ADDENDUM NO. 1

TO THE CONTRACT DOCUMENTS

(PROJECT MANUAL, TECHNICAL SPECIFICATIONS AND DESIGN DRAWINGS)

FOR THE

AIRFIELD AND AIR TRAFFIC CONTROL TOWER (ATCT) GENERATORS REPLACEMENT AND UPGRADES PROJECT

BID NO. 2023-BRAA-07

BOCA RATON AIRPORT

BOCA RATON, FLORIDA

Project funded by:

FLORIDA DEPARTMENT OF TRANSPORTATION (FDOT)

August 17, 2023

TO: ALL HOLDERS OF CONTRACT DOCUMENTS

a. Your attention is directed to the following interpretations of, changes in, and additions to the Contract Specifications and Plans for the above-named project at Boca Raton Airport, Boca Raton, Florida.

b. This Addendum is part of the Contract Documents and Plans, and the bidders are required to acknowledge receipt of this Addendum in the space provided below.

c. Addendums are to be submitted along with the Bid Documents for a complete Bid.

This addendum includes the following (see attachments):

1. **Pre-Bid Conference - Agenda**
2. **Pre-Bid Conference – Meeting Minutes and Attachments**
3. **Requests for Clarification Submitted prior to the August 15th, 2023 deadline.** See following page and attachments.
4. **Revised Technical Specification 26 32 00, Packaged Generator Assemblies –** Technical Specification 26 32 00 included the original set of Project Technical Specifications shall be replaced with revised pages included in this addendum. All Bidders shall use these revised Technical Specifications for the Packaged Generator Assemblies along with the other technical specifications issued for this Project that remained unchanged for bid pricing and during construction.
5. **Revised Design Drawings –** Drawings Sheets A202, E101, E103, E201, and E202 included the original set of design drawings shall be replaced with "Revision 1" drawings sheets

numbered as A202, E101, E103, E201, and E202. These sheets have been revised as appropriate to reflect responses issued to questions raised during the pre-bid conference or submitted to the Airport Authority prior to the August 15, 2023 deadline to questions and clarifications requests. All Bidders shall use these revised design drawings sheets, along with those from the original design drawings set that remained unchanged for bid pricing and during construction.

Acknowledged:_____(Signature of Bidder)

Name of Bidder:_____Date:_____

AGENDA

Pre-Bid Conference

for

Airfield and Air Traffic Control Tower (ATCT) Generators Replacement and Upgrades

at

Boca Raton Airport

BID NO. 2023-BRAA-007

PROJECT FUNDED BY:
Florida Department of Transportation,
and
Boca Raton Airport Authority

Tuesday, August 8, 2023
2:00 PM
Boca Raton Airport

1. **OWNER** — **Boca Raton Airport Authority (BRAA)**

Clara Bennett	Executive Director
Scott Kohut	Deputy Director
Travis Bryan	Operations Director

2. **AIRPORT'S GENERAL CONSULTANT**

Ricondo & Associates, Inc.

3. **DESIGNER/ENGINNERS**

HDg Architecture
Craig Hanson, AIA, NCARB, LEED AP (chanson@hdg-arc.com)
Natalia Aguzino (naguzino@hdg-arc.com)

Quantum Electrical Engineering, Inc.
James (Jim) Kappes james.kappes@quantum-ee.com

4. **BID SUBMITTAL DATE** — **Friday, August 25, 2023; 2:00 pm, Local Time**

Boca Raton Airport (BCT)
903 NW 35th Street
Boca Raton, Florida 33431
Attn: Travis Bryan, Operations Director
Phone: (561) 391-2202, Extension 210

Bid proposals must be submitted on the forms provided by BRAA and accompanied by a bid security in the form of a certified check, cashier's check, money order or a bid bond, submitted on the form provided, in favor of BRAA in the amount of not less than five percent (5%) of the bid price. Bidders are required to submit three (3) sealed copies of their Bid with all required documentation, complete.

5. **BID DOCUMENTS** – Plans, Specifications, and Addenda can be obtained by contacting Boca Raton Airport. Contact Person:

Travis Bryan, Operations Director
Phone: (561) 391-2202 Ext. 210
e-mail- travis@bocaairport.com

6. **BID FORM**

Allowance Account		
Line Item 9	General Allowance Account	$20,000 (W 103)

7. **CONTRACT TERM AND COMPLETION SCHEDULE**

Administrative Activities Period (NTP)	406	Calendar Days
Notice to Proceed (NTP – Construction Period)	150	Calendar Days
Substantial to Final Completion (close-out)	30	Calendar Days
Total (Calendar Days are Cumulative)	586	Calendar Days

60-Day Administrative Period Activities

- Quality Control Plan
- Safety Plan
- CPM Schedule with Critical Milestones
- Submittals for Long Lead Items
- Procurement time for Long Lead Items

8. **CONRACTOR BIDS AND ANTICIPATED CONTRACT AWARD**

- Anticipated NTP for Contract Work (Administrative period): soon after the September 20th, 2023 Board Meeting

9. **DBE PARTICIPATION REQUIREMENTS – C&S Companies (C&S)**
   - 0.00% DBE Goal
   - Good Faith Efforts – Not Applicable

10. **SAFETY AND SECURITY**

Security badges are required to operate on the Airport Operations Area (AOA). If any staging of materials or access to the AOA is anticipated, security badges will be required. Cost per badge is $25 dollars per badge and shall be considered incidental to the work bid.

11. **PERMIT FEES**

Contractor All permits and licenses required by federal, state or local laws, rules and regulations necessary for the prosecution of the Work undertaken by Contractor pursuant to this Contract shall be secured and paid for by Contractor. Refer to Article 11 (page CD 24 of 59) for additional information on Permits, Licenses and Impact Fees.

12. **BID DOCUMENT CLARIFICATIONS/REQUESTS FOR INFORMATION**

All questions pertaining to design and construction must be in writing.

E-mail all questions to: Travis Bryan, Operations Director travis@bocaairport.com

Last date to submit questions is Tuesday, August 15th, 2023, 2:00 PM EST.

13. **PROJECT SCOPE**

The project consists of the replacement of both the Airfield Vault Building Generator System and the Air Traffic Control Tower (ATCT) Generator System at the Boca Raton Airport (BCT). The project includes but is not limited to the demolition of existing generator systems and associated fuel systems, two (2) new generators with associated subbase fuel tank and outdoor enclosure, new concrete foundations, new automatic transfer switches, and miscellaneous electrical, architectural and mechanical improvements.

