category

8. Recommendations for arc flash energy reduction

2.06 STUDY ANALYSES

A. Written Summary:

1. Scope of studies performed.

2. Explanation of bus and branch numbering system.

3. Prevailing conditions.

4. Selected equipment deficiencies.

5. Results of short circuit and coordination studies.

6. Comments or suggestions.

B. Suggest changes and additions to equipment rating and/or characteristics.

C. Notify Engineer in writing of existing circuit protective devices improperly rated for new fault conditions.

PART 3 – EXECUTION

3.01 GENERAL

A. Adjust relay and protective device settings according to values established by coordination study.

B. Make minor modifications to equipment as required to accomplish conformance with the short circuit and protective device coordination studies.

C. Notify Engineer in writing of any required major equipment modifications.

END OF SECTION

SECTION 16050

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.01 REFERENCES

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

1. American National Standards Institute (ANSI):
    a. C62.11, Standard for Metal-Oxide Surge Arrestors for AC Circuits.
    b. Z55.1, Gray Finishes for Industrial Apparatus and Equipment.
    c. C57, Standard General Requirements for Dry Type Distribution and Power Transformers
2. American Society for Testing and Materials (ASTM):
    a. A167, Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
    b. A240, Standard Specification for Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels.
    c. A570, Standard Specification for Steel, Sheet, and Strip, Carbon, Hot-Rolled, Structural Quality.
3. Federal Specifications (FS):
    a. W-C-596, Connector, Receptacle, Electrical.
    b. W-S-896E, Switches, Toggle, Flush Mounted.
4. National Electrical Contractor's Association, Inc. (NECA): 5055, Standard of Installation.
5. National Electrical Manufacturers Association (NEMA):
    a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
    b. AB 1, Molded Case Circuit Breakers and Molded Case Switches.
    c. ICS 2, Industrial Control Devices, Controllers, and Assemblies.
    d. KS 1, Enclosed Switches.
    e. LA I, Surge Arrestors.
    f. PB 1, Panelboards
    g. ST 20, Dry-Type Transformers for General Applications.
    h. WD I, General Requirements for Wiring Devices.
    i. NEMA Standard TP-1-2002.

6. National Fire Protection Association (NFPA): 70, National Electrical Code (NEC).

7. Underwriters Laboratories, Inc. (UL):

   a. 67, Standard for Panelboards.

   b. 98, Standard for Enclosed and Dead-Front Switches.

   c. 198C, Standard for Safety High-Interrupting-Capacity Fuses, Current-Limiting Types.

   d. 198E, Standard for Class Q Fuses.

   e. 486E, Standard for Equipment Wiring Terminals.

   f. 489, Standard for Molded Case Circuit Breakers and Circuit Breaker Enclosures.

   g. 508, Standard for Industrial Control Equipment.

   h. 810, Standard for Capacitors.

   i. 943, Standard for Ground-Fault Circuit Interrupters.

   j. 1059, Standard for Terminal Blocks.

   k. 1561, Standard for Dry-Type General-Purpose and Power Transformers.

1.02 SUBMITTALS

A. Shop Drawings:

1. Device boxes for use in hazardous areas.

2. Junction and pull boxes used at, or below, grade.

3. Hardware.

4. Terminal junction boxes.

5. Panelboards and circuit breaker data.

6. Fuses.

7. Contactors.

8. Transformers.

9. All other miscellaneous material part of this project.

10. Wire pulling compound.

B. Quality Control Submittals:

1. Test Report: Sound test certification for dry type power transformers (0 to 600-volt, primary).

1.03 QUALITY ASSURANCE

A. UL Compliance: Materials manufactured within scope of Underwriters Laboratories shall conform to UL Standards and have an applied UL listing mark.

B. Hazardous Areas: Materials and devices shall be specifically approved for hazardous areas of the class, division, and group shown and of a construction that will ensure safe performance when properly used and maintained.

1.04 SPARE PARTS

A. Furnish, tag, and box for shipment and storage of the following spare parts:

1. Fuses, 0 to 600 Volts: Six (6) of each type and each current rating installed.

2. 1 of each type of VFD control boards.

PART 2 – PRODUCTS

2.01 OUTLET AND DEVICE BOXES

A. Sheet Steel: One-piece drawn type, zinc- or cadmium-plated.

B. Cast Metal:

1. Box: Cast ferrous metal.

2. Cover: Gasketed, weatherproof, cast ferrous metal, with stainless steel screws.

3. Hubs: Threaded.

4. Lugs (Cast Mounting) Manufacturer:

a. Crouse-Hinds; Type FS or FD.

b. Appleton; Type FS or FD.

C. Cast Aluminum:

1. Material:

a. Box: Cast, copper-free aluminum.

b. Cover: Gasketed, weatherproof, cast copper-free aluminum with stainless steel screws.

2. Hubs: Threaded.

3. Lugs: Cast mounting.

4. Manufacturers:

a. Crouse-Hinds; Type FS-SA or FD-SA.

b. Appleton; Type FS or FD.

D. PVC-Coated Sheet Steel:

1. Type: One-piece.

2. Material: Zinc- or cadmium-plated.

3. Coating: All surfaces; 40-mil PVC.

4. Manufacturer: Appleton.

E. Nonmetallic:

1. Box: PVC.

2. Cover: PVC, weatherproof, with stainless steel screws.

3. Manufacturer: Carlon; Type FS or FD, with Type E98 or E96 covers.

2.02 JUNCTION AND PULL BOXES

A. Outlet Boxes Used as Junction or Pull Box: As specified under Article OUTLET AND DEVICE BOXES.

B. Large Sheet Steel Box: NEMA 250, Type 1.

1. Box: Code-gauge, galvanized steel.

2. Cover: Full access, screw type.

3. Machine Screws: Corrosion-resistant.

C. Large Cast Metal Box: NEMA 250, Type 4.

1. Box: Cast malleable iron, hot-dip galvanize finished, with drilled and tapped conduit entrances.

2. Cover: Hinged with screws.

3. Hardware and Machine Screws: ASTM A167, Type 316 stainless steel.

4. Manufacturers, Surface Mounted Type:

a. Crouse-Hinds; Series W.

b. O.Z./Gedney; Series Y.

5. Manufacturers, Recessed Type:

a. Crouse-Hinds; Type WJBF.

b. O.Z./Gedney; Series YR.

D. Large Stainless Steel Box: NEMA 250, Type 4X.

1. Box: 14-gauge, ASTM A240, Type 316 stainless steel.

2. Cover: Hinged with screws.

3. Hardware and Machine Screws: ASTM A167, Type 316 stainless steel.

4. Manufacturers:

a. Hoffman Engineering Co.

b. Robroy Industries.

E. Large Steel Box: NEMA 250, Type 4.

1. Box: 12-gauge steel, with white enamel painted interior and gray primed exterior, over phosphated surfaces, with final ANSI Z55.1, No. 61 gray enamel on exterior surfaces.

2. Cover: Hinged with screws.

3. Hardware and Machine Screws: ASTM A167, Type 316 stainless steel.

4. Manufacturers:

a. Hoffman Engineering Co.

b. Robroy Industries.

F. Large Nonmetallic Box:

1. NEMA 250, Type 4X.

2. Box: High-impact, fiberglass-reinforced polyester or engineered thermoplastic, with stability to high heat.

3. Cover: Hinged with screws.

4. Hardware and Machine Screws: ASTM A167, Type 316 stainless steel.

5. Conduit hubs and mounting lugs.

6. Manufacturers:

a. Crouse-Hinds; Type NJB.

b. Carlon; Series N, C, or H.

c. Robroy Industries.

G. Concrete Box:

1. Box: Rebar reinforced, cast concrete.

2. Cover: H20-44 traffic rated cast iron.

3. Cover Marking: ELECTRICAL, TELEPHONE, SIGNAL, CONTROL or as shown.

4. Manufacturers:

   a. Brooks Products Inc.; No. 36/36T.

   b. Qwikset; W 17.

2.03 WIRING DEVICES

A. Receptacle, Single and Duplex:

1. NEMA WD 1 and FS W-C-596.

2. Specification grade, two-pole, three-wire grounding type with screw type wire terminals suitable for No. 10 AWG.

3. High strength, thermoplastic base color.

4. Color:

   a. Office Areas: Ivory.

   b. Other Areas: Brown.

5. Contact Arrangement: Contact to be made on two sides of each inserted blade without detent.

6. Rating: 125 volts, NEMA WD 1, Configuration 5-20R, 20 amps.

7. Manufacturers:

   a. Bryant.

   b. Leviton.

   c. Hubbell.

   d. Pass and Seymour.

   e. Sierra.

   f. Arrow Hart.

B. Receptacle, Ground Fault Circuit Interrupter: Duplex, specification grade, tripping at 5 mA.

1. Color: Ivory.

2. Rating: 125 volts, NEMA WD 1, Configuration 5-20R, 20 amps, capable of interrupting 5,000 amps without damage.

3. Size: For 2-inch by 4-inch outlet boxes.

4. Standard Model: NEMA WD 1 with No. 12 AWG copper USE/RHH/RHW-XLPE insulated pigtails and provisions for testing.

5. Feed-Through Model: NEMA WD 1, with No. 12 AWG copper USE/RHH/RHW-XLPE insulated pigtails and provisions for testing.

6. Manufacturers:

   a. Pass and Seymour.

   b. Bryant.

   c. Leviton.

   d. Hubbell.

   e. Arrow Hart.

C. Receptacle, Special-Purpose:

1. Rating and number of poles as indicated or required for anticipated purpose.

2. Matching plug with cord-grip features for each special-purpose receptacle.

D. Multi-outlet Surface Raceway System: Three-wire grounding receptacles, spaced on 6-inch centers with insulated grounding conductor to each receptacle.

1. Color: Gray with black receptacles.

2. Manufacturers:

   a. Plugmold; 2000.

   b. Walker; Duct 2GW.

2.04 DEVICE PLATES

A. General: Sectional type plates not permitted.

B. Plastic:

1. Material: Specification grade, 0.10-inch minimum thickness, noncombustible, thermosetting.

2. Color: To match associated wiring device.

3. Mounting Screw: Oval-head metal, color matched to plate.

C. Metal:

1. Material: Specification grade, one-piece, 0.040-inch nominal thickness stainless steel.

2. Finish: ASTM A167, Type 302/304, satin.

3. Mounting Screw: Oval-head, finish matched to plate.

D. Cast Metal:

1. Material: Malleable ferrous metal, with gaskets.

2. Screw: Oval-head stainless steel.

E. Engraved:

1. Character Height: 3/16 inch.

2. Filler: Black.

F. Weatherproof:

1. For Receptacles: Gasketed, cast metal or stainless steel, with individual cap over each receptacle opening.

2. Mounting Screw: Stainless steel.

a. Cap Spring: Stainless steel.

b. Manufacturers:

1) Bryant

2) Hubbell

3) Pass and Seymour

4) Crouse-Hinds

3. For Switches: Gasketed, cast metal incorporating external operator for internal switch.

a. Mounting Screw: Stainless steel.

b. Manufacturers:

1) Crouse-Hinds; DS-181 or DS-185.

2) Appleton; FSK-LVTS or FSK-IVS.

G. Raised Sheet Metal: 1/2-inch high zinc- or cadmium-plated steel designed for one-piece drawn type sheet steel boxes.

2.05 LIGHTING AND POWER DISTRIBUTION PANELBOARD

A. NEMA PB I, NFPA 70, and UL 67, including panelboards installed in motor control equipment.

B. Panelboards and Circuit Breakers: Suitable for use with 75 degrees C wire at full NFPA 70, 75 degrees C ampacity.

C. Short-Circuit Current Equipment Rating: Fully rated; series connected unacceptable.

D. Rating: If not otherwise shown in plans. Applicable to a system with available short-circuit current of 25,000 amperes rms symmetrical at 208Y/120 or 120/240 volts and 65,000 amperes rms symmetrical at 480Y/277 volts.

E. Where ground fault interrupter circuit breakers are indicated or required by code: 5 mA trip, 10,000 amps interrupting capacity circuit breakers.

F. Cabinet: As shown on plans.

G. Bus Bar:

1. Material: Copper, full sized throughout length.

2. Provide for mounting of future circuit breakers along full length of bus regardless of number of units and spaces shown. Machine, drill, and tap as required for current and future positions.

3. Neutral: Insulated, rated 100 percent of phase bus bars with at least one terminal screw for each branch circuit.

4. Ground: Copper, installed on panelboard frame, bonded to box with at least one terminal screw for each circuit.

5. Lugs and Connection Points:

   a. Suitable for either copper or aluminum conductors.

   b. Solderless main lugs for main, neutral, and ground bus bars.

   c. Sub-feed or through-feed lugs as shown.

6. Bolt together and rigidly support bus bars and connection straps on molded insulators.

H. Circuit Breakers:

1. NEMA AB 1 and UL 489.

2. Thermal-magnetic, quick-make, quick-break, molded case, of the indicating type showing ON/OFF and TRIPPED positions of operating handle.

3. Non-interchangeable, in accordance with NFPA 70.

4. Locking: Provisions for handle padlocking, unless otherwise shown.

5. Type: Bolt-on circuit breakers in all panelboards.

6. Multi-pole circuit breakers designed to automatically open all poles when an overload occurs on one pole.

7. Do not substitute single-pole circuit breakers with handle ties for multipole breakers.

8. Do not use tandem or dual circuit breakers in normal single-pole spaces.

9. Ground Fault Interrupter:

   a. Equip with conventional thermal-magnetic trip and ground fault sensor rated to trip in 0.025 second for a 5-milliampere ground fault (UL 943, Class A sensitivity).

   b. Sensor with same rating as circuit breaker and a push-to-test button.

I. SPD

1. Provide external surge protective device (SPD). Provide breaker for SPD.

J. SURGE PROTECTIVE DEVICE (SPD)

1. This section describes the material and installation requirements for surge protective devices (SPD) for switchboards, panelboards, and motor control centers for the protection of all AC electrical circuits.

2. SPD shall be listed and component recognized in accordance with UL 1449 and UL 1283.

3. SPD shall be installed and warranted by and shipped from the electrical distribution equipment manufacturer’s factory.

4. SPD shall provide surge current diversion paths for all modes of protection; L-L, L-N, L-G, N-G in WYE systems, and L-L, L-G in DELTA systems.

5. SPD shall be modular in design. Each module shall be fused with a surge rated fuse.

6. A UL approved disconnect switch shall be provided as a means of disconnect in the switchboard device only.

7. SPD shall meet or exceed the following criteria:

   a. Maximum surge current capability (single pulse rated) shall be:

1. Service entrance switchboards 300kA
2. Branch panelboards 150kA
3. Motor control centers 80kA

b. UL 1449 Listed and Recognized Component Suppression Voltage Ratings shall not exceed the following:

Voltage	L-N	L-G	N-G
208Y/120	400V	400V	400V
480Y/277	800V	800V	800V

8. SPD shall have a minimum EMI/RFI filtering of -50dB at 100kHz with an insertion ration of 50:1 using MIL STD. 220A methodology.

9. SPD shall be provided with 1 set of NO/NC dry contacts.

10. SPD shall have a warranty for a period of five years, incorporating unlimited replacements of suppressor parts if transients destroy them during the warranty period. Warranty will be the responsibility of the electrical distribution equipment manufacturer.

K. Manufacturers:

1. Eaton.

2. Or approved equal

2.06 DRY TYPE TRANSFORMERS (0-600 VOLT PRIMARY)

A. UL 1561, NEMA ST 20, unless otherwise indicated.

B. Self-cooled, two-winding, UL K-4 rated for nonlinear loads.

C. Insulation Class and Temperature Rise: Manufacturer's standard.

D. Core and Coil:

1. Encapsulated for single-phase units 1/2 to 25 kVA and for three-phase units 3 to 15 kVA.

2. Thermosetting varnish impregnated for single-phase units 37.5 kVA and above, and for three-phase units 30 kVA and above.

E. Enclosure:

1. Single-Phase, 3 to 25 kVA: NEMA 250, Type 3R, non-ventilated.

2. Single-Phase, 37-1/2 kVA and Above: NEMA 250, Type 2, ventilated.

3. Three-Phase, 3 to 15 kVA: NEMA 250, Type 3R, nonventilated.

4. Three-Phase, 30 kVA and Above: NEMA 250, Type 2, ventilated.

5. Outdoor Transformers: NEMA 250, Type 3R.

F. Wall Bracket: For single-phase units, 15 to 37-1/2 kVA, and for three-phase units, 15 to 30 kVA.

G. Voltage Taps:

1. Single-Phase, 3 to 10 kVA: Four 2-1/2 percent, full capacity; two above and two below normal voltage rating.

2. Single-Phase, 15 kVA and Above: Four 2-1/2 percent, full capacity; two above and two below normal voltage rating.

3. Three-Phase, 3 to 15 kVA: Four 2-1/2 percent, full capacity; two above and two below normal voltage rating.

4. Three-Phase, 30 kVA and Above: Four 2-1/2 percent, full capacity; two above and two below normal voltage rating.

H. Impedance: 4.5 percent minimum on units 75 kVA and larger.

I. Maximum Sound Level: NEMA ST 20:

1. 40 decibels for 0 to 9 kVA.

2. 45 decibels for 10 to 50 kVA.

3. 50 decibels for 51 to 150 kVA.

4. 55 decibels for 151 to 300 kVA.

5. 60 decibels for 301 to 500 kVA.

J. Vibration Isolators:

1. Rated for transformer's weight.

2. Isolation Efficiency: 99 percent, at fundamental frequency of sound emitted by transformer.

3. Less Than 30 kVA: Isolate entire unit from structure with external vibration isolators.

4. 30 kVA and Above: Isolate core and coil assembly from transformer enclosure with integral vibration isolator.

K. Manufacturers:

1. Eaton.

2. Or approved equal.

2.07 NONFUSED DISCONNECT SWITCH, INDIVIDUAL, 0 TO 600 VOLTS

A. NEMA KS 1.

B. Quick-make, quick-break, motor rated, load-break, heavy-duty (HD) type with external markings clearly indicating ON/OFF positions.

C. Suitable for use with 75 degrees C wire at full NFPA 70, 75 degrees C ampacity.

D. Enclosure: NEMA 250, Type 12, industrial use, 4X 316 stainless steel - outdoors, wet locations and corrosive areas, unless otherwise shown.

E. Interlock: Enclosure and switch to prevent opening cover with switch in the ON position and capable of being locked in the OPEN position.

F. Auxiliary contacts where indicated in the drawings.

G. Disconnect switches shall be furnished with a factory installed internal barrier kit that helps prevent accidental contact with live parts and provides “finger-safe” protection when the door of the enclosed switch is open.

H. Manufacturers:

1. Eaton.

2. Or approved equal

2.08 FUSED SWITCH, INDIVIDUAL, 0 TO 600 VOLTS

A. UL 98 listed for use and location of installation.

B. NEMA KS 1 and UL 98 Listed for application to system with available short circuit current of 22,000 amps rms symmetrical.

C. Quick-make, quick-break, motor rated, load-break, heavy-duty (HD) type with external markings clearly indicating ON/OFF positions.

D. Suitable for use with 75 degrees C wire at full NFPA 70, 75 degrees C ampacity.

E. Fuse mountings shall reject Class H fuses and accept only current-limiting fuses specified.

F. Enclosure: NEMA 250, Type 12, Industrial Use, 4X - outdoors, wet locations and corrosive areas, unless otherwise shown.

G. Interlock: Enclosure and switch to prevent opening cover with switch in the ON position.

2.09 FUSE, 0 TO 600 VOLTS

A. Current-limiting, with 200,000 ampere rms interrupting rating.

B. Provide to fit mountings specified with switches and features to reject Class H fuses.

C. Motor and Transformer Circuits, 0- to 600-Volt:

1. Amperage: 0 to 600.
2. UL 198E, Class RK-1, dual element, with time delay.
3. Manufacturers:
    a. Bussmann; Type LPS-RK.
    b. Littlefuse; Type LLS-RK.

D. Motor and Transformer Circuits, 0- to 250-Volt:
1. Amperage: 0 to 600.
2. UL 198E, Class RK-1, dual element, with time delay.
3. Manufacturers:
    a. Bussmann; Type LPN-RK.
    b. Littlefuse; Type LLN-RK.

E. Feeder and Service Circuits, 0- to 600-Volt:
1. Amperage: 0 to 600.
2. UL 198E, Class RK-I, dual element, with time delay.
3. Manufacturers:
    a. Bussmann; Type LPS-RK.
    b. Littlefuse; Type LLS-RK.

F. Feeder and Service Circuits, O- to 250-Volt:
1. Amperage: 0 to 600.
2. UL 198E, Class RK-I, dual element, with time delay.
3. Manufacturers:
    a. Bussmann; Type LPN-RK.
    b. Littleluse; Type LLN-RK.

G. Feeder and Service Circuits, 0- to 600-Volt:
1. Amperage: 601 to 6,000.
2. UL 198C, Class L, double O-rings and silver links.
3. Manufacturers:
    a. Bussmann; Type KRP-C.
    b. Littlefuse; Type KLPC.

2.10 PUSHBUTTON, INDICATING LIGHT, AND SELECTOR SWITCHES

A. Contact Rating: NEMA ICS 2, Type A600.

B. Selector Switch Operating Lever: Standard.

C. Indicating Lights: Push-to-test LED type.

D. Pushbutton Color:

1. ON or START: Black.

2. OFF or STOP: Red.

E. Pushbuttons and selector switches lockable in the OFF position where indicated.

F. Legend Plate:

1. Material: Aluminum.

2. Engraving: 11 character/spaces on one line, 14 character/spaces on each of two lines, as required, and indicating specific function.

3. Letter Height: 7/64 inch.

G. Manufacturers:

1. Heavy-Duty, Oiltight Type:

a. Eaton.

b. Allen-Bradley.

2.11 TERMINAL JUNCTION BOX

A. Cover: Hinged, unless otherwise shown.

B. Terminal Blocks: Provide separate connection point for each conductor entering or leaving box.

1. Spare Terminal Points: 25 percent.

C. Interior Finish: Paint with white enamel or lacquer.

2.12 TERMINAL BLOCK (0 TO 600 VOLTS)

A. UL 486E and UL 1059.

B. Size components to allow insertion of necessary wire sizes.

C. Capable of termination of all control circuits entering or leaving equipment, panels, or boxes.

D. Screw clamp compression, dead front barrier type, with current bar providing direct contact with wire between the compression screw and yoke.

E. Yoke, current bar, and clamping screw of high strength and high conductivity metal.

F. Yoke shall guide all strands of wire into terminal.

G. Current bar shall ensure vibration-proof connection.

H. Terminals:

1. Capable of wire connections without special preparation other than stripping.

2. Capable of jumper installation with no loss of terminal or rail space.

3. Individual, rail mounted.

I. Marking system allowing use of preprinted or field-marked tags.

J. Manufacturers:

1. Weidmuller.

2. Ideal.

3. Electrovert.

2.13 MAGNETIC CONTROL RELAY

A. NEMA ICS 2, Class A600 (600 volts, 10 amps continuous, 7,200VA make, 720VA break), industrial control with field convertible contacts.

B. Time Delay Relay Attachment:

1. Electronic type, timer adjustable from 0.2 to 60 seconds (minimum).

2. Field convertible from ON delay to OFF delay and vice versa.

C. Latching Attachment: Mechanical latch having unlatching coil and coil clearing contacts.

D. Manufacturers:

1. Cutler-Hammer; Type M-600.

2. General Electric

2.14 ELAPSED TIME METER

A. Drive: Synchronous motor.

B. Range: 0 to 99,999.9 hours, non-reset type.

C. Mounting: Semi-flush, panel.

D. Manufacturers:

1. General Electric; Type 240, 2-1/2-inch Big Look.

2. Eagle Signal; Bulletin 705.

2.15 NAMEPLATES

A. Material: Laminated plastic.

B. Attachment Screws: Stainless steel.

C. Color: White, engraved to a black core.

D. Engraving:

1. Pushbuttons/Selector Switches: Name of drive controlled on one, two, or three lines, as required.

2. Panelboards: Panelboard designation, service voltage, and phases.

E. Letter Height:

1. Pushbuttons/Selector Switches: 1/8 inch.

2. Panelboards: 1/4 inch.

2.16 GENERAL PURPOSE RELAYS

A. General purpose relays in the control panels shall be plug in type with contacts rated 10 amperes at 120 volts AC. The quantity and type of contacts shall be as shown on the Drawings. Each relay shall be enclosed in a clear plastic heat and shock resistant dust cover. Sockets for relays shall have screw type terminals. Relay shall be push to test type with LED indication light. Relays shall be Square-D Type RUMC, or equal.

2.17 COMBINATION MAGNETIC MOTOR STARTERS

A. Motor starters shall be a combination motor circuit protector and contractor, 2 or 3 pole, 1 or 3-phase as required, 60 Hz, 600 volt, magnetically operated, full voltage non-reversing except as shown on the Drawings. NEMA sizes shall be as required for the horse-powers shown on the drawings.

B. Two speed starters shall be for single or two winding motors as shown on the Drawings.

C. Each motor starter shall have a 120-volt operating coil and control power transformer. Three phase starters shall have 3 overload relays. Auxiliary contacts shall be provided as shown on the Drawings or required.

D. Overload relays shall not be adjustable and must be manually reset.

E. Built-in control stations and indicating lights shall be furnished where shown on the Drawings.

F. Enclosure: NEMA 250, Type 12, Industrial Use, 4X - outdoors, wet locations and corrosive areas, unless otherwise shown.

G. Motor circuit protectors shall be molded case with adjustable magnetic trip only. They shall be specially designed for use with magnetic motor starters. Motor circuit protectors shall be furnished with bolt-on current limiting fuses.

H. Combination magnetic motor starters shall be as manufactured by EATON or approved alternate.

I. Motor starter contacts shall be serviceable without removing the starter from the enclosure.

2.18 SUPPORT AND FRAMING CHANNELS

A. Material:

1. ASTM A167, Type 316 stainless steel. Use 316 stainless steel rods, nuts and bolts to attach or anchor to the concrete slab or wall.

B. Finish:

1. ASTM A167, Type 316 stainless steel.

C. Inserts: Continuous.

D. Beam Clamps: Gray cast iron for non-corrosive areas and FRP (fiberglass) for corrosive/ chemical areas.

E. Manufacturers:

1. B-Line.

2. Unistrut.

3. Or approved equal.

PART 3 - EXECUTION

3.01 GENERAL

A. Install equipment in accordance with NECA 5055.

3.02 OUTLET AND DEVICE BOXES

A. Install suitable for conditions encountered at each outlet or device in the wiring or raceway system, sized to meet NFPA 70 requirements.

B. Size:

1. Depth: Minimum 2 inches, unless otherwise required by structural conditions. Box extensions not permitted.

    a. Hollow Masonry Construction: Install with sufficient depth such that conduit knockouts or hubs are in masonry void space.

2. Ceiling Outlet: Minimum 4-inch octagonal sheet steel device box, unless otherwise required for installed fixture.

3. Switch and Receptacle: Minimum 2-inch by 4-inch sheet steel device box.

C. Locations:

1. Drawing locations are approximate.

2. To avoid interference with mechanical equipment or structural features, relocate outlets as directed by ENGINEER.

3. Light Switch: Install on lock side of doors.

4. Light Fixture: Install in symmetrical pattern according to room layout unless otherwise shown.

D. Mounting Height:

1. General:

    a. Measured to centerline of box.

    b. Where specified heights do not suit building construction or finish, mount as directed by ENGINEER.

2. Light Switch: 48 inches above floor.

3. Thermostat: 54 inches above floor.

4. Telephone Outlet: 6 inches above counter tops or 15 inches above floor.

5. Wall Mounted Telephone Outlet: 52 inches above floor.

6. Convenience Receptacle:

    a. General Interior Areas: 15 inches above floor.

    b. General Interior Areas (Counter Tops): Install device plate bottom or side flush with top of splash back, or 6 inches above countertops without splash back.

    c. Industrial Areas, Workshops: 48 inches above floor.

d. Outdoor, All Areas: 24 inches above finished grade.

7. Special-Purpose Receptacle: 54 inches above floor or as shown.

E. Install plumb and level.

F. Flush Mounted:

1. Install with concealed conduit.

2. Install proper type extension rings or plaster covers to make edges of boxes flush with finished surface.

3. Holes in surrounding surface shall be no larger than required to receive box.

G. Support boxes independently of conduit by attachment to building structure or structural member.

H. Install bar hangers in frame construction, or fasten boxes directly with wood screws on wood, bolts and expansion shields on concrete or brick, toggle bolts on hollow masonry units, and machine screws threaded into steelwork.

I. Threaded studs driven in by powder charge and provided with lock washers and nuts are acceptable in lieu of expansion shields.

J. Provide plaster rings where necessary.

K. Boxes embedded in concrete or masonry need not be additionally supported.

L. Install stainless steel mounting hardware in industrial areas.

M. Boxes Supporting Fixtures: Provide means of attachment with adequate strength to support fixture.

N. Open no more knockouts in sheet steel device boxes than are required; seal unused openings.

O. Box Type (Steel Raceway System):

1. Exterior Locations:

a. Exposed Raceways: Cast metal.

b. Concealed Raceways: Cast metal.

c. Concrete Encased Raceways: Cast metal.

d. Class I, II, or III Hazardous Areas: Cast metal.

2. Interior Dry Locations:

    a. Exposed Rigid Conduit: Cast metal.

    b. Exposed EMT: Sheet steel.

    c. Concealed Raceways: Sheet steel.

    d. Concrete Encased Raceways: Cast metal.

    e. Lighting Circuits, Ceiling: Sheet steel.

    f. Class I, II, or III Hazardous Areas: Cast metal.

3. Interior Wet Locations:

    a. Exposed Raceways: Cast metal.

    b. Concealed Raceways: Cast metal.

    c. Concrete Encased Raceways: Cast metal.

    d. Lighting Circuits, Ceiling: Sheet steel.

    f. Class I, II, or III Hazardous Areas: Cast metal.

4. Cast-In-Place Concrete Slabs: Sheet steel.

P. Box Type (Rigid Aluminum Raceway System): Cast aluminum.

Q. Box Type (Nonmetallic Raceway System):

1. Corrosive Locations: Nonmetallic.

2. Exposed Raceways: Nonmetallic.

3. Concealed Raceways: Nonmetallic.

4. Concrete Encased Raceways: Nonmetallic.

3.03 JUNCTION AND PULL BOXES

A. Install where shown and where necessary to terminate, tap-off, or redirect multiple conduit runs.

B. Install pull boxes where necessary in raceway system to facilitate conductor installation.

C. Install in conduit runs at least every 150 feet or after the equivalent of three right-angle bends.

D. Use outlet boxes as junction and pull boxes wherever possible and allowed by applicable codes.

E. Installed boxes shall be accessible.

F. Do not install on finished surfaces.

G. Install plumb and level.

H. Support boxes independently of conduit by attachment to building structure or structural member.

I. Install bar hangers in frame construction, or fasten boxes directly with wood screws on wood, bolts and expansion shields on concrete or brick, toggle bolts on hollow masonry units, and machine screws or welded threaded studs on steelwork.

J. Threaded studs driven in by powder charge and provided with lock washers and nuts are acceptable in lieu of expansion shields.

K. Boxes embedded in concrete or masonry need not be additionally supported.

L. At or Below Grade:

1. Install boxes for below grade conduits flush with finished grade in locations outside of paved areas, roadways, or walkways.

2. If adjacent structure is available, box may be mounted on structure surface just above finished grade in accessible but unobtrusive location.

3. Obtain ENGINEER'S written acceptance prior to installation in paved areas, roadways, or walkways.

4. Use boxes and covers suitable to support anticipated weights.

M. Flush Mounted:

1. Install with concealed conduit.

2. Holes in surrounding surface shall be no larger than required to receive box.

3. Make edges of boxes flush with final surface.

N. Mounting Hardware:

1. Non-corrosive Interior Areas: Galvanized.

2. All Other Areas: Stainless steel.

O. Location/Type:

1. Finished, Indoor, Dry: NEMA 250, Type 1.

2. Unfinished, Indoor, Dry: NEMA 250, Type 12.

3. Unfinished, Indoor and Outdoor, Wet and Corrosive: NEMA 250, Type 4X.

4. Unfinished, Indoor and Outdoor, Wet, Dust, or Oil: NEMA 250, Type 13.

5. Unfinished, Indoor and Outdoor, Hazardous: NEMA 250, Type 7 and Type 9, where indicated.

6. Underground Conduit: Concrete Encased.

7. Corrosive Locations: Nonmetallic.

8. Receptacles: Install in accordance with manufacturer's instructions.

3.04 WIRING DEVICES

A. Switches:

1. Mounting Height: See Paragraph OUTLET AND DEVICE BOXES.

2. Install with switch operation in vertical position.

3. Install single-pole, two-way switches such that toggle is in up position when switch is on.

B. Receptacles:

1. Install with grounding slot down except where horizontal mounting is shown, in which case install with neutral slot up.

2. Ground receptacles to boxes with grounding wire only.

3. Weatherproof Receptacles:

a. Install in cast metal box.

b. Install such that hinge for protective cover is above receptacle opening.

4. Ground Fault Interrupter: Install feed-through model at locations where ground fault protection is specified for "downstream" conventional receptacles.

5. Special-Purpose Receptacles: Install in accordance with manufacturer's instructions.

3.05 DEVICE PLATES

A. Securely fasten to wiring device; ensure a tight fit to the box.

B. Flush Mounted: Install with all four edges in continuous contact with finished wall surfaces without use of mats or similar materials. Plaster fillings will not be acceptable.

C. Surface Mounted: Plate shall not extend beyond sides of box unless plates have no sharp corners or edges.

D. Install with alignment tolerance to box of 1/16 inch.

E. Engrave with designated titles.

F. Types (Unless Otherwise Shown):

1. Office: Stainless Steel.

2. Exterior: Weatherproof.

3. Interior:

a. Flush Mounted Boxes: Stainless Steel.

b. Surface Mounted, Cast Metal Boxes: Cast metal.

c. Surface Mounted, Sheet Steel Boxes: Stainless Steel.

d. Surface Mounted, Nonmetallic Boxes: Plastic.

3.06 PUSHBUTTON, INDICATING LIGHT, AND SELECTOR SWITCH

A. Heavy-Duty, Oil tight Type: Locations (Unless Otherwise Shown): Non-hazardous, indoor, dry locations, including motor control centers, control panels, and individual stations.

B. Heavy-Duty, Watertight, and Corrosion-Resistant Type:

1. Locations (Unless Otherwise Shown): Non-hazardous, outdoor, or normally wet areas.

2. Mounting: NEMA 250, Type 4X enclosure.

3.07 TERMINAL JUNCTION BOX

A. Install in accordance with Paragraph JUNCTION AND PULL BOXES.

B. Label each block and terminal with permanently attached, non-destructible tag.

C. Do not install on finished outdoor surfaces.

D. Location:

1. Finished, Indoor, Dry: NEMA 250, Type 1.

2. Unfinished, Indoor, Dry: NEMA 250, Type 12.

3. Unfinished, Indoor and Outdoor, Wet and Corrosive: NEMA 250, Type 4X.

4. Unfinished, Indoor and Outdoor, Wet, Dust, or Oil: NEMA 250, Type 13.

3.08 NONFUSED DISCONNECT SWITCH, INDIVIDUAL, 0 TO 600 VOLTS

A. All disconnect switches shall be mounted five (5) feet above the floor, at the equipment height where appropriate, or where shown otherwise.

3.09 DRY TYPE TRANSFORMER (0- TO 600-VOLT PRIMARY)

A. Load external vibration isolator such that no direct transformer unit metal is in direct contact with mounting surface.

B. Provide moisture proof, flexible conduit for electrical connections.

C. Connect voltage taps to achieve (approximately) rated output voltage under normal plant load conditions.

D. Provide wall brackets for single-phase units, 15 to 167-1/2 kVA, and three-phase units, 15 to 112 kVA.

3.10 LIGHTING AND POWER DISTRIBUTION PANELBOARD

A. Install securely, plumb, in-line and square with walls.

B. Install top of cabinet 6 feet above floor unless otherwise shown.

C. Provide typewritten circuit directory for each panelboard.

3.11 SUPPORT AND FRAMING CHANNEL

A. Furnish zinc-rich primer; paint cut ends prior to installation, where applicable.

B. Install where required for mounting and supporting electrical equipment and raceway systems.

END OF SECTION

SECTION 16110

RACEWAYS

PART 1 - GENERAL

1.01 REFERENCES

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

1. American Association of State Highway and Transportation Officials (AASHTO): Division I, Standard Specifications for Highway Bridges, Fourteenth Edition.

2. American National Standards Institute (ANSI):
   a. C80.1, Rigid Steel Conduit-Zinc Coated.
   b. C80.3, Electrical Metallic Tubing-Zinc Coated.
   c. CS0.5, Rigid Aluminum Conduit.
   d. C80.6, Intermediate Metal Conduit (IMC)-Zinc Coated.

3. American Society for Testing and Materials (ASTM):
   a. A123 El, Standard Specification for Zinc-Coated (Galvanized) Coatings on Iron and Steel Products.
   b. C857, Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures.

4. National Electrical Contractor's Association, Inc. (NECA): 5055, Standard of Installation.

5. National Electrical Manufacturers Association (NEMA):
   a. RN 1, Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
   b. TC 2, Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80).
   c. TC 3, PVC Fittings for Use with Rigid PVC Conduit and Tubing.
   d. TC 6, PVC and ABS Plastic Utilities Duct for Underground Installation.
   e. VE 1, Metallic Cable Tray Systems.

6. National Fire Protection Association (NFPA): 70, National Electrical Code. (NEC)

7. Underwriters Laboratories, Inc. (UL):
   a. 1, Standard for Safety Flexible Metal Conduit.
   b. 6, Standard for Safety Rigid Metal Conduit.
   c. 360, Standard for Safety Liquid-Tight Flexible Steel Conduit.
   d. 514B, Standard for Safety Fittings for Conduit and Outlet Boxes.
   e. 514C, Standard for Safety Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers.
   f. 651, Standard for Safety Schedule 40 and 80 PVC Conduit.
   g. 651A, Standard for Safety Type EB and Rigid PVC Conduit and HDPF Conduit.
   h. 797, Standard for Safety Electrical Metallic Tubing.

i. 870, Standard for Safety Wireways, Auxiliary Gutters, and Associated Fittings.
j. 1242, Standard for Safety Intermediate Metal Conduit.
k. 1660, Standard for Safety Liquid-Tight Flexible Nonmetallic Conduit.

1.02 SUBMITTALS

A. Shop Drawings:

1. Manufacturer's Literature:
a. PVC Schedule 40 conduit.
b. Rigid Aluminum conduit.
c. Flexible metal, liquid-tight conduit.
d. Flexible, nonmetallic, liquid-tight conduit.
e. Conduit fittings.
f. Wireways.

1.03 UL COMPLIANCE

A. Materials manufactured within scope of Underwriters Laboratories shall conform to UL Standards and have an applied UL listing mark.

PART2 - PRODUCTS

2.01 CONDUIT AND TUBING

A. PVC Schedule 40 and 80 Conduit:

1. Meet requirements of NEMA TC 2 and UL 651.

2. UL listed for concrete encasement, underground direct burial, concealed or direct sunlight exposure, and 90 degrees C insulated conductors.

3. Have smooth Interior and grey color.

B. Rigid Aluminum Conduit

1. Meets requirements of UL 514B

2. Type: Threaded, copper-free. Set screw fittings not permitted.

C. Flexible Metal, Liquid-Tight Conduit:

1. UL 360 listed for 105 degrees C insulated conductors.

2. Material: Galvanized steel, with an extruded PVC jacket.

D. Flexible, Nonmetallic, Liquid-Tight Conduit:

1. Material: PVC core with fused flexible PVC jacket.

2. UL 1660 listed for:
   a. Dry Conditions: 80 degrees C insulated conductors.
   b. Wet Conditions: 60 degrees C insulated conductors.

3. Manufacturers:
   a. Carlon; Carflex or X-Flex.
   b. T & B; Xtraflex LTC or EFC.

2.02 FITTINGS

A. PVC Conduit and Tubing:

1. Meet requirements of NEMA TC-3.

2. Type: PVC, slip-on.

B. Rigid Aluminum Conduit:

1. General:
   a. Meet requirements of UL 514B.
   b. Type: Threaded, galvanized. Set screw fittings not permitted.

2. Bushing:
   a. Material: Cast Aluminum with integral insulated throat, rated for 150 degrees C.
   b. Manufacturers:
      1) O.Z./Gedney; Type AB.

3. Grounding Bushing:
   a. Material: Cast Aluminum with integral insulated throat rated for 150 degrees C, with solderless lugs.
   b. Manufacturers:
      1) Appleton; Series GIB.
      2) O.Z. Gedney; Type ABLG.

3. Conduit Hub:
   a. Material: Cast Aluminum with insulated throat.
   b. Manufacturers:
      1) O.Z. Gedney; Series CHA.
      2) T & B; Series 370AL.

5. Conduit Bodies:
   a. Material: Cast Aluminum, sized as required by NFPA 70.
   b. Manufacturers:
      1) Appleton; Form 85 threaded Unilets.
      2) Crouse-Hinds; Mark 9 or Form 7-SA threaded condulets.
      3) Killark; Series O Electrolets.

6. Couplings: As supplied by conduit manufacturer.

7. Conduit Sealing Fitting Manufacturers:
   a. Appleton; Type EYF-AL or EYM-AL.
   b. Crouse-Hinds; Type EYS-SA or EZS-SA.
   c. Killark; Type EY or EYS.

8. Drain Seal Manufacturers:
   a. Appleton; Type EYDM-A.
   b. Crouse-Hinds; Type EYD-SA or EZD-SA.

9. Drain/Breather Fitting Manufacturers:
   a. Appleton; Type ECDB.
   b. Crouse-Hinds; ECD.

10. Expansion Fitting Manufacturers:
   a. Deflection/Expansion Movement:
      1) Steel City; Type DF-A
   b. Expansion Movement Only:
      1) Steel City; Type AF-A

11. Cable Sealing Fittings:
   a. To form watertight non-slip cord or cable connection to conduit.
   b. For Conductors with OD of 1/2 Inch or Less: Neoprene bushing at connector entry.
   c. Manufacturers:
      2) Appleton; CG-S.

C. Flexible Metal, Liquid-Tight Conduit:

1. Metal insulated throat connectors with integral nylon or plastic bushing rated for 105 degrees Celsius.

2. Insulated throat and sealing O-rings.

3. Long design type extending outside of box or other device at least 2 inches.

4. Manufacturer: T & B; Series 5300.

D. Flexible, Nonmetallic, Liquid-Tight Conduit: Meet requirements of UL 514B.

1. Type: One-piece fitting body, complete with lock nut, O-ring, threaded ferrule, sealing ring, and compression nut.

2. Manufacturers:
   a. Carlon; Type LT.
   b. Kellems; Polytuff.
   c. T & B; LT Series.

E. Watertight Entrance Seal Device:

1. New Construction:

a. Material: Oversized sleeve, malleable iron body with sealing ring, pressure ring, grommet seal, and pressure clamp.
b. Manufacturer: O.Z./Gedney; Type FSK or WSK, as required.

2. Gored-Hole Application:
a. Material: Assembled dual pressure disks, neoprene sealing ring, and membrane clamp.
b. Manufacturer: O.Z./Gedney; Series CSM.

F. Hazardous Locations: Approved for use in the atmosphere involved.

1. Manufacturer: Crouse-Hinds; Type ECGJH.

2.03 WIREWAYS

A. Meet requirements of UL 870.

B. Type: Steel-enclosed, with removable, hinged cover.

C. Rating: Outdoor raintight if outdoor, and indoor if indoor.

D. Finish: Gray, baked enamel.

E. Manufacturers:

1. Square D.

2. B-Line Systems, Inc.

2.04 ACCESSORIES

A. Identification Devices:

1. Raceway Tags:
a. Material: Permanent, nylon.
b. Shape: Round.
c. Raceway Designation: Pressure stamped, embossed, or engraved.
d. Tags relying on adhesives or taped-on markers not permitted.

2. Warning Tape:
a. Material: Polyethylene, 4-mil gauge.
b. Color: Red.
c. Width: Minimum 6-inch.
d. Designation: Warning on tape that electric circuit is located below tape.
e. Manufacturers:
1) Blackburn, Type RT.
2) Griffolyn Co.

3. Buried Raceway Marker:

a. Material: Sheet bronze, consisting of double-ended arrows, straight for straight runs and bent at locations where runs change direction.
b. Designation: Incise to depth of 3/32 inch, ELECTRIC CABLES. in letters 1/4-inch high.
c. Minimum Dimension: 1/4-inch thick, 10 inches long, and 3/4-inch wide.

B. Raceway Coating:

1. Material: Bitumastic or plastic tape coating.

2. Manufacturers:
a. Koppers bitumastic; No. 505.
b. Scotchwrap; No. 51, plastic tape.

C. Wraparound Duct Band:

1. Material: Heat-shrinkable, cross-linked polyolefin, precoated with hot-melt adhesive.

2. Manufacturer: Raychem; Type TWDB.

PART 3 - EXECUTION

3.01 GENERAL

A. Conduit and Tubing sizes shown are based on the use of copper conductors.

B. All installed Work shall comply with NECA 5055.

C. Crushed or deformed raceways not permitted.

D. Maintain raceway entirely free of obstructions and moisture.

E. Immediately after installation, plug or cap raceway ends with watertight and dust-tight seals until time for pulling in conductors.

F. Aluminum Conduit: Do not install in direct contact with concrete.

G. Sealing Fittings: Provide drain seal in vertical raceways where condensate may collect above sealing fitting.

H. Avoid moisture traps where possible. When unavoidable in exposed conduit runs, provide junction box and drain fitting at conduit low point.

I. Group raceways installed in same area.

J. Proximity to Heated Piping: Install raceways minimum 12 inches from parallel runs.

K. Follow structural surface contours when installing exposed raceways. Avoid obstruction of passageways.

L. Run exposed raceways parallel or perpendicular to walls, structural members, or intersections of vertical planes.

M. Block Walls: Do not install raceways in same horizontal course with reinforcing steel.

N. Install watertight fittings in outdoor, underground, or wet locations.

O. Paint threads, before assembly of fittings, of galvanized conduit with zinc-rich paint or liquid galvanizing compound.

P. All metal conduit to be reamed, burrs removed, and cleaned before installation of conductors, wires, or cables.

Q. Do not install raceways in concrete equipment pads, foundations, or beams.

R. Horizontal raceways installed under floor slabs shall lie completely under slab, with no part embedded within slab.

S. Install concealed, embedded, and buried raceways so that they emerge at right angles to surface and have no curved portion exposed.

3.02 INSTALLATION IN CAST-IN-PLACE STRUCTURAL CONCRETE

A. Minimum cover 1-1/2 inches, unless otherwise noted.

B. Provide support during placement of concrete to ensure raceways remain in position.

C. Floor Slabs:

1. Outside diameter of conduit not to exceed one-third of the slab thickness.

2. Separate conduit by minimum six times conduit outside diameter, except at crossings.

3.03 CONDUIT APPLICATION

A. Diameter: Minimum 3/4 inch.

B. Exterior, Exposed:

1. Rigid Aluminum Conduit all other areas.

C. Interior, Exposed:

1. Rigid Aluminum Conduit all other areas.

D. Direct Earth Burial: – Schedule 40 PVC

E. Direct Buried With Concrete Slab On Top – PVC Schedule 40.

F. Concrete-Encased Raceways – Schedule 40 PVC

G. Under Slabs-On-Grade – Schedule 40 PVC

3.05 CONNECTIONS

A. For motors, wall or ceiling mounted fans and unit heaters, dry type transformers, electrically operated valves, instrumentation, and other equipment where flexible connection is required to minimize vibration:

1. Conduit Size 4 Inches or Less: Flexible metal, liquid-tight conduit.

2. Conduit Size Over 4 Inches: Nonflexible.

3. Corrosive Areas: Flexible, nonmetallic, liquid or PVC-coated metallic, liquid-tight.

4. Length: 18-inch minimum, 60-inch maximum, of sufficient length to allow movement or adjustment of equipment.

B. Lighting Fixtures in Dry Areas: Flexible metal, liquid-tight conduit.

C. Outdoor Areas, Process Areas Exposed to Moisture, and Areas Required to be Oiltight and Dust-Tight: Flexible metal, liquid-tight conduit.

D. Transition from Underground or Concrete Embedded to Exposed: Rigid Aluminum Conduit.

E. Under Equipment Mounting Pads – Schedule 40 PVC

F. Exterior Light Pole Foundations – Schedule 40 PVC

3.06 PENETRATIONS

A. Make at right angles, unless otherwise shown.

B. Notching or penetration of structural members, including footings and beams, not permitted.

C. Fire-Rated Walls, Floors, or Ceilings: Fire-stop openings around penetrations to maintain fire-resistance rating.

D. Apply single layer of wraparound duct band to all metallic conduit in contact with concrete floor slabs to a point 2 inches above concrete surface.

E. Concrete Walls, Floors, or Ceilings (Aboveground): Provide nonshrink grout dry-pack, or use watertight seal device.

F. Entering Structures:

1. General: Seal raceway at the first box or outlet with minimum 2 inches thick expandable plastic compound to prevent the entrance of gases or liquids from one area to another.

2. Concrete Roof or Membrane Waterproofed Wall or Floor:

    a. Provide a watertight seal.
    b. Without Concrete Encasement: Install watertight entrance seal device on each side.
    c. With Concrete Encasement: Install watertight entrance seal device on the accessible side.
    d. Securely anchor malleable iron body of watertight entrance seal device into construction with one or more integral flanges.
    e. Secure membrane waterproofing to watertight entrance seal device in a permanent, watertight manner.

3. Heating, Ventilating, and Air Conditioning Equipment:

    a. Penetrate equipment in area established by manufacturer.
    b. Terminate conduit with flexible metal conduit at junction box or condulet attached to exterior surface of equipment prior to penetrating equipment.
    c. Seal penetration with silicone type sealant as specified.

4. Corrosive-Sensitive Areas:

    a. Seal all conduit passing through chlorine and ammonia room walls.
    b. Seal all conduit entering equipment panel boards and field panels containing electronic equipment.
    c. Seal penetration with silicone type sealant as specified.

5. Existing or Precast Wall (Underground): Core drill wall and install a watertight entrance seal device.

6. Nonwaterproofed Wall or Floor (Underground, without Concrete Encasement):

    a. Provide Schedule 40 galvanized pipe sleeve, or watertight entrance seal device.
    b. Fill space between raceway and sleeve with an expandable plastic compound on each side.

7. Manholes and Handholes:

    a. Metallic Raceways: Provide insulated grounding bushings.
    b. Nonmetallic Raceways: Provide bell ends flush with wall.
    c. Install such that raceways enter as near as possible to one end of wall, unless otherwise shown.

3.07 SUPPORT

A. Support from structural members only, at intervals not exceeding NFPA 70 requirements, and in any case not exceeding 10 feet. Do not support from piping, pipe supports, or other raceways.

B. Multiple Adjacent Raceways: Provide ceiling trapeze. For trapeze-supported conduit, allow 40 percent extra space for future conduit.

C. Provide and attach wall brackets, strap hangers, or ceiling trapeze as follows:

1. Wood: Wood screws.

2. Hollow Masonry Units: Toggle bolts.

3. Concrete or Brick: Expansion shields, or threaded studs driven in by powder charge, with lock washers and nuts.

4. Steelwork: Machine screws.

D. Nails or wooden plugs inserted in concrete or masonry for attaching raceway not permitted. Do not weld raceways or pipe straps to steel structures. Do not use wire in lieu of straps or hangers.

3.08 BENDS

A. Install concealed raceways with a minimum of bends in the shortest practical distance.

B. Make bends and offsets of longest practical radius.

C. Install with symmetrical bends or cast metal fittings.

D. Avoid field-made bends and offsets, but where necessary, make with acceptable hickey or bending machine. Do not heat metal raceways to facilitate bending.

E. Make bends in parallel or banked runs from same center or centerline with same radius so that bends are parallel.

F. Factory elbows may be installed in parallel or banked raceways if there is change in plane of run, and raceways are same size.

G. PVC Conduit:

1. Bends 30-Degree and Larger: Provide factory-made elbows.

2. 90-Degree Bends: Provide rigid aluminum elbows.

3. Use manufacturer's recommended method for forming smaller bends.

H. Flexible Conduit: Do not make bends that exceed allowable conductor bending radius of cable to be installed or that significantly restricts conduit flexibility.

3.09 EXPANSION/DEFLECTION FITTINGS

A. Provide on all raceways at all structural expansion joints, and in long tangential runs.

B. Provide expansion/deflection joints for 50 degrees Fahrenheit maximum temperature variation.

C. Install in accordance with manufacturer's instructions.

3.10 PVC CONDUIT

A. Solvent Welding:

1. Provide manufacturer recommended solvent; apply to all joints.

2. Install such that joint is watertight.

B. Adapters:

1. PVC to Metallic Fittings: PVC terminal type.

2. PVC to Rigid Metal Conduit or IMC: PVC female adapter.

C. Belied-End Conduit: Bevel the unbelled end of the joint prior to joining.

3.11 PVC-COATED RIGID STEEL CONDUIT: Not Used

3.12 WIREWAYS

A. Install in accordance with manufacturer's instructions.

B. Locate with cover on accessible vertical face of wireway, unless otherwise shown.

3.13 TERMINATION AT ENCLOSURES

A. Cast Metal Enclosure: Provide manufacturer's premolded insulating sleeve inside metallic conduit terminating in threaded hubs.

B. Sheet Metal Boxes, Cabinets, and Enclosures:

1. Flexible Metal Conduit: Provide two screw type, insulated, malleable iron connectors.

2. Flexible, Nonmetallic Conduit: Provide nonmetallic, liquid-tight strain relief connectors.

3. Rigid Aluminum Conduit:

a. Provide one lock nut each on inside and outside of enclosure.
b. Install grounding bushing.

c. Provide bonding jumper from grounding bushing to equipment ground bus or ground pad; if neither ground bus nor pad exists, connect jumper to lag bolt attached to metal enclosure.
d. Install insulated bushing on ends of conduit where grounding is not required.
e. Provide insulated throat when conduit terminates in sheet metal boxes having threaded hubs.

4. PVC Schedule 40 Conduit: Provide PVC terminal adapter with lock nut.

C. Motor Control Center, Switchboard, Switchgear, and Free-Standing Enclosures: Terminate conduit entering bottom with grounding bushing; provide a grounding jumper extending to equipment ground bus or grounding pad.

3.15 UNDERGROUND RACEWAYS

A. Grade: Maintain minimum grade of 4 inches in 100 feet, either from one manhole, handhole, or pull box to the next, or from a high point between them, depending on surface contour.

B. Cover: Maintain minimum 2-foot cover above conduit and concrete encasement, unless otherwise shown.

C. Make routing changes as necessary to avoid obstructions or conflicts.

D. Couplings: In multiple conduit runs, stagger so that couplings in adjacent runs are not in same transverse line.

E. Union type fittings not permitted.

F. Spacers:

1. Provide preformed, nonmetallic spacers, designed for such purpose, to secure and separate parallel conduit runs in a trench or concrete encasement.

2. Install at intervals not greater than that specified in NFPA 70 for support of the type conduit used, but in no case greater than 10 feet.

G. Support conduit so as to prevent bending or displacement during backfilling or concrete placement.

H. Installation with Other Piping Systems:

1. Crossings: Maintain minimum 12-inch vertical separation.

2. Parallel Runs: Maintain minimum 12-inch separation.

3. Installation over valves or couplings not permitted.

I. Metallic Raceway Coating: At couplings and joints and along entire length, apply wraparound duct band with one-half tape width overlap to obtain two complete layers.

J. Concrete Encasement:

1. Concrete Color: Gray, dust top of concrete ductbank with powdered red concrete dye before concrete sets and trowel dry onto top of ductbank.

K. Backfill:

1. As specified in Civil Section.

2. Do not backfill until inspected by Engineer.

3.16 EMPTY RACEWAYS

A. Provide permanent, removable cap over each end.

B. Provide PVC plug with pull tab for underground raceways with end bells.

C. Provide nylon pull cord.

D. Identify, as specified in Paragraph IDENTIFICATION DEVICES, with waterproof tags attached to pull cord at each end, and at intermediate pull point.

3.17 IDENTIFICATION DEVICES

A. Raceway Tags:

1. Identify origin and destination.

2. Install at each terminus, near midpoint, and at minimum intervals of every 50 feet of exposed Raceway, whether in ceiling space or surface mounted.

3. Provide nylon strap for attachment.

B. Warning Tape: Install approximately 12 inches above underground or concrete-encased raceways. Align parallel to, and within 12 inches of, centerline of runs.

C. Buried Raceway Markers:

1. Install at grade to indicate direction of underground raceways.

2. Install at all bends and at intervals not exceeding 100 feet in straight runs.

3. Embed and secure to top of concrete base, sized 14 inches long, 6 inches wide, and 8 inches deep; top set flush with finished grade.

3.18 PROTECTION OF INSTALLED WORK

A. Protect products from effects of moisture, corrosion, and physical damage during construction.

B. Provide and maintain manufactured watertight and dust-tight seals over all conduit openings during construction.

C. Touch up painted conduit threads after assembly to cover nicks or scars.

D. Touch up damage to coating on PVC-coated conduit with patching compound approved by manufacturer.

END OF SECTION

SECTION 16120

CONDUCTORS

PART 1 - GENERAL

1.01 REFERENCES

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

1. American National Standards Institute (ANSI): 386, Standard for Separable Insulated Connector Systems for Power Distribution Systems above 600V.

2. American Society for Testing and Materials (ASTM):

   a. A167, Standard Specification for Stainless and Heat Resisting Chromium-Nickel-P1ated Steel Plate, Sheet, and Strip.

   b. B3, Standard Specification for Soft or Annealed Copper Wire.

   c. B8, Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft.

   d. B263, Standard Test Method for Determination of Cross- Sectional Area of Stranded Conductors.

3. Association of Edison Illuminating Companies (AEIC):

   a. CS 5, Cross-linked Polyethylene Insulated Shielded Power Cables Rated 5 Through 35 kV.

   b. CS 6, Ethylene- Propylene-Rubber-Insulated Shielded Power Cables Rated 5 Through 69 kV.

4. Insulated Cable Engineer's Association, Inc. (ICEA): T-29-250, Procedure for Conducting Vertical Cable Tray Flame Test with a Theoretical Heat Input of 210,000 Btu/hour.

5. Institute of Electrical and Electronics Engineers, Inc. (IEEE):

   a. 48, Standard Test Procedures and Requirements or High-Voltage Alternating Current Cable Terminations.

   b. 404, Standard for Cable Joints for Use with Extruded Dielectric Cable Rated 5,000V through 46,000V and Cable Joints for Use with Laminated Dielectric Cable Rated 2,500V through 500,000V.

6. National Electrical Contractors Association, Inc. (NECA): 5055, Standard of Installation.

7. National Electrical Manufacturers' Association (NEMA):

   a. CC 1, Electric Power Connectors for Substations.

b. WC 3, Rubber-insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

c. WC 5, Thermoplastic Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

d. WC 7, Crosslinked-Thermosetting-Polyethylene-insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

e. WC 8, Ethylene-Propylene-Rubber Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

f. WC 55, Instrumentation Cables and Thermocouple Wire.

8. National Fire Protection Association (NFPA): 70, National Electrical Code (NEC).

9. Underwriters Laboratories, Inc. (UL):

a. 13, Standard for Safety Power-Limited Circuit Cables.

b. 44, Standard for Safety Rubber-Insulated Wires and Cables.

c. 62, Standard for Safety Flexible Cord and Fixture Wire.

d. 486A, Standard for Safety Wire Connector and Soldering Lugs for Use with Copper Conductors.

e. 486B, Standard for Safety Wire Connectors and Soldering Lugs for Use with Aluminum Conductors.

f. 510, Standard for Safety Insulating Tape.

g. 854, Standard for Safety Service-Entrance Cables.

h. 910, Standard for Safety Test Method for Fire and Smoke Characteristics of Electrical and Optical-Fiber Cables Used in Air Handling Spaces.

i. 1072, Standard for Safety Medium-Voltage Power Cables.

j. 1277, Standard for Safety Electrical Power and Control Tray Cables with Optional Optical-Fiber Members.

k. 1581, Standard for Safety Reference Standard for Electrical Wires, Cables, and Flexible Cords.

1.02 SUBMITTALS

A. Shop Drawings:

1. Wire and cable descriptive product information.

2. Wire and cable accessories descriptive product information.

B. Quality Control Submittals:

1. Certified Factory Test Report for conductors 600 volts and below.

2. Certified Factory Test Report per AEIC CS6, including AEIC qualification report for conductors above 600 volts.

1.03 UL COMPLIANCE

A. Materials manufactured within scope of Underwriters Laboratories shall conform to UL Standards and have an applied UL listing mark.

PART 2 - PRODUCTS

2.01 CONDUCTORS 600 VOLTS AND BELOW

A. Conform to applicable requirements of NEMA WC 3, WC 5, and WC 7.

B. Conductor Type:

1. 120- and 277-Volt Lighting, No. 10 AWG and Smaller: Stranded copper.

2. 120-Volt Receptacle Circuits, No. 10 AWG and Smaller: Stranded copper.

3. All Other Circuits: Stranded copper.

C. Insulation: Type THHN/THWN for No.6 AWG and smaller. XHHW for No.4 AWG and larger or installations in wet location.

D. Direct Burial and Aerial Conductors and Cables:

1. Type USE/RHH/RHW insulation, UL 54 listed, Type RHW-2/USE-2.

2. Conform to physical and minimum thickness requirements of NEMA WC3.

E. Flexible Cords and Cables:

1. Type SOW-A50 with ethylene propylene rubber insulation in accordance with UL 62.

2. Conform to physical and minimum thickness requirements of NEMA WC 8.

F. Cable Tray Conductors and Cables: Type TC.

2.02 600-VOLT RATED CABLE

A. General:

1. Type: TC, meeting requirements of UL 1277, including Vertical Tray Flame Test at 20,000 Btu/hr, and NFPA 70, Article 340, or UL 13 Listed Power Limited Circuit Cable meeting requirements of NFPA 70, Article 725.

2. Permanently and legibly marked with manufacturer's name, maximum working voltage for which cable was tested, type of cable, and UL listing mark.

3. Suitable for installation in open air, in cable trays, or conduit.

4. Minimum Temperature Rating: 90 degrees C dry locations, 75 degrees C wet locations.

5. Overall Outer Jacket: PVC, flame-retardant, sunlight- and oil-resistant.

B. Wire and Connectors:

1. Cable shall be rated for 600 volts and shall meet the requirements below:

a. Conductors shall be stranded

b. All wire shall be brought to the job in unbroken packages and shall bear the data of manufacturing; not older than 12 months.

c. Type of wire shall be XHHW or THWN, rated 75 degrees C suitable for wet locations except where required otherwise by the drawings.

d. No wire smaller than No. 12 gauge shall be used unless specifically indicated.

e. Conductor metal shall be copper.

f. All conductors shall be megger tested after installation and insulation must be in compliance with the Insulated Power Cable Engineers Association Minimum Values of Insulation Resistance.

C. Type l-Multiconductor Control Cable:

1. Conductors:

a. No. 14 AWG, seven-strand copper.

b. Insulation: 15-mil PVC with 4-mil nylon.

c. UL 1581 listed as Type THHN/THWN rated VW-I.

d. Conductor group bound with spiral wrap of barrier tape.

e. Color Code: Provide in accordance with NEMA WC 5, Method 1, and Sequence K-2.

2. Cable: Passes the ICEA T-29-520 210,000 Btu/hr Vertical Tray Flame Test.

3. Cable Sizes:

No. of Conductors	Max. Outside Diameter (inches)	Jacket Thickness (mils)
3	0.41	45
5	0.48	45
7	0.52	45

12	0.72	60
19	00.83	60
25	1.00	60
37	1.15	80

4. Manufacturers:

   a. Okonite Co.

   b. Rome Cable.

   c. Southwire.

D. Type 2-Multiconductor Power Cable:

1. Conductors:

   a. Class B stranded, coated copper.

   b. Insulation: Chemically crosslinked ethylene-propylene with Hypalon jacket.

   c. UL 1581 listed as Type EPR, rated VW-1.

   d. Color Code: Conductors, size No. 8 AWG and smaller, colored conductors, NEMA WC5 Method 1, color 5 per Article POWER CONDUCTOR COLOR CODING. Conductors, size No. 6 AWG and larger, NEMA WC5, Method 4.

2. Cable pass the ICEA T-29-520 210,000 Btu/hr Vertical Tray Flame Test.

3. Cable Sizes:

Conductor Size	Minimum Ground Wire Size	No. of Conductors	Max. Outside Diameter (Inches)	Nominal Jacket Thickness (Mils)
12	12	2 3 4	0.42 0.45 0.49	45 45 45
10	10	2 3 4	0.54 0.58 0.63	60 60 60
8	10	3 4	0.66 0.72	60
6	8	3 4	0.74 0.81	60
4	6	3 4	0.88 0.97	60 80
2	6	3	1.01	80

		4	1.11	
1/0	6	3 4	1.22 1.35	80
2/0	4	3 4	1.32 1.46	80
4/0	4	3 4	1.56 1.78	80

4. Manufacturers:

   a. Okonite Co.

   b. Rome Cable.

   c. Southwire

E. Type B-No. 16 AWG, Twisted, Shielded Pair, Instrumentation Cable: Single pair, designed for noise rejection for process control, computer, or data log applications meeting NEMA WC 55 requirements.

1. Outer Jacket: 45-mil nominal thickness.

2. Individual Pair Shield: 1.35-mil, double-faced aluminum/synthetic polymer overlapped to provide 100 percent coverage.

3. Dimension: 0.31-inch nominal OD.

4. Conductors:

   a. Bare soft annealed copper, Class B, seven-strand concentric, meeting requirements of ASTM B8

   b. 20 AWG, seven-strand tinned copper drain wire.

   c. Insulation: 15-mil nominal PVC.

   d. Jacket: 4-mil nominal nylon.

   e. Color Code: Pair conductors black and red.

5. Manufacturers:

   a. Okonite Co.

   b. Rome Wire Corp.

   c. Belden.

F. Type B1-No. 16 AWG, Twisted, Shielded Triad Instrumentation Cable: Single triad, designed for noise rejection for process control, computer, or data log applications meeting NEMA WC 55 requirements.

1. Outer Jacket: 45-mil nominal.

2. Individual Pair Shield: 1.35-mil, double-faced aluminum/synthetic polymer, overlapped to provide 100 percent coverage.

3. Dimension: 0.32-inch nominal OD.

4. Conductors:

   a. Bare soft annealed copper, Class B, seven-strand concentric, meeting requirements of ASTM B8.

   b. 20 AWG, seven-strand, tinned copper drain wire.

   c. Insulation: 15-mil nominal PVC.

   d. Jacket: 4-mil nylon.

   e. Color Code: Triad conductors black, red, and blue.

5. Manufacturers:

   a. Okonite Co.

   b. Rome Wire Corp.

   c. Belden.

G. Type B2-No. 18 AWG, Multi-Twisted, Shielded Pairs with a Common, Overall Shield Instrumentation Cable: Designed for use as instrumentation, process control, and computer cable, meeting NEMA WC 55 requirements.

1. Conductors:

   a. Bare soft annealed copper, Class B, seven-strand concentric, in accordance with ASTM B8

   b. Tinned copper drain wires.

   c. Pair drain wire size AWG 20, group drain wire size AWG 18.

   d. Insulation: 15-mil PVC.

   e. Jacket: 4-mil nylon.

   f. Color Code: Pair conductors black and red with red conductor numerically printed for group identification.

g. Individual Pair Shield: 1.35-mil, double-faced aluminum/synthetic polymer.

2. Cable Shield: 2.35-mil, double-faced aluminum/synthetic polymer, overlapped for 100 percent coverage.

3. Cable Sizes:

Number of Pairs	Maximum Outside Diameter (inches)	Nominal Jacket Thickness (mils)
4	0.50	45
8	0.68	60
12	0.82	60
16	0.95	80
24	1.16	80
36	1.33	80
50	1.56	80

4. Manufacturers:

a. Okonite Co.

b. Rome Wire Corp.

c. Belden.

H. Type B3-No. 18 AWG, Multi-twisted Pairs with a Common Overall Shield Instrumentation Cable: Designed for use as instrumentation, process control, and computer cable meeting NEMA WC 55.

1. Conductors:

a. Bare soft annealed copper, Class B, seven-strand concentric, in accordance with ASTM B8.

b. Tinned copper drain wire size 18 AWG

c. Insulation: 15-mil nominal PVC.

d. Jacket: 4-mil nylon.

e. Color Code: Pair conductors black and red, with red conductor numerically printed for group identification.

2. Cable Shield: 2.35-mil, double-faced aluminum/synthetic polymer, overlapped for 100 percent coverage.

3. Cable Sizes:

Number Of Pairs	Maximum Outside Diameter (inches)	Nominal Jacket Thickness (mils)
4	0.46	45
8	0.63	60
12	0.75	60
16	0.83	60
24	1.06	80
36	1.21	80
50	1.42	80

4. Manufacturers:

   a. Okonite Co.

   b. Rome Wire Corp.

   c. Belden.

I. Ethernet Cat. 6e UTP Cable (Copper):

1. Section applies to all Ethernet Cable (Copper) except for Fiber Optic cable.

2. Conductor Physical Characteristics: 4 twisted pairs (8 conductors), 23 AWG solid bare Copper with Polyolefin Insulation. Overall Nominal Diameter: 0.235 inch. Operating Temperature Range: -20'C to +75'C. Model Number – 7881A, Belden Inc. Provide green color to match the City's standard Ethernet Cables.

3. NEC/UL specification CMR, UL444, UL verified category 6.

4. Manufacturer:

   a. Belden Inc.

   b. Or approved equal.

J. Variable Frequency Drive (VFD) Output Power Cable:

1. Section applies to power cables routed between the output of VFD's and motor terminals.

2. Cable shall be rated for 600 volts type MC and shall meet the requirements below:

   a. Conductors shall be stranded copper.

   b. All wire shall be brought to the job in unbroken packages and shall bear the data of manufacturing; not older than 12 months.

c. Type of wire shall be XHHW or RHW rated 75 degrees C suitable for wet locations.

d. No wire smaller than No. 12 gauge shall be used unless specifically indicated.

e. Cable construction shall consist of three insulated current-carrying phase conductors and three bare ground conductors, symmetrically placed between the phase conductors, and twisted beneath a continuous aluminum armor and overall polymeric jacket.

f. Armor must be continuous corrugated aluminum armor (CCA) manufacture. Aluminum interlocked armor (AIA) construction is not acceptable.

3. Each ground conductor size (circular mil area) shall be one-third (1/3) of the NEC required size (circular mil area) for a single ground conductor. If one third of the required circular mil area does not correspond to a standard size (circular mil area) of construction, the next largest size of standard construction shall be used. All conductors shall be megger tested after installation and insulation must be in compliance with the Insulated Power Cable Engineers Association Minimum Values of Insulation Resistance.

4. Manufacturers:
   a. Southwire – ARMOR-X.
   b. General Cable.
   c. Approved Equal.

2.03 GROUNDING CONDUCTORS

A. Equipment: Stranded copper with green, Type USE/RHH/RHW-XLPE or THHN/THWN, insulation.

B. Direct Buried: Bare stranded copper.

2.04 ACCESSORIES FOR CONDUCTORS 600 VOLTS AND BELOW

A. Tape:

1. General Purpose, Flame Retardant: 7-mil, vinyl plastic, Scotch Brand 33, rated for 90 degrees C minimum, meeting requirements of UL 510.

2. Flame Retardant, Cold and Weather Resistant: 8.5-mil, vinyl plastic, Scotch Brand 88.

3. Arcs and Fireproofing:

a. 30-mil, elastomer

b. Manufacturers and Products:

1) Scotch; Brand 77, with Scotch Brand 69 glass cloth tape binder.

2) Plytnount; Plyarc 30, with Plymount Plyglas glass cloth tape binder.

B. Identification Devices:

1. Sleeve: Permanent, PVC, yellow or white, with legible machine-printed black markings.

2. Marker Plate: Nylon, with legible designations permanently hot stamped on plate.

3. Grounding Conductor: Permanent green heat-shrink sleeve, 2-inch minimum.

4. Each signal, control, alarm, and indicating circuit conductor connected to a given electrical point shall be designated by a single unique number which shall be shown on all Shop Drawings. These numbers shall be marked on all conductors at every terminal using permanently marked heat-shrink plastic. Instrument signal circuit conductors shall be tagged with unique multiple digit numbers. Black and white wires from the circuit breaker panelboard shall be tagged including the one (1) or two (2) digit number of the branch circuit breaker.

C. Connectors and Terminations:

1. Nylon, Self-Insulated Crimp Connectors:

a. Manufacturers and Products:

1) Thomas & Betts; Sta-Kon.

2) Burndy; Insulink.

3) ILSCO.

2. Nylon, Self-Insulated, Crimp Locking-Fork, Torque-Type Terminator:

a. Manufacturers and Products:

1) Thomas & Betts; Sta-Kon.

2) Burndy; Insulink.

3) ILSCO.

D. Cable Lugs:

1. In accordance with NEMA CC I.

2. Rated 600 volts of same material as conductor metal.

3. Insulated, Locking-Fork, Compression Lugs:

a. Manufacturers and Products:

1) Thomas & Betts; Sta-Kon.

2) ILSCO; ILSCONS.

4. Un-insulated Crimp Connectors and Terminators:

a. Manufacturers and Products:

1) Square D; Versitide.

2) Thomas & Betts; Color-Keyed.

3) ILSCO.

5. Un-insulated, Bolted, Two-Way Connectors and Terminators:

a. Manufacturers and Products:

1) Thomas & Betts; Locktite.

2) Burndy; Quiklug.

3) ILSCO.

E. Cable Ties: Nylon, adjustable, self-locking, and reusable.

1. Manufacturers and Product: Thomas & Betts; TY-RAP.

F. Heat Shrinkable Insulation: Thermally stabilized, cross-linked polyofin.

1. Manufacturers and Product: Thomas & Betts; SHRINK-KON.

2.05 PULLING COMPOUND

A. Nontoxic, non-corrosive, noncombustible, nonflammable, wax-based lubricant; UL listed.

B. Suitable for rubber, neoprene, PVC, polyethylene, hypalon, CPE, and lead-covered wire and cable.

C. Suitable for zinc-coated steel, aluminum, PVC, bituminized fiber, and fiberglass raceways.

D. Manufacturers and Products:

1. Ideal Co.; Yellow 77.

2. Polywater, Inc.

3. Cable Grip Co.

2.06 WARNING TAPE

A. As specified in Section 16110, RACEWAYS.

2.07 SOURCE QUALITY CONTROL

A. Conductors 600-Volts and Below: Test in accordance with UL 44 and 854 Standards.

PART 3 - EXECUTION

3.01 GENERAL

A. Conductor installation to be in accordance with NECA 5055.

B. Conductor and cable sizing shown is based on copper conductors, unless noted otherwise.

C. Do not exceed cable manufacturer's recommendations for maximum pulling tensions and minimum bending radii.

D. Tighten screws and terminal bolts in accordance with UL 486A for copper conductors.

E. Cable Lugs: Provide with correct number of holes, bolt size, and center-to-center spacing as required by equipment terminals.

F. Bundling: Where single conductors and cables in manholes, hand holes, vaults, and other indicated locations are not wrapped together by some other means, bundle conductors from each conduit throughout their exposed length with cable ties placed at intervals not exceeding 18 inches on center.

G. Ream, remove burrs, and clear interior of installed conduit before pulling wires or cables.

H. Concrete-Encased Raceway Installation: Prior to installation of conductors, pull through each raceway a mandrel approximately 1/4-inch smaller than raceway inside diameter.

3.02 POWER CONDUCTOR COLOR CODING

A. Conductors 600 Volts and Below:

1. No. 6 AWG and Larger: Apply general purpose, flame retardant tape at each end, and at accessible locations wrapped at least six full overlapping turns, covering an area 1-1/2 to 2 inches wide.

2. No. 8 AWG and Smaller: Provide colored conductors.

3. Colors: (Unless local Authority Having Jurisdiction has different requirements)

System	Conductor	Color
All Systems	Equipment Grounding	Green
240/120 Volts Single-Phase, Three-Wire	Grounded Neutral One Hot Leg Other Hot Leg	White Black Red
208Y/120 Volts Three-Phase, Four-Wire	Grounded Neutral Phase A Phase B Phase C	White Black Red Blue
240/120 Volts Three-Phase, Four-Wire Delta, Center Tap Ground on Single-Phase	Grounded Neutral Phase A High (wild) Leg Phase C	White Black Orange Blue
480Y/277 Volts Three-Phase, Four-Wire	Grounded Neutral Phase A Phase B Phase C	Gray Brown Orange Yellow
NOTE: Phase A, B, C implies direction of positive phase rotation		

4. Tracer: Outer covering of white with an identifiable colored strip other than green in accordance with NFPA 70.

3.03 CIRCUIT IDENTIFICATION

A. Circuits Appearing in Circuit Schedules: identify power, instrumentation, and control conductor circuits, using circuit schedule designations, at each termination and in accessible locations such as manholes, hand holes, panels, switchboards, motor control centers, pull boxes, and terminal boxes.

B. Circuits Not Appearing in Circuit Schedules:

1. Assign circuit name based on device or equipment at load end of circuit.

2. Where this would result in same name being assigned to more than one circuit, add number or letter to each otherwise identical circuit name to make it unique.

C. Method:

1. Conductors No. 3 AWG and Smaller: Identify with sleeves.

2. Cables, and Conductors No. 2 AWG and Larger:

a. Identify with marker plates.

b. Attach marker plates with nylon tie cord.

3. Taped-on markers or tags relying on adhesives not permitted.

D. Each signal, control, alarm, and indicating circuit conductor connected to a given electrical point shall be designated by a single unique number which shall be shown on all contractor as-built drawings. These numbers shall be marked on all conductors at every terminal using permanently marked heat-shrink plastic. Instrument signal circuit conductors shall be tagged with unique multiple digit numbers.

3.04 CONDUCTORS 600 VOLTS AND BELOW

A. Install 10 AWG or 12 AWG conductors for branch circuit power wiring in lighting and receptacle circuits.

B. Do not splice incoming service conductors and branch power distribution conductors No. 6 AWG and larger unless specifically indicated or approved by ENGINEER.

C. Connections and Terminations:

1. Install wire nuts only on solid conductors.

2. Install nylon self-insulated crimp connectors and terminators for instrumentation, control, and power circuit conductors No. 6 AWG and smaller.

3. Install un-insulated crimp connectors and terminators for instrumentation, control, and power circuit conductors No. 4 AWG through No. 2/0 AWG.

4. Install un-insulated, bolted, two-way connectors and terminators for power circuit conductors No. 4/0 AWG and larger.

5. Install un-insulated bolted two-way connectors for motor circuit conductors No. 12 and larger.

6. Tape insulates all un-insulated connections.

7. Place no more than one conductor in any single-barrel pressure connection.

8. Install crimp connectors with tools approved by connector manufacturer.

9. Install terminals and connectors acceptable for type of material used.

10. Compression Lugs

a. Attach with a tool specifically designed for purpose.

b. Tool shall provide complete controlled crimp and shall not release until crimp is complete.

c. Do not use plier-type crimpers.

D. Do not use soldered mechanical joints.

E. Splices and Terminations:

1. Indoors: Use general purpose, flame retardant tape.

2. Outdoors: Use flame retardant, cold- and weather-resistant tape.

F. Cap spare conductors and conductors with UL listed end caps.

G. Cabinets, Panels, and Motor Control Centers:

1. Remove surplus wire, bridle and secure.

2. Where conductors pass through openings or over edges in sheet metal, remove bums, chamfer edges, and install bushings and protective strips of insulating material to protect the conductors.

H. Control and Instrumentation Wiring:

1. Where terminals provided will accept such lugs, terminate control and instrumentation wiring, except solid thermocouple leads, with insulated, locking-fork compression lugs.

2. Terminate with methods consistent with terminals provided, and in accordance with terminal manufacturer's instructions.

3. Locate splices in readily accessible cabinets or junction boxes using terminal strips.

4. Where connections of cables installed under this section are to be made under Division 13, leave pigtails of adequate length for bundled connections.

5. Cable Protection:

a. Under Infinite Access Floors: May be installed without bundling.

b. All Other Areas: Install individual wires, pairs, or triads in flex conduit under the floor or grouped into bundles at least 1/2-inch in diameter.

c. Maintain integrity of shielding of instrumentation cables.

d. Ensure grounds do not occur because of damage to jacket over the shield.

6. The following test shall be performed on instrumentation and control system cables. All tests shall be end-to-end test of installed cables with the ends supported in free air, not adjacent to any ground object. All test data shall be recorded on forms acceptable to the Engineer. Complete records of all tests shall be made and delivered to the Engineer.

a. Continuity tests shall be performed by measuring wire/shield loop resistances of signal cable as the wires, taken one at a time, are shorted to the channel shield. No loop resistance measurement shall carry by more than +2 ohms from the calculated average loop resistance valve.

b. Insulation resistance tests shall be performed by using a 500-volt megohmeter to measure the insulation resistance between each channel wire and channel shield, between individual channel shields in a multi-channel cable, between each individual channel and the overall cable shield in multi-channel cable, between each wire and ground, and between each shield and ground. Values of resistance less than 10 megohms shall be unacceptable.

I. Extra Conductor Length: For conductors to be connected by others, install minimum 6 feet of extra conductor in freestanding panels and minimum 2 feet in other assemblies.

3.05 UNDERGROUND DIRECT BURIAL CABLE

A. Install in trench as required.

B. Warning Tape: Install approximately 12 inches above cable, aligned parallel to, and within 12 inches of centerline of the run.

3.06 FIELD QUALTTY CONTROL

A. In accordance Section 16950, ELECTRICAL TESTING.

END OF SECTION

SECTION 16450

GROUNDING

PART 1 - GENERAL

1.01 REFERENCES

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

1. American National Standards Institute (ANSI): C2, National Electrical Safety Code (NESC).

2. National Fire Protection Association (NFPA): 70, National Electrical Code (NEC).

1.02 SUBMITTALS

A. Shop Drawings:

1. Product Data:

a. Exothermic weld connectors.

b. Mechanical connectors.

1.03 UL COMPLIANCE

A. Materials manufactured within scope of Underwriters Laboratories shall conform to UL Standards and have an applied UL listing mark.

PART 2 - PRODUCTS

2.01 GROUND ROD

A. Material: Copper clad.

B. Diameter: 3/4 inch.

C. Length: 20 feet.

2.02 GROUND CONDUCTORS

A. As specified in Section 16120, CONDUCTORS.

2.03 CONNECTORS

A. Exothermic Weld Type:

1. Outdoor Weld: Suitable for exposure to elements or direct burial.

2. Indoor Weld: Utilize low-smoke, low-emission process.

3. Manufacturers:

a. Erico Products, Inc.; Cadweld and Cadweld Exolon.

b. Thermoweld.

c. Approved equal.

B. Mechanical Type: Split-bolt, saddle, or cone screw type; copper alloy material.

1. Manufacturers:

a. Burndy Corp.

b. Thomas and Betts Co.

c. Approved equal.

2.04 GROUNDING WELLS:

A. Ground rod box complete with cast iron riser ring and traffic cover marked GROUND ROD.

B. Manufacturers:

1. Christy Co.; No. G5.

2. Lightning and Grounding Systems, Inc.; I-R Series

3. Approved equal.

2.05 MOTOR SHAFT GROUNDING RINGS

A. All motors operated on variable frequency drives shall be equipped with a maintenance-free, conductive microfiber shaft grounding ring to meet NEMA MG-1, 3.4.4.4.3 requirements, with a minimum of two rows of circumferential microfibers to discharge damaging shaft voltages away from the bearings to ground. SGR's Service Life: Designed to last for service life of motor. Provide AEGIS SGR Conductive MicroFiber Shaft Grounding Ring, or approved equal.

B. Application Note: Motors up to 100 HP shall be provided with one shaft grounding ring installed on either the drive end or non-drive end. Motors over 100 HP shall be provided with an insulated bearing on the non-drive

end and a shaft grounding ring on the drive end of the motor with the exception of line contact bearings in the drive end of the machine. In this instance the line contact bearing must be electrically insulated and the AEGIS Bearing Protection Ring installed on the opposite drive end of the motor. Grounding rings shall be provided and installed by the motor manufacturer or contractor and shall be installed in accordance with the shaft grounding ring manufacturer's recommendations.

PART 3 - EXECUTION

3.01 GENERAL

A. Grounding shall be in compliance with NFPA 70 and ANSI C2.

B. Ground electrical service neutral at service entrance equipment to supplementary grounding electrodes.

C. Ground each separately derived system neutral to nearest effectively grounded building structural steel member or separate grounding electrode.

D. Bond together system neutrals, service equipment enclosures, exposed non-current-carrying metal parts of electrical equipment, metal raceways, ground conductor in raceways and cables, receptacle ground connections, and metal piping systems.

E. Shielded Power Cables: Ground shields at each splice or termination in accordance with recommendations of splice or termination manufacturer.

F. Shielded Control Cables:

1. Ground shield to ground bus at power supply for analog signal.

2. Expose shield minimum I inch at termination to field instrument and apply heat shrink tube.

3. Do not ground control cable shield at more than one point.

3.02 WIRE CONNECTIONS

A. Ground Conductors: Install in conduit containing power conductors and control circuits above 50 volts.

B. Nonmetallic Raceways and Flexible Tubing: Install an equipment grounding conductor connected at both ends to non-current-carrying grounding bus.

C. Connect ground conductors to raceway grounding bushings.

D. Extend and connect ground conductors to ground bus in all equipment containing a ground bus.

E. Connect enclosure of equipment containing ground bus to that bus.

F. Bolt connections to equipment ground bus.

G. Bond grounding conductors to metallic enclosures at each end, and to intermediate metallic enclosures.

H. Junction Boxes: Furnish materials and connect to equipment grounding system with grounding clips mounted directly on box, or with 3/8-inch machine screws.

3.03 MOTOR GROUNDING

A. Extend equipment ground bus via grounding conductor installed in motor feeder raceway; connect to motor frame.

B. Nonmetallic Raceways and Flexible Tubing: Install an equipment-grounding conductor connected at both ends to non-current carrying grounding bus.

C. Motors Less Than 10 hp: Furnish compression, spade-type terminal connected to conduit box mounting screw.

D. Motors 10 hp and above: Tap motor frame or equipment housing; furnish compression, one-hole, lug type terminal connected with minimum 5/16-inch brass threaded stud with bolt and washer.

E. Circuits 20 Amps or Above: Tap motor frame or equipment housing; install solderless terminal with minimum 5/16-inch diameter bolt.

F. All existing VFD motors shall have an AEGIS SCR motor shaft ground ring installed.

3.04 GROUND RODS

A. Install full length with conductor connection at upper end.

B. Install with connection point below finished grade, unless otherwise shown.

3.05 GROUNDING WELLS

A. Install inside buildings, asphalt, and paved areas.

B. Install riser ring and cover flush with surface.

C. Place 9 inches crushed rock in bottom of each well.

3.06 CONNECTIONS

A. General:

1. Above grade Connections: Use either exothermic weld or mechanical-type connectors.

2. Below grade Connections: Install exothermic weld type connectors.

3. Remove paint, dirt, or other surface coverings at connection points to allow good metal-to-metal contact.

4. Notify ENGINEER prior to backfilling ground connections.

B. Exothermic Weld Type:

1. Wire brush or file contact point to bare metal surface.

2. Use welding cartridges and molds in accordance with manufacturer's recommendations.

3. Avoid using badly worn molds.

4. Mold to be completely filled with metal when making welds.

5. After completed welds have cooled, brush slag from weld area and thoroughly clean joint.

C. Mechanical Type:

1. Apply homogeneous blend of colloidal copper and rust and corrosion inhibitor before making connection.

2. Install in accordance with connector manufacturer's recommendations.

3. Do not conceal mechanical connections.

3.07 METAL STRUCTURE GROUNDING

A. Ground metal sheathing and exposed metal vertical structural elements to grounding system.

B. Bond electrical equipment supported by metal platforms to the platforms.

C. Provide electrical contact between metal frames and railings supporting pushbutton stations, receptacles, and instrument cabinets, and raceways carrying circuits to these devices.

3.08 MANHOLE AND HANDHOLE GROUNDING

A. Install one ground rod inside each.

B. Ground Rod Floor Protrusion: 4 to 6 inches above floor.

C. Make connections of grounding conductors fully visible and accessible.

D. Connect all non current-carrying metal parts, and any metallic raceway grounding bushings to ground rod with No. 6 AWG copper conductor.

3.09 TRANSFORMER GROUNDING

A. Bond neutrals of transformers within buildings to system ground network, and to any additional indicated grounding electrodes.

B. Bond neutrals of substation transformers to substation grounding grid and system grounding network.

C. Bond neutrals of pad-mounted transformers to four locally driven ground rods and buried ground wire encircling transformer and system ground network.