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14. **PROJECT SPECIFIC DATA**

No work periods (and Airport holidays) – Article 55

15. **CONTRACTOR QUESTIONS/CLARIFICATIONS**

MEETING SUMMARY

Pre-Bid Conference

Airfield and Air Traffic Control Tower (ATCT) Generators Replacement and Upgrades

Boca Raton Airport

BID NO. 2023-BRAA-007

Date: August 8, 2023. Time: 2:00 -3:00 pm.

Host: Travis Bryan, Boca Raton Airport Operations Director.

Summary Meeting Discussion and Questions

- Travis Bryan opened the meeting with Introductions. Mr. Bryan indicated he is the point of contact for the Project and would coordinate any requests for clarifications, questions, and the issuance of contract document addendums. Boca Raton Airport Authority representatives present included Mr. Bryan, Mr. Robert Pratt (Operations Coordinator), and Ms. Hannah Oakland (Operations Coordinator). The meeting hosted in-person participants as well as several individuals that participated virtually via Zoom. Please refer to sign-in sheet (attached) for a listing of participants.
- Bid Submittal deadline (Friday, August 25th, 2023; 2:00 pm, Local Time) was emphasized. All bids shall be submitted on or prior to this date and time, in hard copy (paper form).
- Bids must be accompanied by the various Authority forms included in the bid documents as well as a bid security in the form of a certified check, money order, or bid bond for an amount equal to not less than 5% of the bid price. Three (3) sealed copies of the bid and supporting documents are required. All bids received with be date and time stamped by the Authority.
- Questions and addendums may be obtained from Mr. Bryan (email: Travis@bocaairport.com).
- Addendum 1 will includes responses to questions received by the deadline for questions (Tuesday, August 15th, 2023 at 2:00 PM local time). A site visit was also conducted following the pre-bid meeting.
- The project includes a $20,000 general allowance account for unforeseen or unanticipated site conditions discovered during the Project. It may not need to be used in its entirety or at all.
- The Administrative Period, set at 406 calendar days, has been set in recognition of the long lead order time that there is for generators. During the Administrative Period, the quality control plan, CPM schedule, safety plan, and shop drawings would also need to be submitted and approved by the Engineer of Record. The construction duration following the receipt of materials is set at 150 calendar days, with a 30 calendar day period to reach final completion following the attainment of substantial completion. This represents a total of 586 calendar days for the replacement of two generators.
- The intended timing for award of the contract would be soon after the Authority's September 20th, 2023 Board Meeting.
- The DBE goal is set at 0%.

- Anyone actively participating in the day-to-day construction activities will need to be badged with the Airport Authority. The badging process includes a 2-page application, employer-completed background check, and payment of a $25 fee (per badge).
- Regarding permitting, the Boca Raton Airport Authority is a special district of the state and not subject to all of the Palm Beach County and City of Boca Raton permitting requirements. Nonetheless, there may be certain approvals and fees that may be required with the City of Boca Raton.
- The Project consists of the replacement of both the Airfield Vault Building Generator System and the Air Traffic Control Tower (ATCT) Generator System at the Boca Raton Airport (BCT). The project includes but is not limited to the demolition of existing generator systems and associated fuel systems, two (2) new generators with associated subbase fuel tank and outdoor enclosure, new concrete foundations, new automatic transfer switches, and miscellaneous electrical, architectural and mechanical improvements. The new generators will be exterior-located and pad mounted (in lieu of locating them in interior generator rooms as they are presently located).
- Mr. Jappes (Engineer of Record) added that the intent of the project is to build the pad and install the new generator in the proposed location, complete testing, and do the switchover at the end while keeping the existing generator in operation. The project/bid requires having a temporary generator in place during the switchover to avoid any power disruptions.
- Participants were asked if there were any questions on the project and contract/project requirements. Several questions were provided and addressed during the meeting (see following page)
- Participants were once again asked if there were any questions on the project and contract/project requirements. No questions were presented.
- The Prebid Meeting then ended. A site visit/tour was then hosted by the Authority following the meeting.

Summarized version of the questions and responses asked during the Pre-Bid Meeting.

1. ACCEPTABLE GENERATOR SET MANUFACTURERS. The listed manufacturers are Cummins, Caterpillar or approved alternate. How would I see the approved alternate manufacturers? What about an option like Kohler?
   Response: Manufacturers that meet the requirements as shown in the Contract Documents shall be submitted for review and approval in order to be considered an approved alternate. An alternate manufacturer shall be submitted for review during the bidding period with a confirmation of acceptability issued as part of an addendum.

2. Just to confirm that the generator sizes are an 80KW and a 40KW correct?
   Response: That is correct.

3. What are the sizes of the transfer switches?
   Response: One of the transfer switches is a 400A switch style transfer switch and the other is a 400A breaker style with 150A trips.

4. Didn't see a detail for generator slabs.
   Response: The plans will be revised to add a note to provide per the generator manufacturer's requirements along with some minimum requirements.

5. Will the new fuel be by owner or contractor?
   Response: Fuel shall be provided by Contractor, refer to specification 26 32 00 section 2.2(D)(3)(o) for additional information.

6. What about the disposal of old fuel?
   Response: Contractor shall dispose of the fuel tank and the fuel (such costs shall be included in the bid price).

7. How many gallons are the existing fuel tanks and what is the approximate fuel in each?
   Response: Airport believes the fuel tanks are approximately 300 gallons each. The ATCT generator does not have a day tank but the Airfield Electrical Vault generator does have a day tank which is approximately 100 gallons. Assume the fuel tanks are full.

8. There is also a reference for air conditioners, a couple of split-unit systems?
   Response: Yes. The existing generator room for the air traffic control tower, when the louvers get removed and the openings are sealed, the Authority wishes to air condition that space. One split system will handle that space. There is another adjacent space that will also be air conditioned with the second split system unit referenced in the contract documents.

9. Does the generator enclosure need to be HVHZ missile impacted rated?
   Response: Yes. Specification 26 32 00 has been revised to include the requirement for the HVHZ rating.