3.10 SURGE PROTECTION EQUIPMENT GROUNDING

A. Connect surge arrestor ground terminals to equipment ground bus.

3.11 INSTRUMENT GROUND - SURGE SUPPRESSION

A. Connect all instrument surge protection with #6 insulated copper ground wire (in conduit where above grade) to closest plant ground system

3.12 BONDING

A. Bond to Main Conductor System:

1. All roof mounted ventilators, fans, air handlers, masts, flues, cooling towers, handrails, and other sizeable metal objects.

2. Roof flashing, gravel stops, insulation vents, ridge vents, roof drains, soil pipe vents, and other small metal objects if located within 6 feet of main conductors or another grounded object.

3. Provide air terminals as required.

B. Bond steel columns or major framing members to grounding system per National Electrical Code.

C. Bond each main down conductor to grounding system.

3.13 GROUNDING SYSTEM

A. Grounding Conductor:

1. Completely encircle well and building structure.

2. Bury minimum 30” below finished grade.

3. Minimum 2 feet distance from foundation walls.

B. Interconnect ground rods by direct-buried copper cables.

C. Connections:

1. Install ground cables continuous between connections.

2. Exothermic welded connections to ground rods, cable trays, structural steel, handrails, and buried and non-accessible connections.

3. Provide bolted clamp type mechanical connectors for all exposed secondary connections.

4. Use bolded offset parapet bases or through-roof concealed base assemblies for air terminal connections.

5. Provide interconnections with electrical and telephone systems and all underground water and metal pipes.

6. Provide electric service arrestor ground wire to building water main.

3.14 FIELD QUALITY CONTROL

A. As specified in Section 16950, ELECTRICAL TESTING.

END OF SECTION

SECTION 16485

VARIABLE FREQUENCY DRIVE

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Provide all labor, materials, equipment and incidentals required, and install, place in operation and field test variable frequency drive(s) (VFD's).

B. The VFD's shall be built with heatsink which is mounted outside of the enclosure through the back of the enclosure.

C. The variable frequency drive shall be heavy duty type and rated for constant torque. The VFD drive rating shall be a minimum of one size larger than actual installed motor horsepower. For 100 HP motor provide 125 HP rated drive, unless otherwise noted on the drawing.

D. The variable frequency drive shall be a space vector Pulse-Width Modulated (PWM) design. Modulation methods which incorporate "gear-changing" techniques are not acceptable. The VFD panel builder shall have overall responsibility. All drives shall be supplied by one manufacturer. The VFD shall be manufactured within the United States of America to alleviate concerns of future serviceability and parts availability.

E. VFD'S shall be 6 pulse drives with 5% input line reactor and dv/dt output filter which all shall be enclosed in one enclosure. External output filter will not be accepted.

F. VFD shall have hard-wired inputs and outputs (I/O's) as shown on Electrical drawings. In addition to the hard-wired I/O's, VFD shall have Ethernet IP communication card for monitoring VFD's parameters.

G. Coordinate with Motor manufacturer and set the minimum speed, starting and stopping ramp times, and carrier frequency of the VFD per motor manufacturer's recommendation.

H. VFD shall be set properly to ride through the power glitch including undervoltage control, auto restart after power failure settings.

I. Provide spare VFD drive as per paragraph 3.04.

1.02 RELATED SECTIONS

A. NONE

1.03 REFERENCES

A. The variable frequency drives and all components shall be designed, manufactured and tested in accordance with the latest applicable standards.
   1. Institute of Electrical and Electronic Engineers (IEEE)
      a. IEEE 519-1992: Guide for harmonic content and control
         1. Underwriters Laboratories (UL508C: Power Conversion Equipment)
      b. UL

c. CUL

1. National Electrical Manufacturer's Association (NEMA)

d. ICS 7.0: Industrial Controls & Systems for VFD.

1. IEC 61800-2 and –3. EN 50082-1 and –2

e. Fulfill all EMC immunity requirements

B. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

1.04 SUBMITTALS

A. The following information shall be submitted to the Engineer.

1. Dimensioned outline drawing
2. Schematic diagram
3. Power and control connection diagram(s)
4. Product sheets

1.05 QUALIFICATIONS

A. The supplier of the assembly shall be the manufacturer of the electromechanical power components used within the assembly, such as bypass contactors when specified.

B. For the equipment specified herein, the manufacturer shall be ISO 9001 certified.

C. The supplier of this equipment shall have produced similar electrical equipment for a minimum period of ten (10) years. When requested by the Engineer, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Equipment shall be handled and stored in accordance with manufacturer's instructions. One (1) copy of these instructions shall be included with the equipment at time of shipment.

1.07 WARRANTY

A. VFD shall be warranted for onsite parts and labor by the contractor and the equipment manufacturer for a period of one (1) year following the date of final completion of the work.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Eaton

B. Owner Approved Equal

2.02 VARIABLE FREQUENCY DRIVES (VFD)

A. Where shown on the drawings, variable frequency drives 1 through 250 Horsepower (HP), Constant Torque (CT), shall have the following features:

1. The VFD shall be rated for 480 VAC. The VFD shall provide microprocessor-based control for three-phase induction motors. The controller's full load output current rating shall be based on 50° C ambient and 3.6 kHz switching frequency and above to reduce motor noise and avoid increased motor losses as standard.
2. The VFD shall be of the Pulse Width Modulated (PWM) design converting the utility input voltage and frequency to a variable voltage and frequency output via a two-step operation. Adjustable Current Source VFD are not acceptable. Insulated Gate Bipolar Transistors (IGBT's) shall be used in the inverter section. Bipolar Junction Transistors, GTO's or SCR's are not acceptable. The VFD shall run at the above listed switching frequencies.
3. The VFD shall have efficiency at full load and speed that exceeds 95% for VFD below 15-HP and 97% for drives 15-HP and above. The efficiency shall exceed 90% at 50% speed and load.
4. The VFD shall maintain the line side displacement power factor at no less than 0.96, regardless of speed and load.
5. The VFD shall have a one (1) minute overload current rating of 150% and a two (2) second overload current rating of 200% for constant torque drives.
6. The VFD shall be capable of operating of operating any NEMA design B squirrel cage induction motor, regardless of manufacturer, with a horsepower and current rating within the capacity of the VFD.
7. Provide an input EMI filter to minimize conducted electrical noise to meet the requirements of IEC 61800-3.
8. The VFD shall limit harmonic distortion reflected onto the utility system to a voltage and current level as defined by IEEE 519 for general systems applications, by utilizing the 5% input line reactor.
9. VFD to have minimum 65kAIC short circuit withstand rating.
10. Include all metal conduit plate and rubber grommets.
11. The system containing the VFD shall comply with the 5% level of total harmonic distortion of line voltage and the line current limits as defined in IEEE 519-1992. The VFD shall be six pulse type, for 125HP and smaller. The VFD manufacturer shall supply an eighteen pulse, multiple bridge rectifier AC to DC conversion section with phase shifting transformer for all drives 150-HP and above. This eighteen-pulse rectifier converter shall result in a multiple pulse current waveform that will more nearly approximate a true sine-wave to reduce voltage harmonic content on the utility line. The phase shifting transformer shall be of a single winding type to optimize its KVA rating and harmonic cancellation capability.
12. The VFD shall be able to start into a spinning motor (flying start). The VFD shall be able to determine the motor speed in any direction and resume operation without tripping. If the motor is spinning in the

reverse direction, the VFD shall start into the motor in the reverse direction, bring the motor to a controlled stop, and then accelerate the motor to the preset speed.

13. Standard operating conditions shall be:
    a. Incoming Power: Three-phase, 480 Vac (+10% to -15%) and 60 Hz (+/-5 Hz) power to a fixed potential DC bus level.
    b. Frequency stability of +/-0.05% for 24 hours with voltage regulation of +/-1% of maximum rated output voltage.
    c. Speed regulation of +/- 0.5% of base speed.
    d. Load inertia dependent carryover (ride-through) during utility loss.
    e. Insensitive to input line rotation.
    f. Humidity: 0 to 95% (non-condensing and non-corrosive).
    g. Altitude: 0 to 3,280 feet (1000 meters) above sea level without de-rating
    h. Ambient Temperature: -10 to 50 °C (CT) with de-ratings up to 60 °C
    i. Storage Temperature: -40 to 70 °C.
14. Diagnostic Features
    a. Fault History
        1. Record and log faults
        2. Indicate the most recent first, and store up to 30 faults with day and time stamp
15. Keypad
    a. The keypad shall include a Local/Remote pushbutton selection. Both start/ stop source and speed reference shall be independently programmable for Keypad, Remote I/O, or Field Bus.
    b. Upon initial power up of the VFD, the keypad shall display a startup guide that will sequence all the necessary parameter adjustments for general start up.
    c. Frequently accessed VFD programmable parameters shall be adjustable from a digital operator keypad located on the front of the VFD. The VFD shall have a 3-line alphanumeric programmable display with status indicators. Keypads must use plain English words for parameters, status, and diagnostic messages. Keypads that use only alphanumeric code and tables are not acceptable. Keypads shall be adjustable for contrast with large characters easily visible in normal ambient light.
    d. The navigation interface shall include four independent direction navigation keys up, down, left and right with a center “OK” key. The interface keypad shall include additional independent keys for “Local/Remote”, “Back/Reset”, “Start”, “Stop”. Include two additional soft keys that that allow for menu shortcuts.
    e. The interface keypad shall include three independent status LEDs. The three are “Remote”, “Run”, and “Fault”.
    f. The display is a multi-line LED backlight display.

g. Keypad shall be removable with Ethernet communications for remote mounting
h. The keypad must serve as a Copy/Paste module that can hold two sets of parameters
i. The operator shall be able to scroll through the keypad menu to choose between the following screens:
    i. Parameters
    ii. Keypad control
    iii. Active faults
    iv. Fault history
    v. System menu
    vi. Expander boards
    vii. Monitor
    viii. Operate menu

16. The VFD keypad shall be capable of displaying the following monitoring functions at a minimum:
    a. Output frequency
    b. Frequency reference
    c. Motor speed
    d. Motor current
    e. Motor torque
    f. Motor power
    g. Motor voltage
    h. DC-bus voltage
    i. Unit temperature
    j. Calculated motor temperature
    k. Voltage level of analog input
    l. Current level of analog input
    m. Digital inputs status
    n. Digital and relay outputs status
    o. Analog Input

17. Protective Functions
    The VFD shall include the following protective features at minimum:
    a. Over-current
    b. Over-voltage
    c. Inverter fault
    d. Under-voltage
    e. Input phase loss
    f. Output phase loss
    g. Under-temperature
    h. Over-temperature

i. Motor stalled
j. Motor over-temperature
k. Motor under-load
l. Logic voltage failure
m. Microprocessor failure

18. The VFD shall provide ground fault protection during power-up, starting, and running. VFD with no ground fault protection during running are not acceptable.

19. On-board Communications
    a. The VFD shall include the Ethernet I/P communication.
    b. The VFD shall have the following communication protocols as an optional card. Profibus DP, CANopen, Devicenet, Profinet, Smartwire DT, Lonworks, Modbus TCP, Modbus RTU, BACnet MS/TP.

20. Input/Output
    a. The VFD shall include the follow as standard:
        i. Eight (8), 24VDC digital input as standard
        ii. One (1), open collector 24VDC digital output
        iii. Two (2) 4 to 20mA analog inputs
        iv. Two (2) 4 to 20 mA analog outputs
        v. Three (3) dry relay contacts rated for 250VAC at 2A or 250VDC at 0.4mA
    b. The VFD shall offer the following optional expansion cards
        i. Three (3) digital inputs and three (3) digital outputs
        ii. One (1) isolated analog input and two (2) analog outputs
        iii. Three (3) dry contact relay outputs
        iv. Three (3) RTD inputs
        v. Six (6) digital inputs rated for 240VAC
    c. All field inputs and output connections to the interface board shall use quick-connect terminals
    d. All input/output are field programmable

21. Circuit boards
    a. All circuit boards shall be conformal coated as standard for moisture and temperature protection

22. Input and Output Filters
    a. All 6-pulse VFD's shall be provided with 5% input line reactors.
    b. All VFD's shall be provided with dV/dT output filters integral to VFD panel.
    c. All filters shall have core plates dipped with extra layer of coating to prevent corrosion.

23. Real time clock
    a. VFD software shall include a real time clock function for a day and time stamp of fault occurrence, start time stamp, stop time stamp, and operating hours.
    b. Time clock to include battery back-up

24. Energy Control
    a. VFD software shall include energy optimization algorithm. The software algorithm shall compare output voltage to the motor load. The output voltage is optimized to reduce the motor core losses and maintain a high enough voltage to prevent the motor from becoming unstable.
    b. Includes onboard energy savings calculator that allows local kW cost

25. Safe Torque Off
    a. VFD shall include safe torque off where IGBTs can be directly deenergized. Safe torque off shall be SIL1 certified (IEC/EN 61800-5-2 and DIN EN ISO 13849 Category 1, Level

26. VFD Software
    a. Manufacturer to include programming and monitoring configuration software as no extra charge
    b. Software applications to include Standard, Multi-Fan and Pump, Multi-PID and Multi-purpose

2.03 Enclosure

A. All VFD components shall be factory mounted, wired and grounded in a NEMA 1 enclosure.

PART 3 EXECUTION

3.01 FACTORY TESTING

A. The following standard factory tests shall be performed on the equipment provided under this section. All tests shall be in accordance with the latest version of UL and NEMA standards.
    1. All printed circuit boards shall be functionally tested via automatic test equipment prior to unit installation.
    2. After all tests have been performed, each VFD shall undergo a burn-in test. The drive shall be burned in at 100% inductive or motor load without an unscheduled shutdown.
    3. After the burn-in cycle is complete, each VFD shall be put through a motor load test before inspection and shipping.

B. The manufacturer shall provide three (3) certified copies of factory test reports.

3.02 START-UP FIELD SERVICE

A. Provide the services of a qualified manufacturer's employed Field Service Engineer to assist the Contractor in installation and start-up of the equipment specified under this section. Field Service personnel shall be factory trained with periodic updates and have experience with the same model of VFD on the job site. Sales representatives will not be acceptable to perform this work. The manufacturer's service representative shall provide technical direction and assistance to the Contractor in general assembly of the equipment, installation as specified in manufacturer's installation instructions, wiring, application dependent adjustments, and verification of proper VFD operation.

B. The Contractor under the technical direction of the manufacturer's service representative shall perform the following minimum work.

1. Inspection and final adjustments.
2. Operational and functional checks of VFD and spare parts.
3. The contractor shall certify that he has read the drive manufacturer's installation instructions and has installed the VFD in accordance with those instructions.

C. The Contractor shall provide three (3) copies of the manufacturer's field start-up report before final payment is made.

3.03 TRAINING

A. The manufacturer's qualified representative shall conduct the training.

B. The cost of training programs to be conducted with Owner's personnel shall be included in the Contract price. The training and instruction, insofar as practicable, shall be directly related to the system being supplied.

C. The supplier shall provide detailed manuals to supplement the training courses. The manuals shall include specific details of equipment supplied and operations specific to the project.

D. The supplier shall make use of teaching aids, manuals, slide/video presentations, etc. After the training services, such materials shall be delivered to Owner.

E. The training program shall represent a comprehensive program covering all aspects of the operation, maintenance and cleaning procedures for the system.

F. All training schedules shall be coordinated with, and at the convenience of the Owner. Shift training may be required to correspond to the Owner's working schedule.

3.04 SPARE PARTS

A. Provide 1 spare VFD.

END OF SECTION

SECTION 16490

SOLID STATE REDUCED VOLTAGE STARTER

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Provide the solid state reduced voltage starter (SSRVS) as shown on the drawings and/or as specified herein. The SSRVS shall be microprocessor controlled suitable for use with three phase induction motors rated 600 VAC or less. It shall provide a closed loop current ramp for smooth and stepless motor acceleration and deceleration.

1.02 SYSTEM DESCRIPTION AND QUALIFICATIONS

A. The SSRVS shall be the product of a manufacturer who has produced SSRVS for a minimum of 10 years (consecutive).

B. The SSRVS shall be U.L. labeled where U.L. has such a listing.

C. The SSRVS shall be designed, manufactured and tested to conform, where applicable, with the following industry standards and specifications:
   1. ANSI
   2. CSA
   3. IEEE
   4. UL
   5. NEC
   6. EEMAC
   7. NEMA
   8. OSHA

D. SSRVS performance requirements

   1. Nominal operating ambient temperatures: 0 - 40 deg C (32 deg F to 104 deg F) with relative humidity of up to 95% (noncondensing).
   2. Power: Operate with three phase AC power at nominal voltages 200 through 600 VAC.
   3. Frequency: operates on 25 through 70 Hz.
   4. Meet Uniform Building Code on Non-building structures, section 2338 for zone 1, 2, 3, and 4 requirements.

E. Design Criteria:

DESCRIPTION	SPECIFICATION
Horsepower	HP: as shown on plans
Power Ratings	500% for 30 sec. and 125% cont.
PIV	2.5 x line voltage or 1200 PIV min.
Starting Torque	0 to 100%
Ramp Time	0 to 120 seconds
Decel Time	0 to 60 seconds
Nominal ratings	200 through 600 VAC. 25 through 70 Hz. With frequency tracking within this range
Standard Insulation Test	2500 VAC minimum
Overall Efficiency	Average 99.7%
SCR Firing Technique	Hard Drive with "picket fence"
Transient Voltage Protection	DV/DT=s or SIOV=s
Diagnostics and LEDs	Power On Gate Power Micro Computer Fault SCR Condition LCD display (16 char. X two lines.)
Control Input	120 VAC or dry contact, 2/3 wire.

1.03 SUBMITTALS

A. The following drawings/information shall he supplied by the SSRVS manufacturer in the shop drawings and with the shipment of each starter:

1. Elementary wiring diagrams.
2. Wiring and interconnect diagrams.
3. Enclosure frontal elevation and dimension drawings.
4. Internal component layout diagrams
5. Available conduit entry and exit locations.
6. Instruction manuals required for proper operation of the SSRVS.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualification: The manufacturer of the SSRVS shall be a firm experienced in manufacturing the equipment as specified herein for this project and who has a record of successful in-service performance.

1.05 DELIVERY, STORAGE AND HANDLING

A. Handling and shipment of the equipment shall be in such a manner to prevent internal component damage, breakage, and denting and scoring of the enclosure finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Eaton

B. Engineer approved equal.

2.02 GENERAL

A. Provide SSRVS where and as shown on the plans and as described by frontal elevation drawings, one-line diagrams, and/or equipment schedules.

B. The SSRVS assembly shall include the necessary interface relays, timers, and those additional items necessary for interface to the pumps controls as identified on the plans.

C. The complete SSRVS shall be rated for an available fault current of 65,000 asymmetrical.

2.03 ENCLOSURE CONSTRUCTION

A. The SSRVS enclosure shall be constructed as NEMA 1.

B. The dimensions of the over-all enclosure shall be maximum as shown on the plans and include a door mounted operator interface panel.

C. The enclosure shall include a lockable circuit breaker disconnect handle mechanism used to remove power from the SSRVS. Enclosure door shall be interlocked with the disconnect handle mechanism such that entry to the enclosure is prevented until power to the SSRVS is removed.

D. Enclosure Dimension: 20”W x 18”D x 48”H

2.04 DISCONNECTS

A. The SSRVS package shall be supplied complete with a circuit breaker used as a means of removing line power from the starter as well as for short circuit protection.

B. The circuit breaker shall be supplied as shown on the drawings and as indicated within this section. Where no circuit breaker ratings are specified on the drawings or within this section, the circuit breaker shall be supplied to meet the normal standards of the manufacturer of the SSRVS. As a minimum, the circuit breaker shall conform to the requirements of the National Electric Code (NEC).

C. The disconnect shall be interlocked via the disconnect handle mechanism such that entry to any part of the enclosure is prevented until power to the SSRVS is removed.

2.05 BYPASS CONTACTORS

A. A bypass contactor shall be supplied. This bypass contactor shall bypass the SCRs of

the SSRVS once the motor is up to speed. The effect of the bypass contactor during run shall eliminate the heat buildup resulting from the voltage drop across the SCRs of the SSRVS.

B. It is not the intent of the owner to use the bypass contactor as a means of starting the motor should problems be encountered with the SSRVS.

2.06 SSRVS LOGIC CONTROL CONFIGURATION

A. Description

1. The SSRVS shall be supplied standard with programming buttons and local start/stop buttons on one main keypad with LCD display.

2. Standard starter control logic shall be located on a microprocessor-based PC card, which provides the sequential logic for the starter and gate signals to the power card, which is used to drive the SCRs.

3. Design control logic to perform timing required for operation of the SSRVS and bypass contactor while continuously monitoring motor and starter for faults. If a fault is detected, the control logic of the SSRVS shall provide fault indication via an LCD display. In the event of a fault condition, the control logic shall safely shut down the starter to disable the motor.

4. The PC cards of the SSRVS shall be interchangeable with other control logic cards on starters of a similar design.

B. Electrical

1. The logic control of the SSRVS shall incorporate a microcomputer which consists of all circuitry required to drive the power semiconductors and provide motor and starter monitoring functions.

2. The SSRVS logic shall provide the following standard features:

a. Adjustable Ramp Time (0-120 seconds)
b. Adjustable Initial Current (50-400% of motor FLA)
c. Adjustable Max Current (200-600% of motor FLA)
d. Adjustable Decel Profile for Pumps
e. Line Phase Loss Detection
f. Adjustable Line Current Imbalance Detection (10-40%)
g. Adjustable Over/Under Line Voltage Protection (10-30%)
h. Up To Speed Indication
i. Line Phase Sequence Sensitivity or Insensitivity
j. Selectable Solid State Overload Class (10, 20, 30, None)
k. Selectable Motor Service Factor (1.0, 1.15, or 1.25)
l. Adjustable Motor Full Load Amperes
m. Adjustable Current Transformer Ratio
n. Battery "Backup" of Set Starter Parameters
o. Selectable Passcode Protection of Set Starter Parameters
p. Line Voltage Independent Operation

q. Line Frequency Tracking (25Hz Through 70Hz)
r. Instantaneous Overcurrent Detection
s. Shorted SCR Detection
t. Software Selectable (Via LCD) Relay Outputs
u. ""Revolving" Event Recorder (99 most recent events)
v. LCD Status Display

3. Standard features shall operate concurrently.

4. The following optional features shall be included with each SSRVS:

a. Selectable Automatic Energy Savings Feature
b. Over/Under Current Fault Protection used in pumping applications for indicating pump jam
c. Starts Per Hour Limiter
d. Elapsed Time Meter (Via LCD Display)
e. Time Between Starts Limiter

C. Software Selectable Relay Outputs

1. Two selectable relay outputs shall be provided with each SSRVS.

2. Relay outputs shall be selectable via LCD display.

3. Selectable relay outputs shall be from the following menu:

a. Run
b. Up To Speed
c. Shorted SCR Trip
d. Motor Thermal Overload Trip
e. Motor Thermal Overload Warning
f. Motor Thermal Overload Lockout
g. SHT Fault Relay

4. The selectable relay outputs shall be in addition to one fixed general fault relay output. This general fault relay shall indicate any of the following faults:

a. Line Phase Loss
b. Line Phase Imbalance
c. Low Three Phase Line
d. Line Phase Sequence Change
e. Motor Thermal Overload Trip
f. Battery Backup Failure (Computer PC Card)
g. Instantaneous Overcurrent
h. Shorted SCR Fault
i. Three Phase Line Frequency Deviation
j. Control Power Failure
k. Computer Error
l. Up To Speed Fault (Stall Time Has Expired)

5. Contact ratings for output relays shall be rated 5 Amps inductive and 10 Amps

resistive.

D. LCD Status Display Display

1. Each SSRVS shall have a keyboard/LCD display assembly designed to:
   a. Set or examine operating parameters.
   b. Provide starter status information.
   c. Provide real-time information about line current, voltage and frequency.
   d. Provide a means to start and stop the SSRVS.

2. The LCD display for the SSRVS shall be mounted on the door of the starter enclosure for viewing from the outside of the enclosure.

E. LED Indicators

1. The following LED indicators shall be provided for advisory status and fault annunciation:

   a. Power On
   b. Micro Computer Fault
   c. SCR Gate Drive Power
   d. SCR Condition

PART 3 EXECUTION

3.01 SHIPPING AND HANDLING

A. All equipment parts shall be properly protected in accordance with Manufacturer requirements so that no damage or deterioration will occur during a prolonged delay from the time of shipment until installation is completed and the units and equipment are ready for operation.

B. Factory assembled parts and components shall not be dismantled for shipment unless permission is received in writing from the Engineer.

C. Finished iron or steel surfaces not painted shall be properly protected to prevent rust and corrosion.

D. Each box or package shall be properly marked to show its net weight in addition to its contents.

E. All scratched or otherwise marred painted surfaces shall be touched-up after installation to match original finishes.

3.02 INSTALLATION AND STARTUP

A. The Manufacturer, through the Contractor, shall examine all areas and conditions under which the variable frequency drives, motors, and isolation transformers are to be installed. The Manufacturer shall notify the Contractor, in writing of conditions detrimental to the proper completion of the work. No work shall proceed until all

unsatisfactory conditions have been corrected in a manner acceptable to the Contractor.

B. If there are any difficulties in installation or operation of the equipment due to the Manufacturer's design or fabrication, additional services shall be provided at no cost or expense to the Owner.

C. The Contractor shall be responsible for furnishing a Manufacturer's engineer to assist in installation, to inspect and adjust the equipment before initial service, and during startup. Testing, checkout, and start-up of the variable frequency drive system shall be performed under the technical direction of the manufacturer's service engineer. Under no circumstances, are any portions of the drive system to be energized without authorization from the manufacturer's representative.

D. Install SSRVS's and motors in accordance with the equipment Manufacturer's written instructions and with recognized industry practices; complying with applicable requirements of NEC, U.L. and NEMA standards, to insure that products fulfill requirements.

E. Tighten connectors and terminals, including screws and bolts, in accordance with equipment Manufacturer's published torque tightening values for equipment connectors. Where Manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in U.L. Standards 486A and B, and the National Electrical Code. The SSRVS enclosure shall not be used as a raceway for wiring unless a dedicated wiring space is provided. Wiring shall not run through or between components not served.

F. Prior to energization of SSRVS equipment, check with ground resistance tester, phase-to-phase and phase-to-ground insulation resistance levels to ensure requirements are fulfilled. Check circuitry for electrical continuity, and for short-circuits, and ensure that direction of rotation of each motor fulfills requirements.

G. Provide equipment grounding connections for SSRVS equipment as indicated. Tighten connections to comply with tightening torques specified in U.L. Standard 486A to assure permanent and effective grounding.

H. Upon completion of installation of SSRVS equipment and electrical circuitry, energize SSRVS circuitry and demonstrate functioning of equipment in accordance with requirements. Where possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and retest to demonstrate compliance.

3.03 SERVICES OF MANUFACTURER'S REPRESENTATIVE

A. The Contractor shall provide the services of a qualified Manufacturer's technical representative who shall adequately supervise the installation and testing of and start up of all equipment furnished under this Contract and instruct the Contractor's personnel and the Owner's operating personnel in its maintenance and operation as outlined in the General Conditions. The services of the Manufacturer's representative shall be provided for the periods stated in the following schedule:

	INSTALLATION	OPERATION	GUARANTEE

	TRIP (DAYS)	TRIP* (DAYS)	PERIOD TRIP (DAYS)
For each Type of SSRVS	2	2	2

* During the operation trip, the Manufacturer shall instruct Owner's personnel.

A total of six (6) service days (48 hours) shall be provided by the Manufacturer's representative.

B. The Manufacturer's representative shall direct all final adjustments necessary for the drive system to meet all operational and performance requirements outlined herein.

C. Any additional time required to achieve successful installation and operation shall be at the expense of the Contractor. The Manufacturer's representative shall sign in and out at the office of the resident representative on each day of arrival at the project.

3.04 WARRANTY

A. Equipment furnished under this Section shall be guaranteed for one (1) year from the date of substantial completion.

B. Work shall include labor, materials, and travel time for necessary repairs at the job site.

END OF SECTION

SECTION 16670

LIGHTNING PROTECTION SYSTEM

PART 1 - GENERAL

1.01 REFERENCES

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

1. Lightning Protection Institute (LPI): 175, Installation Standard.

2. National Fire Protection Association (NFPA): 780, Lightning Protection Code.

3. Underwriters Laboratories, Inc. (UL):
   a. 96, Standard for Safety Lightning Protection Components.
   b. 96A, Standard for Safety Installation Requirements for Lightning Protection Systems.

1.02 DESIGN REQUIREMENTS

A. Provide lightning protection system design for all of the following facilities:

a. Electrical Control Building
b. Light poles

B. The work includes, but is not limited to, furnishing and installing air terminals, grounding conductors, connectors, fasteners, and other materials necessary for a complete protective system. Contractor shall certify the lightning protection system.

C. Lightning protection system design to comply with all applicable provisions of LPI 175 and 176, UL 96 and 96A, and NFPA 780.

1.03 SUBMITTALS

A. Shop Drawings:

1. Reproducible Drawings:
   a. Lightning protection system layout.
   b. Component locations.

2. Detailed plans.

3. Down conductor.

4. Connecting conductor.

5. Bond strap.

6. Air terminals.

7. Fittings.

8. Connectors.

9. Ground rods.

B. Quality Control Submittals: Field test report.

C. Contract Closeout Submittals: Submit to OWNER:

1. Ground Witness Certification-Form LPI-175A.

2. Post-Installation System Certification

1.04 QUALITY ASSURANCE

A. Designer: Lightning protection system design shall be prepared by an LPI-certified designer or recognized lightning protection manufacturer.

B. Manufacturer: All system components shall be the product of a single manufacturer regularly engaged in the manufacturing of lightning protection components in accordance with LPI 176 and UL 96.

C. Installer: Lightning protection system shall be installed under the direct supervision of an LPI 175 Certified Master Installer.

D. Inspector: Final installation and grounding connection inspection of the System shall be performed by the owner representative or agent in accordance with LPI 177.

E. UL Compliance: Materials manufactured within scope of Underwriters Laboratories, Inc. shall conform to UL Standards and have an applied UL listing mark.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Thompson Lightning.

B. IPC Protection.

C. AC Lightning Security.

D. Lightning & Grounding Systems, Inc.

E. Approved Alternate

2.02 GENERAL

A. System Material: Copper or high copper content, heavy-duty bronze castings, unless otherwise specified.

B. All material shall comply in weight, size, and composition for the class of structure to be protected as established by UL 96 and 96A.

2.03 AIR TERMINAL

A. Material: Solid copper rods, with tapered points.

B. Length: Sufficient to extend minimum 10 inches above object being protected.

C. UL 96 Label B applied to each terminal.

2.04 CONDUCTORS

A. Copper Cable: Bare medium stranded, having 97.5 percent minimum conductivity.

B. Main Down Conductor: Per UL and NFPA criteria and based on building height.

C. Connecting Conductor: Secondary size per UL and NFPA criteria

D. Bonding Conductor: Flexible strap, minimum 3/4-inch wide by 1/8-inch thick.

E. All main down and connecting conductors shall bear the UL 96 Label A, applied every 10 feet.

2.05 CABLE FASTENER AND ACCESSORIES

A. Capable of withstanding minimum pull of 100 pounds.

2.06 FITTINGS

A. Heavy-duty Class II bolt pressure type.

B. Bolts, Screws, and Related Hardware: Stainless steel.

2.07 CABLE CONNECTIONS AND SPLICERS

A. Fasteners: Bolted clamp type, corrosion-resistant copper alloy (above grade).

B. Through-Roof Connectors: Straight or right angle with lead flashing washer and other appurtenances to match existing roofing system.

2.08 CONDUIT

A. Schedule 40 PVC, as specified in Section 16110, RACEWAYS.

PART 3 - EXECUTION

3.01 GENERAL

A. Workmanship to comply with all applicable provisions of LPI 175, UL 96 and 96A, and NFPA 780.

B. Installation of bare copper materials on aluminum surfaces will not be permitted.

C. Provide waterproof seal of all roof penetrations.

D. Install system in inconspicuous manner so that components blend with building aesthetics.

3.02 EXAMINATION

A. Verify conditions prior to installation. Actual conditions may require adjustments in air terminal and ground rod locations.

3.03 AIR TERMINALS

A. Supports: Brackets or braces.

B. Parapet Bracket Attachment: Lag or expansion bolts.

C. Secure base to roof surface with adhesive or pitch compatible with roofing bond.

D. Provide terminal flashing at roof penetrations.

E. Perimeter Terminals:

1. Maximum Spacing: 20 feet.

2. Maximum Distance from Outside Edge of Building: 2 feet.

F. Roof Ridge Terminals: Maximum spacing 20 feet.

G. Mid-Roof Terminals: Maximum spacing 50 feet.

3.04 CONDUCTORS

A. Conceal whenever practical.

B. Provide 1-inch PVC conduit in building walls or columns for main downleads and roof risers.

C. Support: Maximum spacing for exposed conductors.

1. Vertical and Horizontal: 3 feet.

D. Maintain horizontal and vertical conductor courses free from dips or pockets.

E. Bends: Maximum 90 degrees, with minimum 8-inch radius.

F. Install air terminal conductors on the structural roof surface before roofing composition is applied.

3.05 BONDING

A. Bond to Main Conductor System:

1. All roof mounted ventilators, fans, air handlers, masts, flues, cooling towers, handrails, and other sizeable metal objects.

2. Roof flashing, gravel stops, insulation vents, ridge vents, roof drains, soil pipe vents, and other small metal objects if located within 6 feet of main conductors or another grounded object.

3. Provide air terminals as required.

B. Bond steel columns or major framing members to grounding system per National Electrical Code.

C. Bond each main down conductor to grounding system.

3.06 GROUNDING SYSTEM

A. Connections:

1. Install ground cables continuous between connections.

2. Exothermic welded connections to cable trays, structural steel, handrails, and non-accessible connections.

3. Provide bolted clamp type mechanical connectors for all exposed secondary connections.

4. Use bolded offset parapet bases or through-roof concealed base assemblies for air terminal connections.

3.07 FIELD QUALITY CONTROL

A. Isolate lightning protection system from other ground conditions while performing tests.

B. Resistance: Test ground resistance of grounding system by the fall-of-potential method.

1. Test Resistance to Ground: Maximum 25 ohms per National Electric Code.

2. Install additional ground rods as required to obtain maximum allowable resistance.

C. Test Report:

1. Description of equipment tested.

2. Description of test.

3. Test results.

4. Conclusions and recommendations.

5. Appendix, including appropriate test forms.

6. Identification of test equipment used.

7. Signature of responsible test organization authority.

END OF SECTION

SECTION 16950

ELECTRICAL TESTING

PART1 – GENERAL

1.01 REFERENCES

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

1. American National Standards Institute (ANSI):

a. C2, National Electrical Safety Code.

b. C37.20.1, Metal-Enclosed Low Voltage Power Circuit Breaker Switchgear.

c. C37.20.2, Metal-Clad and Station-Type Cubicle Switchgear.

d. C37.20.3, Metal-Enclosed Interrupter Switchgear.

e. C62.33, Standard Test Specifications for Varistor Surge-Protective Devices.

2. Institute of Electrical and Electronics Engineers (IEEE):

a. 43, Recommended Practice for Testing Insulating Resistance of Rotating Machinery.

b. 48, Standard Test Procedures and Requirements for High-Voltage Alternating-Current Cable Terminators.

c. 81, Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System.

d. 95, Recommended Practice for Insulation Testing of Large AC Rotating Machinery with High Direct Voltage.

e. 118, Standard Test Code for Resistance Measurement.

f. 400, Guide for Making High-Direct-Voltage Tests on Power Cable Systems in the Field.

3. National Electrical Manufacturers Association (NEMA):

a. AB 4, Guideline for Inspection and Preventive Maintenance of Molded Case Circuit Breakers Used in Commercial and Industrial Applications.

b. PB 2, Deadfront Distribution Switchboards.

c. WC 7, Cross-Linked-Thermosetting-Polyethylene- Wire and Cable for the Transmission and Distribution of Electrical Energy.

d. WC 8, Ethylene-Propylene-Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

4. International Electrical Testing Association (NETA): ATS, Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

5. National Fire Protection Association (NFPA):

a. 70, National Electrical Code (NEC).

b. 70E, Standard for Electrical Safety Requirements for Employee Workplaces.

1.02 SUBMITTALS

A. Administrative Submittals: Submit 30 days prior to performing inspections or tests:

1. Schedule for performing inspection and tests.

2. List of references to be used for each test.

3. Sample copy of equipment and materials inspection form(s).

4. Sample copy of individual device test form.

5. Sample copy of individual system test form.

B. Quality Control Submittals: Submit within 30 days after completion of test:

1. Test or inspection reports and certificates for each electrical item tested.

C. Contract Closeout Submittals:

1. Operation and Maintenance Data:

a. After test or inspection reports and certificates have been reviewed by ENGINEER and returned, insert a copy of each in operation and maintenance manual.

1.03. QUALITY ASSURANCE

A. Testing Firm Qualifications:

1. Corporately and financially independent organization functioning as an unbiased testing authority.

2. Professionally independent of manufacturers, suppliers, and installers, of electrical equipment and systems being tested.

3. Employer of engineers and technicians regularly engaged in testing and inspecting of electrical equipment, installations, and systems.

4. Supervising engineer accredited as Certified Electrical Test Technologist by National Institute for Certification of Engineering Technologists (NICET), or International Electrical Testing Association and having a minimum of 5 years testing experience on similar projects.

5. Technicians certified by NICET or NETA.

6. Assistants and apprentices assigned to project at ratio not to exceed two certified to one noncertified assistant or apprentice.

7. Registered Professional Engineer to provide comprehensive project report outlining services performed, results of such services, recommendations, actions taken, and opinions.

8. In compliance with OSHA Title 29, Part 1907 criteria for accreditation of testing laboratories or a full Member Company of International Electrical Testing Association.

B. Test equipment shall have an operating accuracy equal to, or greater than, requirements established by NETA ATS.

C. Test instrument calibration shall be in accordance with NETA ATS.

1.04 SEQUENCING AND SCHEDULING

A. Perform inspection and electrical tests after equipment has been installed.

B. Perform inspection and electrical tests on existing cryogenic compressor motors.

C. Perform tests with apparatus de-energized whenever feasible.

D. Inspection and electrical tests on energized equipment are to be:

1. Scheduled with ENGINEER prior to de-energization.

2. Minimized to avoid extended period of interruption to the operating plant equipment.

E. Notify ENGINEER at least 24 hours prior to performing tests on energized electrical equipment.

PART 2 -- PRODUCTS (NOT USED)

PART 3 -- EXECUTION

3.01 GENERAL

A. Tests and inspection shall establish that:

1. Electrical equipment is operational within industry and manufacturer's tolerances.

2. Installation operates properly.

3. Equipment is suitable for energization.

4. Installation conforms to requirements of Contract Documents and NFPA 70, NFPA 70E, and ANSI C2.

B. Perform inspection and testing in accordance with NETA ATS, industry standards, and manufacturer's recommendations.

C. Adjust mechanisms and moving parts for free mechanical movement.

D. Adjust adjustable relays and sensors to correspond to operating conditions, or as recommended by manufacturer.

E. Verify nameplate data for conformance to Contract Documents.

F. Realign equipment not properly aligned and correct unlevelness.

G. Properly anchor electrical equipment found to be inadequately anchored.

H. Tighten accessible bolted connections, including wiring connections, with calibrated torque wrench to manufacturer's recommendations, or as otherwise specified.

I. Clean contaminated surfaces with cleaning solvents as recommended by manufacturer.

J. Provide proper lubrication of applicable moving parts.

K. Inform ENGINEER of working clearances not in accordance with NFPA 70.

L. Investigate and repair or replace:

1. Electrical items that fail tests.

2. Active components not operating in accordance with manufacturer's instructions.

3. Damaged electrical equipment.

M. Electrical Enclosures:

1. Remove foreign material and moisture from enclosure interior.

2. Vacuum and wipe clean enclosure interior.

3. Remove corrosion found on metal surfaces.

4. Repair or replace, as determined by ENGINEER, door and panel sections having dented surfaces.

5. Repair or replace, as determined by ENGINEER, poor fitting doors and panel sections.

6. Repair or replace improperly operating latching, locking, or interlocking devices.

7. Replace missing or damaged hardware.

8. Finish:

a. Provide matching paint and touch up scratches and mars.

b. If required due to extensive damage, as determined by ENGINEER, refinish the entire assembly.

N. Replace fuses and circuit breakers that do not conform to size and type required by the Contract Documents.

O. Replace transformer insulating oil not in compliance with ASTM D923.

3.02 DRY TYPE TRANSFORMERS

A. Visual and Mechanical Inspection:

1. Physical and insulator damage.

2. Proper winding connections.

3. Bolt torque level in accordance with NETA ATS, Table 10.1, unless otherwise specified by manufacturer.

4. Defective wiring.

5. Proper operation of fans, indicators, and auxiliary devices.

6. Removal of shipping brackets, fixtures, or bracing.

7. Free and properly installed resilient mounts.

8. Cleanliness and improper blockage of ventilation passages.

9. Verify that tap-changer is set at correct ratio for rated output voltage under normal operating conditions.

10. Verify proper secondary voltage phase-to-phase and phase-to-ground after energization and prior to loading.

B. Electrical Tests:

1. Insulation Resistance Tests:

a. Applied megohmmeter dc voltage in accordance with NETA ATS, Table 7.2.3 for each:

1) Winding-to-winding.
2) Winding-to-ground.

b. Ten minute test duration with resistances tabulated at 30 seconds, 1 minute, and 10 minutes.

c. Results temperature corrected in accordance with NETA ATS, Table 7.2.4.

d. Temperature corrected insulation resistance values equal to, or greater than, ohmic values established by manufacturer.

e. Insulation resistance test results to compare within 1 percent of adjacent windings.

2. Perform tests and adjustments for fans, controls, and alarm functions as suggested by manufacturer.

3.03 LOW VOLTAGE CABLES, 600 VOLTS MAXIMUM

A. Visual and Mechanical Inspection:

1. Inspect Each Individual Exposed Power Cable No. 6 and Larger For:

a. Physical damage.
b. Proper connections in accordance with single-line diagram.
c. Cable bends not in conformance with manufacturer's minimum allowable bending radius where applicable.
d. Color coding conformance with specifications.
e. Proper circuit identification.

2. Mechanical Connections For:

a. Proper lug type for conductor material.
b. Proper lug installation.
c. Bolt torque level in accordance with NETA ATS, Table 10. 1, unless otherwise specified by manufacturer.

3. Shielded Instrumentation Cables For:

   a. Proper shield grounding.
   b. Proper terminations.
   c. Proper circuit identification.

4. Control Cables For:

   a. Proper termination.
   b. Proper circuit identification.

5. Cables Terminated Through Window Type CT's: Verify that neutrals and grounds are terminated for correct operation of protective devices.

B. Electrical Tests for Conductors No. 6 and Larger:

1. Insulation Resistance Tests:

   a. Test each conductor with respect to ground and to adjacent conductors per IEEE 118 procedures for 1 minute.
   b. Evaluate ohmic values by comparison with conductors of same length and type.
   c. Investigate values less than 50 megohms.
   d. Utilize 1,000VDC megohmmeter for 600V insulated conductors.

2. Continuity test by ohmmeter method to ensure proper cable connections.

3.04 MOLDED AND INSULATED CASE CIRCUIT BREAKERS

A. General: Inspection and testing limited to circuit breakers rated 70 amperes and larger and to motor circuit protector breakers rated 50 amperes and larger.

B. Visual and Mechanical Inspection:

1. Proper mounting.

2. Proper conductor size.

3. Feeder designation according to nameplate and one-line diagram.
4. Cracked casings.

5. Connection bolt torque level in accordance with NETA ATS, Table 10.1.

6. Operate breaker to verify smooth operation.

7. Compare frame size and trip setting with circuit breaker schedules or one-line diagram.

8. Verify that terminals are suitable for 75 degrees C rated insulated conductors.

C. Electrical Tests:

1. Insulation Resistance Tests:

a. Utilize 1,000-volt dc megohmmeter for 480- and 600-volt circuit breakers and 500-volt dc megohmmeter for 240-volt circuit breakers.

b. Pole-to-pole and pole-to-ground with breaker contacts opened for 1 minute.

c. Pole-to-pole and pole-to-ground with breaker contacts closed for 1 minute.

d. Test values to comply with NETA ATS, Table 10.2.

2. Contact Resistance Tests:

a. Contact resistance in microhms across each pole.

b. Investigate deviation of 50 percent or more from adjacent poles and similar breakers.

3. Primary Current Injection Test to Verify:

a. Long-time minimum pickup and delay.

b. Short-time pickup and delay.

c. Ground fault pickup and delay.

d. Instantaneous pickup by run-up or pulse method.

e. Trip characteristics of adjustable trip breakers shall be within manufacturer's published time-current characteristic tolerance band, including adjustment factors.

f. Trip times shall be within limits established by NEMA AB 4, Table 5-3.

g. Instantaneous pickup value shall be within values established by NEMA AB 4, Table 5-4.

3.05 GROUNDING SYSTEMS

A. Visual and Mechanical Inspection:

1. Equipment and circuit grounds in motor control centers, panelboards, switchboards, and switchgear assemblies for proper connection and tightness.

2. Ground bus connections in motor control centers, panelboards, switchboards, and switchgear assemblies for proper termination and tightness.

3. Effective transformer core and equipment grounding.

4. Accessible connections to grounding electrodes for proper fit and tightness.

5. Accessible exothermic-weld grounding connections to verify that molds were fully filled and proper bonding was obtained.

B. Electrical Tests:

1. Fall-Of-Potential Test:

a. In accordance with IEEE 81, Section 8.2.1.5 for measurement of main ground system's resistance.

b. Main ground electrode system resistance to ground to be no greater than 5 ohms.

2. Two-Point Direct Method Test:

a. In accordance with IEEE 81, Section 8.2. 1.1 for measurement of ground resistance between main ground system, equipment frames, and system neutral and derived neutral points.

b. Equipment ground resistance shall not exceed main ground system resistance by 0.50 ohm.

3.06 THERMOGRAPHIC SURVEY

A. Provide a thermographic survey of connections associated with incoming service conductors, bus work, and branch feeder conductors No. 2 and larger at each:

1. Medium voltage switchgear and transformer.

2. Switchboard.

3. Low voltage motor control center.

4. Panelboard.

B. Provide a thermographic survey of feeder conductors No. 2 and larger terminating at:

1. Motors rated 30 horsepower and larger.

2. Medium and low voltage disconnect switches.

3. Transfer switches.

4. Engine-generators.

C. Remove necessary enclosure metal panels and covers prior to performing survey.

D. Perform with equipment energized during periods of maximum possible loading.

E. Do not perform survey on equipment operating at less than 20 percent of rated connected operating load.

F. Utilize Thermographic Equipment Capable Of:

1. Detecting emitted radiation.

2. Converting detected radiation to visual signal.

3. Detecting 1 degree C temperature difference between subject area and reference point of 30 degrees C.

G. Temperature Gradients Of:

1. 3 degrees C to 7 degrees C indicates possible deficiency that warrants investigation.

2. 7 degrees C to 15 degrees C indicates deficiency that is to be corrected as time permits.

3. 16 degrees C and above indicates deficiency that is to be corrected immediately.

H. Provide Written Report Of:

1. Areas surveyed and the resultant temperature gradients.

2. Locations of areas having temperature gradients of 3 degrees C or greater.

3. Cause of heat rise and actions taken to correct the cause of heat rise.

4. Detected phase unbalance.

END OF SECTION

ELECTRICAL LEGEND

SYMBOL	DESCRIPTION
	CONNECTION POINT TO EQUIPMENT SPECIFIED, FURNISHED AND INSTALLED UNDER OTHER SECTIONS. RACEWAY, CONDUCTOR AND CONNECTION IN THIS SECTION.
1"C,2#12,1#12G 1"C,1–25/C TYPE 1	INDICATES RACEWAY AND CIRCUIT CONDUCTORS. FIRST NUMBER IS RACEWAY SIZE. THE FOLLOWING NUMBERS ARE THE CONDUCTOR QUANTITIES, SIZES, AND TYPES.
5	MOTOR, SQUIRREL CAGE INDUCTION – HORSEPOWER INDICATED
X	LUMINAIRE AND POLE – SEE DRAWINGS FOR TYPE
X	WALL MOUNTED LUMINAIRE – SEE DRAWINGS FOR TYPE
	LIGHTING FIXTURE POWER AND SWITCHING LEGEND
X Y Z (TYP) Y Z X CRE	X=FIXTURE TYPE Y=PANEL–CIRCUIT BRKR Z=SWITCH CRE–CORROSION RESISTANT IF NO Z INDICATED, CONNECT DIRECTLY TO CIRCUIT BREAKER.
	GROUND ROD – 3/4" x 20' COPPER CLAD UNLESS OTHERWISE NOTED
	GROUND ROD WITH TEST WELL – 3/4" x 20' COPPER CLAD UNLESS OTHERWISE NOTED
S	WALL SWITCH: 2– DOUBLE POLE, 3– THREE WAY, 4– FOUR WAY, WP–WEATHERPROOF, P– PILOT LIGHT, K– KEY OPERATED, D– DIMMER, CRE–CORROSION RESISTANT
S_M	MANUAL MOTOR STARTER SWITCH, NEMA 4X UNLESS OTHERWISE NOTED. NUMBER OF POLES AS REQUIRED
G	GENERATOR
	CONVENIENCE RECEPTACLE 20A RATED– DUPLEX UNLESS SPECIFIED OTHERWISE WP–WEATHERPROOF, C– CLOCK HANGER, TL– TWIST LOCK, CRE–CORROSION RESISTANT GFI–GROUND FAULT INTERRUPTER
J	JUNCTION BOX NEMA 12 ENCLOSURE UNLESS INDICATED OTHERWISE. 4X = NEMA 4X SS
	TELEPHONE RECEPTACLE (OUTLET BOX, 18" AFF) W – WALL MOUNTED, 48" AFF
[B2] LPA–2	CONDUIT/CONDUCTOR – REFER TO CIRCUIT SCHEDULE HOME RUN – PANEL AND CIRCUIT NUMBER SHOWN
	EXPOSED CONDUIT AND CONDUCTORS*
	UNDERGROUND CONDUIT AND CONDUCTORS* NOTE: * ALL UNMARKED CONDUIT RUNS CONSIST OF 2#12, 1#12G IN 3/4"C.
YCX	YARD CONDUIT. REFER TO YARD CONDUIT SCHEDULE
	DIRECT BURIED CABLE
	CONDUIT, STUBBED AND CAPPED AS SHOWN
G	GROUND WIRE, #4/0 UNLESS OTHERWISE NOTED
30 4X	NONFUSED DISCONNECT SWITCH, SIZE INDICATED, 3 POLE UNLESS INDICATED OTHERWISE, NEMA 12 ENCLOSURE, 4X = NEMA 4X 316 STAINLESS STEEL
F 40 60 4X	FUSED DISCONNECT SWITCH, SIZE INDICATED (60 = SWITCH RATING: 40 = FUSE RATING) 3 POLE UNLESS INDICATED OTHERWISE, NEMA 12 ENCLOSURE, 4X = NEMA 4X 316 STAINLESS STEEL
LC 30 4X	LIGHTING CONTACTOR, CURRENT RATING INDICATED, NEMA 12 ENCLOSURE UNLESS INDICATED OTHERWISE. SEE CONTROL DIAGRAM FOR NUMBER OF POLES. 4X = NEMA 4X 316 STAINLESS STEEL
2 4X	MAGNETIC STARTER, NEMA SIZE INDICATED, NEMA 12 ENCLOSURE, UNLESS INDICATED OTHERWISE. SEE CONTROL DIAGRAM. 4X = NEMA 4X 316 STAINLESS STEEL
2 4X	COMBINATION (FUSE OR CIRCUIT BREAKER AS INDICATED). MAGNETIC STARTER, NEMA SIZE INDICATED, NEMA 12 ENCLOSURE UNLESS INDICATED OTHERWISE. SEE CONTROL SCHEMATIC DIAGRAM. 4X = NEMA 4X 316 STAINLESS STEEL
	GROUND ROD, 3/4" X 20'

SYMBOL	DESCRIPTION
120V or 480–120/208V 15 KVA, 3ø	TRANSFORMER, VOLTAGES, PHASE AND RATING INDICATED AS APPLICABLE
	PUSH–BUTTON SWITCH, MOMENTARY CONTACT, NORMALLY OPEN
	PUSH–BUTTON SWITCH, MOMENTARY CONTACT, NORMALLY CLOSED
	REMOTE DEVICE
H O A 1 XOO 2 OOX	SELECTOR SWITCH: MAINTAINED CONTACT WITH CONTACT POSITION INDICATED, CHART IDENTIFIES OPERATION

	POSITION		
CKT.	HAND	OFF	AUTO
1	X	O	O
2	O	O	X

X – CLOSED CONTACT
O – OPEN CONTACT

CRX	CONTACT – NORMALLY OPEN WITH COIL INDICATED
CRX	CONTACT – NORMALLY CLOSED WITH COIL INDICATED
	OVERLOAD RELAY HEATER
1	MAGNETIC STARTER WITH NEMA SIZE INDICATED
M	MOTOR CIRCUIT PROTECTOR, MAGNETIC, 3 POLE UNLESS INDICATED OTHERWISE.
400	CIRCUIT BREAKER, THERMAL MAGNETIC TRIP SHOWN, 3 POLE UNLESS INDICATED OTHERWISE.
400 225	FUSED SWITCH, SWITCH AND FUSE CURRENT RATING INDICATED, 3 POLE UNLESS INDICATED OTHERWISE.
100	SWITCH – CURRENT RATING INDICATED, 3 POLE UNLESS INDICATED OTHERWISE.
SPD	SURGE PROTECTIVE DEVICE
	DEMOLITION TO BE REMOVED OR DELETED
	FUSE
CRX	CONTROL RELAY, X=SEQUENTIAL NUMBER
	CONNECTION POINT TO EQUIPMENT SPECIFIED, FURNISHED AND INSTALLED UNDER OTHER SECTIONS. RACEWAY, CONDUCTOR AND CONNECTION IN THIS SECTION.

ABBREVIATIONS

ABBREVIATIONS	DESCRIPTION
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AIT	ANALYTICAL INSTRUMENT TRANSMITTER
AE	ANALYTICAL ELEMENT
ATS	AUTOMATIC TRANSFER SWITCH
C	CONDUIT, CONTACTOR
CB	CIRCUIT BREAKER
CKT	CIRCUIT
CPT	CONTROL POWER TRANSFORMER
CR	CONTROL RELAY
CT	CURRENT TRANSFORMER
DIV	DIVISION
ETM	ELAPSED TIME METER
EXST	EXISTING
F, FU	FUSE
FI	FLOW INDICATOR
FM	FLOW METER
FS01	FLOW SWITCH 01
FT	FLOW TRANSMITTER
FUT	FUTURE
FVNR	FULL VOLTAGE NON–REVERSING STARTER
GALV	GREEN, GROUND GALVANIZED
GEN	GENERATOR
GFI	GROUND FAULT INTERRUPTER
GND	GROUND
HH	HANDHOLE
HOA	HAND/OFF/AUTO
HOR	HAND/OFF/REMOTE
MSC	MANUFACTURER SUPPLIED CABLE
FRP	FIBERGLASS–REINFORCED POLYESTER

ABBREVIATIONS	DESCRIPTION
HVAC	HEATING, VENTILATING & AIR CONDITIONING
IC	INTERRUPTING CAPACITY
I & C	INSTRUMENTATION AND CONTROL
IP	INSTRUMENT PANEL (PANELBOARD)
J, J–BOX	JUNCTION BOX
LC	LIGHTING CONTACTOR
LR	LOCAL/REMOTE
LS	LIMIT SWITCH
LTG	LIGHTING
M	MAGNETIC CONTACTOR COIL OR MOTOR
MCC	MOTOR CONTROL CENTER
MDP	MAIN DISTRIBUTION PANEL
MH	MOTOR HEATER, MANHOLE
MLO	MAIN LUGS ONLY
MPZ	MINI POWER ZONE
MTD	MOTOR TEMPERATURE DETECTOR
N	NEUTRAL
NC	NORMALLY CLOSED
NEMA	NATIONAL ELECTRIC MANUFACTURER'S ASSOCIATION
NO	NORMALLY OPEN
NTS	NOT TO SCALE
OL	OVERLOAD RELAY
SS	STAINLESS STEEL

ABBREVIATIONS

ABBREVIATIONS	DESCRIPTION
PB	PULL BOX
PG	PRESSURE GAUGE
PCM	EXISTING PLANT CONTROL PANEL
PH	PHASE MONITOR
PM	POWER MONITOR
PNL	PANEL
PP	POWER PANEL (480VAC)
PS	PRESSURE SWITCH
PVC	POLYVINYL CHLORIDE CONDUIT
RTU	REMOTE TELEMETRY UNIT
RGS	RIGID GALVANIZED STEEL
SF	SUPPLY FAN
SH	SPACE HEATER
SPD	SURGE PROTECTIVE DEVICE

ABBREVIATIONS	DESCRIPTION
SSRVS	SOLID STATE REDUCED VOLTAGE STARTER
SST	STAINLESS STEEL
SV	SOLENOID VALVE
SW	SWITCH
T	THERMOSTAT
TB	TERMINAL BOARD
TCJS	TERMINAL CABINET 3 SIGNAL
TJB	TERMINAL JUNCTION BOX
TS	THERMAL SWITCH
TSP	TWISTED SHIELDED PAIR
TYP	TYPICAL
V	VOLTMETER, VOLT
VD	VOLTAGE DROP
WP	WEATHERPROOF – NEMA 4X
XFMR	TRANSFORMER

GENERAL NOTES AND SPECIFICATIONS:

1. THE SCOPE OF WORK SHALL BE AS SHOWN ON PLANS AND AS DESCRIBED IN SPECIFICATIONS.
2. THE CONTRACTOR SHALL PROVIDE ALL MATERIALS AND LABOR TO INSTALL THE ELECTRICAL SYSTEMS AS INDICATED PER PLANS AND SPECIFICATIONS. ITEMS NOT SHOWN BUT OBVIOUSLY NECESSARY FOR COMPLETION OF THE WORK SHALL BE INCLUDED.
3. THE INSTALLATION SHALL BE IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE, NATIONAL ELECTRICAL SAFETY CODE, LOCAL CITY CODES, LOCAL COUNTY CODES, AND FLORIDA BUILDING CODE WITH AMENDMENTS.
4. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS, INSPECTIONS AND APPROVALS AND TO INCLUDE ALL FEES AS PART OF THEIR BID IF NOT OTHERWISE NOTED. THE CONTRACTOR SHALL COORDINATE THEIR WORK WITH THE ENGINEER AND OWNER.
5. THE CONTRACTOR SHALL, BEFORE SUBMITTING THEIR BID, VISIT THE SITE OF THE PROJECT AND BECOME FAMILIAR WITH THE EXISTING CONDITIONS. NO ALLOWANCE WILL BE MADE FOR EXISTING CONDITIONS OR FAILURE OF THE CONTRACTOR TO OBSERVE THEM.
6. IT IS THE CONTRACTOR'S RESPONSIBILITY TO COORDINATE WITH ALL LOCAL UTILITIES, INCLUDING THE POWER UTILITY TO MEET ALL OF THEIR INSTALLATION REQUIREMENTS. ALL FEES, LABOR, EQUIPMENT OR MATERIALS NECESSARY TO MEET THESE REQUIREMENTS IS TO BE INCLUDED IN THE BID. THE CONTRACTOR SHALL OBTAIN, DELIVER AND INSTALL ALL CONDUITS, PULL–BOXES AND EQUIPMENT AS REQUIRED BY THE UTILITIES TO THEIR SPECIFICATIONS.
7. ALL CONTRACTOR EQUIPMENT AND MATERIAL SHALL BE NEW, UNUSED AND U.L. LISTED.
8. THE CONTRACTOR IS RESPONSIBLE TO TEST ALL SYSTEMS INSTALLED OR MODIFIED UNDER THIS PROJECT AND REPAIR OR REPLACE ALL DEFECTIVE WORK TO THE SATISFACTION OF THE ENGINEER AND OWNER.
9. ALL EQUIPMENT FURNISHED AND INSTALLED BY THE CONTRACTOR SHALL BE GUARANTEED AGAINST DEFECTS IN MATERIAL AND WORKMANSHIP FOR A PERIOD OF ONE YEAR FROM DATE OF ACCEPTANCE.
10. COORDINATE ALL ELECTRICAL EQUIPMENT LOCATIONS AND VERIFY ALL OBSTRUCTIONS WITH ALL SUBCONTRACTORS AND EQUIPMENT SUPPLIERS PRIOR TO ANY INSTALLATION.
11. NOT ALL CONDUITS SHOWN ON RISER AND ONE–LINE DIAGRAMS ARE SHOWN ON BUILDING OR SITE LAYOUTS. CONTRACTOR SHALL SUPPLY ALL CONDUITS AND CABLES AS SHOWN ON RISER AND ONE–LINE DIAGRAMS.
12. THE DRAWINGS ARE NOT INTENDED TO SHOW THE EXACT LOCATION OF CONDUIT RUNS. THESE ARE TO BE COORDINATED WITH THE OTHER TRADES SO THAT CONFLICTS ARE AVOIDED PRIOR TO INSTALLATIONS. ALL LOCATIONS OF EQUIPMENT, PANELS ETC. ARE SHOWN FOR ILLUSTRATION PURPOSES. CONTRACTOR SHALL VERIFY EXACT LOCATION AND SIZE AND INSTALL AS SUCH WITH CORRESPONDING CONDUIT STUB–UPS. SEE OTHER DISCIPLINE DRAWINGS FOR COORDINATION OF ALL DRAWINGS. ANY CONFLICTS SHALL BE BROUGHT TO THE ENGINEER'S ATTENTION AND MOVEMENT OF CONDUITS OR OTHER ELECTRICAL EQUIPMENT SHALL BE ACCOMPLISHED WITHOUT ANY ADDITIONAL COST FOR THE OWNER. DRAWINGS ARE SCHEMATIC AND SHOWN FOR CLARITY.
13. ALL REFERENCES TO A PARTICULAR MANUFACTURER ARE GIVEN ON AN "APPROVED EQUAL" BASIS.
14. MINIMUM DEPTH FROM TOP OF DUCTBANKS OR CONDUITS TO FINISHED GRADE SHALL BE 24" UNLESS OTHERWISE NOTED.
15. ALL EXCAVATIONS FOR CONDUITS AND HANDHOLES, NEAR EXISTING PIPING, CONDUIT AND EQUIPMENT SHALL BE HAND EXCAVATED AND COORDINATED WITH PLANT ENGINEER.
16. CONDUCTOR PULLING TENSIONS SHALL NET EXCEED MANUFACTURER'S RECOMMENDATION. CONTRACTOR SHALL INSTALL PULL BOXES TO MEET MANUFACTURER'S REQUIREMENTS.
17. MINIMUM DISTANCE ALLOWED BETWEEN CROSSING POWER CONDUITS AND INSTRUMENTATION CONDUITS SHALL BE 6 INCHES SEPARATION. MINIMUM DISTANCE ALLOWED BETWEEN PARALLEL POWER CONDUITS AND INSTRUMENTATION CONDUITS SHALL BE:

VOLTAGE	DISTANCE
480V	2 FT
120V	1 FT

18. ALL YARD CONDUITS/ EXTERIOR UNDERGROUND CONDUITS SHALL BE CONCRETE ENCASED AS SHOWN ON DETAIL. PROVIDE WARNING TAPE AND #4/0 BARE COPPER GROUND ABOVE THE CONCRETE ENCASEMENT.
19. COLORED WARNING TAPE 6" WIDE SHALL BE INSTALLED 8" BELOW FINISHED GRADE DIRECTLY ABOVE ALL UNDERGROUND CONCRETE ENCASEMENT.
20. FLEXIBLE CONDUITS SHALL BE USED TO TERMINATE ALL MOTORS AND OTHER VIBRATING EQUIPMENT AND SHALL BE BETWEEN 18" AND 3' IN LENGTH.
21. ALL SPARE CONDUITS SHALL BE CAPPED WITH A PVC CAP AND A NYLON PULL STRING INSTALLED WITH IDENTIFICATION ON BOTH ENDS.
22. CONTRACTOR SHALL RESTORE SIDEWALKS, ROADWAYS, SOD AND SPRINKLER SYSTEM PIPING TO MATCH EXISTING, AFTER THE COMPLETION OF THE ELECTRICAL INSTALLATION, SUCH AS CONDUITS, PULLBOX, GROUNDING, ETC.
23. ALL MATERIAL IN DESIGNATED CORROSIVE AREAS SHALL BE NEMA 4X 316 STAINLESS STEEL.
24. ALL REFERENCES TO SS OR STAINLESS STEEL SHALL MEAN 316 STAINLESS STEEL.
25. ALL CONTROL PANELS SHALL BE CONSTRUCTED BY A UL 508A APPROVED PANEL VENDOR AND SHALL BEAR A UL 508A LABEL ON THE PANEL.
26. INSTRUMENTATION IS LOW VOLTAGE SIGNALS SUCH AS 4–20MA, TELEPHONE COMMUNICATION, FIRE ALARM COMMUNICATION. POWER CONDUIT SHALL ONLY CROSS INSTRUMENTATION CONDUIT PERPENDICULARLY AT RIGHT ANGLES WITH 6" SEPARATION.
27. CONTRACTOR SHALL PROVIDE RECORD DRAWINGS TO THE OWNER WITHIN 30 DAYS OF SYSTEM ACCEPTANCE.
28. CONTRACTOR SHALL PROVIDE OPERATION MANUALS TO THE OWNER.
29. THE MAXIMUM VOLTAGE DROP FOR BRANCH CIRCUIT CONDUCTORS IS 3% PER FLORIDA BUILDING CODE AND NEC.
30. ALL CONDUITS PENETRATING RATED FIRE WALLS OR RATED FIRE FLOORS SHALL BE INSTALLED WITH U.L. APPROVED DEVICES TO MAINTAIN THE FIRE RATING OF THE WALL OR FLOOR PENETRATED.
31. DEMOLISH ALL ITEMS AS INDICATED ON DRAWINGS. TURN OVER TO THE OWNER AT THE OWNER'S DISCRETION AND PROPERLY DISPOSE OF ALL DEMOLITION ITEMS NOT WANTED BY THE OWNER.

LINE WEIGHT LEGEND

NEW — EXISTING

NO	DATE	REVISION	BY	NO	DATE	REVISION	BY

HILLERS ELECTRICAL ENGINEERING, INC.
23257 STATE ROAD 7, SUITE 100
BOCA RATON, FLORIDA 33428
(561) 451–9165
(561) 451–4886 FAX
LICENSE NO: EB 0006877

CITY OF PEMBROKE PINES
EASTERN WELLFIELD ELECTRICAL IMPROVEMENTS
PEMPROKE PINE, FLORIDA

ELECTRICAL LEGEND AND NOTES

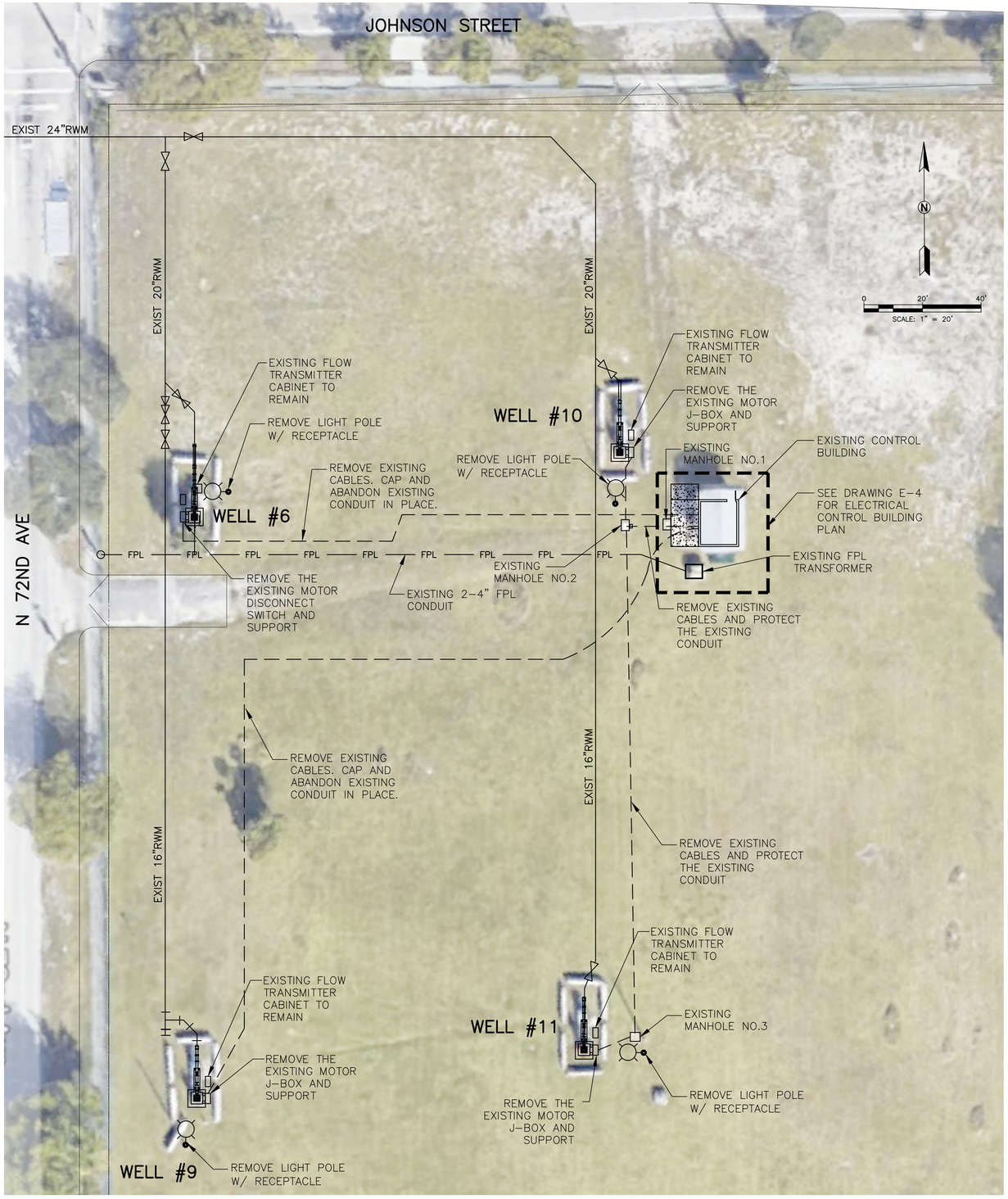
JAMES W. KAPPES, P.E.
STATE OF FLORIDA PROFESSIONAL ENGINEER
LICENSE No. 71499

DATE: AUGUST 2018

SCALE: NONE

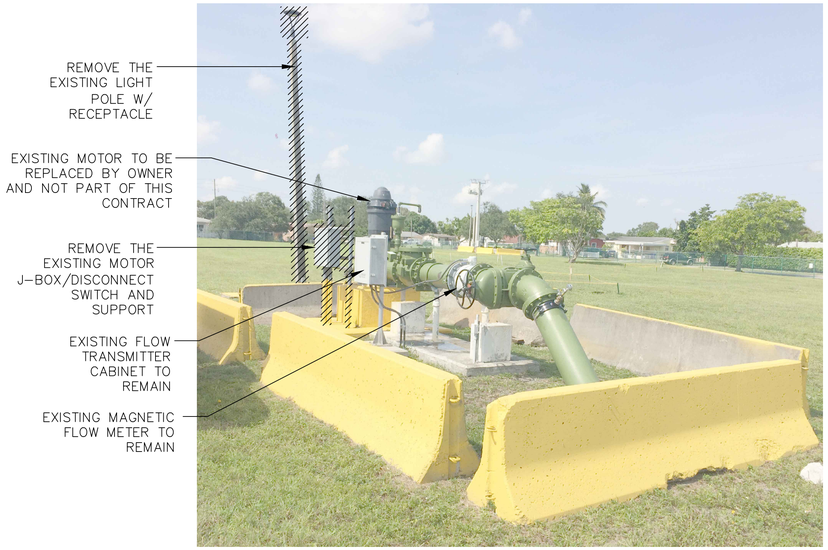
PROJECT No: PP05

SHEET: E-1



EASTERN WELLFIELD ELECTRICAL PLAN – DEMOLITION

SCALE; 1" = 20'-0"



TYPICAL EXISTING WELL PHOTO – DEMOLITION

NOT TO SCALE

NOTES

1. EXISTING UNDERGROUND RAW WATER LINES AND FPL POWER LINE ARE SHOWN FOR ILLUSTRATION PURPOSE. CONTRACTOR SHALL FIELD VERIFY.

811 KNOW WHAT'S BELOW ALWAYS CALL 811 BEFORE YOU DIG

NO	DATE	REVISION	BY	NO	DATE	REVISION	BY

HILLERS ELECTRICAL ENGINEERING, INC.
23257 STATE ROAD 7, SUITE 100
BOCA RATON, FLORIDA 33428
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LICENSE NO: EB 0006877

CITY OF PEMBROKE PINES
EASTERN WELLFIELD ELECTRICAL IMPROVEMENTS
PEMPROKE PINE, FLORIDA

EASTERN WELLFIELD ELECTRICAL PLAN - DEMOLITION

JAMES W. KAPPES, P.E.
STATE OF FLORIDA PROFESSIONAL ENGINEER
LICENSE No. 71499

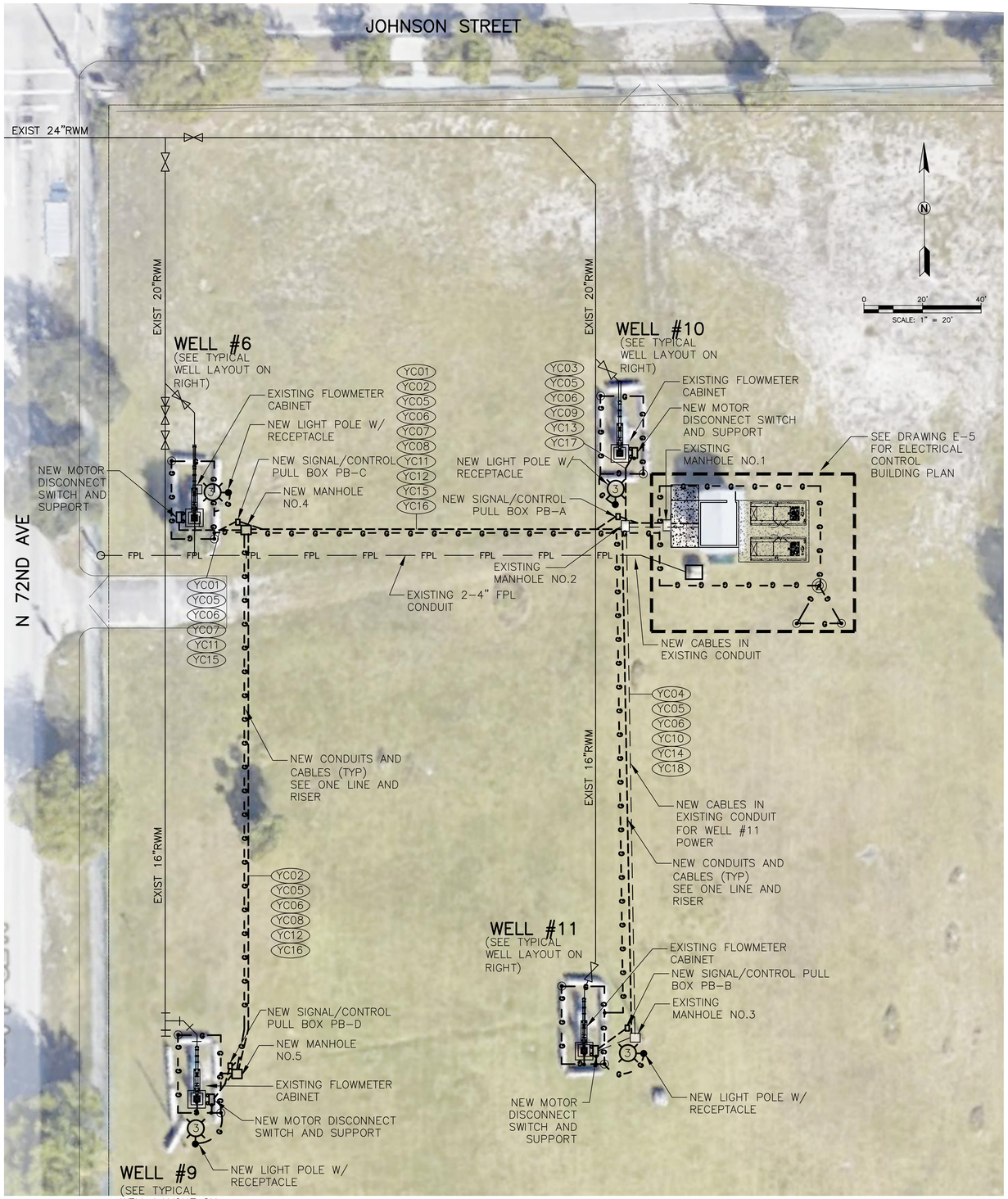
DATE: AUGUST 2018

SCALE: AS SHOWN

PROJECT No: PP05

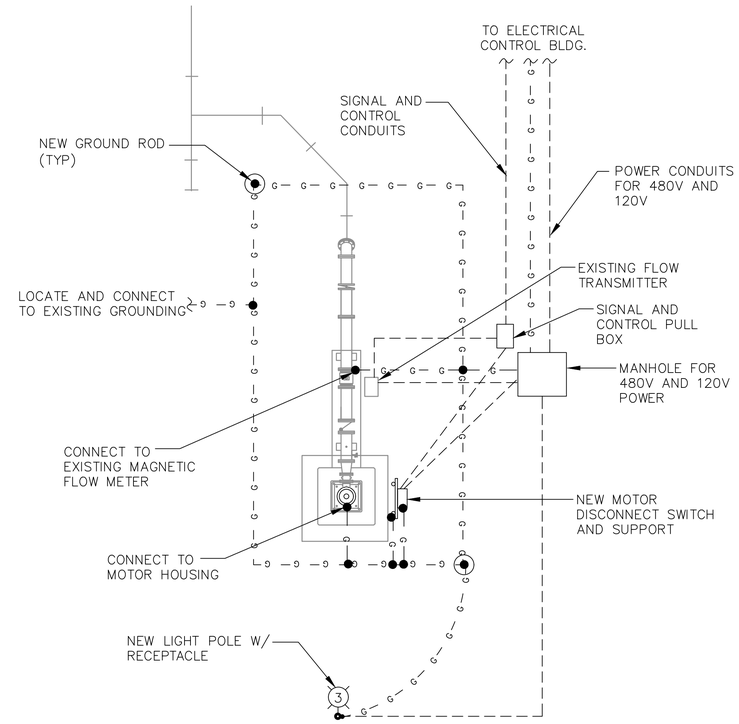
SHEET: E-2

File Name: E:\PROJECTS\PP\PP05\DRAWINGS\PP05E02 - SITE PLAN DEMO.dwg - (Plotted by: Daniel Urquijo on Wednesday, August 22, 2018 4:04:41 PM)



EASTERN WELLFIELD ELECTRICAL PLAN – PROPOSED

SCALE; 1" = 20'-0"



TYPICAL WELL LAYOUT – PROPOSED

NOT TO SCALE

NOTES

1. EXISTING UNDERGROUND RAW WATER LINES AND FPL POWER LINE ARE SHOWN FOR ILLUSTRATION PURPOSE. CONTRACTOR SHALL FIELD VERIFY.
2. CONTRACTOR SHALL MAINTAIN ENOUGH CLEARANCE PER NEC IN FRONT OF MOTOR DISCONNECT SWITCH.
3. CORE DRILL EXISTING CONCRETE MANHOLES FOR NEW CONDUIT INSTALLATION.
4. THERE ARE EXISTING REMOVABLE CONCRETE BARRIERS AROUND EACH WELL SITE. PROVIDE THE LIFTING EQUIPMENT IF REQUIRED TO WORK AROUND THE WELL SITES AND PUT BACK AT THE END OF THE PROJECT.
5. IF THERE IS A CONFLICT WITH THE EXISTING UNDERGROUND UTILITIES, THE NEW DUCTBANK SHALL BE INSTALLED EITHER ABOVE OR BELOW THE EXISTING UNDERGROUND UTILITIES TO MEET THE REQUIRED BURIAL DEPTH PER NEC.
6. THE NEW GENERATORS AND ATS ARE PROVIDED UNDER A SEPARATE CONTRACT. CONTRACTOR SHALL COORDINATE WITH UPGRADE EMERGENCY BACKUP ELECTRICAL SERVICES EQUIPMENT CONTRACT DOCUMENTS.
7. INSTALL UNDERGROUND SIGNAL AND CONTROL CONDUITS IN ONE CONCRETE ENCASEMENT AND 480V AND 120V POWER IN ANOTHER CONCRETE ENCASEMENT. MAINTAIN 24" SEPARATION BETWEEN THOSE TWO CONCRETE ENCASEMENTS.
8. BURROWING OWLS AND NESTS ARE INSIDE THE EASTERN WELLFIELD FACILITY. COORDINATE WITH OWNER BEFORE DIGGING AND AVOID BURROWS.
9. PROVIDE SPD FOR FLOWMETER ON BOTH POWER AND CONTROL.

811 KNOW WHAT'S BELOW ALWAYS CALL 811 BEFORE YOU DIG

NO	DATE	REVISION	BY	NO	DATE	REVISION	BY

HILLERS ELECTRICAL ENGINEERING, INC.
23257 STATE ROAD 7, SUITE 100
BOCA RATON, FLORIDA 33428
(561) 451-9165
(561) 451-4886 FAX
LICENSE NO: EB 0006877

CITY OF PEMBROKE PINES
EASTERN WELLFIELD ELECTRICAL IMPROVEMENTS
PEMPROKE PINE, FLORIDA

EASTERN WELLFIELD ELECTRICAL PLAN - PROPOSED

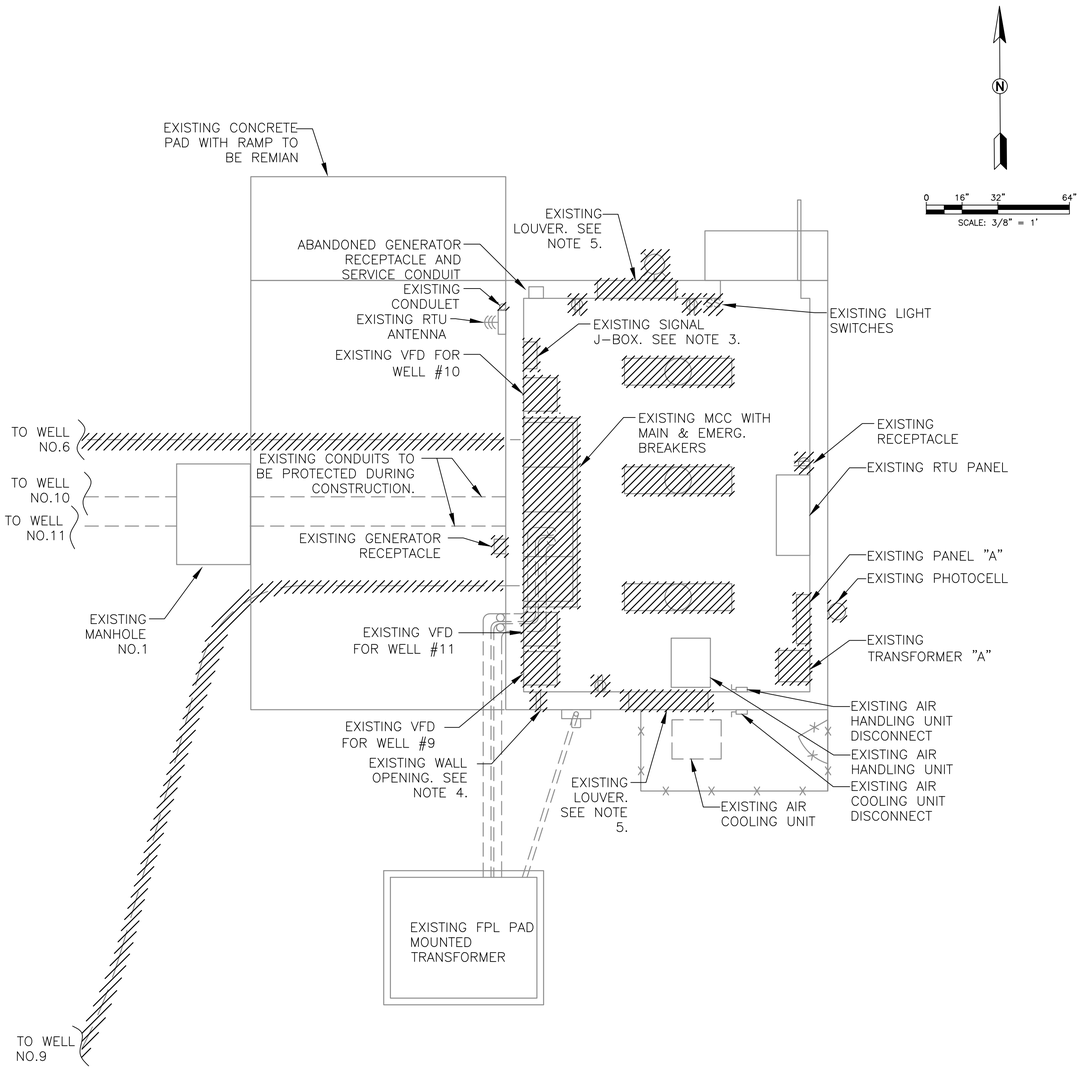
JAMES W. KAPPES, P.E.
STATE OF FLORIDA PROFESSIONAL ENGINEER
LICENSE No. 71499

DATE: AUGUST 2018

SCALE: AS SHOWN

PROJECT No: PP05

SHEET: E-3



ELECTRICAL FLOOR PLAN – DEMOLITION

SCALE: 3/8" = 1'-0"

NOTES:

1. EXISTING CONDUIT ROUTINGS ARE SHOWN FOR ILLUSTRATION PURPOSES ONLY. CONTRACTOR SHALL FIELD VERIFY.
2. THE EXISTING CONDUITS, CABLES, PULL BOX AND EQUIPMENT THAT BECOME OBSOLETE BECAUSE OF THE ELECTRICAL UPGRADE SHALL BE REMOVED.
3. EXISTING SIGNAL JUNCTION BOX TO BE REMOVED AFTER NEW CONDUITS AND SIGNAL CABLES FOR THE FLOW METER ARE INSTALLED, TESTED AND IN OPERATION. FLOW METERS SHALL REMAIN IN OPERATION AT ALL TIMES.
4. CONTRACTOR SHALL REMOVE EXISTING EXTENSION CORD ROUTED THROUGH WALL AND PATCH AND SEAL EXISTING VOID/OPENING WITH CONCRETE. CONTRACTOR SHALL PATCH AND SEAL WITH A FIRE RATED SEALANT TO KEEP INTACT THE EXISTING FIRE RATED RATING OF BUILDING. PAINT TO MATCH EXISTING FINISH.
5. CONTRACTOR SHALL REMOVE EXISTING LOUVERS AND PROVIDE AND INSTALL NEW BLOCK/CONCRETE TO FILL OPENING. CONTRACTOR SHALL PATCH AND SEAL WITH A FIRE RATED SEALANT TO KEEP INTACT THE EXISTING FIRE RATED RATING OF BUILDING. PAINT TO MATCH EXISTING FINISH.