Boca Raton Airport Authority
Airfield and Air Traffic Control Tower Generators Replacement and Upgrades (BID No. 2023-BRAA-07)
Pre-bid Conference
Date: August 8, 2023

Name	Representing	Phone #	E-Mail Address
Travis Aryan	BRAA	561-391-2201	Travis@Bocaairport.com
Jim KAPPES	Quantum Electrical Engineering	561-210-9224	james.kappes@quantum-ee.com
Robert Pratt	BRAA	561-391-2202	RPratt@Bocaairport.com
Hannah Oakland	BRAA	561-391-2202	Hannah@bocaairport.com
Chuck TOBY	A.F.C.S.	954 5123256	MCOX@AFCS-CO.com
Tom Tietje	Zabatt Power Systems	786-350-7855	Tom.Tietje@Zabatt.com
Daniel ALMAZAN	ZABATT	407-607-5929	Danny.ALMAZAN@ZABATT.com
Abraham Torres	Zabatt Power Systems	805-849-6492	Abraham.Torres@Zabatt.Com
George BRAUN	Pioneer Critical Power	786-378-4813	gBRAUN@~~Critical~~ PIONEER CRITICAL POWER.COM

Boca Raton Airport Authority
Airfield and Air Traffic Control Tower Generators Replacement and Upgrades (BID No. 2023-BRAA-07)
Pre-bid Conference - Virtual (Zoom) Attendees **Date: August 8, 2023**

Name	Representing	Phone #	E-Mail Address
Jennifer Austin	Eau Gallie Electric		
Javier Mazzarado	Cummins		
Natalia Aguzino	HDG Architecture		
Jorge Lopez	Waypoint Contracting		
Robert Kelly	*Not Identified*		
Kiki Anderson	Anderson Power		
Miguel Lara	Cummins		
Carrie	Miami Generator		

AIRFIELD AND AIR TRAFFIC CONTROL TOWER (ATCT) GENERATORS REPLACEMENT AND UPGRADES
BID NO. 2023-BRAA-07
BOCA RATON AIRPORT - BOCA RATON, FLORIDA

QUESTIONS/REQUESTS FOR CLARIFICATION AND ASSOCIATED RESPONSES:

1.) What is the estimated project budget cost?

RESPONSE: The estimated engineer's cost range for the Project is $950,000-$1,000,000.

2.) Will there be a pre-bid site visit scheduled?

RESPONSE: A pre-bid site visit was held on the same day, and immediately following the pre0bid conference on August 8th, 2023.

3.) Reference: Technical Specification Section 26 32 00.2.1 ACCEPTABLE GENERATOR SET MANUFACTURERS. The listed manufacturers are Cummins, Caterpillar or approved alternate. Who are the approved alternate manufacturers?

RESPONSE: Manufacturers that meet the requirements as shown in the Contract Documents shall be submitted for review and approval in order to be considered an approved alternate. An alternate manufacturer shall be submitted for review during the bidding period with a confirmation of acceptability issued as part of an addendum.

4.) Question: Will the contractor be responsible for providing the concrete pad(s) for the new outdoor generators? I did not see specifications, drawings or details in the bid documents for concrete pad(s).

RESPONSE: Contractor shall provide and install concrete foundations for the generators per the generator manufacturer's requirements. Refer to revised plan sheets E101 and E103 for additional information.

5.) Technical Specification Section 26 32 00.2.1 ACCEPTABLE GENERATOR SET MANUFACTURERS. The listed manufacturers are Cummins, Caterpillar or approved alternate. Is Kohler an approved alternate manufacturer?

RESPONSE: Kohler is considered an approved alternate manufacturer.

6.) REF: Technical Specification Section 26 32 00.2.1 ACCEPTABLE GENERATOR SET MANUFACTURERS. The listed manufacturers are Cummins, Caterpillar or approved alternate. Is Generac an approved alternate manufacturer?

RESPONSE: Generac is considered an approved alternate manufacturer.

7.) REF: Technical Specification Section 26 32 00.2.1 ACCEPTABLE GENERATOR SET MANUFACTURERS. The listed manufacturers are Cummins, Caterpillar or approved alternate. Is MTU an approved alternate manufacturer?

RESPONSE: MTU is considered an approved alternate manufacturer.

8.) REF: Technical Specification Section 26 32 00.2.1 ACCEPTABLE GENERATOR SET MANUFACTURERS. The listed manufacturers are Cummins, Caterpillar or approved alternate. Is Detroit Diesel an approved alternate manufacturer?

RESPONSE: Detroit Diesel is considered an approved alternate manufacturer.

6.) Who is responsible for existing fuel removal and disposal?

RESPONSE: Contractor shall dispose of the fuel tank and the fuel.

7.) Estimated gallons of on-site fuel to be disposed?

RESPONSE: Airport believe the fuel tanks are approximately 300 gallons each. The ATCT generator does not have a day tank but the Airfield Electrical Vault generator does have a day tank which is approximately 100 gallons. Assume the fuel tanks are full.

8.) Enclosure criteria include aluminum construction and PE Certified wind load resistance to 180 MPH constant. Does the enclosure also require a HVHZ Missile impact rating?

RESPONSE: Yes. Specification 26 32 00 has been revised and included in this Addendum to include the requirement for the HVHZ rating.

9.) Does the housekeeping pad under the generator in the Airfield vault need to be removed?

RESPONSE: No. However, as part of the bid, Contractors/Bidders shall include the cost to cut any conduits flush and patch the hole(s).

10.) Please clarify what agency has process jurisdiction regarding project permitting.

RESPONSE: to the extent there are any permitting requirements, the City of Boca Raton would be the agency with jurisdiction. However, we do not anticipate any permitting required for this Project.

11.) Please clarify the use of “special inspectors”.

RESPONSE: The Authority, the Engineer of Record, and other Authority-retained consultants would conduct inspections throughout the project duration. We do not anticipate the need for any “special inspectors” for this project.

12.) Who is responsible for paying for the “special inspectors” services?

RESPONSE: We do not anticipate the need for any “special inspectors” for this project.

13.) Please Clarify on bid number 2023-BRAA-007 form BB002. ... Please clarify why this is needed and what we need to provide.

RESPONSE: Bidders must provide a Bid bond in the amount of 5% of the total bid amount (see Bid Form BB001) ***or*** a Bid guaranty in the form of a Letter of Credit in the amount of 5% of the total bid amount (See Bid Form BB002). Bidders are not required to submit both a Bid Bond and a Bid Guaranty/Unconditional Letter of Credit.

END OF QUESTIONS/REQUESTS FOR CLARIFICATIONS

SECTION 263200 – PACKAGED GENERATOR ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. The General Provisions, Supplemental General Provisions, Special Provisions and Division 1 Specification Sections apply to Work covered by this Section.

B. Comply with other Division 26 Sections, as applicable and as noted herein. Refer to other Divisions for coordination of the Work.

C. Automatic electrical transfer equipment: furnished separately under sections 263600 Automatic Transfer Switch – Breaker Type and 263610 Automatic Transfer Switch – Contactor Type.