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CITY OF PEMBROKE PINES
EASTERN WELLFIELD ELECTRICAL IMPROVEMENTS
PEMPROKE PINE, FLORIDA

ELECTRICAL CONTROL BUILDING
PLAN - DEMOLITION

JAMES W. KAPPES, P.E.
STATE OF FLORIDA PROFESSIONAL ENGINEER
LICENSE No. 71499

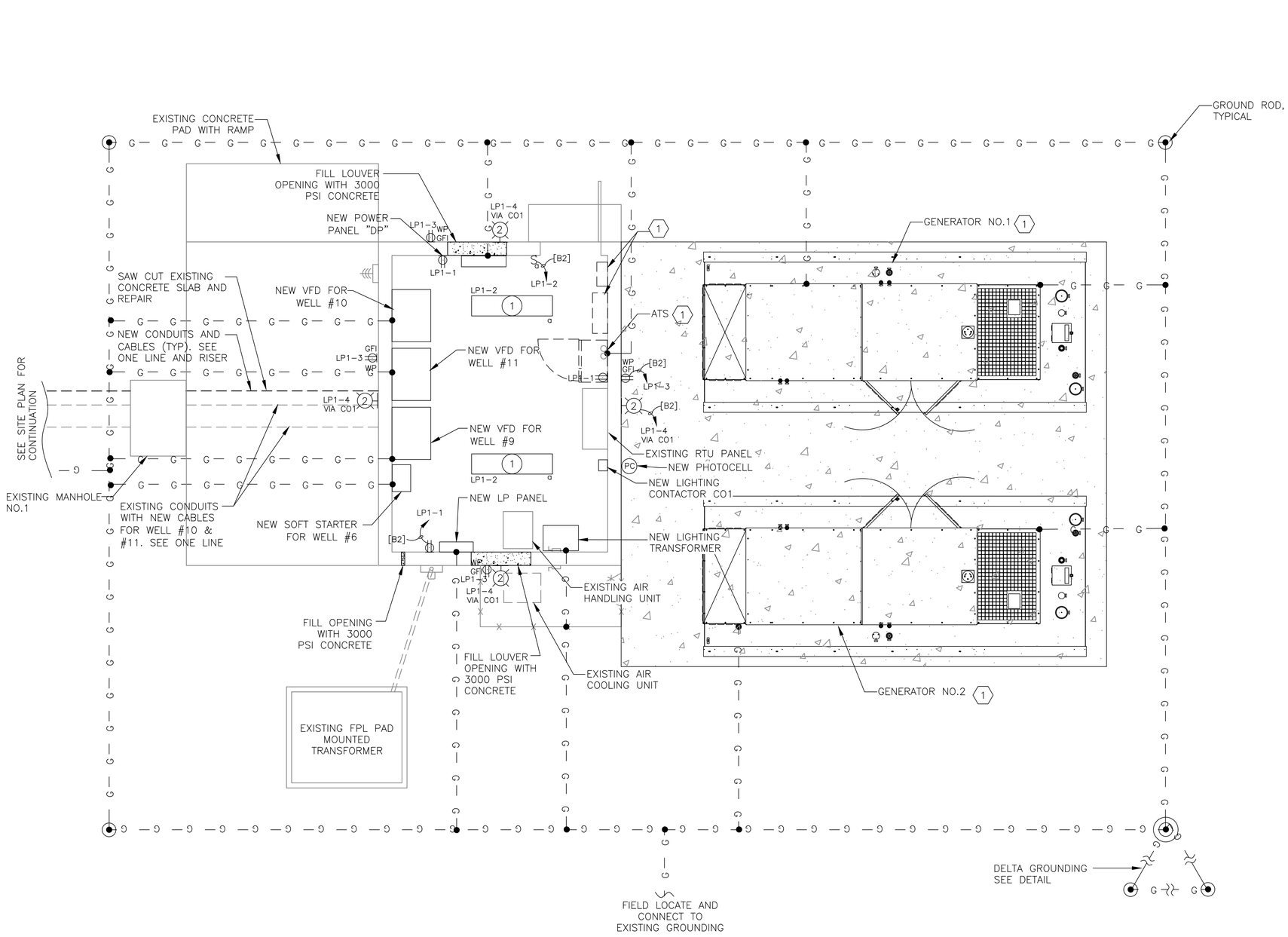
DATE: AUGUST 2018

SCALE: AS SHOWN

PROJECT No: **PP05**

SHEET: **E-4**

File Name: E:\PROJECTS\PP\PP05\DRAWINGS\PP05E04 - ELECTRICAL BLDG PLAN DEMO.dwg - (Plotted by: Daniel Urquijo on Wednesday, August 22, 2018 4:04:48 PM)



ELECTRICAL FLOOR PLAN – PROPOSED

SCALE: 3/8" = 1'–0"

NOTES

1. CONTRACTOR SHALL INSTALL GROUNDING CONDUCTOR FROM THE GROUNDING GRID TO ALL PANELS, PUMPS, DISCONNECTS, MOUNTING SUPPORTS, FLOW METERS AND LIGHT POLES, ETC. FOR A COMPLETE GROUNDING SYSTEM.
2. PROVIDE LIGHTNING PROTECTION PER SPECIFICATION 16670 AND BOND TO THE GROUND GRID.
3. THE NEW GENERATORS AND ATS ARE PROVIDED UNDER A SEPARATE CONTRACT. CONTRACTOR SHALL COORDINATE WITH UPGRADE EMERGENCY BACKUP ELECTRICAL SERVICES EQUIPMENT CONTRACT DOCUMENTS.
4. CONTRACTOR SHALL CORE DRILL EXISTING CONCRETE WALL FOR NEW CONDUIT INSTALLATION.
5. CONTRACTOR SHALL SAW CUT THE EXISTING CONCRETE SLAB LOCATED OUTSIDE THE WEST BUILDING WALL AS REQUIRED AND REPAIR TO MATCH EXISTING.

KEYED NOTES:

(1) THE NEW GENERATORS, GENERATOR PARALLELING GEAR, AUTOMATIC TRANSFER SWITCH (ATS) AND ASSOCIATED CONDUITS AND CONDUCTORS ARE PROVIDED UNDER UPGRADE EMERGENCY BACKUP ELECTRICAL SERVICE EQUIPMENT CONTRACT DOCUMENTS. CONTRACTOR SHALL COORDINATE AND PLAN THE WORK ACCORDINGLY.

CIRCUIT SCHEDULE

[B2]=3/4"C, 2#12, 1#12G

NO	DATE	REVISION	BY	NO	DATE	REVISION	BY

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CITY OF PEMBROKE PINES
EASTERN WELLFIELD ELECTRICAL IMPROVEMENTS
PEMPROKE PINE, FLORIDA

ELECTRICAL CONTROL BUILDING PLAN - PROPOSED

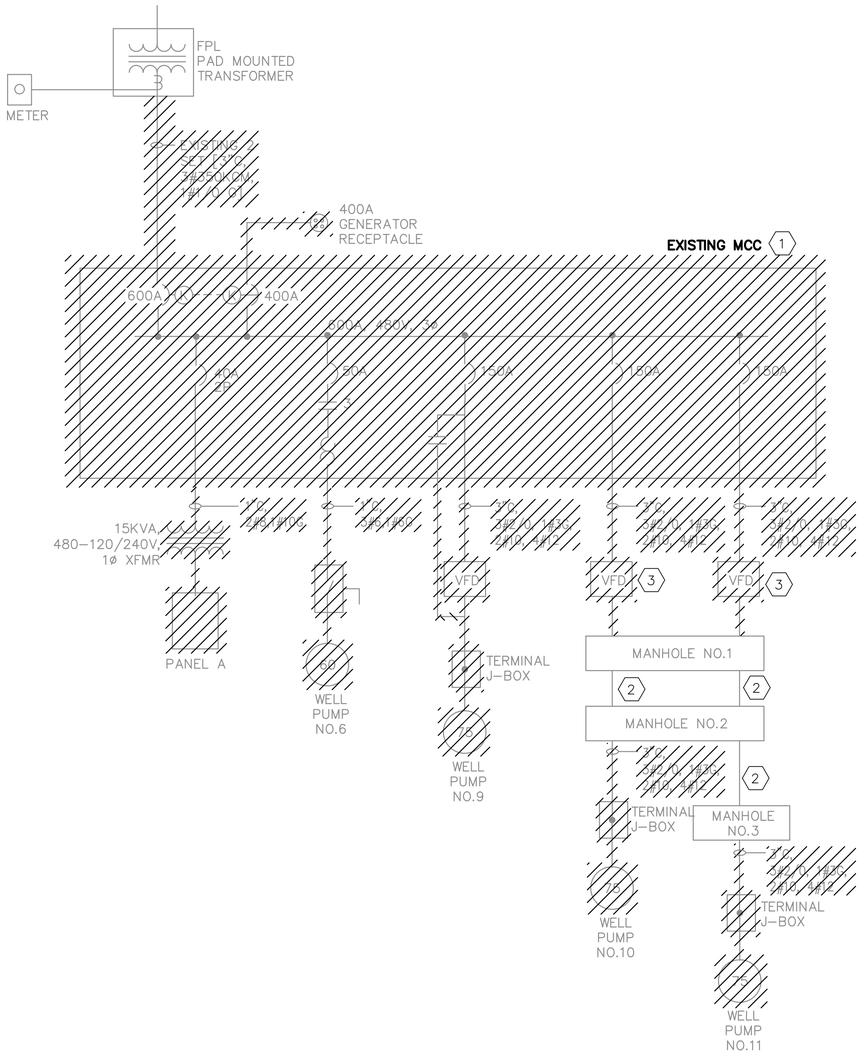
JAMES W. KAPPES, P.E.
STATE OF FLORIDA PROFESSIONAL ENGINEER
LICENSE No. 71499

DATE: AUGUST 2018

SCALE: AS SHOWN

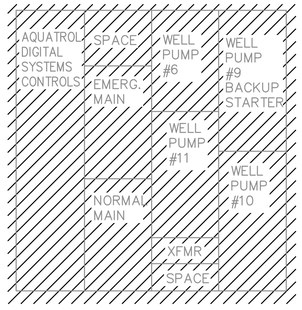
PROJECT No: PP05

SHEET: E-5



EXISTING ONE LINE – DEMOLITION

NOT TO SCALE



EXISTING MCC ELEVATION 1

NOT TO SCALE

KEYED NOTE:

1. PRIOR TO THE EXISTING MCC DEMOLITION AND TAKING ANY WELL OUT OF SERVICE, NEW POWER PANEL DP SHALL BE INSTALLED, TESTED AND ENERGIZED. COORDINATE WITH THE ENGINEER AND OWNER TO GET APPROVAL.
2. REMOVE THE EXISTING POWER CONDUCTORS FROM THE EXISTING MCC TO WELL #10 AND #11 MOTORS. CONTRACTOR SHALL PROTECT THE EXISTING CONDUITS BETWEEN MANHOLES TO BE RE–USED.
3. PROVIDE TEMPORARY POWER TO EXISTING WELL #10 VFD AND WELL #11 VFD DURING THE EXISTING MCC DEMOLITION TO MAKE SPACE FOR NEW VFD'S. PROVIDE AND INSTALL NECESSARY TEMPORARY POWER AND CONDUITS FROM NEW DP PANEL TO WELL #10 AND 11 VFD'S.

NOTES:

1. NO MORE THAN ONE WELL SHALL BE OUT OF SERVICE AT ANY TIME. COORDINATE WITH OWNER AND GET APPROVAL PRIOR TO ANY WELL TAKEN OUT OF SERVICE.
2. THE NEW GENERATORS AND ATS ARE PROVIDED BY UPGRADE EMERGENCY BACKUP ELECTRICAL SERVICE EQUIPMENT CONTRACT DOCUMENTS. CONTRACTOR SHALL COORDINATE AND PLAN THE WORK ACCORDINGLY.
3. SUGGESTED CONSTRUCTION SEQUENCE FOR WELLS IN ORDER ARE NO. 10, 11, 9 AND 6. COORDINATE WITH THE OWNER AT THE TIME OF CONSTRUCTION FOR ACTUAL SEQUENCE.

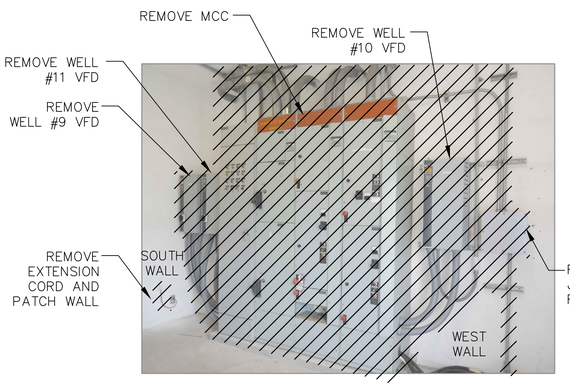


PHOTO 1– ELECTRICAL DEMOLITION WEST WALL

NOT TO SCALE

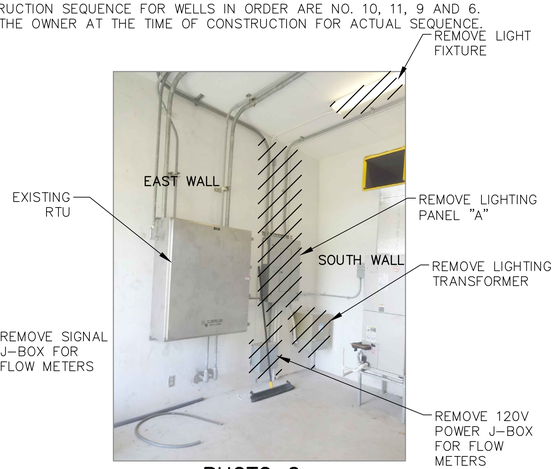


PHOTO 2 – ELECTRICAL DEMOLITION EAST AND SOUTH WALL

NOT TO SCALE

EXISTING LIGHTING PANEL "A" SCHEDULE

BUS AMPS A	BUS AMPS B	LOAD	POLES	AMPS	BUS A	BUS B	AMPS	POLES	LOAD	BUS AMPS A	BUS AMPS B
		SPACE			1	2	60	2	MAIN BREAKER		
		SPACE			3	4	1	1			
–		RECEPTACLE	1	20	5	6	20	1	ELECTRICAL ROOM INTERIOR LIGHTS	–	
		PHOTOCELL	1	20	7	8	20	1	MCC CONTROL POWER		
		ELECTRICAL ROOM INTERIOR RECEPTACLE	1	20	9	10	20	1	RTU	–	
	–	SPARE	1	20	11	12	20	1	WELL #11 FLOW METER		–
		SPACE			13	14	20	1	WELL #6 FLOW METER	–	
		SPACE			15	16	20	1	WELL #10 FLOW METER		
1.5		AIR HANDLING UNIT	2	20	17	18	20	1	WELL #9 FLOW METER		
	1.5		1	1	19	20			SPACE		
12.0		AIR COOLING UNIT	2	30	21	22			SPACE		
	12.0		1	1	23	24			SPACE		

RATED VOLTAGE: ■ 120/240 ☐ 277/480 ☐ 1 PHASE ■ 3 WIRE | BRANCH POLES: ☐ 12 ■ 24 ☐ 30 ☐ 42

RATED AMPS: ■ 80 ☐ 225 ☐ 400 ☐ | CABINET: ■ SURFACE ☐ FLUSH | ☐ SERVICE ENTRANCE RATED

NEUTRAL BUS: ■ 100% ☐ 150% ☐ 200% | ■ GROUND BUS | ■ HINGED DOOR | ☐ KEYED DOOR LATCH | LOCATION: _____

■ CIRCUIT BREAKER | BOLT ON BRANCH DEVICES | ☐ EXTERNAL SPD | ENCLOSURE TYPE: ■ NEMA 1 ☐ NEMA 3R ☐ NEMA 4X ☐ _____

☐ MAIN LUGS ONLY | MAIN: 60 ■ BREAKER ☐ _____ TO BE GFI BREAKERS

PANEL BOARD MUST BE RATED TO INTERRUPT A SHORT CIRCUIT I.S.C. OF _____ 000 AMPS SYMMETRICAL

EXISTING GENERAL ELECTRIC PANEL | COPPER BUSSES | MAIN LUGS _____ SETS SIZE _____

NO	DATE	REVISION	BY	NO	DATE	REVISION	BY

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CITY OF PEMBROKE PINES
EASTERN WELLFIELD ELECTRICAL IMPROVEMENTS
PEMPROKE PINE, FLORIDA

ELECTRICAL ONE LINE DEMOLITION

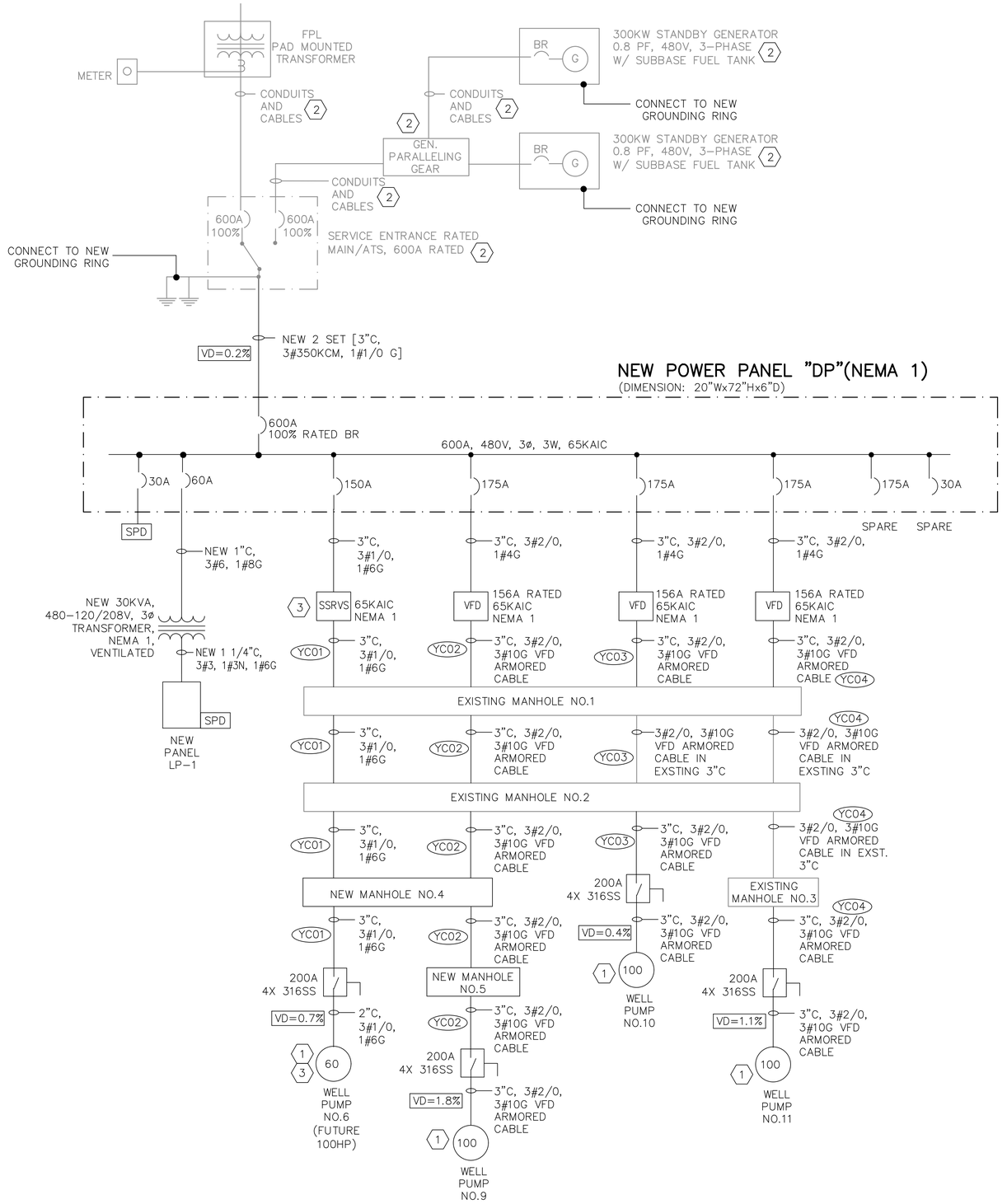
JAMES W. KAPPES, P.E.
STATE OF FLORIDA PROFESSIONAL ENGINEER
LICENSE No. 71499

DATE: AUGUST 2018

SCALE: NONE

PROJECT No: PP05

SHEET: E-6



PROPOSED ONE LINE DIAGRAM

NOT TO SCALE

POWER PANEL "DP" LOAD CALCULATION

480V, 3ø

LOAD DESCRIPTION	CONNECTED LOAD (AMPS)	RUNNING LOAD (AMPS)
LIGHTING TRANSFORMER	36.1 A	16.5 A
WELL PUMP #6 (FUTURE 100 HP)	124.0 A	124.0 A
WELL PUMP #9	124.0 A	124.0 A
WELL PUMP #10	124.0 A	124.0 A
WELL PUMP #11	124.0 A	124.0 A
TOTAL AMPS	532.1 A	512.5 A
TOTAL KVA	442.4 KVA	426.1 KVA

NOTES:

1. VFD ARMORED CABLE SHALL HAVE ALUMINUM METALLIC SHEATH THAT MEETS THE GROUNDING REQUIREMENTS OF NEC 250.122 AND AS ALLOWED BY NEC 250.118.(10).C.

KEYED NOTES:

1. ON ALL EXISTING WELL MOTORS, THE CONTRACTOR SHALL INSTALL AN AEGIS SGR GROUNDING RING. CONTRACTOR SHALL CONTACT AEGIS FOR CORRECT MODEL NUMBER FOR EACH WELL MOTOR.
2. THE NEW GENERATORS, GENERATOR PARALLELING GEAR, AUTOMATIC TRANSFER SWITCH (ATS) AND ASSOCIATED CONDUITS AND CONDUCTORS ARE PROVIDED UNDER UPGRADE EMERGENCY BACKUP ELECTRICAL SERVICE EQUIPMENT CONTRACT DOCUMENTS. CONTRACTOR SHALL COORDINATE AND PLAN THE WORK ACCORDINGLY.
3. CONTRACTOR SHALL FIELD VERIFY THE MOTOR FULL LOAD AMP FOR WELL NO.6 AND COORDINATE WITH THE ENGINEER FOR THE SSRVS RATING IN THE SUBMITTAL PHASE.

NO	DATE	REVISION	BY	NO	DATE	REVISION	BY

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CITY OF PEMBROKE PINES
EASTERN WELLFIELD ELECTRICAL IMPROVEMENTS
PEMPROKE PINE, FLORIDA

ELECTRICAL ONE LINE PROPOSED

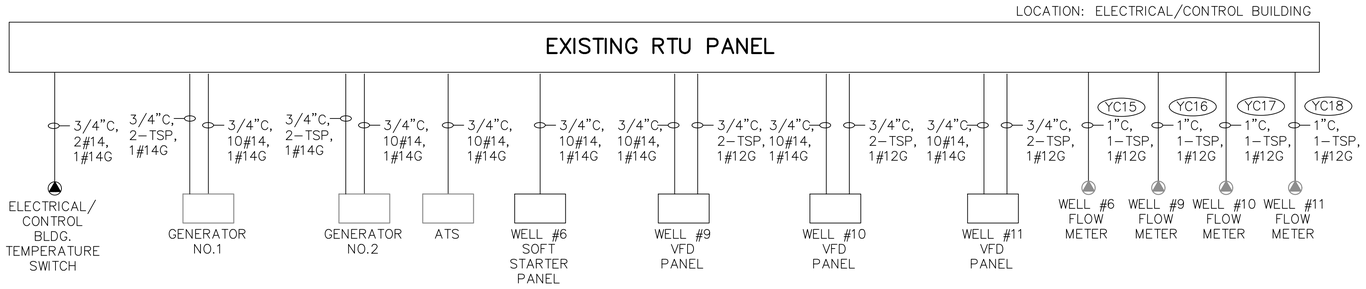
JAMES W. KAPPES, P.E.
STATE OF FLORIDA PROFESSIONAL ENGINEER
LICENSE No. 71489

DATE: AUGUST 2018

SCALE: NONE

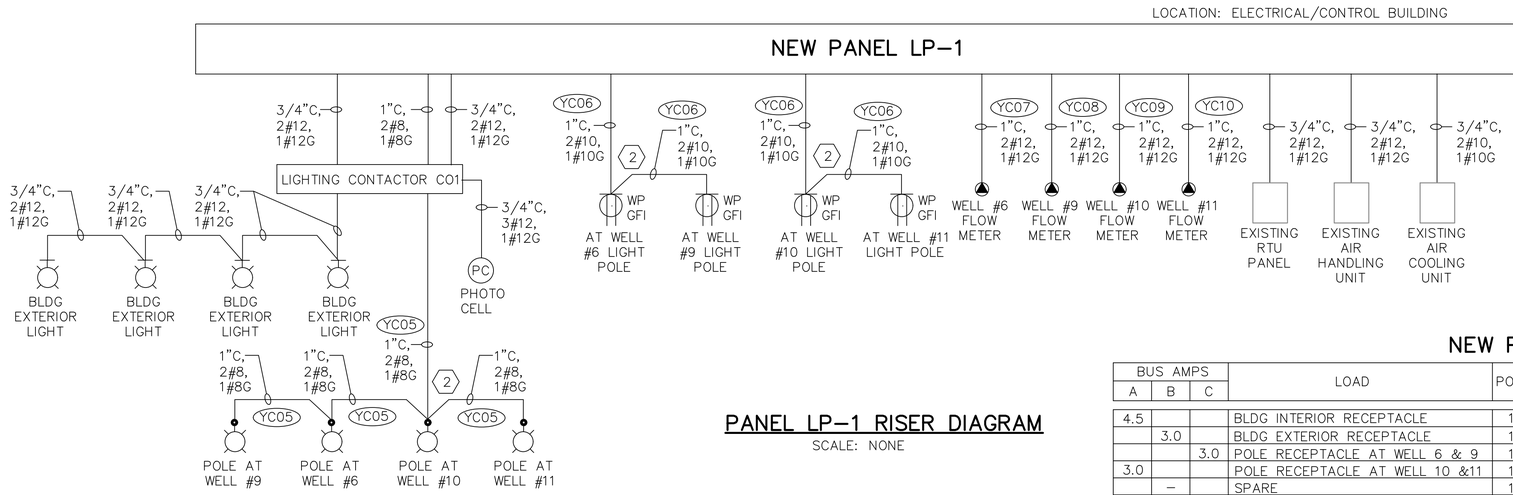
PROJECT No: PP05

SHEET: E-7



SIGNAL & CONTROL RISER DIAGRAM

SCALE: NONE



PANEL LP-1 RISER DIAGRAM

SCALE: NONE

KEYED NOTES:

1. THE NEW GENERATORS, GENERATOR PARALLELING GEAR, AUTOMATIC TRANSFER SWITCH (ATS) AND ASSOCIATED CONDUITS AND CONDUCTORS ARE PROVIDED UNDER UPGRADE EMERGENCY BACKUP ELECTRICAL SERVICE EQUIPMENT CONTRACT DOCUMENTS. CONTRACTOR SHALL COORDINATE WITH THAT CONTRACT AND ADJUST THE BREAKER SIZES ACCORDINGLY.
2. ALL UNDERGROUND WATERPROOF SPLICES FOR LIGHTING AND RECEPTACLE CIRCUITS SHALL BE MADE WITH TYCO SPLICE KITS MODEL NUMBER GELCAP-SL-2/0-3HOLE OR APPROVED EQUAL AND SEALED WITH APPROVED WATERPROOF COVER

NOTES:

1. ROUTE NEW 120V POWER CONDUITS VIA EXISTING/NEW MANHOLES AND ROUTE NEW SIGNAL AND CONTROL CONDUITS VIA NEW PULL BOXES AS SHOWN ON WELLFIELD ELECTRICAL PLAN.

NEW PANEL SCHEDULE "LP-1"

BUS AMPS A	BUS AMPS B	BUS AMPS C	LOAD	POLE	AMPS	BUS A B C	AMPS	POLE	LOAD	BUS AMPS A	BUS AMPS B	BUS AMPS C
4.5			BLDG INTERIOR RECEPTACLE	1	20	1 2	20	1	BLDG INTERIOR LIGHTS	2.0		
	3.0		BLDG EXTERIOR RECEPTACLE	1	20	3 4	20	1	BLDG EXTERIOR LIGHTS		1.0	
		3.0	POLE RECEPTACLE AT WELL 6 & 9	1	20	5 6	20	1	POLE LIGHTS (WELLS 6, 9, 10, 11)			9.6
3.0			POLE RECEPTACLE AT WELL 10 &11	1	20	7 8	20	1	LIGHTING CONTACTOR	1.0		
	–		SPARE	1	20	9 10	20	1	EXISTING RTU PANEL		3.0	
		8.0	GEN. 1 BATT. CHARGER	1	20	11 12	20	1	EXISTING WELL 6 FLOW METER			1.0
18.0			GEN. 1 JACKET WTR HTR	2	30	13 14	20	1	EXISTING WELL 9 FLOW METER	1.0		
	18.0		⊥	⊥	⊥	15 16	20	1	EXISTING WELL 10 FLOW METER		1.0	
		8.0	GEN. 2 BATT. CHARGER	1	20	17 18	20	1	EXISTING WELL 11 FLOW METER			1.0
18.0			GEN. 2 JACKET WTR HTR	2	30	19 20	20	1	SPARE	–		
	18.0		⊥	⊥	⊥	21 22	20	1	SPARE		–	
		1.9	EXISTING AIR HANDLING UNIT	2	20	23 24	20	1	SPARE			–
1.9			⊥	⊥	⊥	25 26	30	3	SPD	–		
	12.0		EXISTING AIR COOLING UNIT	2	30	27 28					–	
		12.0	⊥	⊥	⊥	29 30						–

(1)

TOTAL AMPS: BUS A 49.4 BUS B 56.0 BUS C 44.5 CONNECTED Kva 18.0

RATED VOLTAGE: ■ 120/208 ☐ 480 3 PHASE, 4 WIRE	BRANCH POLES ☐ 12 ☐ 20 ■ 30 ☐ 42		
RATED AMPS: ■ 100 ☐ 225 ☐ 400 ☐ _____	CABINET: ■ SURFACE ☐ FLUSH		
NEUTRAL BUS ■ 100% ☐ 150% ☐ 200%	■ GROUND BUS	■ HINGED DOOR ■ KEYED DOOR LATCH	LOCATION: ELECTRICAL/CONTROL BUILDING
■ CIRCUIT BREAKER (BOLT-IN) BRANCH DEVICES	■ SPD	ENCLOSURE TYPE ■ NEMA 1 ☐ NEMA 3R ☐ NEMA 4X ☐ _____	
☐ MAIN LUGS ONLY	MAIN 100A AMPS ■ BREAKER	☐ _____ TO BE GFI BREAKERS	
PANELBOARD MUST BE RATED TO INTERRUPT A SHORT CIRCUIT ISC OF ____10,000 AMPS SYMMETRICAL.			
APPROVED MF'RS. SEE SPECIFICATION 16050.		COPPER BUSSES	MAIN LUGS ____ SETS SIZE: _____

YARD CONDUIT SCHEDULE

NO.	FROM	TO	REMARKS
YC01	PANEL DP	WELL PUMP NO. 6 MOTOR	POWER
YC02	PANEL DP	WELL PUMP NO. 9 MOTOR	POWER
YC03	PANEL DP	WELL PUMP NO. 10 MOTOR	POWER
YC04	PANEL DP	WELL PUMP NO. 11 MOTOR	POWER
YC05	PANEL LP	WELL PUMP LIGHTING	POWER
YC06	PANEL LP	WELL PUMP RECEPTACLES	POWER
YC07	PANEL LP	WELL PUMP NO. 6 FLOW METER	POWER
YC08	PANEL LP	WELL PUMP NO. 9 FLOW METER	POWER
YC09	PANEL LP	WELL PUMP NO. 10 FLOW METER	POWER
YC10	PANEL LP	WELL PUMP NO. 11 FLOW METER	POWER
YC11	WELL PUMP NO. 6 SOFT STARTER	WELL PUMP NO. 6 MOTOR	CONTROL
YC12	WELL PUMP NO. 9 VFD	WELL PUMP NO. 9 MOTOR	CONTROL
YC13	WELL PUMP NO. 10 VFD	WELL PUMP NO. 10 MOTOR	CONTROL
YC14	WELL PUMP NO. 11 VFD	WELL PUMP NO. 11 MOTOR	CONTROL
YC15	RTU PANEL	WELL PUMP NO. 6 FLOW METER	CONTROL
YC16	RTU PANEL	WELL PUMP NO. 9 FLOW METER	CONTROL
YC17	RTU PANEL	WELL PUMP NO. 10 FLOW METER	CONTROL
YC18	RTU PANEL	WELL PUMP NO. 11 FLOW METER	CONTROL

LUMINAIRE SCHEDULE

TYPE	VOLTS	DESCRIPTION	MANUFACTURER	CATALOG NO	LAMPS	MOUNTING	MOUNTING	REMARKS
1	120	INTERIOR LIGHT	METALUX	4VT2-LD4-6-DR-UNV-L840-CD1-WL-SSL-U-VT2-CHAIN	56.0 WATTS LED	SUSPENDED	8' AFF	PROVIDE ALL STAINLESS STEEL MOUNTING HARDWARE
2	120	EXTERIOR LIGHT	LUMARK	XTOR2B	18 WATTS LED	WALL	8' AFF	PROVIDE ALL STAINLESS STEEL MOUNTING HARDWARE
3	120	LED AREA FIXTURE	MCGRAW-EDISON	GLEON-AF-04-LED-5WG-BZ	225 WATTS LED	POLE	20' AFF	COORDINATE WITH LIGHTNING PROTECTION SPECIFICATION

NO	DATE	REVISION	BY	NO	DATE	REVISION	BY

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CITY OF PEMBROKE PINES
EASTERN WELLFIELD ELECTRICAL IMPROVEMENTS
PEMBROKE PINE, FLORIDA

ELECTRICAL RISERS AND SCHEDULES

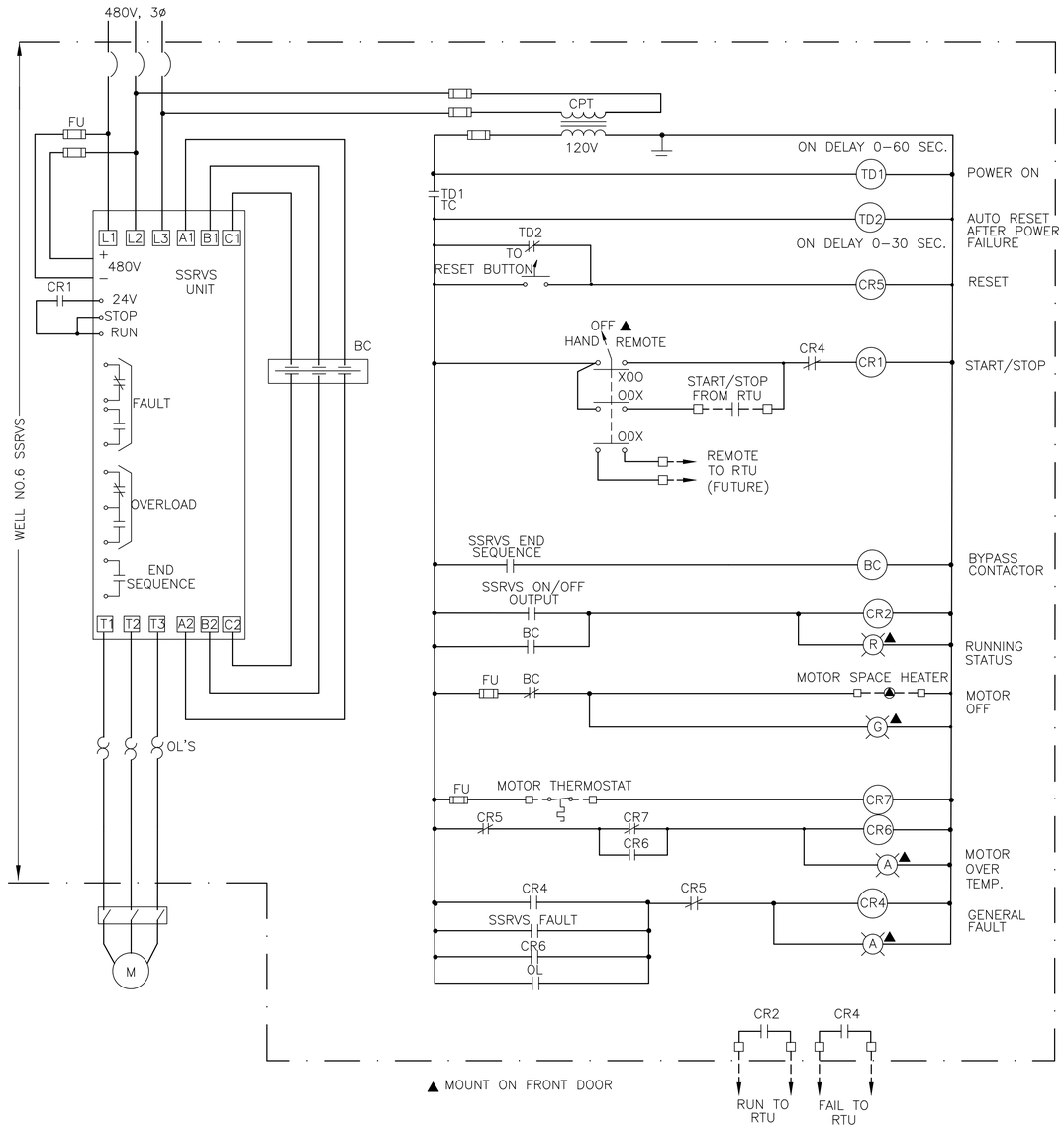
JAMES W. KAPPES, P.E.
STATE OF FLORIDA PROFESSIONAL ENGINEER
LICENSE No. 71499

DATE: AUGUST 2018

SCALE: NONE

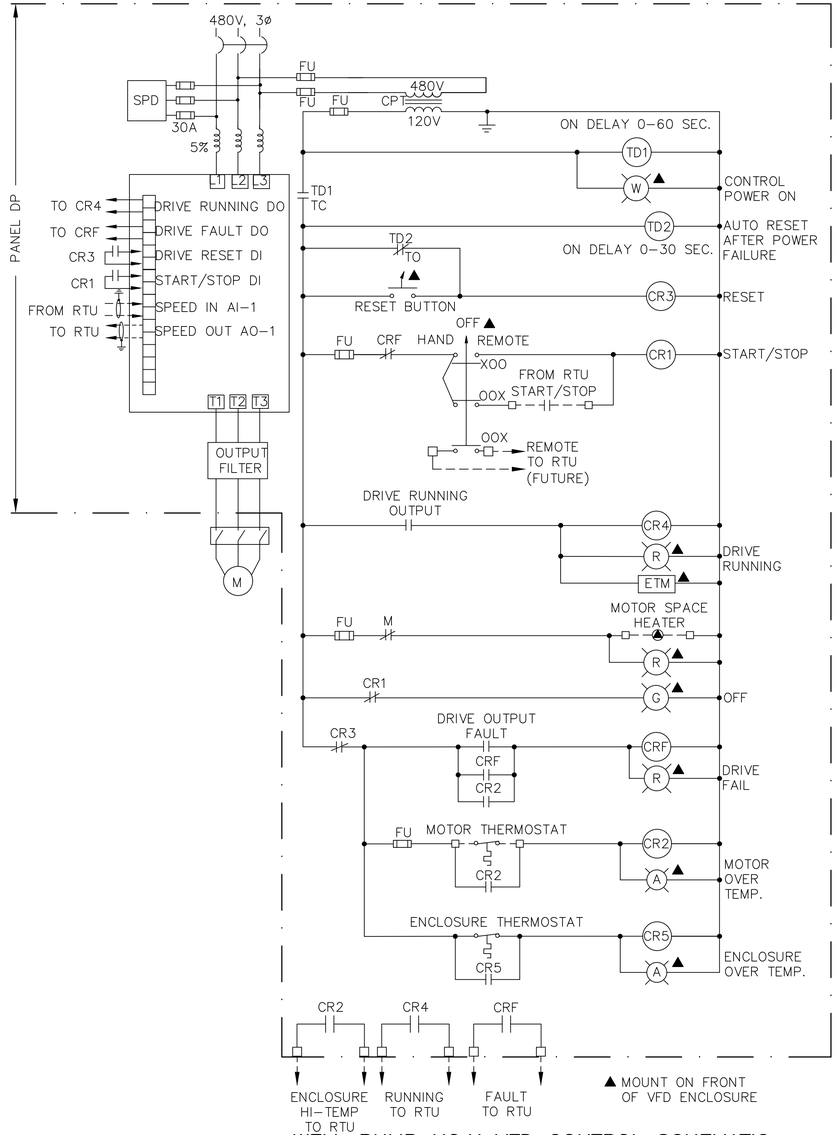
PROJECT No: PP05

SHEET: E-8



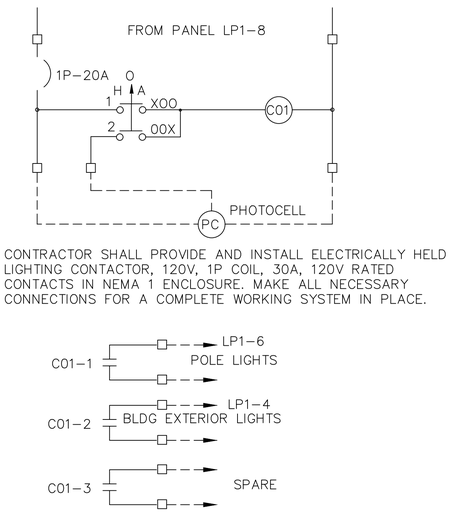
WELL PUMP NO.6 SSRVS SCHEMATIC

NOT TO SCALE



WELL PUMP NO.X VFD CONTROL SCHEMATIC

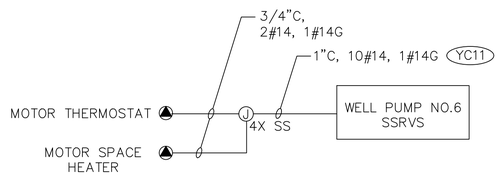
X = 9, 10, 11 NOT TO SCALE



CONTRACTOR SHALL PROVIDE AND INSTALL ELECTRICALLY HELD LIGHTING CONTACTOR, 120V, 1P COIL, 30A, 120V RATED CONTACTS IN NEMA 1 ENCLOSURE. MAKE ALL NECESSARY CONNECTIONS FOR A COMPLETE WORKING SYSTEM IN PLACE.

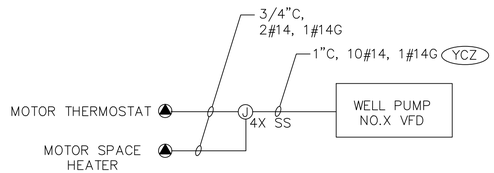
LIGHTING CONTROL (C01) SCHEMATIC

NOT TO SCALE



WELL PUMP NO.6 RISER

NOT TO SCALE



WELL PUMP NO.X VFD RISER

NOT TO SCALE
X,Z = 9,12; 10,13; 11,14

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CITY OF PEMBROKE PINES
EASTERN WELLFIELD ELECTRICAL IMPROVEMENTS
PEMPROKE PINE, FLORIDA

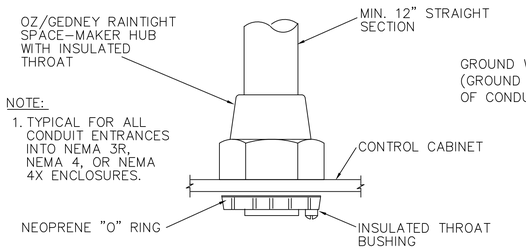
ELECTRICAL SCHEMATICS

JAMES W. KAPPES, P.E.
STATE OF FLORIDA PROFESSIONAL ENGINEER
LICENSE No. 71499

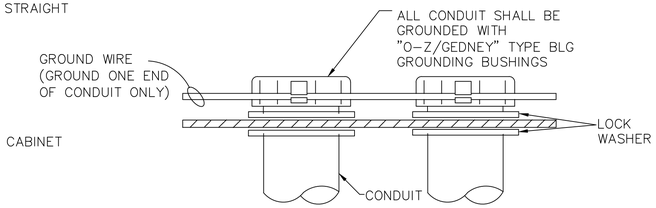
DATE: AUGUST 2018

SCALE: NONE
PROJECT No: PP05
SHEET: E-9

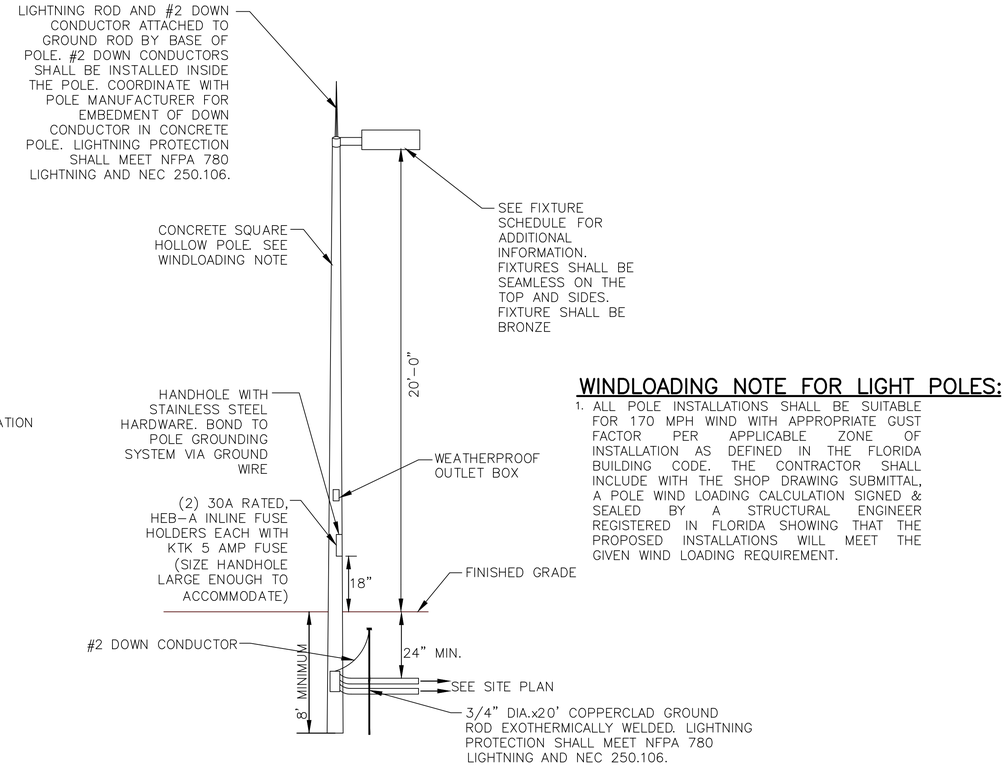
File Name: E:\PROJECTS\PP\PP05\DRAWINGS\PP05E09 - VFD SCHEMATIC.dwg - (Plotted by: Daniel Urquijo on Wednesday, August 22, 2018 4:05:03 PM)



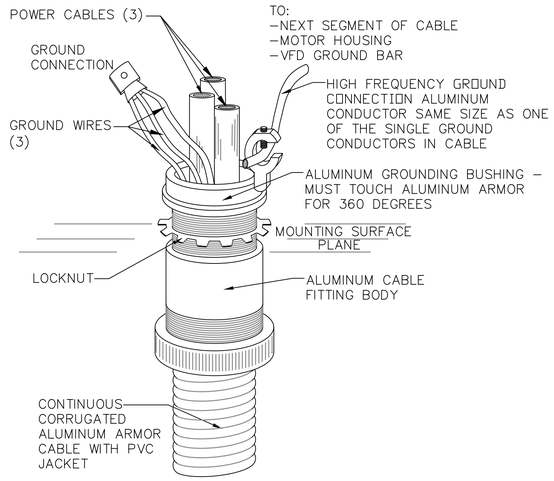
CONDUIT HUB
NOT TO SCALE



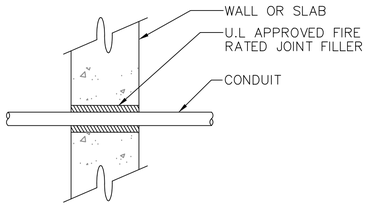
CONDUIT GROUNDING
NOT TO SCALE



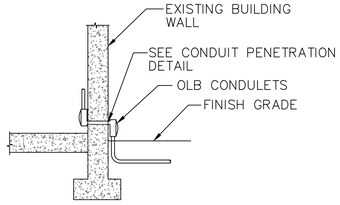
WINDLOADING NOTE FOR LIGHT POLES:
1. ALL POLE INSTALLATIONS SHALL BE SUITABLE FOR 170 MPH WIND WITH APPROPRIATE GUST FACTOR PER APPLICABLE ZONE OF INSTALLATION AS DEFINED IN THE FLORIDA BUILDING CODE. THE CONTRACTOR SHALL INCLUDE WITH THE SHOP DRAWING SUBMITTAL, A POLE WIND LOADING CALCULATION SIGNED & SEALED BY A STRUCTURAL ENGINEER REGISTERED IN FLORIDA SHOWING THAT THE PROPOSED INSTALLATIONS WILL MEET THE GIVEN WIND LOADING REQUIREMENT.



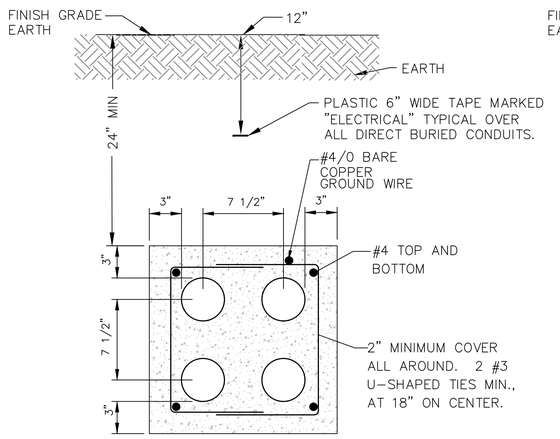
ARMORED CABLE TERMINATION DETAIL
NOT TO SCALE



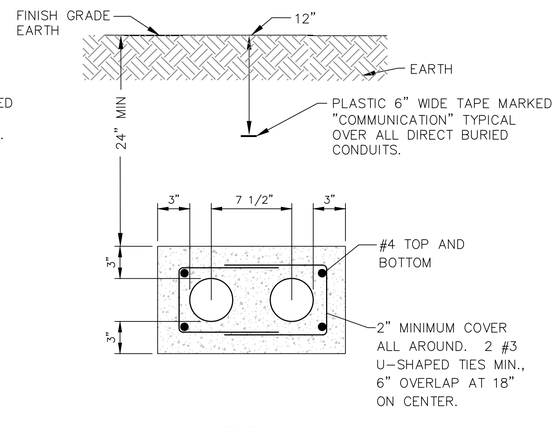
CONDUIT PENETRATION AT WALL OR SLAB
NOT TO SCALE



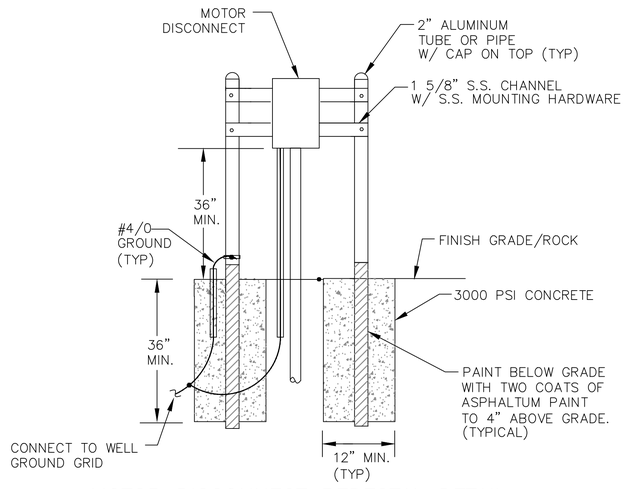
CONDUIT ENTRANCE
NOT TO SCALE



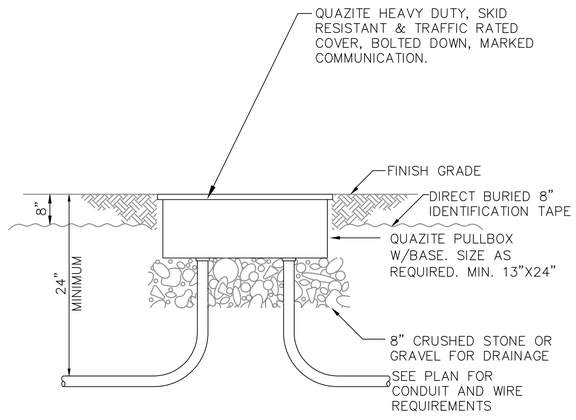
TYPICAL 4-WAY DUCTBANK
NOT TO SCALE
TYPICAL FOR POWER CONDUITS



TYPICAL 2-WAY DUCTBANK
NOT TO SCALE
TYPICAL FOR COMMUNICATION CONDUITS



MOTOR DISCONNECT PEDESTAL DETAIL
NOT TO SCALE



SIGNAL/CONTROL PULL BOX DETAIL
NOT TO SCALE

LIGHTING FIXTURE AND POLE IN EARTH DETAIL
NOT TO SCALE

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CITY OF PEMBROKE PINES
EASTERN WELLFIELD ELECTRICAL IMPROVEMENTS
PEMPROKE PINE, FLORIDA

ELECTRICAL DETAILS

JAMES W. KAPPES, P.E.
STATE OF FLORIDA PROFESSIONAL ENGINEER
LICENSE No. 71499

DATE: AUGUST 2018

SCALE: NONE

PROJECT No: PP05

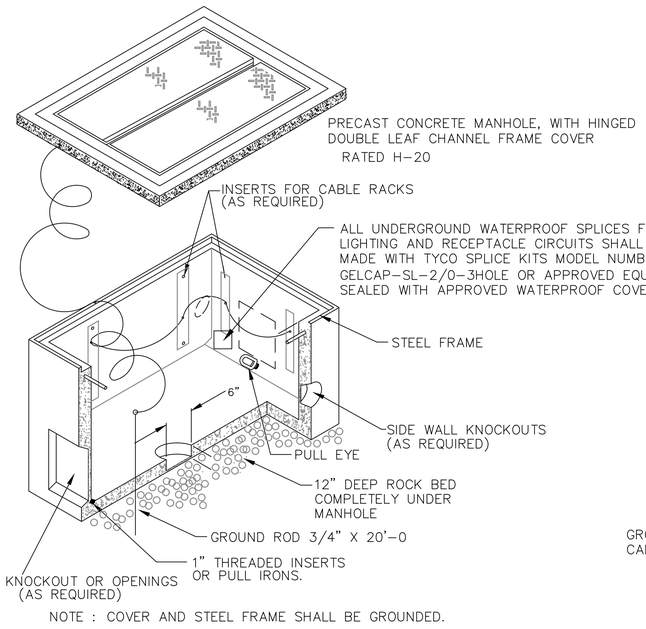
SHEET: E-10

NOTES FOR ALL MANHOLES:

1. CONTRACTOR SHALL PROVIDE REQUIRED END BELL LOCATIONS TO MANHOLE MANUFACTURER BEFORE MANUFACTURING.
2. ALL MANHOLES SHALL BE H-20-44 TRAFFIC RATED.
3. THE HEIGHT OF CONDUIT ENTRANCES SHALL BE COORDINATED BY THE CONTRACTOR TO ACCOMMODATE OTHER UTILITIES IN THE AREA.
4. CONTRACTOR SHALL COORDINATE CONDUIT ENTRY REQUIREMENTS WITH SITE PLAN, PRIOR TO ORDERING MANHOLES.

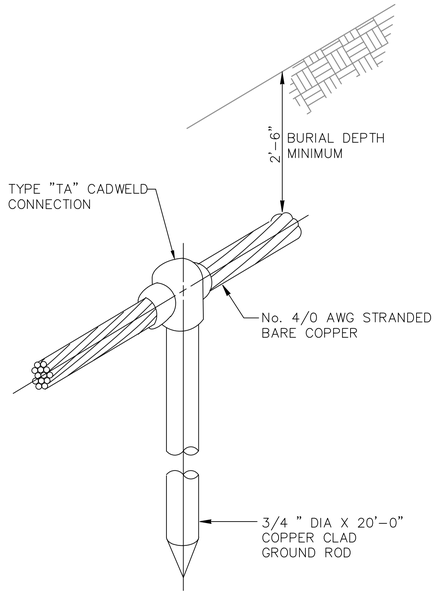
MANHOLE NOTES:

1. CABLE RACK, API CR24-B OR EQUAL
   CABLE HOOKS, API RA08 OR EQUAL
   ARM LOCK, API HDL OR EQUAL
2. PULLING-IN-IRONS INSTALL OPPOSITE CONDUIT ENTRANCE. POSITION BELOW LEVEL OF CONDUIT ENTRANCE. HUBBART & CO. CATALOG 9119 OR EQUAL.
3. TERMINATE ALL DUCTS IN MANHOLE WITH END BELLS.
4. MANHOLE COVERS SHALL BE MARKED "ELECTRICAL POWER" BY THE MANUFACTURER, WITH RAISED LETTERS. THE CONTRACTOR SHALL STAMP IN THE MANHOLE COVERS THE IDENTIFICATION NUMBER OF THE MANHOLE, LETTERS AND NUMBERS SHALL BE 2" HIGH. AS AN ALTERNATE THE CONTRACTOR MAY INSTALL SST NAMEPLATES ATTACHED WITH FOUR SST BOLTS TO THE MANHOLE. COVERS INDICATING THE MANHOLE NUMBER. LETTERS AND NUMBERS TO BE RAISED AND 2" HIGH. SUBMIT ONE SAMPLE NAMEPLATE FOR ENGINEER'S APPROVAL PRIOR TO INSTALLATION.
5. GROUND ROD, 3/4"X20'-0, COPPER CLAD.
6. BOND ALL METALLIC PARTS TO GROUNDING SYSTEM.
7. PRECAST CONCRETE MANHOLE WITH COVER, U.S. PRECAST CORP. OR EQUAL.
8. TOP OF MANHOLE SHALL BE PLACED 1" AFG AND SLOPE DOWN.
9. MANHOLE MINIMUM INTERNAL DIMENSION 36"X36"X36".

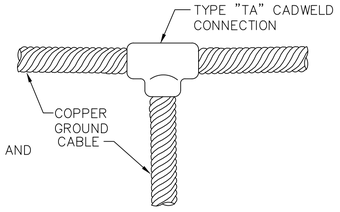


NOTE : COVER AND STEEL FRAME SHALL BE GROUNDED.

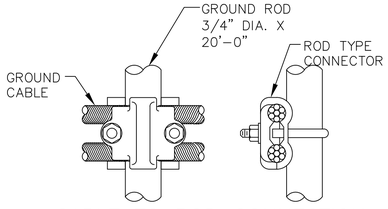
MANHOLE DETAIL
NOT TO SCALE



GROUND ROD DETAIL
NOT TO SCALE



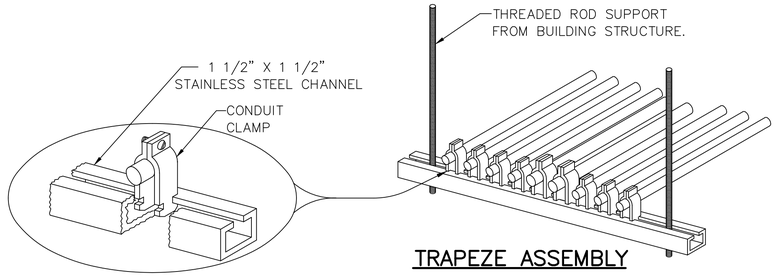
GROUND CABLE CONNECTION
NOT TO SCALE



CABLE TO ROD CONNECTION
NOT TO SCALE

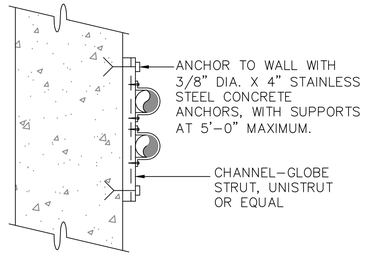
NOTES:

1. THIS DETAIL TYPICAL FOR BOTH VERTICAL AND HORIZONTAL MOUNTING
2. CHANNEL AND ALL SUPPORT DEVICES TO BE STAINLESS STEEL. FIELD COAT ALL CUTS, ETC. TO MATCH.
3. CHANNELS TO BE SPACED 5' MAXIMUM.



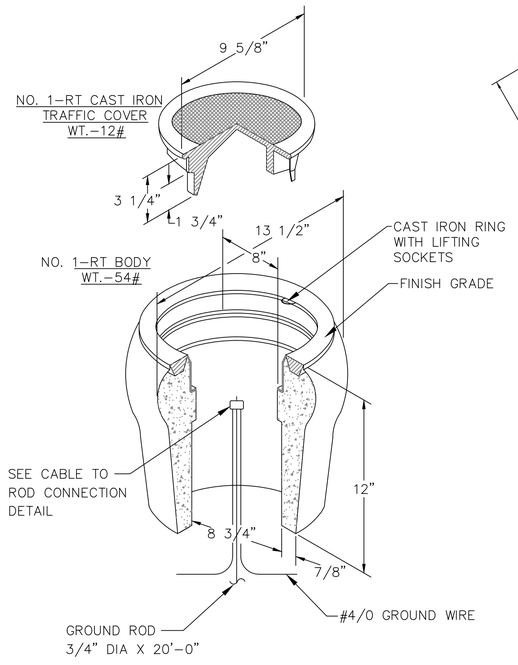
CONDUIT PIPE STRAP MOUNTING DETAILS

TRAPEZE ASSEMBLY

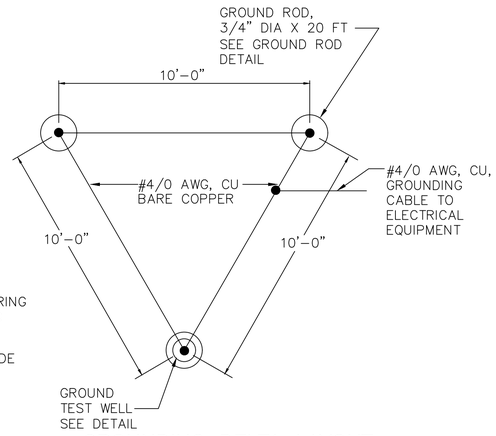


CONDUIT SUPPORT ON WALL
NOT TO SCALE

CONDUIT SUPPORT DETAIL
NOT TO SCALE



GROUND TEST WELL DETAIL
NOT TO SCALE



GROUNDING DELTA LAYOUT
NOT TO SCALE

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CITY OF PEMBROKE PINES
EASTERN WELLFIELD ELECTRICAL IMPROVEMENTS
PEMPROKE PINE, FLORIDA

ELECTRICAL DETAILS

JAMES W. KAPPES, P.E.
STATE OF FLORIDA PROFESSIONAL ENGINEER
LICENSE No. 71499

DATE: AUGUST 2018

SCALE: NONE

PROJECT No: PP05

SHEET: E-11

TO PLANT MASTER RADIO

RADIO TRANSMISSION

RADIO

EXISTING RTU

RTU HIGH TEMP QA 01

RTU POWER FAIL QA 01A

WELL 6 PUMP START/STOP HS 06

WELL 6 PUMP RUNNING Q 06

WELL 6 FAIL QA 06

WELL 6 FLOW FI 06

WELL 9 VFD PANEL HI–TEMP QA 9

WELL 9 PUMP START/STOP HS 09

WELL 9 PUMP RUNNING Q 09

WELL 9 FAIL QA 09A

VFD 9 SPEED FEEDBACK SI 09

VFD 9 SPEED CONTROL SK 09

WELL 9 FLOW FI 09

WELL 10 VFD PANEL HI–TEMP QA 10

WELL 10 PUMP START/STOP HS 10

WELL 10 PUMP RUNNING Q 10

WELL 10 FAIL QA 10A

VFD 10 SPEED FEEDBACK SI 10

VFD 10 SPEED CONTROL SK 10

WELL 10 FLOW FI 10

WELL 11 VFD PANEL HI–TEMP QA 11

WELL 11 PUMP START/STOP HS 11

WELL 11 PUMP RUNNING Q 11

WELL 11 FAIL QA 11A

VFD 11 SPEED FEEDBACK SI 11

VFD 11 SPEED CONTROL SK 11

WELL 11 FLOW FI 11

TS 01 — ROOM HIGH TEMP SWITCH PROVIDED BY CONTRACTOR

NEW WELL NO.6 SSRVS PANEL

HOA HS 06 — RESET HS 06A

QAL 06 MOTOR HI TEMP. — QL 06 MOTOR SPACE HEATER — QL 06A PUMP RUNNING — QAL 06A FAIL

NEW WELL NO.9 VFD PANEL

HOA HS 09 — RESET HS 09A

QAL 9 PANEL HI TEMP. — QAL 9A MOTOR HI TEMP. — QL 9 MOTOR SPACE HEATER — QL 9A PUMP RUNNING — QAL 9B FAIL

NEW WELL NO.10 VFD PANEL

HOA HS 10 — RESET HS 10A

QAL 10 PANEL HI TEMP. — QAL 10A MOTOR HI TEMP. — QL 10 MOTOR SPACE HEATER — QL 10A PUMP RUNNING — QAL 10B FAIL

NEW WELL NO.11 VFD PANEL

HOA HS 11 — RESET HS 11A

QAL 11 PANEL HI TEMP. — QAL 11A MOTOR HI TEMP. — QL 11 MOTOR SPACE HEATER — QL 11A PUMP RUNNING — QAL 11B FAIL

RAW WATER TO WATER TREATMENT PLANT

WELL NO.6 PUMP: TS 06, M, FIT 06, FE 06, PI 06, 120 VAC — WELL 6

WELL NO.9 PUMP: TS 09, M, FIT 09, FE 09, PI 09, 120 VAC — WELL 9

WELL NO.10 PUMP: TS 10, M, FIT 10, FE 10, PI 10, 120 VAC — WELL 10

WELL NO.11 PUMP: TS 11, M, FIT 11, FE 11, PI 11, 120 VAC — WELL 11

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EASTERN WELLFIELD ELECTRICAL IMPROVEMENTS
PEMPROKE PINE, FLORIDA

EASTERN WELLFIELD P&ID

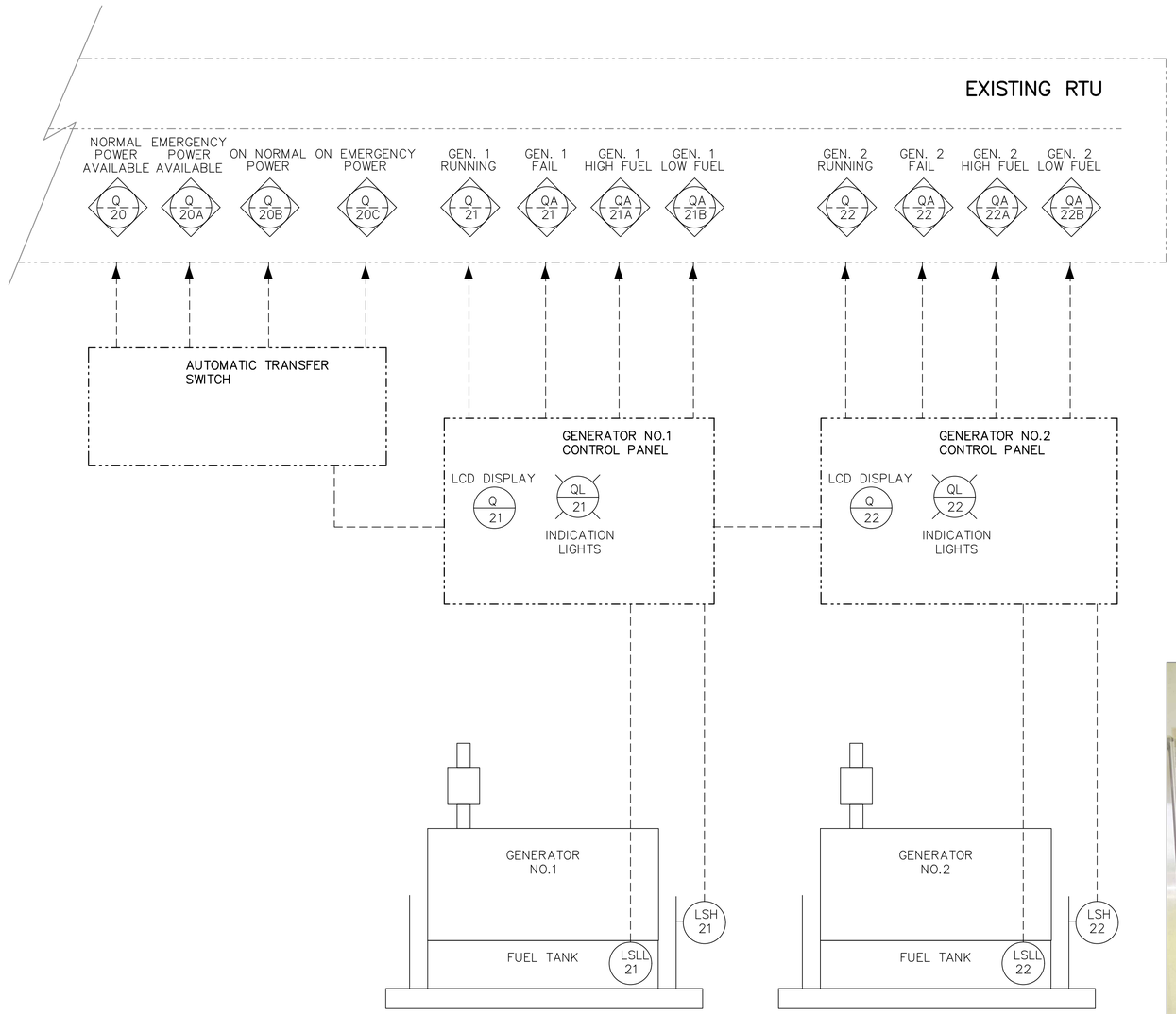
JAMES W. KAPPES, P.E.
STATE OF FLORIDA PROFESSIONAL ENGINEER
LICENSE No. 71499

DATE: AUGUST 2018

SCALE N.T.S.

PROJECT No PP05

SHEET E-12



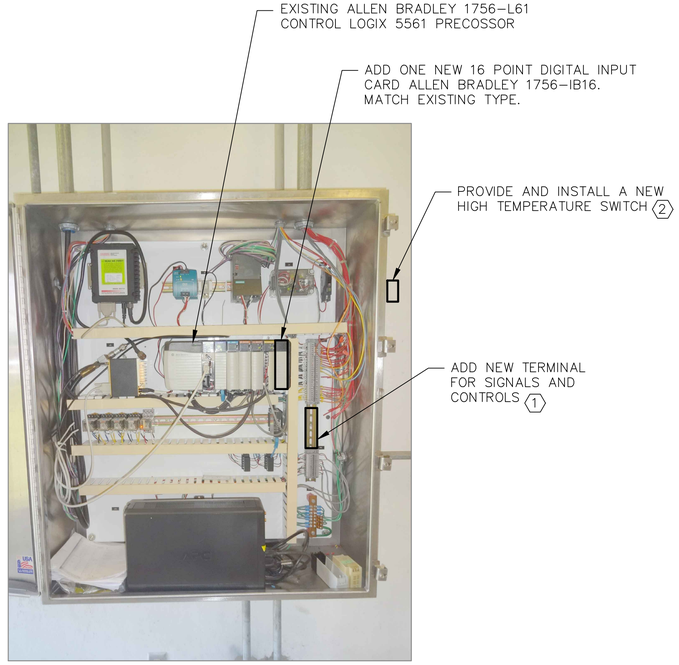
NOTES:

1. EXISTING I/O POINTS ARE FROM THE AS-BUILT DRAWINGS. CONTRACTOR SHALL FIELD VERIFY AND ADJUST AS NEEDED.
2. CONTRACTOR SHALL RE-USE THE SAME EXISTING I/O POINTS IN RTU PANEL FOR NEW WELLS 6, 9, 10, 11 VFD AND SSRVS PANELS.
3. CONTRACTOR SHALL PROGRAM THE EXISTING RTU AND THE PLANT SCADA. MAP THE NEW I/O POINTS AT THE EXISTING RTU, EXPAND THE DATA POINTS AT THE PLANT SCADA AND MODIFY THE SCADA SCREEN.
4. NEW MOTORS FOR WELLS 6, 9, 10, AND 11 ARE PROVIDED AND INSTALLED BY THE OWNER AND NOT PART OF THIS CONTRACT. CONTRACTOR IS RESPONSIBLE FOR NEW CONDUITS AND CABLES TO MOTORS AS SHOWN ON ONE LINE AND RISER DRAWINGS.
5. PROVIDED UPDATED PLC LOOP DIAGRAMS.
6. GENERATORS, ATS AND FUEL LEVEL SWITCHES ARE PROVIDED UNDER UPGRADE EMERGENCY BACKUP ELECTRICAL SERVICE EQUIPMENT CONTRACT DOCUMENTS. COORDINATE AND ADJUST ACCORDINGLY.

KEYED NOTES:

(1) PROVIDE AND INSTALL NEW TERMINAL BLOCKS FOR NEW SIGNALS AND CONTROLS. PROVIDE ALL NECESSARY COMPONENTS INCLUDING WIRING AND SURGE ARRESTORS.

(2) PROVIDE AND INSTALL NEW HIGH TEMPERATURE SWITCH EXTERIOR OF THE EXISTING RTU PANEL. PROVIDE NECESSARY WIRING TO PLC.



EXISTING RTU MODIFICATIONS

NOT TO SCALE

MODIFIED RTU I/O LISTS

RACK 1 DIGITAL INPUT SLOT 2

WELL PUMP NO.6 ON/OFF STATUS	DIGITAL INPUT I/0
WELL PUMP NO.6 FAIL	DIGITAL INPUT I/1
WELL PUMP NO.9 ON/OFF STATUS	DIGITAL INPUT I/2
WELL PUMP NO.9 FAIL	DIGITAL INPUT I/3
WELL PUMP NO.10 ON/OFF STATUS	DIGITAL INPUT I/4
WELL PUMP NO.10 FAIL	DIGITAL INPUT I/5
WELL PUMP NO.11 ON/OFF STATUS	DIGITAL INPUT I/6
WELL PUMP NO.11 FAIL	DIGITAL INPUT I/7
RTU POWER FAIL	DIGITAL INPUT I/8
~~SPARE~~ WELL 9 PANEL HI-TEM	DIGITAL INPUT I/9
~~SPARE~~ WELL 10 PANEL HI-TEMP	DIGITAL INPUT I/10
~~SPARE~~ WELL 11 PANEL HI-TEMP	DIGITAL INPUT I/11
~~SPARE~~ ELEC ROOM HI-TEMP	DIGITAL INPUT I/12
~~SPARE~~ NORMAL POWER AVAIL.	DIGITAL INPUT I/13
~~SPARE~~ EMERG. POWER AVAIL.	DIGITAL INPUT I/14
~~SPARE~~ ON NORMAL POWER	DIGITAL INPUT I/15

RACK 1 DIGITAL OUTPUT SLOT 3

WELL PUMP NO.6 START/STOP	DIGITAL OUTPUT O/0
WELL PUMP NO.9 START/STOP	DIGITAL OUTPUT O/1
WELL PUMP NO.10 START/STOP	DIGITAL OUTPUT O/2
WELL PUMP NO.11 START/STOP	DIGITAL OUTPUT O/3
SPARE	DIGITAL OUTPUT O/4
SPARE	DIGITAL OUTPUT O/5
SPARE	DIGITAL OUTPUT O/6
SPARE	DIGITAL OUTPUT O/7
SPARE	DIGITAL OUTPUT O/8
SPARE	DIGITAL OUTPUT O/9
SPARE	DIGITAL OUTPUT O/10
SPARE	DIGITAL OUTPUT O/11
SPARE	DIGITAL OUTPUT O/12
SPARE	DIGITAL OUTPUT O/13
SPARE	DIGITAL OUTPUT O/14
SPARE	DIGITAL OUTPUT O/15

RACK 1 ANALOG INPUT SLOT 4

WELL NO.6 FLOW	ANALOG INPUT IN0, IN1
WELL NO.9 FLOW	ANALOG INPUT IN2, IN3
WELL NO.10 FLOW	ANALOG INPUT IN4, IN5
WELL NO.11 FLOW	ANALOG INPUT IN6, IN7
WELL NO.9 SPEED FEEDBACK	ANALOG INPUT IN8, IN9
WELL NO.10 SPEED FEEDBACK	ANALOG INPUT IN10, IN11
WELL NO.11 SPEED FEEDBACK	ANALOG INPUT IN12, IN13
SPARE	ANALOG INPUT IN14, IN15

RACK 1 ANALOG OUTPUT SLOT 5

WELL NO.9 SPEED CONTROL	ANALOG OUTPUT O/0
WELL NO.10 SPEED CONTROL	ANALOG OUTPUT O/1
WELL NO.11 SPEED CONTROL	ANALOG OUTPUT O/2
SPARE	ANALOG OUTPUT O/3
SPARE	ANALOG OUTPUT O/4
SPARE	ANALOG OUTPUT O/5
SPARE	ANALOG OUTPUT O/6
SPARE	ANALOG OUTPUT O/7

RACK 1 DIGITAL INPUT SLOT 5 (NEW CARD)

ON EMERGENCY POWER	DIGITAL INPUT I/0
GEN. 1 RUNNING	DIGITAL INPUT I/1
GEN. 1 FAIL	DIGITAL INPUT I/2
GEN. 1 HIGH FUEL LEVEL	DIGITAL INPUT I/3
GEN. 1 LOW FUEL LEVEL	DIGITAL INPUT I/4
GEN. 2 RUNNING	DIGITAL INPUT I/5
GEN. 2 FAIL	DIGITAL INPUT I/6
GEN. 2 HIGH FUEL LEVEL	DIGITAL INPUT I/7
GEN. 2 LOW FUEL LEVEL	DIGITAL INPUT I/8
SPARE	DIGITAL INPUT I/9
SPARE	DIGITAL INPUT I/10
SPARE	DIGITAL INPUT I/11
SPARE	DIGITAL INPUT I/12
SPARE	DIGITAL INPUT I/13
SPARE	DIGITAL INPUT I/14
SPARE	DIGITAL INPUT I/15

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PEMPROKE PINE, FLORIDA

RTU MODIFICATIONS

JAMES W. KAPPES, P.E.
STATE OF FLORIDA PROFESSIONAL ENGINEER
LICENSE No. 71499

DATE: AUGUST 2018

SCALE: N.T.S.

PROJECT No: **PP05**

SHEET: **E-13**

September 17, 2018 IFB # PSUT-18-06

Addendum # 2
City of Pembroke Pines
IFB # PSUT-18-06
Utility Electrical Projects 2018

A) ADDITIONAL DOCUMENTS

There are three utility electrical projects included:

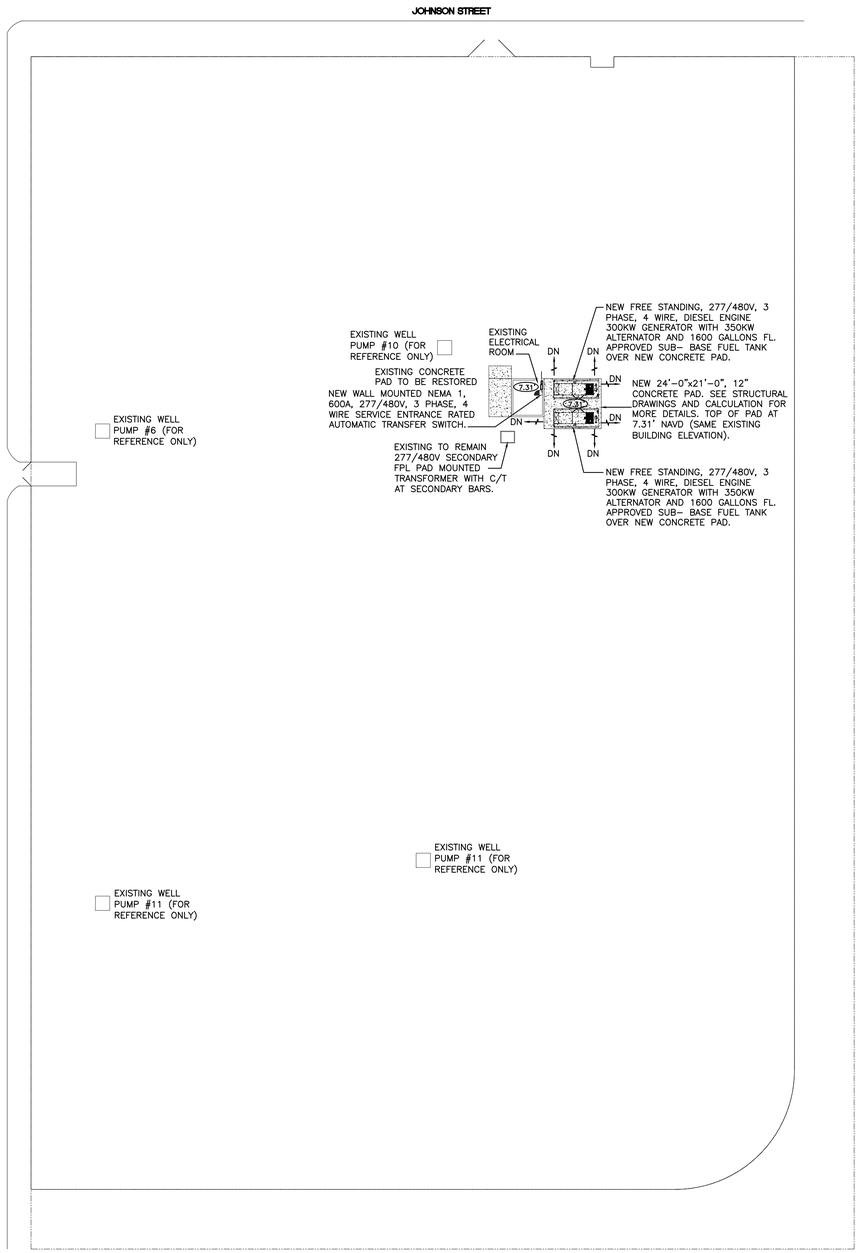
1. A new manual transfer switch for the east stand-by generator system at the City WWTP. **(See Attachment P – WWTP East Portable Generator Connection Improvements Drawings & Specifications)**

2. A new stand-by generator set and ATS at the City eastern wellfield. **(See Attachment Q – Eastern Wellfield Generator and ATS Drawings & Specifications)**

3. Electrical upgrades to the eastern wellfield power supply and VFD systems. **(See Attachment R – Hillers Electrical Engineering, Inc. Evaluation of Eastern Wellfield)**

The City is providing the following additional documents:

- **Attachment Q Revised – 7190 - ES-1 SITE PLAN-ES-1**
- **Attachment S Revised - PP05E01 - LEGEND&NOTES Layout**
- **Attachment S Revised - PP05E03 - SITE PLAN PROP Layout**
- **Attachment S Revised - PP05E04 - ELECTRICAL BLDG PLAN DEMO Layout**
- **Attachment S Revised - PP05E05 - ELECTRICAL BLDG PLAN PROPOSED Layout**
- **Attachment S Revised - PP05E07 - ONE LINE PROPOSED Layout**
- **Attachment S Revised - PP05E08 - RISER & SCHEDULE Layout**
- **Attachment S Revised - PP05E10 & E11 - DETAILS Layout1**
- **Attachment S Revised - PP05E10 & E11 - DETAILS Layout2**



SITE PLAN
SCALE: 1" = 30'-0"

GENERATORS "A" & "B" NOTES

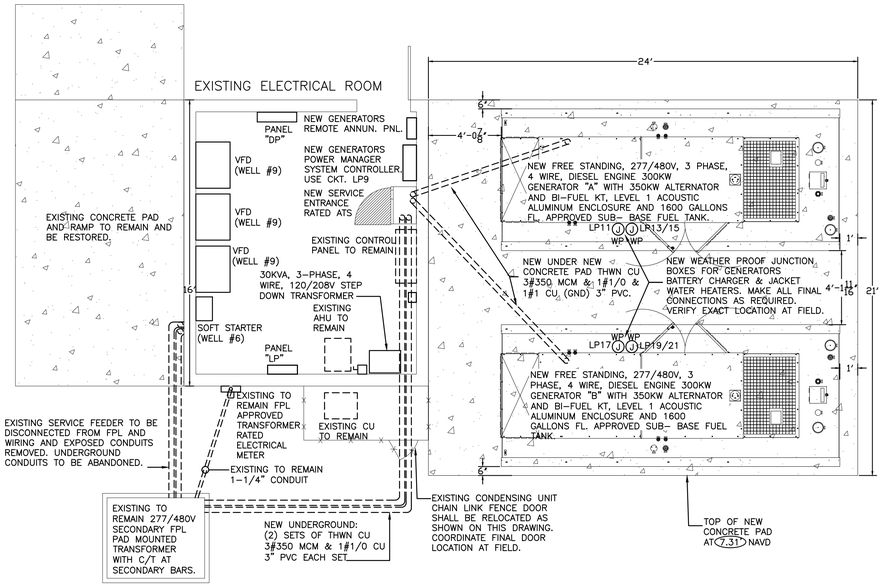
TWO GENERAC MD300 OR EQUAL DIESEL ENGINE DRIVEN GENERATOR W/ UPSIZED 350KW ALTERNATOR FOR OPERATION AT 375KW, 300 KVA, 0.8 PF, 277/480 VOLTS, 3 PHASE, 4 WIRE, 60 HERTZ, 1800 RPM, LIQUID COOLED UNIT MOUNTED RADIATOR, COMPLETE WITH ALL STANDARD EQUIPMENT, OVERSIZED GENERATORS, INCLUDING THE FOLLOWING:

* COMPLETE A/C INSTRUMENT CONTROL PANEL
* MICROPROCESSOR ENGINE CONTROL MODULE WITH COOL DOWN TIMER
* FOUR ENGINE SHUTDOWNS WITH SIGNAL LIGHTS AND ALARMS PER NFPA 110, LEVEL 1
* ENGINE DRIVEN BATTERY CHARGING ALTERNATOR
* JACKET WATER HEATER 3000 WATTS 240 VOLTS
* FLOAT TYPE BATTERY CHARGER, 10 AMP, 120V WALL MOUNTED WITH ALARM CONTACTS PER NFPA
* LEAD ACID TYPE STARTING BATTERIES
* BATTERY RACK AND CABLES
* FLEXIBLE FUEL LINES, 18 INCH MINIMUM
* CRITICAL GRADE SILENCER
* STAINLESS STEEL FLEXIBLE EXHAUST CONNECTOR
* STEEL SUB-BASE WITH BUILT-IN VIBRATOR ISOLATION MOUNTS
* FACTORY CERTIFIED TEST
* TEST/ACCEPTANCE RUN BY FACTORY TRAINED SERVICE TECHNICIAN
* MAIN CKT. BKR. THERMAL MAGNETIC, GENERAL ELECTRIC, 300 AMPS, 100% RATED, 3P, 277/480V, 65KAIC
* UL APPROVED 1600 GALLONS, DOUBLE WALL W/RUPTURE-BASIN, UL#142, SUB-BASE, FUEL TANK W/LEAK DETECTOR, FLA. DEP & DERM APPROVAL.
* LOW LEVEL ALARM
* FUEL LEVEL GAUGE
* REMOTE MOUNTED ANNUNCIATOR WITH SIXTEEN LIGHTS & AUDIBLE ALARM WITH SILENCE SWITCH
* GTI BI-FUEL KIT
* REMOTE EMERGENCY STOP BREAK-GLASS SWITCH
* LEVEL 1 ACOUSTIC ALUMINUM ENCLOSURE
* EXTENDED 5 YEARS WARRANTY.
* A LOAD BANK TEST SHALL BE PERFORMED ONCE THE EQUIPMENT IS COMPLETELY INSTALLED AND PRIOR TO TCO. (1)
* 4 DRY CONTACTS AT EACH GENERATOR CONTROL PANEL TO BE CONNECTED TO WELL FIELD RTU FOR GENERATOR RUNNING, FAIL, HIGH FUEL & LOW FUEL. SEE HILLERS ELECTRICAL ENGINEERING DRAWINGS FOR MORE DETAILS.

AUTOMATIC TRANSFER SWITCH ATS

PROVIDE ONE 600 AMPERE, STYLE 3, UL 1008 LISTED; POWER SERIES SERIES ENTRANCE RATED AUTOMATIC TRANSFER SWITCH BY GENERAC OR EQUAL FOR OPERATION AT 277/480V VOLTS, 3 POLE, THREE PHASE, FOUR WIRE, 60 HERTZ, 65,000 AIC. THE TRANSFER SWITCH SHALL BE MECHANICALLY HELD, POSITIVELY INTERLOCKED, NEMA 1 ENCLOSURE, 100% RATED MAIN CIRCUIT BREAKERS AND BE EQUIPPED WITH THE FOLLOWING:

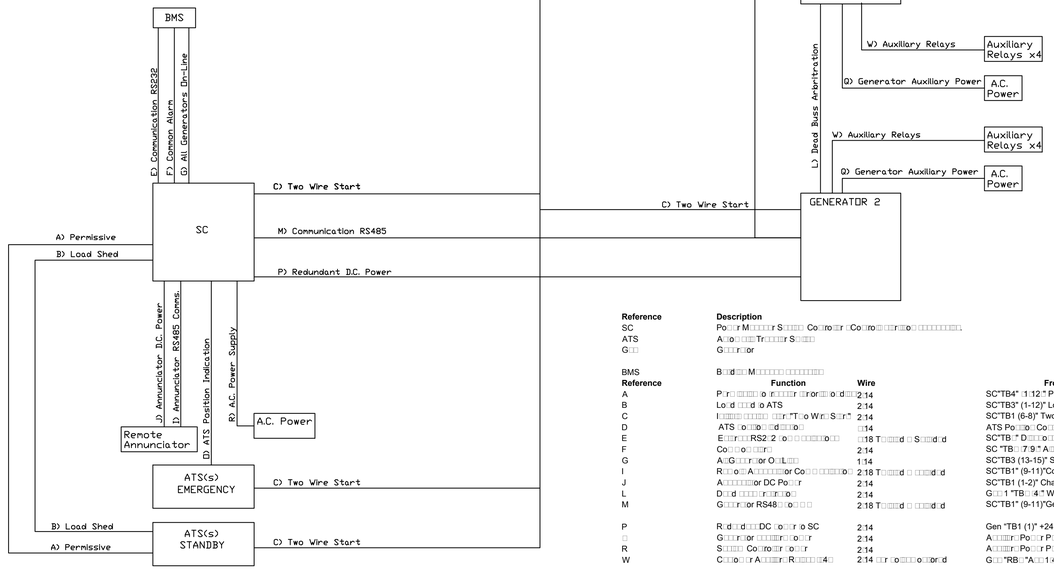
* CLOSE DIFFERENTIAL UNDERVOLTAGE SENSORS, ADJUSTABLE
* TIME DELAY ENGINE START, ADJUSTABLE
* TIME DELAY TRANSFER TO EMERGENCY, ADJUSTABLE
* TIME DELAY NEUTRAL, ADJUSTABLE
* TIME DELAY RETURN TO NORMAL, ADJUSTABLE
* TIME DELAY ENGINE COOLDOWN, ADJUSTABLE
* OPERATIONAL MODE SELECTOR SWITCH (OFF, LOAD TEST, ENGINE CRANK, AUTOMATIC)
* MOMENTARY LOAD TEST SWITCH
* INTERNAL SECONDARY SURGE SUPRESSION FOR UTILITY SOURCE
* EXERCISER CLOCK
* SURGE SUPPRESSOR PROTECTION (TVSS). (1)
* REMOTE ANNUNCIATOR PANEL WITH CONTROLLER
* 4 DRY CONTACTS AT ATS TO BE CONNECTED TO WELL FIELD RTU FOR NORMAL POWER AVAILABLE, EMERGENCY POWER AVAILABLE, ON NORMAL POWER & ON EMERGENCY POWER. SEE HILLERS ELECTRICAL ENGINEERING DRAWINGS FOR MORE DETAILS.