1.2 SCOPE OF WORK

A. Provide labor, materials, equipment, tools and services, and perform operations required for, and reasonably incidental to the providing of two (2) UL2200 Listed standby engine-generator (EG) systems with an outdoor weather protective enclosure mounted on top of a sub base diesel fuel tank, for automatic and manual operation for the transfer of electrical power to the connected Facility loads, including all stairs and platforms, related systems and accessories for a complete working installation in place. The furnished generator sets shall meet all applicable Tier level emission and certification requirements of United States Environmental Protection Agency's (U.S. EPA) standards and regulations. All further specifications refer to both of the above listed generator sets

B. It is the intent of these Specifications that there is a single source of supply and responsibility for the entire specified EG systems to include the new engine generator sets and accessory equipment. Due to the coordination required between the related systems, the engine generator supplier (EG vendor) shall be the responsible party, through the Installing CONTRACTOR, and supply the entire system as a unit, less installation materials and installation to be furnished by the Installing CONTRACTOR. The EG vendor shall coordinate with the Installing CONTRACTOR for installation requirements and actual equipment dimensions for foundation installation and all mechanical and electrical interface requirements.

C. The work covered by this Specification consists of the supply and testing of a standby power duty rated diesel electric generator sets with standby ratings as indicated herein. The entire engine-generator system (EG) shall be furnished by the EG vendor which shall include, but not necessarily be limited to, the following basic components:

1. Diesel engine.
2. Generator.
3. Generator mounted AC main power circuit breakers.
4. Engine-mounted radiator closed loop-cooling system.
5. Weather protected enclosure and appurtenances.

6. Exhaust system with high degree sound attenuating silencer as specified herein.

7. Generator starting / control battery and automatic battery charger.

8. Generator set spring vibration isolators.

9. Engine-generator set system accessory equipment items.

10. Generator system status annunciation signals.

11. Generator Remote Annunciator Panel (for mounting in building)

12. Access platforms, handrails and stairs.

13. Generator enclosure power panel, lights, light switches, and GFCI outlets.

1.3 SYSTEM DESCRIPTION

A. System Operation

1. The standby engine-generator (EG) systems shall be the manufacturer's standard production model nameplate rated to have a minimum rating and site capability of 80KW, 100KVA Standby Power, at 0.80 power factor, 120/240 volt AC, 1-phase, 3-wire, 60 hertz for the Airfield Vault and 40KW, 50KVA Standby Power, at 0.80 power factor, 120/240 volt AC, 1-phase, 3-wire, 60 hertz for the Air Traffic Control Tower (ATCT). The generator sets shall be capable of properly transferring electrical power to the connected Facility's electrical loads. The generator set systems, including equipment and operation, shall, in its entirety, be designed, manufactured, and installed so as to comply with NFPA 110, Level 1, type 10 requirements and in accordance with all other applicable Codes, including those indicated herein. All further specifications refer to both of the above listed generator sets

B. System Function

1. The EG systems shall include the capability of the generator set being automatically controlled for start, run, and stop by the generator set automatic transfer switch equipment controls. Provide selectable manual generator set start and stop controls. Upon engine crank initiation, the new generator set shall start, attain rated speed and voltage, and be able to accept rated electrical load within ten (10) seconds from the issue of generator set start initiation. The engine mounted speed governor shall automatically control generator set speed, while the generator mounted automatic voltage regulator shall control generator output voltage regulation. Manual adjustment of generator speed and voltage shall also be provided with the generator-mounted controls.

C. Site Conditions

1. The operating environment of the standby engine-generator system shall be:

Altitude: ..... maximum of 100 ft

Outdoor temperature: maximum of ..... 110 °F

Outdoor temperature: minimum of ..... 30 °F

Engine jacket water/glycol: 50%/50%

Installation type: ..... Inside an outdoor non-walk-in weather protective enclosure

Fuel type: ..... Standard No. 2 diesel fuel oil

Cooling system type: ..... Generator set mounted closed loop radiator with blower fan

Exhaust system: ..... inside of the of the generator outdoor enclosure

D. System Performance

1. The standby engine-generator system shall conform to the following general performance criteria:

   a. Rating - Engine brake horsepower shall be sufficient to deliver full rated engine-generator set KW / KVA when operated at rated rpm and equipped with all engine-mounted parasitic and external loads as installed within the generator outdoor enclosure within the site condition parameters.

   b. Conditions - the rating shall be based on ISO-3046/1 conditions of 29.53 in Hg and 27°C (81°F).

   c. Fuel - Diesel engines shall be able to deliver rated power when operating on standard No. 2 diesel fuel having 35 degree API (16°C or 60°F) specific gravity.

   d. Fuel Consumption - Diesel fuel rates shall be based on fuel having a low heating value (LHV) of 18,390 Btu / lb when used at 29°C (85°F) and weighing 7.001 lb / U.S. gal.

   e. Start Time and Load Acceptance – Generator set shall start, achieve rated voltage and frequency, and be capable of accepting load within 10 seconds from start initiation when properly equipped and maintained with all installed and specified parasitic loads.

   f. Block Load Acceptance - Transient response shall conform to ISO 8528 requirements.

1.4 REFERENCE STANDARDS

A. The standby engine-generator sets system equipment shall be designed, manufactured, and tested in strict accordance with the latest edition of the specific component manufacturers' governing standards. The design, manufacture, assembly, installation, and operation of all elements of the engine generator system herein specified shall be in accordance with, but limited to, published standards, guidelines, and requirements of the following as applicable:

1. American Society of Mechanical Engineers (ASME).

2. Diesel Engine Manufacturers Association (DEMA).

3. Electrical Generating Systems Association (EGSA).

4. International Standards Organization (ISO).

5. Institute of Electrical and Electronics Engineers (IEEE).

6. National Electrical Code (NEC).

7. National Electric Manufacturers Association (NEMA).

8. National Fire Protection Association (NFPA).

9. Occupational Safety and Health Administration (OSHA).

10. Society of Automotive Engineers (SAE).

11. Underwriters Laboratories (UL), including UL2200

12. Florida Department of Environmental Protection (FDEP).

13. American National Standards Institute (ANSI).

14. American Welding Society (AWS).

15. Florida Building Code (FBC).

16. United States Environmental Protection Agency (US EPA) – New Source Performance Standard (NSPS).

17. Local Authorities Having Jurisdiction (AHJ) and any local Code and regulation requirements.

B. The generator sets to be furnished shall not be released for manufacture until the ENGINEER has reviewed and approved the generator equipment Shop Drawings, no exceptions. The generator set shall be Manufacturer designed, built, and certified to meet the applicable Tier level emissions requirements of the United States Environmental Protection Agency's (U.S. EPA) New Source Performance Standard for Stationary Reciprocating Compression Ignition Engines (NSPS) rules and regulations in affect at the time of generator manufacture and shipment.

1.5 QUALITY ASSURANCE

A. The complete engine generator sets, and all related systems, accessories and equipment shall be furnished by one (1) supplier (EG vendor), thus ensuring that the responsibility for performance to this Specification shall not be divided among individual suppliers and thereby assuring high standards of quality, coordination, reliability, and service for the EG system. The complete provision and performance responsibility for all of the furnished generator equipment shall be assumed solely by one primary vendor who shall directly deliver, service, test, and commission all of the furnished generator sets and accessory generator system equipment. The EG vendor shall be the engine generator manufacturer's factory authorized direct distributor located in South Florida, who maintains complete local sales, parts, and service facilities and provision in the field of electric power generation on direct behalf of the manufacturer of the engine generator set to be furnished, including factory trained mechanics and technicians and engine generator replacement parts for the unit supplied, and shall be located within seventy-five (75) miles of the Project location. Second level manufacturer's sub-dealers or redistribution suppliers do not comply with this requirement and shall not be accepted.

B. The complete generator set, including engine, generator, base, and radiator shall be designed, built, and assembled as a complete unit by the engine manufacturer, shall be complete in all respects and shall include all equipment and controls necessary for a fully operational alternative electric power supply. All system components shall have been designed and built to achieve optimum physical and performance compatibility and prototype tested to prove integrated design and operational capability.

C. All materials, generator equipment, and parts provided shall be new and unused of current design and of the highest grade. The generator set package shall be manufactured and assembled at the engine generator set Factory and shipped by the manufacturer only after the generator set equipment Shop Drawings have been reviewed and approved by the ENGINEER, no exceptions.

D. The EG vendor must be the engine generator manufacturer's factory authorized direct distributor, physically located in South Florida, must maintain no less than 90% of all generator set replacement parts available at all times, and must maintain service facilities with service and parts personnel available to the OWNER on a 24-hour / 365 day basis. Proof of this requirement shall be provided by the EG vendor and included in the Shop drawing submittals. Inspection of the EG vendor's facility may be made by the ENGINEER in order to substantiate this requirement.

1.6 SUBMITTALS

A. Submit an electronic shop drawing submittal to include EG system product data, technical information, and detailed mechanical, electrical and structural drawings indicating compliance for all engine generator equipment, products, operations, performances, interfaces, and services as specified herein.

B. The following information shall be provided for all furnished equipment:

1. A copy of this Specification Section, with all related Project 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 explanation and justification for each requested deviation.

C. Engine-Generator Set

2. Component List – Provide a detailed breakdown by manufacturer and specific part number including associated technical data of all components and options to be provided.

3. Technical Data - Manufacturer's specifications and data sheets identifying make and model of engine and generator, and including relevant component design and performance data as determined from Factory prototype testing of the specific engine generator set package proposed to be furnished. All Prototype testing shall not be performed on the specific generator set equipment to be furnished for this project.

4. Major System Equipment :

a. Dimensions:

1) Length.

2) Width.

3) Height.

b. Weight:

1) Dry.

2) Wet.

5. Engine:

a. Type, aspiration, compression ratio, and combustion cycle

b. Bore, stroke, displacement, number of cylinders, and operational speed in RPM

6. Generator:

a. Insulation class.

b. Number of leads.

c. Excitation type.

d. Temperature rise rating.

e. Insulation type and method.

f. Harmonic, SCR loading capability.

g. Generator set at rated load, voltage, and power factor.

h. Efficiency at 0.80 PF for: 50 % load, 75 % load, 100% load.

i. Time constants, short circuit transient (T'D).

j. Time constants, armature short circuit (TA).

k. Reactance, sub-transient - direct axis (X"D).

l. Reactance, transient - saturated (X'D).

m. Reactance, synchronous - direct axis (XD).

n. Reactance, negative sequence (X2).

o. Reactance, zero sequence (X0).

p. Fault current, 3-phase symmetrical.

q. Damage and Decrement curve.

r. Short circuit ratio.

s. Stator winding coil pitch.

7. Provide the following Manufacturer's engine generator set package prototype technical data for the following minimum operating loads: 1/4, 1/2, 3/4, and at full load:

   a. Engine horsepower rating (BHP) at 0.8 power factor.

   b. Generator set electrical KW output at standby rating.

   c. Standard condition fuel consumption.

   d. Combustion air inlet flow rate.

   e. Radiator airflow.

   f. Maximum radiator / ventilation airflow restriction.

   g. Exhaust gas flow rate.

   h. Exhaust stack temperature.

   i. Exhaust system backpressure restriction (maximum).

   j. Exhaust emissions data at varying loads.

   k. Heat rejection to atmosphere from generator.

   l. Heat rejection to atmosphere from engine.

   m. Mechanical sound data (Overall and at different frequencies and varying distances).

   n. Exhaust sound data (Overall and at different frequencies and varying distances).

8. Provide engine generator set manufacturer's transient analysis graphs indicating generator set maximum and minimum instantaneous transient response of both frequency and voltage, relative to time, for the generator set when imposing the following electrical single step block load changes on the generator set at rated power factor:

   a. 0 to 25% to 0%.

   b. 0 to 50% to 0%.

   c. 0 to 75% to 0%.

   d. 0 to 100% to 0%.

9. Auxiliary Equipment - Specifications and data sheets and drawings, including, but not necessarily limited to: vibration isolators; governor; voltage regulator; generator circuit breaker; battery charger; generator starting/control battery; jacket water heaters; exhaust muffler; exhaust flex; exhaust system components, outdoor weather protective enclosure, stairs, handrails and platforms, and sub base tank, etc.

10. Drawings – Provide detailed dimensional drawings showing overall engine-generator set; generator circuit breaker and muffler measurements. Include mounting locations and interconnecting wiring and terminations for AC power load leads, customer interface points, AC service and all AC / DC control interfaces. Include fuel, exhaust, and cooling systems piping arrangements and interfaces, and oil drain lines.

11. Wiring Diagrams – Provide electrical wiring diagrams, schematic diagrams, and control panel outline drawings published by the manufacturer for engine-generator set controls and for the associated electrical accessory equipment items including all interconnections for remote automatic control, transfer, and communication. Show, and properly identify, point-to-point electrical interconnections and logic diagrams of the entire engine generator assembly for ENGINEER review and for applicable wiring interface information for use by the Installing CONTRACTOR.

12. Warranty Statements – Provide details of the engine generator vendor's furnished warranty coverage to the OWNER including warranty information as published by the respective manufacturers of the furnished component equipment. In no case shall the warranty coverage and warranty period for the complete furnished EG system be less than specified herein.

13. Service – Provide details of location and description of EG vendor's parts and service facility and number of qualified generator set service personnel.

14. Maintenance Contract – Provide detailed outline and description of the EG vendor's service maintenance contract to be furnished for the generator set equipment as specified herein. Include details of the items and services covered within the maintenance service contract.