PARTIAL ELECTRICAL SITE PLAN

SCALE: 1/4" = 1'-0"

GENERATORS NOTE:
THE GENERATOR SYSTEM SHALL BE COMPLIANT WITH NFPA 110 LEVEL 1 DESIGNATION. TO BE CONSIDERED EQUAL, ALL SPECIFICATIONS MUST BE MET AND THE MANUFACTURER MUST HAVE A MINIMUM OF 10 INSTALLATIONS IN SOUTH FLORIDA WITH THE NFPA 110 LEVEL 1 DESIGNATION WHICH HAVE BEEN IN OPERATION A MINIMUM OF FIVE (5) YEARS.



Reference	Description
SC	Po□r M□□□□r S□□□□ Co□ro□□r □Co□ro□ □□r□□o□ □□□□□□□□□.
ATS	A□o□□□□Tr□□□□r S□□□□
G□□	G□□□r□□or
BMS	B□□d□□M□□□□□□ □□□□□□□□

Reference	Function	Wire	From	To
A	P□r□ □□□□o □□□□r □□ro□□ o□d□□□	2:14	SC"TB4" □1□12." P□r□ □□□□ 1,2,□□	ATS "Inhibit"
B	Lo□d □□□d o ATS	2:14	SC"TB3" (1-12)" Load shed 1,2,3	ATS "LS"
C	I□□□□□□□□□ □□r."T□o Wr□S□r."	2:14	SC"TB1 (6-8)" Two Wire start	ATS "Two wire start"
D	ATS □o□□o□d□□□o□	□14	ATS Po□□o□Co□□□□	SC"TB□4□□A□□I□□□□
E	E□□r□□ RS2 2 □o□□ □□□□o□□	□18 T□□□d □□S□□d□d	SC"TB□" D□□□o□□□	BMS
F	Co□□o□□r□	2:14	SC "TB□□7.9." A□r□	BMS
G	A□G□□r□or O□□L□□	1:14	SC"TB3 (13-15)" Status	BMS
I	R□□o□A□□□□□or Co□□ □□□□□o□	2:18 T□□□d □ □□□d□d	SC"TB1" (9-11)"Comms	Co□□□□or J10 □4□□
J	A□□□□□□or DC Po□□r	2:14	SC"TB1 (1-2)" Charger Out	A□□□□□□or 24□□d 0 GND
L	D□□d □□□□r□□r□□□	2:14	G□□1 "TB□□4." WIRE 81□	G□□2 "TB□□2□WIRE 814
M	G□□r□or RS48□□o□□	2:18 T□□□d □ □□□d□d	SC"TB1" (9-11)"Genset Comms	Gen "TB1 (10-12" Genset Comms 10:12
P	R□d□d□□DC □o□r o SC	2:14	Gen "TB1 (1)" +24 VDC	SC "TB3" +24 IN 220
□	G□□r□or □□□□r□□o□□r	2:14	A□□□□r□Po□□r P□□□□	G□□Lo□d C□□□r
R	S□□□□ Co□ro□r□o□□r	2:14	A□□□□r□Po□□r P□□□□	SC TB2 □1□□" 120 VAC Po□□r
W	C□□o□□r A□□□r□R□□□□4□	2:14 □□r □o□□□o□□or□d	G□□"RB□"A□□1/4"	C□□o□□ W□□□

CONTROL INTERCONNECT MODULAR POWER SYSTEMS STANDARD CONTROL WIRING CONFIGURATION

SCALE: N.T.S.

1	ADDENDUM #2 09/13/18

CITY OF PEMBROKE PINES WATER SYSTEM FACILITY
UPGRADE EMERGENCY BACKUP ELECTRICAL SERVICE EQUIPMENT
7190 JOHNSON STREET PEMBROKE PINES, FL. 33024

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EB0003862
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E-mail: ErnestoT@fesinc.biz

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d□□: JULY 26, 2018

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ELECTRICAL LEGEND

SYMBOL	DESCRIPTION
	CONNECTION POINT TO EQUIPMENT SPECIFIED, FURNISHED AND INSTALLED UNDER OTHER SECTIONS. RACEWAY, CONDUCTOR AND CONNECTION IN THIS SECTION.
1"C,2#12,1#12G 1"C,1-25/C TYPE 1	INDICATES RACEWAY AND CIRCUIT CONDUCTORS. FIRST NUMBER IS RACEWAY SIZE. THE FOLLOWING NUMBERS ARE THE CONDUCTOR QUANTITIES, SIZES, AND TYPES.
5	MOTOR, SQUIRREL CAGE INDUCTION – HORSEPOWER INDICATED
X	LUMINAIRE AND POLE – SEE DRAWINGS FOR TYPE
X	WALL MOUNTED LUMINAIRE – SEE DRAWINGS FOR TYPE
	LIGHTING FIXTURE POWER AND SWITCHING LEGEND
X Y Z (TYP) Y Z X CRE	X=FIXTURE TYPE Y=PANEL-CIRCUIT BRKR Z=SWITCH CRE-CORROSION RESISTANT IF NO Z INDICATED, CONNECT DIRECTLY TO CIRCUIT BREAKER.
	GROUND ROD – 3/4" x 20' COPPER CLAD UNLESS OTHERWISE NOTED
	GROUND ROD WITH TEST WELL – 3/4" x 20' COPPER CLAD UNLESS OTHERWISE NOTED
S	WALL SWITCH: 2- DOUBLE POLE, 3- THREE WAY, 4- FOUR WAY, WP-WEATHERPROOF, P- PILOT LIGHT, K- KEY OPERATED, D- DIMMER, CRE-CORROSION RESISTANT
S_M	MANUAL MOTOR STARTER SWITCH, NEMA 4X UNLESS OTHERWISE NOTED. NUMBER OF POLES AS REQUIRED
G	GENERATOR
	CONVENIENCE RECEPTACLE 20A RATED- DUPLEX UNLESS SPECIFIED OTHERWISE WP-WEATHERPROOF, C- CLOCK HANGER, TL- TWIST LOCK, CRE-CORROSION RESISTANT GFI-GROUND FAULT INTERRUPTER
J	JUNCTION BOX NEMA 12 ENCLOSURE UNLESS INDICATED OTHERWISE. 4X = NEMA 4X SS
	TELEPHONE RECEPTACLE (OUTLET BOX, 18" AFF) W – WALL MOUNTED, 48" AFF
[B2] LPA-2	CONDUIT/CONDUCTOR – REFER TO CIRCUIT SCHEDULE HOME RUN – PANEL AND CIRCUIT NUMBER SHOWN
	EXPOSED CONDUIT AND CONDUCTORS*
	UNDERGROUND CONDUIT AND CONDUCTORS* NOTE: * ALL UNMARKED CONDUIT RUNS CONSIST OF 2#12, 1#12G IN 3/4"C.
YCX	YARD CONDUIT. REFER TO YARD CONDUIT SCHEDULE
	DIRECT BURIED CABLE
	CONDUIT, STUBBED AND CAPPED AS SHOWN
G	GROUND WIRE, #4/0 UNLESS OTHERWISE NOTED
30 4X	NONFUSED DISCONNECT SWITCH, SIZE INDICATED, 3 POLE UNLESS INDICATED OTHERWISE, NEMA 12 ENCLOSURE, 4X = NEMA 4X 316 STAINLESS STEEL
F 40 60 4X	FUSED DISCONNECT SWITCH, SIZE INDICATED (60 = SWITCH RATING: 40 = FUSE RATING) 3 POLE UNLESS INDICATED OTHERWISE, NEMA 12 ENCLOSURE, 4X = NEMA 4X 316 STAINLESS STEEL
LC 30 4X	LIGHTING CONTACTOR, CURRENT RATING INDICATED, NEMA 12 ENCLOSURE UNLESS INDICATED OTHERWISE. SEE CONTROL DIAGRAM FOR NUMBER OF POLES. 4X = NEMA 4X 316 STAINLESS STEEL
2 4X	MAGNETIC STARTER, NEMA SIZE INDICATED, NEMA 12 ENCLOSURE, UNLESS INDICATED OTHERWISE. SEE CONTROL DIAGRAM. 4X = NEMA 4X 316 STAINLESS STEEL
2 4X	COMBINATION (FUSE OR CIRCUIT BREAKER AS INDICATED). MAGNETIC STARTER, NEMA SIZE INDICATED, NEMA 12 ENCLOSURE UNLESS INDICATED OTHERWISE. SEE CONTROL SCHEMATIC DIAGRAM. 4X = NEMA 4X 316 STAINLESS STEEL
	GROUND ROD, 3/4" X 20'

SYMBOL	DESCRIPTION
120V or 480-120/208V 15 KVA, 3ø	TRANSFORMER, VOLTAGES, PHASE AND RATING INDICATED AS APPLICABLE
	PUSH-BUTTON SWITCH, MOMENTARY CONTACT, NORMALLY OPEN
	PUSH-BUTTON SWITCH, MOMENTARY CONTACT, NORMALLY CLOSED
	REMOTE DEVICE
H O A 1 XOO 2 OOX	SELECTOR SWITCH: MAINTAINED CONTACT WITH CONTACT POSITION INDICATED, CHART IDENTIFIES OPERATION
CRX	CONTACT – NORMALLY OPEN WITH COIL INDICATED
CRX	CONTACT – NORMALLY CLOSED WITH COIL INDICATED
	OVERLOAD RELAY HEATER
1	MAGNETIC STARTER WITH NEMA SIZE INDICATED
M	MOTOR CIRCUIT PROTECTOR, MAGNETIC, 3 POLE UNLESS INDICATED OTHERWISE.
400	CIRCUIT BREAKER, THERMAL MAGNETIC TRIP SHOWN, 3 POLE UNLESS INDICATED OTHERWISE.
400 225	FUSED SWITCH, SWITCH AND FUSE CURRENT RATING INDICATED, 3 POLE UNLESS INDICATED OTHERWISE.
100	SWITCH – CURRENT RATING INDICATED, 3 POLE UNLESS INDICATED OTHERWISE.
SPD	SURGE PROTECTIVE DEVICE
	DEMOLITION TO BE REMOVED OR DELETED
	FUSE
CRX	CONTROL RELAY, X=SEQUENTIAL NUMBER
	CONNECTION POINT TO EQUIPMENT SPECIFIED, FURNISHED AND INSTALLED UNDER OTHER SECTIONS. RACEWAY, CONDUCTOR AND CONNECTION IN THIS SECTION.

POSITION			
CKT.	HAND	OFF	AUTO
1	X	O	O
2	O	O	X

X – CLOSED CONTACT
O – OPEN CONTACT

ABBREVIATIONS

ABBREVIATIONS	DESCRIPTION
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AIT	ANALYTICAL INSTRUMENT TRANSMITTER
AE	ANALYTICAL ELEMENT
ATS	AUTOMATIC TRANSFER SWITCH
C	CONDUIT, CONTACTOR
CB	CIRCUIT BREAKER
CKT	CIRCUIT
CPT	CONTROL POWER TRANSFORMER
CR	CONTROL RELAY
CT	CURRENT TRANSFORMER
DIV	DIVISION
ETM	ELAPSED TIME METER
EXST	EXISTING
F, FU	FUSE
FI	FLOW INDICATOR
FM	FLOW METER
FS01	FLOW SWITCH 01
FT	FLOW TRANSMITTER
FUT	FUTURE
FVNR	FULL VOLTAGE NON-REVERSING STARTER
GALV	GREEN, GROUND
GEN	GALVANIZED
GFI	GENERATOR
GND	GROUND FAULT INTERRUPTER
HH	GROUND
HOA	HANDHOLE
HOR	HAND/OFF/AUTO
MSC	HAND/OFF/REMOTE
FRP	MANUFACTURER SUPPLIED CABLE
	FIBERGLASS-REINFORCED POLYESTER
HVAC	HEATING, VENTILATING & AIR CONDITIONING
IC	INTERRUPTING CAPACITY
I & C	INSTRUMENTATION AND CONTROL
IP	INSTRUMENT PANEL (PANELBOARD)
J, J-BOX	JUNCTION BOX
LC	LIGHTING CONTACTOR
LR	LOCAL/REMOTE
LS	LIMIT SWITCH
LTG	LIGHTING
M	MAGNETIC CONTACTOR COIL OR MOTOR
MCC	MOTOR CONTROL CENTER
MDP	MAIN DISTRIBUTION PANEL
MH	MOTOR HEATER, MANHOLE
MLO	MAIN LUGS ONLY
MPZ	MINI POWER ZONE
MTD	MOTOR TEMPERATURE DETECTOR
N	NEUTRAL
NC	NORMALLY CLOSED
NEMA	NATIONAL ELECTRIC MANUFACTURER'S ASSOCIATION
NO	NORMALLY OPEN
NTS	NOT TO SCALE
OL	OVERLOAD RELAY
SS	STAINLESS STEEL

ABBREVIATIONS

ABBREVIATIONS	DESCRIPTION
PB	PULL BOX
PG	PRESSURE GAUGE
PCM	EXISTING PLANT CONTROL PANEL
PH	PHASE MONITOR
PM	POWER MONITOR
PNL	PANEL
PP	POWER PANEL (480VAC)
PS	PRESSURE SWITCH
PVC	POLYVINYL CHLORIDE CONDUIT
RTU	REMOTE TELEMETRY UNIT
RGS	RIGID GALVANIZED STEEL
SF	SUPPLY FAN
SH	SPACE HEATER
SPD	SURGE PROTECTIVE DEVICE
SSRVS	SOLID STATE REDUCED VOLTAGE STARTER
SST	STAINLESS STEEL
SV	SOLENOID VALVE
SW	SWITCH
T	THERMOSTAT
TB	TERMINAL BOARD
TC3S	TERMINAL CABINET 3 SIGNAL
TJB	TERMINAL JUNCTION BOX
TS	THERMAL SWITCH
TSP	TWISTED SHIELDED PAIR
TYP	TYPICAL
V	VOLTMETER, VOLT
VD	VOLTAGE DROP
WP	WEATHERPROOF – NEMA 4X
XFMR	TRANSFORMER

GENERAL NOTES AND SPECIFICATIONS:

1. THE SCOPE OF WORK SHALL BE AS SHOWN ON PLANS AND AS DESCRIBED IN SPECIFICATIONS.
2. THE CONTRACTOR SHALL PROVIDE ALL MATERIALS AND LABOR TO INSTALL THE ELECTRICAL SYSTEMS AS INDICATED PER PLANS AND SPECIFICATIONS. ITEMS NOT SHOWN BUT OBVIOUSLY NECESSARY FOR COMPLETION OF THE WORK SHALL BE INCLUDED.
3. THE INSTALLATION SHALL BE IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE, NATIONAL ELECTRICAL SAFETY CODE, LOCAL CITY CODES, LOCAL COUNTY CODES, AND FLORIDA BUILDING CODE WITH AMENDMENTS.
4. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS, INSPECTIONS AND APPROVALS AND TO INCLUDE ALL FEES AS PART OF THEIR BID IF NOT OTHERWISE NOTED. THE CONTRACTOR SHALL COORDINATE THEIR WORK WITH THE ENGINEER AND OWNER.
5. THE CONTRACTOR SHALL, BEFORE SUBMITTING THEIR BID, VISIT THE SITE OF THE PROJECT AND BECOME FAMILIAR WITH THE EXISTING CONDITIONS. NO ALLOWANCE WILL BE MADE FOR EXISTING CONDITIONS OR FAILURE OF THE CONTRACTOR TO OBSERVE THEM.
6. IT IS THE CONTRACTOR'S RESPONSIBILITY TO COORDINATE WITH ALL LOCAL UTILITIES, INCLUDING THE POWER UTILITY TO MEET ALL OF THEIR INSTALLATION REQUIREMENTS. ALL FEES, LABOR, EQUIPMENT OR MATERIALS NECESSARY TO MEET THESE REQUIREMENTS IS TO BE INCLUDED IN THE BID. THE CONTRACTOR SHALL OBTAIN, DELIVER AND INSTALL ALL CONDUITS, PULL-BOXES AND EQUIPMENT AS REQUIRED BY THE UTILITIES TO THEIR SPECIFICATIONS.
7. ALL CONTRACTOR EQUIPMENT AND MATERIAL SHALL BE NEW, UNUSED AND U.L. LISTED.
8. THE CONTRACTOR IS RESPONSIBLE TO TEST ALL SYSTEMS INSTALLED OR MODIFIED UNDER THIS PROJECT AND REPAIR OR REPLACE ALL DEFECTIVE WORK TO THE SATISFACTION OF THE ENGINEER AND OWNER.
9. ALL EQUIPMENT FURNISHED AND INSTALLED BY THE CONTRACTOR SHALL BE GUARANTEED AGAINST DEFECTS IN MATERIAL AND WORKMANSHIP FOR A PERIOD OF ONE YEAR FROM DATE OF ACCEPTANCE.
10. COORDINATE ALL ELECTRICAL EQUIPMENT LOCATIONS AND VERIFY ALL OBSTRUCTIONS WITH ALL SUBCONTRACTORS AND EQUIPMENT SUPPLIERS PRIOR TO ANY INSTALLATION.
11. NOT ALL CONDUITS SHOWN ON RISER AND ONE-LINE DIAGRAMS ARE SHOWN ON BUILDING OR SITE LAYOUTS. CONTRACTOR SHALL SUPPLY ALL CONDUITS AND CABLES AS SHOWN ON RISER AND ONE-LINE DIAGRAMS.
12. THE DRAWINGS ARE NOT INTENDED TO SHOW THE EXACT LOCATION OF CONDUIT RUNS. THESE ARE TO BE COORDINATED WITH THE OTHER TRADES SO THAT CONFLICTS ARE AVOIDED PRIOR TO INSTALLATIONS. ALL LOCATIONS OF EQUIPMENT, PANELS ETC. ARE SHOWN FOR ILLUSTRATION PURPOSES. CONTRACTOR SHALL VERIFY EXACT LOCATION AND SIZE AND INSTALL AS SUCH WITH CORRESPONDING CONDUIT STUB-UPS. SEE OTHER DISCIPLINE DRAWINGS FOR COORDINATION OF ALL DRAWINGS. ANY CONFLICTS SHALL BE BROUGHT TO THE ENGINEER'S ATTENTION AND MOVEMENT OF CONDUITS OR OTHER ELECTRICAL EQUIPMENT SHALL BE ACCOMPLISHED WITHOUT ANY ADDITIONAL COST FOR THE OWNER. DRAWINGS ARE SCHEMATIC AND SHOWN FOR CLARITY.
13. ALL REFERENCES TO A PARTICULAR MANUFACTURER ARE GIVEN ON AN "APPROVED EQUAL" BASIS.
14. MINIMUM DEPTH FROM TOP OF DUCTBANKS OR CONDUITS TO FINISHED GRADE SHALL BE 24" UNLESS OTHERWISE NOTED.
15. ALL EXCAVATIONS FOR CONDUITS AND HANDHOLES, NEAR EXISTING PIPING, CONDUIT AND EQUIPMENT SHALL BE HAND EXCAVATED AND COORDINATED WITH PLANT ENGINEER.
16. CONDUCTOR PULLING TENSIONS SHALL NET EXCEED MANUFACTURER'S RECOMMENDATION. CONTRACTOR SHALL INSTALL PULL BOXES TO MEET MANUFACTURER'S REQUIREMENTS.
17. MINIMUM DISTANCE ALLOWED BETWEEN CROSSING POWER CONDUITS AND INSTRUMENTATION CONDUITS SHALL BE 6 INCHES SEPARATION. MINIMUM DISTANCE ALLOWED BETWEEN PARALLEL POWER CONDUITS AND INSTRUMENTATION CONDUITS SHALL BE:

VOLTAGE	DISTANCE
480V	2 FT
120V	1 FT

18. ALL YARD CONDUITS/ EXTERIOR UNDERGROUND CONDUITS SHALL BE CONCRETE ENCASED AS SHOWN ON DETAIL. PROVIDE WARNING TAPE AND #4/0 BARE COPPER GROUND ABOVE THE CONCRETE ENCASEMENT.
19. COLORED WARNING TAPE 6" WIDE SHALL BE INSTALLED 12" BELOW FINISHED GRADE DIRECTLY ABOVE ALL UNDERGROUND CONCRETE ENCASEMENT. 1
20. FLEXIBLE CONDUITS SHALL BE USED TO TERMINATE ALL MOTORS AND OTHER VIBRATING EQUIPMENT AND SHALL BE BETWEEN 18" AND 3' IN LENGTH.
21. ALL SPARE CONDUITS SHALL BE CAPPED WITH A PVC CAP AND A NYLON PULL STRING INSTALLED WITH IDENTIFICATION ON BOTH ENDS.
22. CONTRACTOR SHALL RESTORE SIDEWALKS, ROADWAYS, SOD AND SPRINKLER SYSTEM PIPING TO MATCH EXISTING, AFTER THE COMPLETION OF THE ELECTRICAL INSTALLATION, SUCH AS CONDUITS, PULLBOX, GROUNDING, ETC.
23. ALL MATERIAL IN DESIGNATED CORROSIVE AREAS SHALL BE NEMA 4X 316 STAINLESS STEEL.
24. ALL REFERENCES TO SS OR STAINLESS STEEL SHALL MEAN 316 STAINLESS STEEL.
25. ALL CONTROL PANELS SHALL BE CONSTRUCTED BY A UL 508A APPROVED PANEL VENDOR AND SHALL BEAR A UL 508A LABEL ON THE PANEL.
26. INSTRUMENTATION IS LOW VOLTAGE SIGNALS SUCH AS 4-20MA, TELEPHONE COMMUNICATION, FIRE ALARM COMMUNICATION. POWER CONDUIT SHALL ONLY CROSS INSTRUMENTATION CONDUIT PERPENDICULARLY AT RIGHT ANGLES WITH 6" SEPARATION.
27. CONTRACTOR SHALL PROVIDE RECORD DRAWINGS TO THE OWNER WITHIN 30 DAYS OF SYSTEM ACCEPTANCE.
28. CONTRACTOR SHALL PROVIDE OPERATION MANUALS TO THE OWNER.
29. THE MAXIMUM VOLTAGE DROP FOR BRANCH CIRCUIT CONDUCTORS IS 3% PER FLORIDA BUILDING CODE AND NEC.
30. ALL CONDUITS PENETRATING RATED FIRE WALLS OR RATED FIRE FLOORS SHALL BE INSTALLED WITH U.L. APPROVED DEVICES TO MAINTAIN THE FIRE RATING OF THE WALL OR FLOOR PENETRATED.
31. DEMOLISH ALL ITEMS AS INDICATED ON DRAWINGS. TURN OVER TO THE OWNER AT THE OWNER'S DISCRETION AND PROPERLY DISPOSE OF ALL DEMOLITION ITEMS NOT WANTED BY THE OWNER.

LINE WEIGHT LEGEND

NEW — EXISTING

NO	DATE	REVISION	BY
1	9/13/18	ADDENDUM NO.2	

HILLERS ELECTRICAL ENGINEERING, INC.
23257 STATE ROAD 7, SUITE 100
BOCA RATON, FLORIDA 33428
(561) 451-9165
(561) 451-4886 FAX
LICENSE NO: EB 0006877

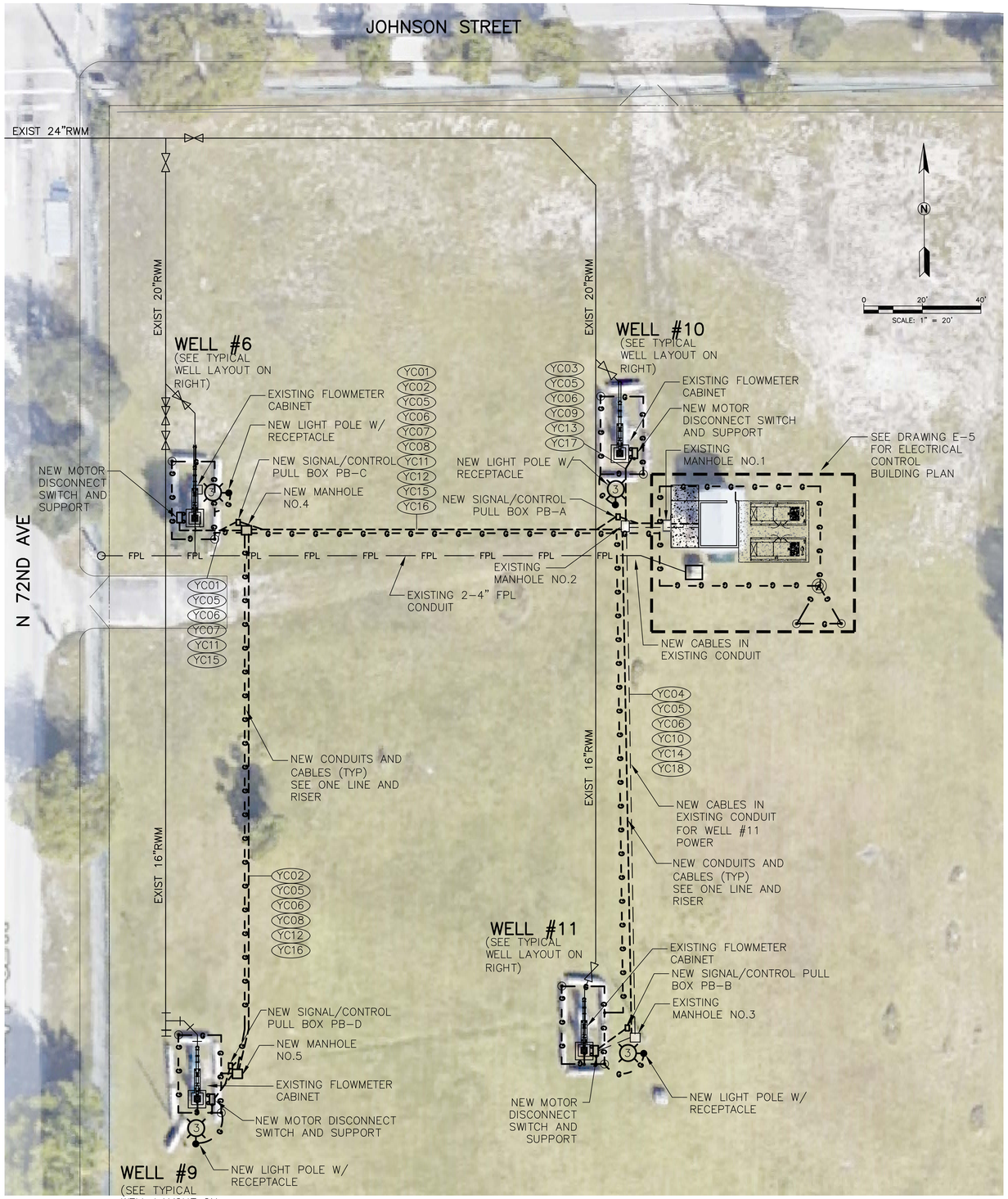
CITY OF PEMBROKE PINES
EASTERN WELLFIELD ELECTRICAL IMPROVEMENTS
PEMPROKE PINE, FLORIDA

ELECTRICAL LEGEND AND NOTES

JAMES W. KAPPES, P.E.
STATE OF FLORIDA PROFESSIONAL ENGINEER
LICENSE No. 71499

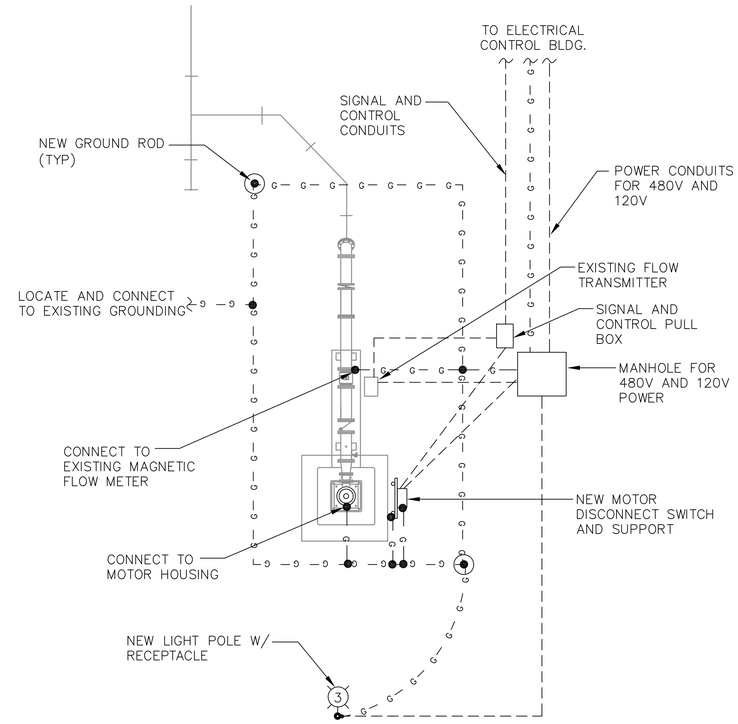
DATE: AUGUST 2018

SCALE: NONE
PROJECT No: PP05
SHEET: E-1



EASTERN WELLFIELD ELECTRICAL PLAN – PROPOSED

SCALE; 1" = 20'-0"



TYPICAL WELL LAYOUT – PROPOSED

NOT TO SCALE

NOTES

1. EXISTING UNDERGROUND RAW WATER LINES AND FPL POWER LINE ARE SHOWN FOR ILLUSTRATION PURPOSE. CONTRACTOR SHALL FIELD VERIFY.
2. CONTRACTOR SHALL MAINTAIN ENOUGH CLEARANCE PER NEC IN FRONT OF MOTOR DISCONNECT SWITCH.
3. CORE DRILL EXISTING CONCRETE MANHOLES FOR NEW CONDUIT INSTALLATION. SEAL AND PATCH WITH NON-SHRINK GROUT. ⚠1
4. THERE ARE EXISTING REMOVABLE CONCRETE BARRIERS AROUND EACH WELL SITE. PROVIDE THE LIFTING EQUIPMENT IF REQUIRED TO WORK AROUND THE WELL SITES AND PUT BACK AT THE END OF THE PROJECT.
5. IF THERE IS A CONFLICT WITH THE EXISTING UNDERGROUND UTILITIES, THE NEW DUCTBANK SHALL BE INSTALLED EITHER ABOVE OR BELOW THE EXISTING UNDERGROUND UTILITIES TO MEET THE REQUIRED BURIAL DEPTH PER NEC.
6. THE NEW GENERATORS AND ATS ARE PROVIDED UNDER A SEPARATE CONTRACT. CONTRACTOR SHALL COORDINATE WITH UPGRADE EMERGENCY BACKUP ELECTRICAL SERVICES EQUIPMENT CONTRACT DOCUMENTS.
7. INSTALL UNDERGROUND SIGNAL AND CONTROL CONDUITS IN ONE CONCRETE ENCASEMENT AND 480V AND 120V POWER IN ANOTHER CONCRETE ENCASEMENT. MAINTAIN 24" SEPARATION BETWEEN THOSE TWO CONCRETE ENCASEMENTS.
8. BURROWING OWLS AND NESTS ARE INSIDE THE EASTERN WELLFIELD FACILITY. COORDINATE WITH OWNER BEFORE DIGGING AND AVOID BURROWS.
9. PROVIDE SPD FOR FLOWMETER ON BOTH POWER AND CONTROL.

811 KNOW WHAT'S BELOW ALWAYS CALL 811 BEFORE YOU DIG It's fast, It's free, It's the law. www.callsunshine.com

NO	DATE	REVISION	BY
1	9/13/18	ADDENDUM NO.2	

HILLERS ELECTRICAL ENGINEERING, INC.
23257 STATE ROAD 7, SUITE 100
BOCA RATON, FLORIDA 33428
(561) 451-9165
(561) 451-4866 FAX
LICENSE NO: EB_0006877

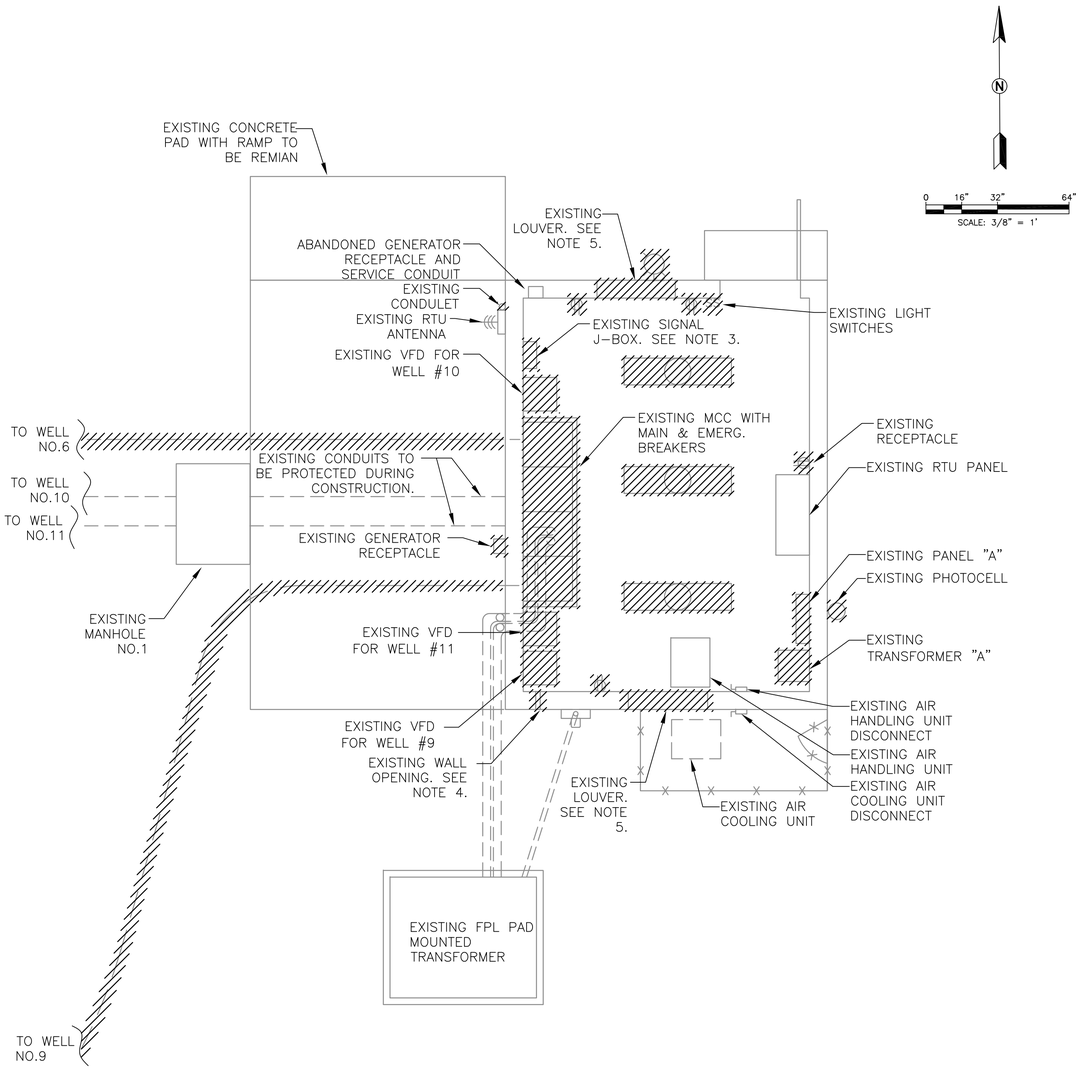
CITY OF PEMBROKE PINES
EASTERN WELLFIELD ELECTRICAL IMPROVEMENTS
PEMPROKE PINE, FLORIDA

EASTERN WELLFIELD ELECTRICAL PLAN - PROPOSED

JAMES W. KAPPES, P.E.
STATE OF FLORIDA PROFESSIONAL ENGINEER
LICENSE No. 71499
DATE: AUGUST 2018

SCALE: AS SHOWN
PROJECT No: PP05
SHEET: E-3

File Name: E:\PROJECTS\PP\PP05\DRAWINGS\addendum\PP05E03 - SITE PLAN PROP.dwg - (Plotted by: Kappes, James on Thursday, September 13, 2018 10:27:41 AM)



ELECTRICAL FLOOR PLAN – DEMOLITION

SCALE: 3/8" = 1'-0"

NOTES:

1. EXISTING CONDUIT ROUTINGS ARE SHOWN FOR ILLUSTRATION PURPOSES ONLY. CONTRACTOR SHALL FIELD VERIFY. 1
2. THE EXISTING CONDUITS, CABLES, PULL BOX AND EQUIPMENT THAT ARE ABANDONED AND/OR BECOME OBSOLETE BECAUSE OF THE ELECTRICAL UPGRADE SHALL BE REMOVED. ABANDONED AND OR OBSOLETE UNDERGROUND CONDUITS SHALL BE CAPPED AND ABANDONED 12" BELOW GRADE.
3. EXISTING SIGNAL JUNCTION BOX TO BE REMOVED AFTER NEW CONDUITS AND SIGNAL CABLES FOR THE FLOW METER ARE INSTALLED, TESTED AND IN OPERATION. FLOW METERS SHALL REMAIN IN OPERATION AT ALL TIMES.
4. CONTRACTOR SHALL REMOVE EXISTING EXTENSION CORD ROUTED THROUGH WALL AND PATCH AND SEAL EXISTING VOID/OPENING WITH CONCRETE. CONTRACTOR SHALL PATCH AND SEAL WITH A FIRE RATED SEALANT TO KEEP INTACT THE EXISTING FIRE RATED RATING OF BUILDING. PAINT TO MATCH EXISTING FINISH.
5. CONTRACTOR SHALL REMOVE EXISTING LOUVERS AND PROVIDE AND INSTALL NEW BLOCK/CONCRETE TO FILL OPENING. CONTRACTOR SHALL PATCH AND SEAL WITH A FIRE RATED SEALANT TO KEEP INTACT THE EXISTING FIRE RATED RATING OF BUILDING. PAINT TO MATCH EXISTING FINISH.

NO	DATE	REVISION	BY
1	9/13/18	ADDENDUM NO.2	

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CITY OF PEMBROKE PINES
EASTERN WELLFIELD ELECTRICAL IMPROVEMENTS
PEMPROKE PINE, FLORIDA

ELECTRICAL CONTROL BUILDING
PLAN - DEMOLITION

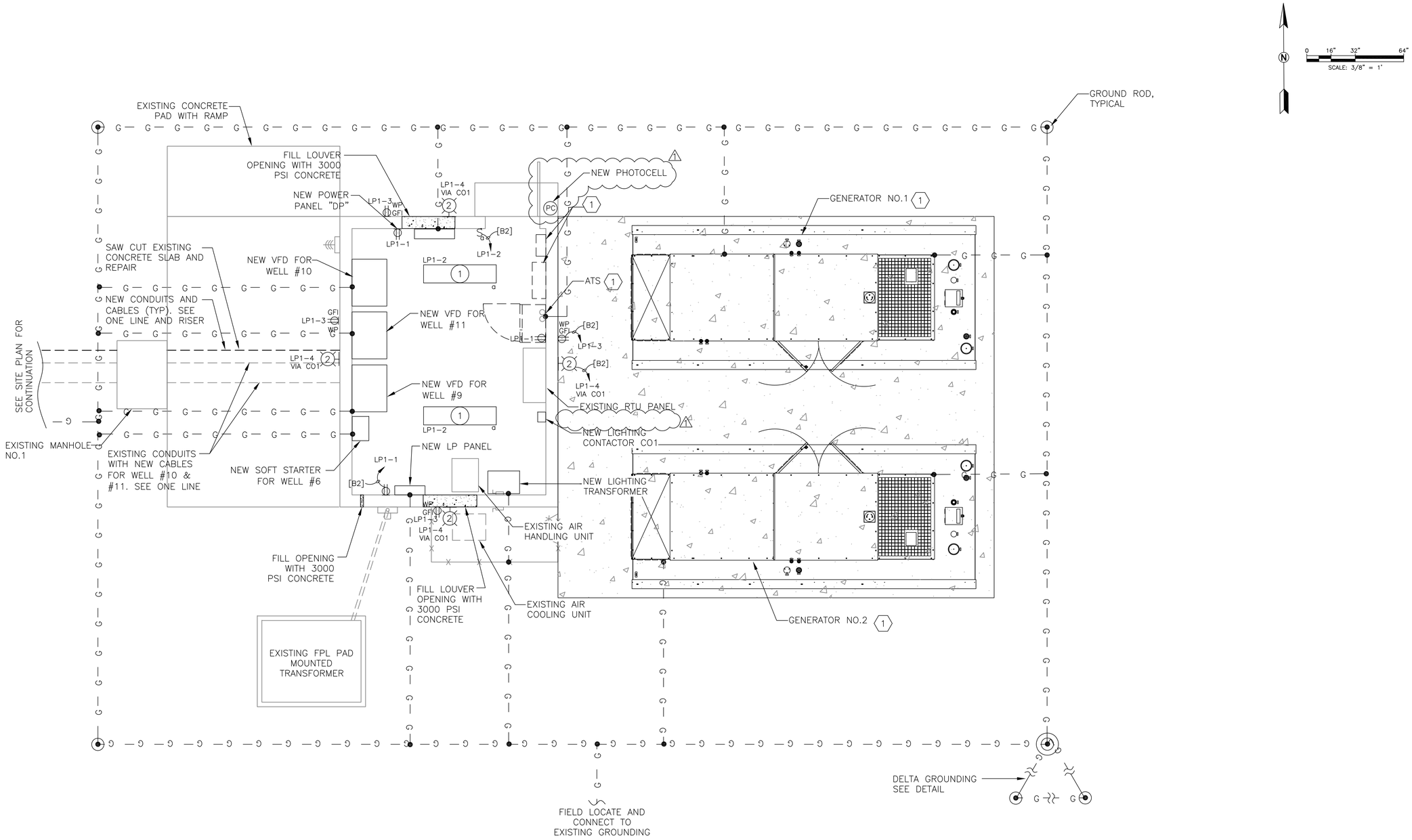
JAMES W. KAPPES, P.E.
STATE OF FLORIDA PROFESSIONAL ENGINEER
LICENSE No. 71499

DATE: AUGUST 2018

SCALE: AS SHOWN

PROJECT No: PP05

SHEET: E-4



ELECTRICAL FLOOR PLAN – PROPOSED

SCALE: 3/8" = 1'–0"

NOTES

1. CONTRACTOR SHALL INSTALL GROUNDING CONDUCTOR FROM THE GROUNDING GRID TO ALL PANELS, PUMPS, DISCONNECTS, MOUNTING SUPPORTS, FLOW METERS AND LIGHT POLES, ETC. FOR A COMPLETE GROUNDING SYSTEM.
2. PROVIDE LIGHTNING PROTECTION PER SPECIFICATION 16670 AND BOND TO THE GROUND GRID.
3. THE NEW GENERATORS AND ATS ARE PROVIDED UNDER A SEPARATE CONTRACT. CONTRACTOR SHALL COORDINATE WITH UPGRADE EMERGENCY BACKUP ELECTRICAL SERVICES EQUIPMENT CONTRACT DOCUMENTS.
4. CONTRACTOR SHALL CORE DRILL EXISTING CONCRETE WALL FOR NEW CONDUIT INSTALLATION. SEAL AND PATCH WITH GROUT AND PAINT TO MATCH EXISTING. (1)
5. CONTRACTOR SHALL SAW CUT THE EXISTING CONCRETE SLAB LOCATED OUTSIDE THE WEST BUILDING WALL AS REQUIRED AND REPAIR TO MATCH EXISTING.