15. Engine Oil Sampling Service – Provide description of service provided, recommended frequency of analysis service, and details of procedures.

1.7 SERVICE AND WARRANTY

A. The EG vendor shall be directly capable, without subcontracting, of providing factory trained servicemen, the required stock of replacement parts, technical assistance, and complete equipment warranty administration.

B. Warranty Administration

1. The EG vendor shall be capable of, and solely responsible for the direct implementation and administering of the engine, generator, and all other components manufacturer's warranties. Subcontracting or rerouting of these services to other service organizations by the EG vendor is not acceptable.

C. Warranty Terms

1. All of the generator system equipment furnished under this Section shall be guaranteed against defects in material, parts, and workmanship. The generator system equipment warranty and associated coverage shall be for a period of five (5) years (60 months). The warranty shall be comprehensive covering all EG vendor furnished generator system equipment including proper operation. All generator system equipment, including, but not limited to all generator system accessory items furnished by the EG vendor shall be covered by this comprehensive 5 year warranty. There shall be no warranty related charge deductibles or associated service fees applicable to the OWNER for EG vendor furnished warranty services for the entire duration of the specified warranty period. The generator equipment warranty coverage shall commence after satisfactory EG vendor startup of the generator set either on the date of beneficial use of the generator set or on the date of acceptance by the OWNER, whichever occurs first, and shall include all EG vendor furnished labor, parts, travel time, expenses, and generator equipment expendable items (lubricating oil, coolant, filters, gaskets, and other serviceable items made unusable or required to be replaced by the warrantable defect) necessary for implementation and completion of all warrantable equipment repairs or corrective actions furnished by the generator supplier at the job site or elsewhere. Provided the generator system is operated properly within the standby generator set application as specified herein, generator set running hours shall not be a limiting factor for the generator system equipment warranty provision, either by the manufacturer or by the generator equipment supplier. The furnished generator set battery is considered a consumable item and shall be 100% warranted by the EG vendor for a period of two (2) years from the date of generator set startup.

2. The EG system Shop Drawing Submittals and furnished generator system parts, operation and maintenance manuals must include written warranties and supporting documentation clearly indicating and certifying complete compliance to these specified warranty requirements for all generator system equipment furnished by the EG vendor, no exceptions. Failure of the generator equipment Supplier to provide the OWNER with the specified warranties and associated warranty services shall be sufficient cause for rejection of the equipment and the EG vendor.

3. The EG vendor must maintain and be able to provide factory trained and qualified service personnel, the specified local stock and availability of replacement or repair parts, technical support assistance, and complete warranty administration on direct authorized behalf of the furnished generator equipment Manufacturers. These warranty services shall be available to the OWNER from the EG vendor on a 365 day / 24 hour basis. Subcontracting or rerouting of any of these warranty related services by the EG vendor to other repair or service providers is not acceptable.

4. Warranty Nameplate A warranty nameplate shall affixed to the generator set with the following data:

    a. Warranty coverage period:

    b. Start-up date:

    c. Termination date:

    d. Engine and generator serial number information:

    e. Engine and generator arrangement information:

    f. EG vendor name:

g. EG vendor address:

h. EG vendor normal business telephone number:

i. EG vendor 24-Hour emergency telephone number:

j. Warranty service contact information:

k. Preventive maintenance to be performed by:

D. The EG vendor shall guarantee 100% parts availability within 48 hours from the time of any service repair request or when an order is entered with the EG vendor.

E. Service Maintenance Contract

1. The engine-generator set supplier shall provide a five (5) full year service maintenance contract for the furnished generator set, including annual engine oil change and proper disposal of removed engine oil for the new generator set. It shall include four (4) routine scheduled maintenance service visits per each year with a complete engine oil change on the fourth visit each year. The service maintenance contract shall commence on the date of acceptance by the OWNER. The EG vendor shall maintain 24 hour / 365 day emergency access to an EG vendor account manager to expedite emergency repairs including service labor scheduling and parts replacements. The EG vendor must furnish this contract and associated services directly to the OWNER, not through an alternate company, supplier or service provider.

2. The generator set service maintenance contract furnished shall protect the OWNER from any parts or labor price increases. The EG vendor's service maintenance agreement contract shall be optionally available for purchase extension by the OWNER at the end of the specified five (5) year service maintenance agreement. The EG vendor shall maintain the following for the entire duration of the specified generator set five (5) year warranty period.

   a. Qualified mechanics, technicians, and service / repair equipment.

   b. The EG vendor shall have factory trained service representatives and all tooling necessary to test, maintain, and repair all provided equipment as necessary.

   c. Specified generator set parts availability must be maintained by the EG vendor for a minimum of fifteen (15) years from date of generator equipment startup.

   d. The EG vendor shall have locally available at all times parts inventory stock of not less than 90% of all engine replacement parts and must maintain generator equipment service and parts availability on a 365 day / 24 hour basis. Proof of this requirement shall be provided by the EG vendor and inspection of the EG vendors local facility may be made by the ENGINEER in order to substantiate this requirement.

F. The EG vendor shall guarantee 100% parts availability within 48 hours from the time of any service repair request or when an order is entered with the EG vendor.

G. Oil sampling analysis service

1. The EG vendor shall be capable of performing and shall provide a scheduled oil sampling service to monitor engine oil condition on an ongoing basis. The sampling method shall be of the atomic absorption spectrophotometry method as opposed to the spectrographic analysis method and shall be accurate to within a fraction of one part per million for the following elements.

    a. Iron

    b. Chromium

    c. Copper

    d. Aluminum

    e. Silicon

    f. Lead

    g. Water

    h. Fuel

    i. Antifreeze

2. In order to provide oil sampling analysis service for the End User for the duration of the Five (5) year extended warranty period, the EG vendor shall provide One (1) scheduled oil sample kit consisting of two (2) oil extraction pumps, twenty (20) oil sample plastic bottles twenty (20) prepaid mailing containers and written instructions. The mailed oil samples shall be analyzed at the EG vendor's local facility by factory trained and certified personnel. Immediate notification of the analysis results of each analysis shall be provided to the OWNER in written report format with written advisement of any remedial action requirements and recommendations. The scheduled oil sampling analysis program shall be optionally available to the OWNER by the EG vendor beyond the specified five year warranty period.

PART 2 - PRODUCTS

2.1 ACCEPTABLE GENERATOR SET MANUFACTURERS

A. Cummins: Cummins Power South, LLC

B. Caterpillar, Inc.: Pantropic Power, Inc.

C. Or approved alternate.

2.2 ENGINE-GENERATOR SET

A. Engine

1. The engine shall be a stationary, diesel cycle, compression ignition; liquid cooled, 1800-RPM, four-stroke design, inline or V-type, with dry exhaust manifolds. Two stroke engines are not acceptable.

2. The engine generator set package shall be capable of one step load acceptance of 100% rating with voltage dip not to exceed 25% of rated voltage and stabilized recovery within 7.5 seconds. Generator set Manufacturer's confirmation documentation of this transient loading capability shall be included in the generator system Shop Drawing Submittals.

3. The engine shall be equipped with air filters, engine driven fuel pump, fuel filters, fuel pressure gauge, engine driven lubricating oil pump and cooler, lubricating oil filters, oil pressure gauge, engine driven water pump, coolant temperature gauge, service hour meter, flywheel and housing, and any other items required to provide proper engine generator set operation.

4. The design of the basic engine shall provide for maximum structural integrity to extend service life. Engines using multiple engine crankshafts are not acceptable. All materials used in the engine shall incorporate the highest level of current proven metallurgical and manufacturing technology.

B. Lubrication System

1. The lubrication system shall include an engine driven mechanical positive displacement oil pump, full flow filtration with replaceable elements and a bypass valve to continue lubrication in the event of filter clogging, flexible oil lines and oil cooler. The bypass valve shall be integral with the engine filter base or receptacle.

2. The engine shall be furnished with flexible hoses sufficiently long enough to route and direct the engine's crankcase ventilation fumes to the inside of the radiator discharge airflow plenum.

3. Provide a flexibly connected engine lubricating oil sump drain line terminated with a stainless steel N.P.T. threaded cap. Furnish a removable handle isolation shutoff valve in the oil drain line extended from the engine sump drain.. The engine oil sump drain line beyond the valve shall be flexible and terminated on the outside of the generator set outdoor weather protective enclosure with a stainless steel N.P.T fitting and a threaded stainless steel cap. Provide a permanently installed "Engine Oil Drain" nameplate secured to the enclosure wall next to the drain fitting.

C. Fuel System

1. The generator set fuel system shall be integral with the engine. It shall consist of a fuel filtration system, engine mounted mechanically driven transfer pump, injection pumps or electronic fuel control and delivery system, and flexible supply and return fuel lines. The transfer pump shall be engine driven and shall deliver fuel under low pressure to the engine's fuel injection system. The system shall be capable of delivering fuel flow from the sub base fuel tank to the engine fuel inlets or nozzles, sufficient for full rated operation of the engine under all ambient temperature conditions and shall return any unused fuel to the sub base fuel tank. The engine's air intake, turbo charger and governor and fuel control systems shall properly operate to deliver fuel to the engine at rated engine horsepower and full rated generator output when operating on diesel fuel oil. No overheating of any engine component or system shall occur when operating at full rated load on diesel fuel as installed inside of the furnished weather protective enclosure within the atmospheric parameters as specified herein.

2. Unit fuel injectors or electronic fuel injection systems shall be designed for optimal and efficient fuel combustion and engine performance at the rated engine horsepower while complying with the US EPS and local Authority Having Jurisdiction engine emissions standards and requirements.

3. Provide a fuel supply fuel filter / water separator system installed on the engine. The filter shall have a clear sediment containment bowl and drain valve. The engine fuel return shall be flexibly connected to the sub base tank fuel return.

4. For engines utilizing the fuel system as a portion means of cooling the engine during operation, or where a large amount of heat is transmitted to the engine's unused return fuel, the fuel shall be piped with flexible connections from the filter/water separator system to the intake of the engine fuel pump and then from the engine's fuel return through a generator manufacturer furnished radiator mounted diesel fuel oil cooler for return of cooled fuel to the sub base tank. The fuel cooler shall not be electrically operated and must be rated and capable of exchanging engine frictional heat rejected to the fuel at full load with the engine's cooling system radiator airflow including a 10% cooling capacity reserve to accommodate operational fouling.

5. Provide installed diesel fuel oil impervious flexible fuel lines on the engine fuel supply and return connections. Flexible fuel line connections shall be N.P.T. Provide and install properly routed schedule 40 carbon steel fuel extension piping, as required, for final connections to the fuel supply and return piping between the engine flexible connections and the sub base fuel tank engine supply and return connections.

6. Fuel shall be piped with flexible connections from the filter/water separator system to the intake of the engine fuel pump and then from the engine's fuel return to fuel oil sub base tank.

D. Diesel Fuel Oil Sub-base Tank

1. EG vendor shall supply one (1) UL2085 Listed above ground steel double wall steel secondary containment construction generator diesel fuel oil storage sub base tank for stationary installation. The sub base tank shall be designed and constructed by a manufacturer officially approved by the Florida Dept. of Environmental Protection Agency (FDEP). The sub base tank shall be designed, manufactured, and installed so as to meet all of the applicable guidelines and requirements of the Florida Building Code, Florida Dept. of Environmental Protection Agency (FDEP), NFPA 30, NFPA 30A, NFPA 37, and NFPA 110 when used with the specified EG system at full standby generator set rating as installed on the Project site. The sub base tank shall be clearly labeled with a permanent label indicating the type of product, the volume capacity, the top loading capacity, the manufacturer, and UL Listing.

2. The generator set, engine exhaust system, and generator weather protective enclosure are to be installed and appropriately secured on top of the sub base tank by the enclosure manufacturer. The Installing Contractor shall install the complete sub base tank and generator set / enclosure assembly on the site in accordance with all referenced and applicable Standards, Codes, Regulations, Ordinances, and as required by the local Authorities Having Jurisdiction.

3. Diesel fuel oil generator set sub base fuel oil tank construction.

   a. Furnish two (2) generator sets double wall sub base diesel fuel oil tanks, designed, constructed and listed as UL2085 Special Purpose, Secondarily Contained & Protected Generator Set Base Tank. The sub base tank shall be manufacturer designed and tested for projectile, ballistic and vehicle impact resistance, and be two (2) hour fire rated. The sub base tank shall be designed and constructed to support the total weight of the generator set, enclosure, all accessory equipment items installed on the sub base tank, and tank full fuel weight. It shall be double wall construction for a minimum of 110% secondary fuel

containment. The primary fuel tank shall be sized and constructed to be of a size that allows the generator to have a 72-hour run time.