KEYED NOTES:

(1) THE NEW GENERATORS, GENERATOR PARALLELING GEAR, AUTOMATIC TRANSFER SWITCH (ATS) AND ASSOCIATED CONDUITS AND CONDUCTORS ARE PROVIDED UNDER UPGRADE EMERGENCY BACKUP ELECTRICAL SERVICE EQUIPMENT CONTRACT DOCUMENTS. CONTRACTOR SHALL COORDINATE AND PLAN THE WORK ACCORDINGLY.

CIRCUIT SCHEDULE

[B2]=3/4"C, 2#12, 1#12G

NO	DATE	REVISION	BY
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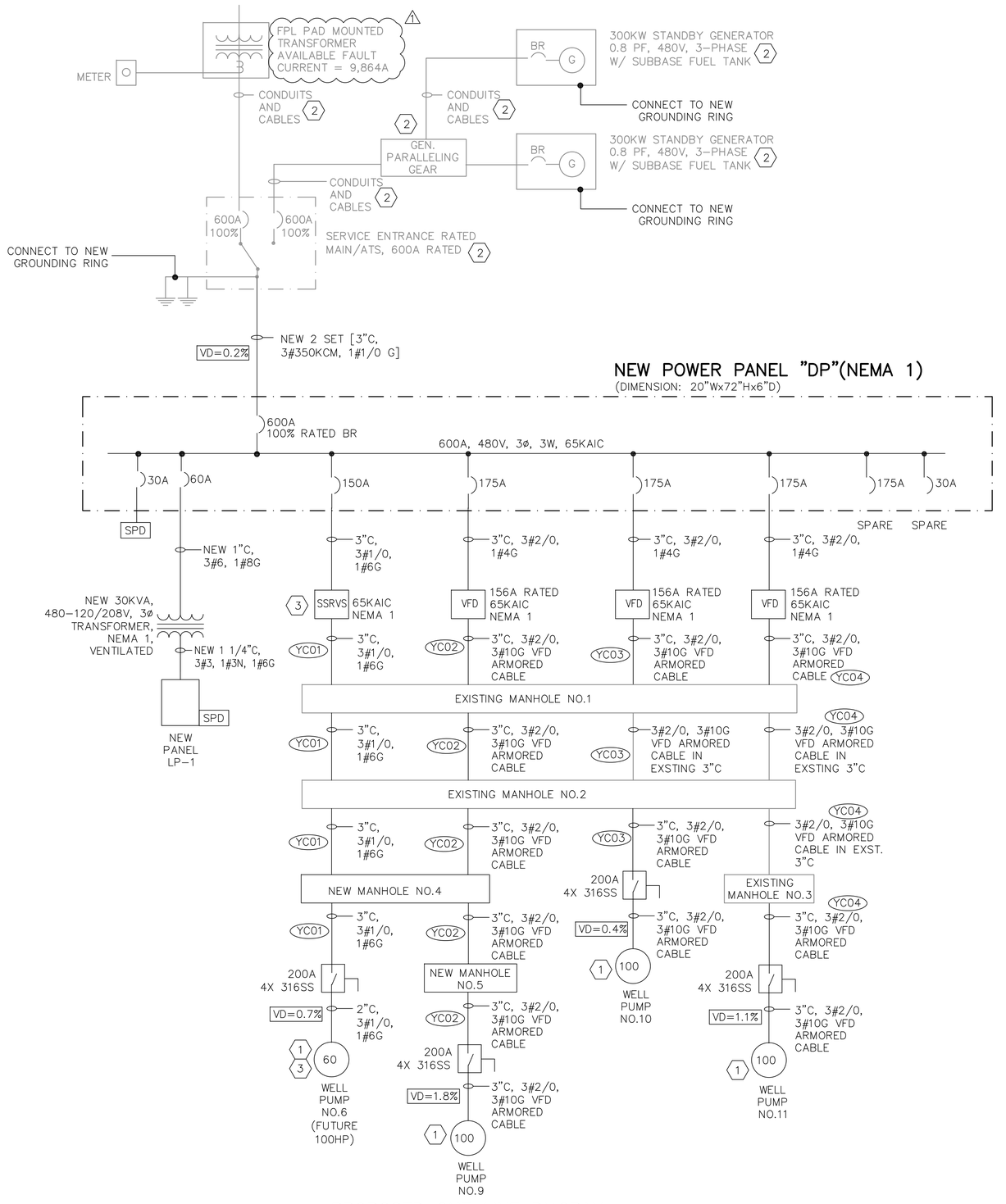
CITY OF PEMBROKE PINES
EASTERN WELLFIELD ELECTRICAL IMPROVEMENTS
PEMPROKE PINE, FLORIDA

ELECTRICAL CONTROL BUILDING PLAN - PROPOSED

JAMES W. KAPPES, P.E.
STATE OF FLORIDA PROFESSIONAL ENGINEER
LICENSE No. 71499

DATE: AUGUST 2018

SCALE: AS SHOWN
PROJECT No: PP05
SHEET: E-5



PROPOSED ONE LINE DIAGRAM

NOT TO SCALE

POWER PANEL "DP" LOAD CALCULATION

480V, 3ø

LOAD DESCRIPTION	CONNECTED LOAD (AMPS)	RUNNING LOAD (AMPS)
LIGHTING TRANSFORMER	36.1 A	16.5 A
WELL PUMP #6 (FUTURE 100 HP)	124.0 A	124.0 A
WELL PUMP #9	124.0 A	124.0 A
WELL PUMP #10	124.0 A	124.0 A
WELL PUMP #11	124.0 A	124.0 A
TOTAL AMPS	532.1 A	512.5 A
TOTAL KVA	442.4 KVA	426.1 KVA

NOTES:

1. VFD ARMORED CABLE SHALL HAVE CONTINUOUS CORRAGATED ALUMINUM ARMOR THAT MEETS THE GROUNDING REQUIREMENTS OF NEC 250.122 AND AS ALLOWED BY NEC 250.118.(10).C. (1)

KEYED NOTES:

(1) ON ALL EXISTING WELL MOTORS, THE CONTRACTOR SHALL INSTALL AN AEGIS SGR GROUNDING RING. CONTRACTOR SHALL CONTACT AEGIS FOR CORRECT MODEL NUMBER FOR EACH WELL MOTOR.

(2) THE NEW GENERATORS, GENERATOR PARALLELING GEAR, AUTOMATIC TRANSFER SWITCH (ATS) AND ASSOCIATED CONDUITS AND CONDUCTORS ARE PROVIDED UNDER UPGRADE EMERGENCY BACKUP ELECTRICAL SERVICE EQUIPMENT CONTRACT DOCUMENTS. CONTRACTOR SHALL COORDINATE AND PLAN THE WORK ACCORDINGLY.

(3) FOR BIDDING PURPOSES, CONTRACTOR SHALL PROVIDE A SSRVS SIZED AS SHOWN ON THE DRAWINGS. HOWEVER, CONTRACTOR SHALL FIELD VERIFY THE MOTOR FULL LOAD AMPS FOR WELL NO.6 AND COORDINATE WITH THE ENGINEER FOR THE SSRVS RATING IN THE SUBMITTAL PHASE. (1)

NO	DATE	REVISION	BY
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CITY OF PEMBROKE PINES
EASTERN WELLFIELD ELECTRICAL IMPROVEMENTS
PEMPROKE PINE, FLORIDA

ELECTRICAL ONE LINE PROPOSED

JAMES W. KAPPES, P.E.
STATE OF FLORIDA PROFESSIONAL ENGINEER
LICENSE No. 71499
DATE: AUGUST 2018

SCALE: NONE
PROJECT No: PP05
SHEET: E-7

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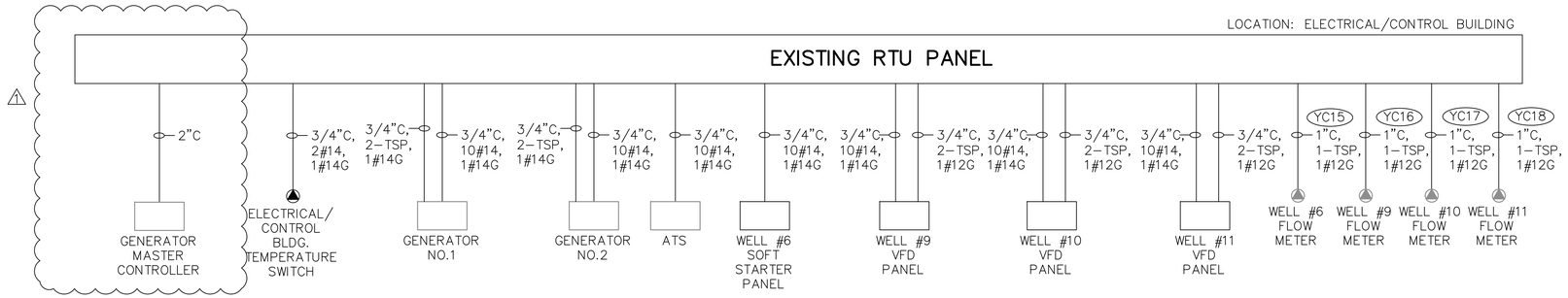
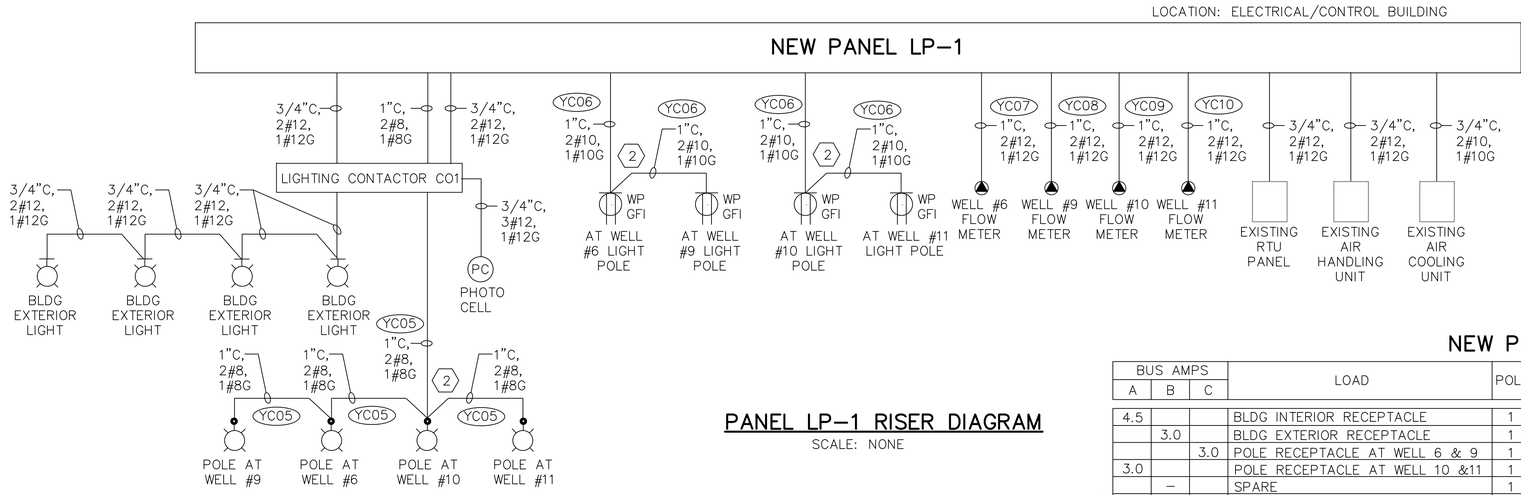


SIGNAL & CONTROL RISER DIAGRAM

SCALE: NONE



PANEL LP-1 RISER DIAGRAM

SCALE: NONE

KEYED NOTES:

1. THE NEW GENERATORS, GENERATOR PARALLELING GEAR, AUTOMATIC TRANSFER SWITCH (ATS) AND ASSOCIATED CONDUITS AND CONDUCTORS ARE PROVIDED UNDER UPGRADE EMERGENCY BACKUP ELECTRICAL SERVICE EQUIPMENT CONTRACT DOCUMENTS. CONTRACTOR SHALL COORDINATE WITH THAT CONTRACT AND ADJUST THE BREAKER SIZES ACCORDINGLY.
2. ALL UNDERGROUND WATERPROOF SPLICES FOR LIGHTING AND RECEPTACLE CIRCUITS SHALL BE MADE WITH TYCO SPLICE KITS MODEL NUMBER GELCAP-SL-2/0-3HOLE OR APPROVED EQUAL AND SEALED WITH APPROVED WATERPROOF COVER

NOTES:

1. ROUTE NEW 120V POWER CONDUITS VIA EXISTING/NEW MANHOLES AND ROUTE NEW SIGNAL AND CONTROL CONDUITS VIA NEW PULL BOXES AS SHOWN ON WELLFIELD ELECTRICAL PLAN.

NEW PANEL SCHEDULE "LP-1"

BUS AMPS A	BUS AMPS B	BUS AMPS C	LOAD	POLE	AMPS	BUS A B C	AMPS	POLE	LOAD	BUS AMPS A	BUS AMPS B	BUS AMPS C
4.5			BLDG INTERIOR RECEPTACLE	1	20	1 — 2	20	1	BLDG INTERIOR LIGHTS	2.0		
	3.0		BLDG EXTERIOR RECEPTACLE	1	20	3 — 4	20	1	BLDG EXTERIOR LIGHTS		1.0	
		3.0	POLE RECEPTACLE AT WELL 6 & 9	1	20	5 — 6	20	1	POLE LIGHTS (WELLS 6, 9, 10, 11)			9.6
3.0			POLE RECEPTACLE AT WELL 10 &11	1	20	7 — 8	20	1	LIGHTING CONTACTOR	1.0		
	–		SPARE	1	20	9 — 10	20	1	EXISTING RTU PANEL		3.0	
		8.0	GEN. 1 BATT. CHARGER	1	20	11 — 12	20	1	EXISTING WELL 6 FLOW METER			1.0
18.0			GEN. 1 JACKET WTR HTR	2	30	13 — 14	20	1	EXISTING WELL 9 FLOW METER	1.0		
	18.0		⊥	⊥	⊥	15 — 16	20	1	EXISTING WELL 10 FLOW METER		1.0	
		8.0	GEN. 2 BATT. CHARGER	1	20	17 — 18	20	1	EXISTING WELL 11 FLOW METER			1.0
18.0			GEN. 2 JACKET WTR HTR	2	30	19 — 20	20	1	SPARE	–		
	18.0		⊥	⊥	⊥	21 — 22	20	1	SPARE		–	
		1.9	EXISTING AIR HANDLING UNIT	2	20	23 — 24	20	1	SPARE			–
1.9			⊥	⊥	⊥	25 — 26	30	3	SPD	–		
	12.0		EXISTING AIR COOLING UNIT	2	30	27 — 28					–	
		12.0	⊥	⊥	⊥	29 — 30	⊥	⊥	⊥			–

(1)

TOTAL AMPS: BUS A 49.4 BUS B 56.0 BUS C 44.5 CONNECTED Kva 18.0

RATED VOLTAGE: ■ 120/208 ☐ 480 3 PHASE, 4 WIRE		BRANCH POLES ☐ 12 ☐ 20 ■ 30 ☐ 42	
RATED AMPS: ■ 100 ☐ 225 ☐ 400 ☐ _____		CABINET: ■ SURFACE ☐ FLUSH	
NEUTRAL BUS ■ 100% ☐ 150% ☐ 200%	■ GROUND BUS	■ HINGED DOOR	■ KEYED DOOR LATCH	LOCATION: ELECTRICAL/CONTROL BUILDING
■ CIRCUIT BREAKER (BOLT-IN) BRANCH DEVICES	■ SPD	ENCLOSURE TYPE ■ NEMA 1 ☐ NEMA 3R ☐ NEMA 4X ☐ _____	
☐ MAIN LUGS ONLY	MAIN 100A AMPS ■ BREAKER	☐ _____ TO BE GFI BREAKERS	
PANELBOARD MUST BE RATED TO INTERRUPT A SHORT CIRCUIT ISC OF ____10,000 AMPS SYMMETRICAL.			
APPROVED MF'RS. SEE SPECIFICATION 16050.		COPPER BUSSES	MAIN LUGS ____ SETS SIZE: _____

YARD CONDUIT SCHEDULE

NO.	FROM	TO	REMARKS
YC01	PANEL DP	WELL PUMP NO. 6 MOTOR	POWER
YC02	PANEL DP	WELL PUMP NO. 9 MOTOR	POWER
YC03	PANEL DP	WELL PUMP NO. 10 MOTOR	POWER
YC04	PANEL DP	WELL PUMP NO. 11 MOTOR	POWER
YC05	PANEL LP	WELL PUMP LIGHTING	POWER
YC06	PANEL LP	WELL PUMP RECEPTACLES	POWER
YC07	PANEL LP	WELL PUMP NO. 6 FLOW METER	POWER
YC08	PANEL LP	WELL PUMP NO. 9 FLOW METER	POWER
YC09	PANEL LP	WELL PUMP NO. 10 FLOW METER	POWER
YC10	PANEL LP	WELL PUMP NO. 11 FLOW METER	POWER
YC11	WELL PUMP NO. 6 SOFT STARTER	WELL PUMP NO. 6 MOTOR	CONTROL
YC12	WELL PUMP NO. 9 VFD	WELL PUMP NO. 9 MOTOR	CONTROL
YC13	WELL PUMP NO. 10 VFD	WELL PUMP NO. 10 MOTOR	CONTROL
YC14	WELL PUMP NO. 11 VFD	WELL PUMP NO. 11 MOTOR	CONTROL
YC15	RTU PANEL	WELL PUMP NO. 6 FLOW METER	CONTROL
YC16	RTU PANEL	WELL PUMP NO. 9 FLOW METER	CONTROL
YC17	RTU PANEL	WELL PUMP NO. 10 FLOW METER	CONTROL
YC18	RTU PANEL	WELL PUMP NO. 11 FLOW METER	CONTROL

LUMINAIRE SCHEDULE

TYPE	VOLTS	DESCRIPTION	MANUFACTURER	CATALOG NO	LAMPS	MOUNTING	MOUNTING	REMARKS
1	120	INTERIOR LIGHT	METALUX	4VT2-LD4-6-DR-UNV-L840-CD1-WL-SSL-U-VT2-CHAIN	56.0 WATTS LED	SUSPENDED	8' AFF	PROVIDE ALL STAINLESS STEEL MOUNTING HARDWARE
2	120	EXTERIOR LIGHT	LUMARK	XTOR2B	18 WATTS LED	WALL	8' AFF	PROVIDE ALL STAINLESS STEEL MOUNTING HARDWARE
3	120	LED AREA FIXTURE	MCGRAW-EDISON	GLEON-AF-04-LED-5WG-BZ	225 WATTS LED	POLE	20' AFF	COORDINATE WITH LIGHTNING PROTECTION SPECIFICATION

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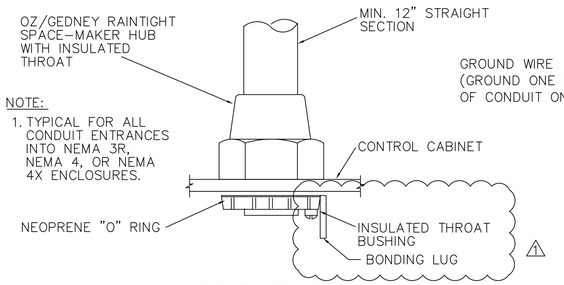
CITY OF PEMBROKE PINES
EASTERN WELLFIELD ELECTRICAL IMPROVEMENTS
PEMBROKE PINE, FLORIDA

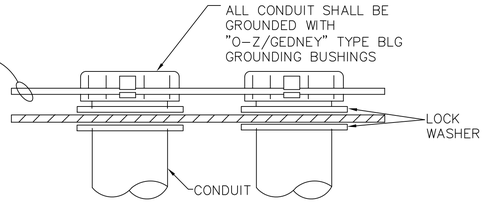
ELECTRICAL RISERS AND SCHEDULES

JAMES W. KAPPES, P.E.
STATE OF FLORIDA PROFESSIONAL ENGINEER
LICENSE No. 71499
DATE: AUGUST 2018

SCALE: NONE
PROJECT No: PP05
SHEET: E-8



CONDUIT HUB
NOT TO SCALE



CONDUIT GROUNDING
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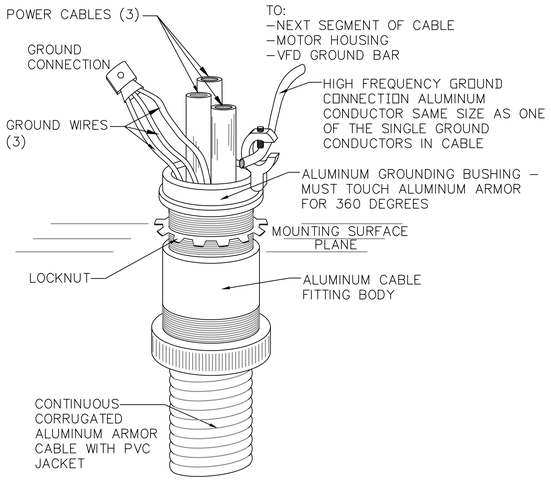

ARMORED CABLE TERMINATION DETAIL
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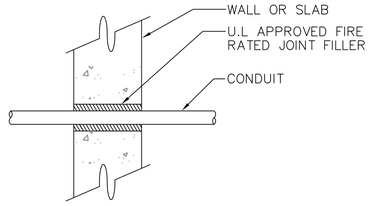
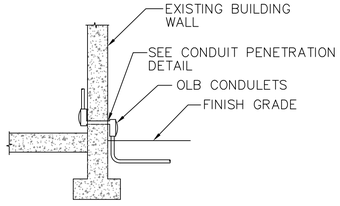


CONDUIT PENETRATION AT WALL OR SLAB
NOT TO SCALE



CONDUIT ENTRANCE
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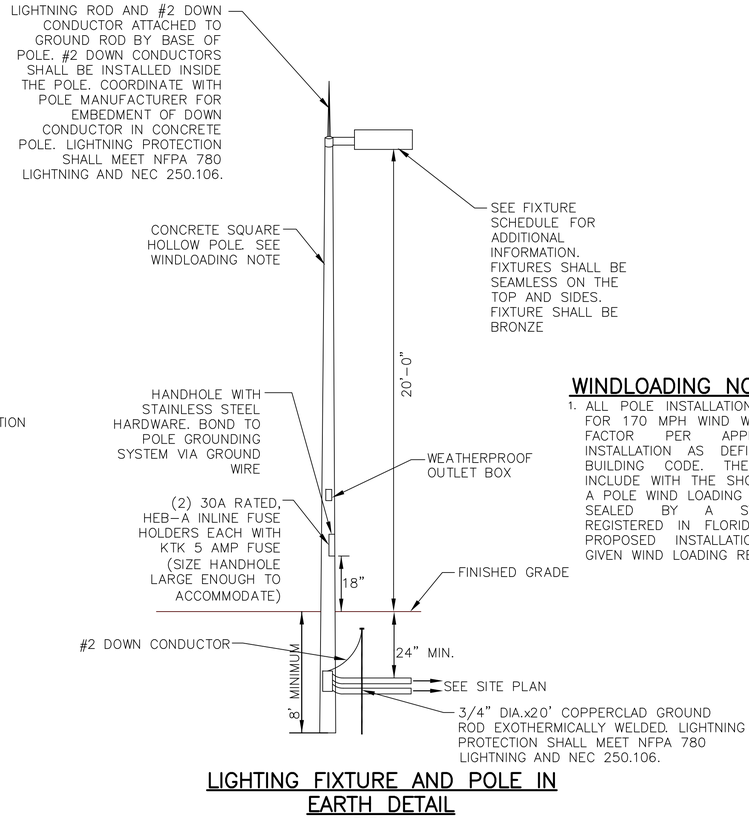
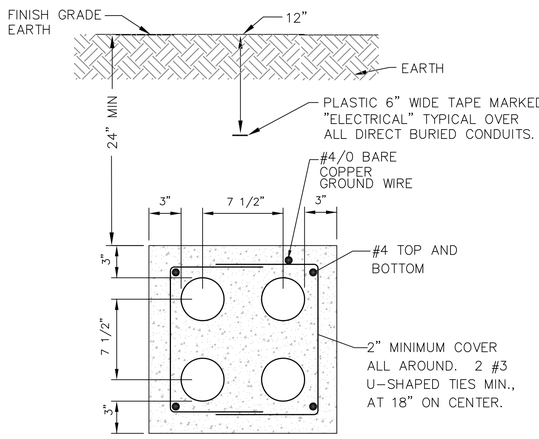


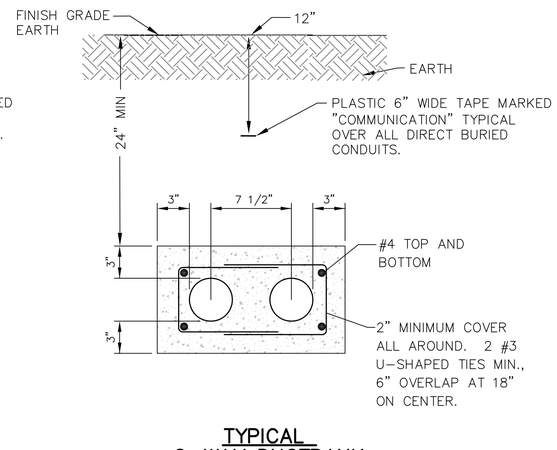
LIGHTING FIXTURE AND POLE IN EARTH DETAIL
NOT TO SCALE

WINDLOADING NOTE FOR LIGHT POLES:

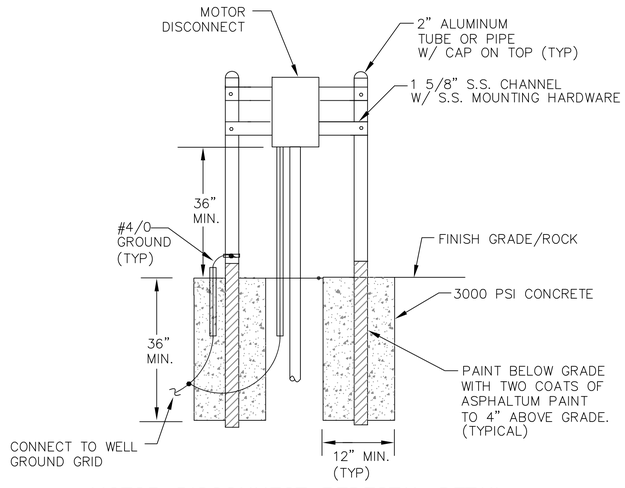
1. ALL POLE INSTALLATIONS SHALL BE SUITABLE FOR 170 MPH WIND WITH APPROPRIATE GUST FACTOR PER APPLICABLE ZONE OF INSTALLATION AS DEFINED IN THE FLORIDA BUILDING CODE. THE CONTRACTOR SHALL INCLUDE WITH THE SHOP DRAWING SUBMITTAL, A POLE WIND LOADING CALCULATION SIGNED & SEALED BY A STRUCTURAL ENGINEER REGISTERED IN FLORIDA SHOWING THAT THE PROPOSED INSTALLATIONS WILL MEET THE GIVEN WIND LOADING REQUIREMENT.



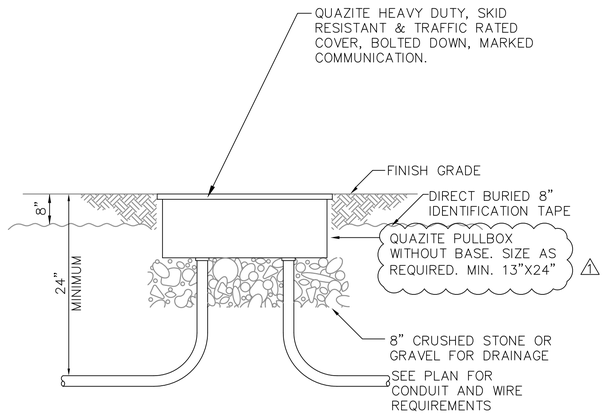
TYPICAL 4-WAY DUCTBANK
NOT TO SCALE
TYPICAL FOR POWER CONDUITS



TYPICAL 2-WAY DUCTBANK
NOT TO SCALE
TYPICAL FOR COMMUNICATION CONDUITS



MOTOR DISCONNECT PEDESTAL DETAIL
NOT TO SCALE



SIGNAL/CONTROL PULL BOX DETAIL
NOT TO SCALE

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CITY OF PEMBROKE PINES
EASTERN WELLFIELD ELECTRICAL IMPROVEMENTS
PEMPROKE PINE, FLORIDA

ELECTRICAL DETAILS

JAMES W. KAPPES, P.E.
STATE OF FLORIDA PROFESSIONAL ENGINEER
LICENSE No. 71499

DATE: AUGUST 2018

SCALE: NONE

PROJECT No: PP05

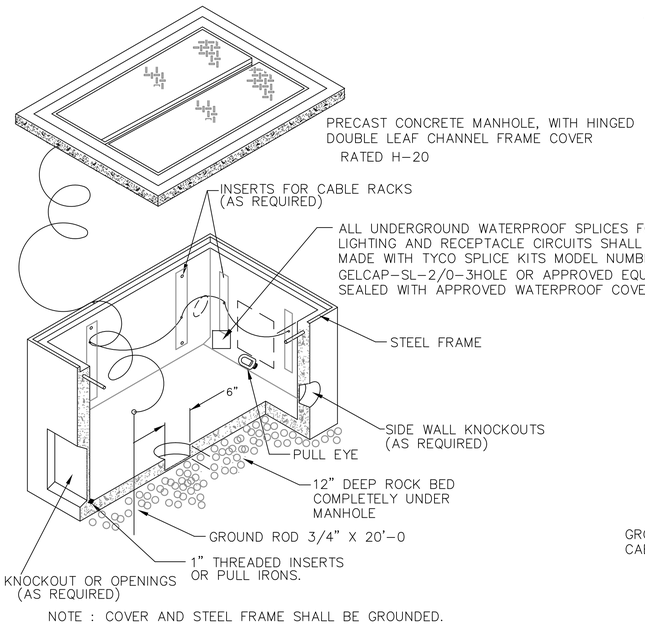
SHEET: E-10

NOTES FOR ALL MANHOLES:

1. CONTRACTOR SHALL PROVIDE REQUIRED END BELL LOCATIONS TO MANHOLE MANUFACTURER BEFORE MANUFACTURING.
2. ALL MANHOLES SHALL BE H-20-44 TRAFFIC RATED.
3. THE HEIGHT OF CONDUIT ENTRANCES SHALL BE COORDINATED BY THE CONTRACTOR TO ACCOMMODATE OTHER UTILITIES IN THE AREA.
4. CONTRACTOR SHALL COORDINATE CONDUIT ENTRY REQUIREMENTS WITH SITE PLAN, PRIOR TO ORDERING MANHOLES.

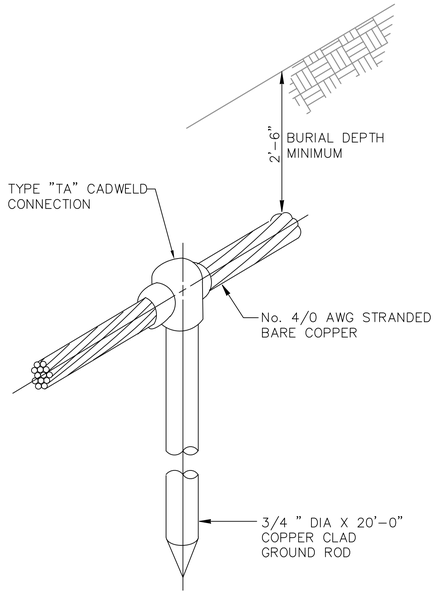
MANHOLE NOTES:

1. CABLE RACK, API CR24-B OR EQUAL
   CABLE HOOKS, API RA08 OR EQUAL
   ARM LOCK, API HDL OR EQUAL
2. PULLING-IN-IRONS INSTALL OPPOSITE CONDUIT ENTRANCE. POSITION BELOW LEVEL OF CONDUIT ENTRANCE. HUBBART & CO. CATALOG 9119 OR EQUAL.
3. TERMINATE ALL DUCTS IN MANHOLE WITH END BELLS.
4. MANHOLE COVERS SHALL BE MARKED "ELECTRICAL POWER" BY THE MANUFACTURER, WITH RAISED LETTERS. THE CONTRACTOR SHALL STAMP IN THE MANHOLE COVERS THE IDENTIFICATION NUMBER OF THE MANHOLE, LETTERS AND NUMBERS SHALL BE 2" HIGH. AS AN ALTERNATE THE CONTRACTOR MAY INSTALL SST NAMEPLATES ATTACHED WITH FOUR SST BOLTS TO THE MANHOLE. COVERS INDICATING THE MANHOLE NUMBER. LETTERS AND NUMBERS TO BE RAISED AND 2" HIGH. SUBMIT ONE SAMPLE NAMEPLATE FOR ENGINEER'S APPROVAL PRIOR TO INSTALLATION.
5. GROUND ROD, 3/4"X20'-0, COPPER CLAD.
6. BOND ALL METALLIC PARTS TO GROUNDING SYSTEM.
7. PRECAST CONCRETE MANHOLE WITH COVER, U.S. PRECAST CORP. OR EQUAL.
8. TOP OF MANHOLE SHALL BE PLACED 1" AFG AND SLOPE DOWN.
9. MANHOLE MINIMUM INTERNAL DIMENSION 36"X36"X36".

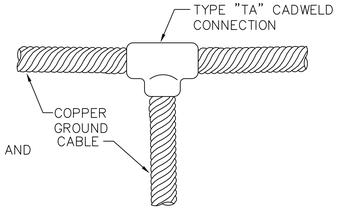


NOTE : COVER AND STEEL FRAME SHALL BE GROUNDED.

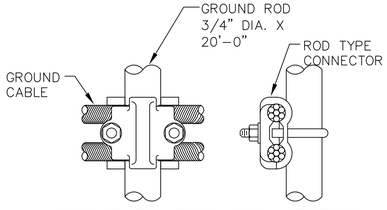
MANHOLE DETAIL
NOT TO SCALE



GROUND ROD DETAIL
NOT TO SCALE



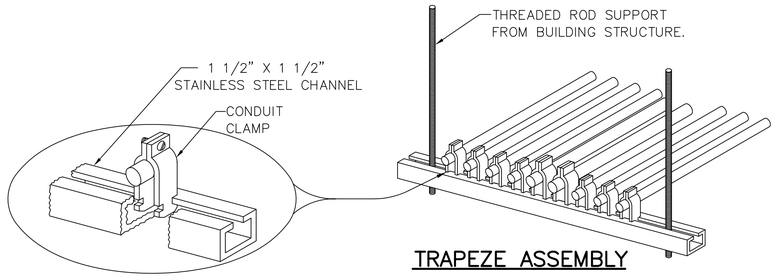
GROUND CABLE CONNECTION
NOT TO SCALE



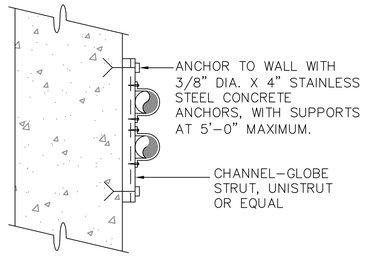
CABLE TO ROD CONNECTION
NOT TO SCALE

NOTES:

1. THIS DETAIL TYPICAL FOR BOTH VERTICAL AND HORIZONTAL MOUNTING
2. CHANNEL AND ALL SUPPORT DEVICES TO BE STAINLESS STEEL. ⚠1
3. CHANNELS TO BE SPACED 5' MAXIMUM.

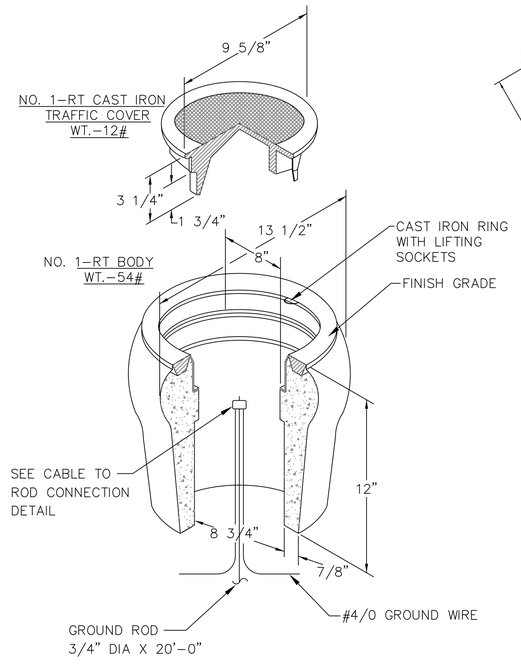


CONDUIT PIPE STRAP MOUNTING DETAILS
TRAPEZE ASSEMBLY

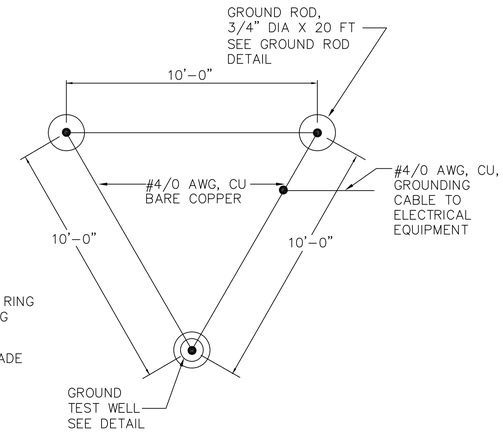


CONDUIT SUPPORT ON WALL
NOT TO SCALE

CONDUIT SUPPORT DETAIL
NOT TO SCALE



GROUND TEST WELL DETAIL
NOT TO SCALE



GROUNDING DELTA LAYOUT
NOT TO SCALE

NO	DATE	REVISION	BY
1	9/13/18	ADDENDUM NO.2	

HILLERS ELECTRICAL ENGINEERING, INC.
23257 STATE ROAD 7, SUITE 100
BOCA RATON, FLORIDA 33428
(561) 451-9165
(561) 451-4886 FAX
LICENSE NO: EB 0006877

CITY OF PEMBROKE PINES
EASTERN WELLFIELD ELECTRICAL IMPROVEMENTS
PEMPROKE PINE, FLORIDA

ELECTRICAL DETAILS

JAMES W. KAPPES, P.E.
STATE OF FLORIDA PROFESSIONAL ENGINEER
LICENSE No. 71499

DATE: AUGUST 2018

SCALE: NONE
PROJECT No: PP05
SHEET: E-11

September 25, 2018 IFB # PSUT-18-06

Addendum # 3
City of Pembroke Pines
IFB # PSUT-18-06
Utility Electrical Projects 2018

A) <u>SCHEDULING MANDATORY SITE VISITS</u>

In an effort to increase participation and competition, the Public Services Department is extending an opportunity for vendors that could not attend the original Mandatory Pre-Bid Meeting on August 23, 2018.

Vendors interested in bidding this project who did not attend the mandatory pre-bid meeting may schedule a Mandatory Site Visit as a substitute. All vendors will be required to complete **Attachment N "Mandatory Pre-Bid Meeting Form"** and submit it as part of their proposal to show proof of attendance to the mandatory pre-bid meeting that was held on August 23, 2018 or proof of attendance to one of the Site Visits.

If you have already attended the August 23, 2018 pre-bid meeting, you will not need to schedule another site visit, however you may schedule a site visit if you like.

Any vendors interested may contact Jonathan Cooper at jcooper@ppines.com to schedule a site visit prior to October 2, 2018 at 5:00 p.m.

The bid date is hereby extended to October 9, 2018.

PEMBROKE PINES
CITY COMMISSION

Frank C. Ortis
MAYOR
954-450-1020
fortis@ppines.com

Thomas Good
VICE MAYOR - DISTRICT 1
954-450-1030
tgood@ppines.com

Angelo Castillo
VICE MAYOR - DISTRICT 4
954-450-1030
acastillo@ppines.com

Jay Schwartz
DISTRICT 2
954-450-1030
jschwartz@ppines.com

Iris A. Siple
DISTRICT 3
954-450-1030
isiple@ppines.com

Charles F. Dodge
CITY MANAGER
954-450-1040
cdodge@ppines.com

October 8, 2018 IFB # PSUT-18-06

Addendum # 4
City of Pembroke Pines
IFB # PSUT-18-06
Utility Electrical Projects 2018

A) SCADA PERFORMANCE

Generator Communication Specification

This project envisions two parallel standby generator sets. These must communicate seamlessly and without error with the City Supervisory Control and Data Acquisition System (SCADA). This includes, but is not limited to, the following outline performance specification. This must be adhered to for acceptance of the proposed generator manufacturer.

The generator manufacturer must provide a letter certifying to this performance at the time of bid.

SCADA System Communications

The generator controller Parallel must be capable of communicating with the owner's existing SCADA Remote Terminal Unit (RTU). An RS-232 serial port must be configured on the controller to match the RTU's communications setup as follows:

Modbus RTU Slave (Generator Controller)

9600 Baud (8N1)

A Modbus register spread sheet must be provided that clearly identifies all generator parameters available to the SCADA System: the following points are required:

Generator Alarms (Temp, Oil, Battery Charger Status, Low Battery, Low Fuel, Not in Auto, Overcrank, Overspeed, Transfer Switch, Running)

Analog Points (Current, Voltage, RPM, Temp, Battery Voltage)

Communications update intervals shall not exceed 5 seconds per Modbus Read.

Question and Answers for Bid #PSUT-18-06 - Utility Electrical Projects 2018

Create New Question

Question Deadline: Sep 10, 2018 8:30:00 PM EDT

Overall Bid Questions

Question 1

Can City provide location, date and time for site visits? **(Submitted: Aug 28, 2018 1:28:50 PM EDT)**

Answer edit

- A non-mandatory site inspection will be held on 09/05/18 at 9:00 am. All parties must check in at the City Water Treatment Plant located at 7950 Johnson Street. **(Answered: Aug 30, 2018 11:09:18 AM EDT)**

Add to Answer:

Question 2

Please clarify how many master permits will be required on these project? is it one per location or one for all locations? **(Submitted: Aug 28, 2018 1:31:01 PM EDT)**

Answer edit

- Two permits will be required; one for each location. Pursuant to section 1.4.2 of the bid package, the City shall provide a permit allowance. **(Answered: Aug 30, 2018 9:30:14 AM EDT)**

Add to Answer:

Question 3

Does the 120 days project timeline include procurement time? We estimate approximately 30 days submittal process, plus Generators manufacturing process may take from 90 to 150 days. These are not stock or out of the shell items. They most likely will need to be manufactured

Project may required 120 days for permitting, submittal, and procurement time, plus 90 days construction time **(Submitted: Aug 28, 2018 1:46:33 PM EDT)** edit

Answer

- The City will increase the project from 120 days to 180 days. **(Answered: Aug 30, 2018 11:09:18 AM EDT)**

Add to Answer:

Submit

PRE-BID ATTENDANCE SHEET

Date: Thursday, August 23, 2018 at 9:00 a.m. Proposal/Bid #: IFB #PSUT-18-06 "Utility Electrical Projects 2018"

Company Name	Address	Representative Name	E-Mail	Phone Number	Signature
FES, INC	34 NW 168 ST NORTH MIAMI BEACH	ERNESTO TORRES	ErnestoT@fesinc.biz	305-653-0212	[signature]
Fisk Elec.	10125 NW 116th Way Medley, FL	Josh Rattner	jrattner@fiskcorp.com	305-882-5520	[signature]
AGC Electric, Inc	2660 W 79 ST Hialeah, FL 33016	Tomas V. Castillo	Tomas@agcelectric.com	3058237780	[signature]
~~BILL DAMANICA~~ ABURI, LLC	2331 N STATE RD 7 #203 LAUDERHILL, FL 33313	BILL DAMANKA	billdamanka@gmail.com	240 441 0307	[signature]
'D' ELECTRICIAN TECHNICAL SVC	4064 N.E 5TH AVE OAKLAND PK FL 33334	TERRENCE DAVIS	INFO@DELECTRICIAN.COM	954-726-0394	[signature]
Hillers Electrical Engineering, Inc.	23257 St. Rd. 7 Suite 100 Boca Raton FL, 33428	Steven Chamness	fchamness@hillersee.com	561-451-9165 x231	[signature]
Hillers Electrical Engineering, Inc.	23257 St. Rd 7 Suite 100 BOCA RATON, FL 33428	Jim KAPPES	jkappes@hillersee.com	561-451-9165 x230	[signature]
City of Pembroke Pines Engineering	8300 S. Palm Dr P.P 33026	Jorge Murgado	jmurgado@ppines.com	(786) 774-3394	[signature]
"	Etc "	Jim Cooper	jcooper@ppines.com	954 518 9063	[signature]

1 of 1