b. Both the primary inner and the secondary outer containment tanks shall be fabricated from a minimum of 3/16 inch thick steel. The tank top shall be a minimum of 1/4 inch thick steel. Each tank shall be built to UL142 standards and pressure tested by the manufacturer to a minimum of 3-5 PSI as outlined in UL142. The tank shall incorporate suitable internal stiffeners to create a smooth tank top surface and to limit the accumulation of water. The outer tank shall be abrasive blast cleaned per SSPC-SP10 (White Metal Blast) and shall be properly surface prepared and coated with one coat of a high build polyester glass flake to a minimum of 12-15 mils (DFT) thickness, and a top finish coat of UV resistant aliphatic polyurethane enamel with a minimum of 2-3 mils (DFT).The tank shall be constructed with no sharp edges to insure uniform coating coverage on all surfaces. No external sub base tank generator set support beams shall be permitted on top of the tank. Provide drillings for ground device / cable attachments.

c. The manufactured sub base tank shall be designed and constructed to support the total wet weight of the generator set, enclosure, all installed accessory equipment, and tank full fuel weight, and be able to withstand a minimum of 180 MPH constant wind velocity with the sub base tank empty of fuel. Provide mounting means and hardware on the top of the sub base tank top to install all generator set spring vibration isolators and generator set mounting base frame to be furnished by the EG vendor. The tank shall incorporate foundation tie down construction and six (6) lifting points, approved by UL with a 4 to 1 safety factor consisting of minimum of 0.50 inch thick (nominal) steel plates welded into the tank base perimeter, each with eyelets designed and installed so as to allow single point spreader bar lifting of the empty sub base tank with the generator set, accessory equipment, and enclosure installed on top of the sub base tank.

d. The tank shall be provided with appropriate quantity of earthquake/hurricane resistant tie down restraint points, minimum of 1 / 4 inch thick, 2 inch high cross support channels installed on the tank assembly by the tank manufacturer across the width of the bottom of the sub base tank in adequate locations as required to support the fuel filled sub base tank, generator set, and enclosure as an assembled package, to control moisture accumulation under the sub base tank, and to allow visual fuel leakage inspection underneath the sub base tank. Each cross support channel shall include foundation mounting holes on both ends to allow for adequate securing of the sub base tank on the site's mounting foundation. Provide a drawing indicating dimensional locations for each of the foundation mounting securing points for the sub base tank. The sub base tank manufacturer shall also provide 3/8" thick by 6" wide full-length neoprene pads for isolation of all tank channel supports to be installed between the bottom of the tank support channels and the site foundation during site installation.

e. The sub base manufacturer shall provide in the Shop Drawing Submittals detailed sub base tank wind load and floatation uplift calculations and recommendations for foundation anchoring means. The calculations will be based on the specific generator set and enclosure to be installed on top of the fuel empty sub base tank. A copy of these calculations and recommendations shall also be included in the sub base tank manufacturer's operation and maintenance manuals furnished to the ENGINEER and to the OWNER. The Installing CONTRACTOR shall be responsible to install the sub base tank on the site. The Installing CONTRACTOR shall furnish all required sub base tank foundation mounting hardware and

installation services to properly install and secure the sub base tank on the site's concrete foundation. Sub base tank foundation securement means shall be verified to withstand 180 MPH wind loading on the generator set /sub base / enclosure assembly with the sub base tank empty of fuel.

f. The tank shall be provided with the following minimum N.P.T. connections and appurtenances: generator supply and return ports, fuel fill port, required fuel level sensor ports, fuel level gage, required primary and secondary tank normal and emergency vents, specified fuel level and leakage sensors, primary and secondary tank drain ports, and spare primary tank connection fittings with threaded plugs. All tank fittings, with the exception of drain fittings are to be N.P.T. threaded # 304L schedule 40 stainless steel, and shall exit the top of the tank only.

g. The sub base tank shall include inner and outer tank standard and emergency updraft venting, pipe risers, and UL142 vent caps and shall be installed in compliance with all applicable NFPA, and applicable local code and permitting approval requirements. The emergency vent capacity shall be calculated by the tank manufacturer in accordance with NFPA 30 & UL142. Primary and secondary emergency vent caps shall be Morrison Bros. #244 or approved equal. The sub base tank vent locations shall be located so as to allow direct vertical pipe routing, with the generator set and enclosure installed on the tank. The standard fuel tank vent and any other tank vents as applicable must be extended from the top of the sub base tank vertically through the roof of the enclosure and terminated with the vent cap. Furnish a removable double poppet foot valve in the bottom of the engine supply drop tube piping. The enclosure manufacturer shall furnish and install removable aluminum or stainless steel construction rain collars and shields in the enclosure roof penetration points for all tank vent extension piping exiting the enclosure roof.

h. The tank shall be furnished with low fuel level, high fuel level, critical low fuel level, and fuel leak sensors/ switches and alarm level activation points. The switches and any required auxiliary relay contacts shall be wired to the generator control panel for local alarm and to the enclosure installed DC junction box for remote annunciation use. Provide one (1) spare 3 in. N.P.T. opening / fitting with galvanized threaded steel plug installed in the top of the tank for additional future sub base primary tank fuel level monitoring purposes.

i. Provide and install a FDEP approved, fuel fill / overspill box with a minimum of seven (7) gallon capacity positive fuel containment box installed on top of the sub base tank. The box shall be stainless steel construction with a stainless steel hinged pad lockable top cover with a UL approved vent cap installed on the top of the box. Sub base tank fuel fill opening shall be a minimum of four (4) inch N.P.T. and provided with a FDEP approved anti-siphon valve and mechanical fuel fill limiter. The fuel containment box shall have a tight fill connection inside to shut off the flow of filling fuel at 95 % of tank capacity. Provide a UL Listed spring loaded drain pull to allow fuel contained within the fill box to be returned directly into the primary fuel tank.

j. Provide and install a mechanical water tight tank fuel level gage to monitor fuel tank level from empty to full and locate on top of the tank inside of the sub base tank fuel fill box. Provide and install for the sub base tank an additional tank manual withdrawal type fuel level dipstick graduated and permanently marked in 100 gallon increments. Dipstick port location shall be inside of the generator enclosure.

k. All fuel system piping shall be schedule 40 black iron, internally cleaned and pressure tested, be sandblasted, primer coated, and finish painted with diesel fuel impervious black colored enamel. Provide a sub base tank fuel inlet installed FDEP approved and UL Listed three (3) inch N.P.T. overfill prevention valve to automatically shut off the flow of filling fuel at 95 % of tank capacity.

l. The enclosure manufacturer shall wire the sub base tank's critical low fuel level generator shutdown switch to the generator shutdown / annunciation controls. Activation of the critical low fuel level switch shall cause the generator set to immediately shutdown while simultaneously shunt trip open the generator mounted main circuit breaker.

m. The sub base tank's critical low fuel level sensor / switch shall be connected to the generator automatic shutdown circuitry. Activation of the critical low fuel level switch shall cause the generator set to immediately shutdown while simultaneously shunt trip open the generator mounted main power circuit breaker and annunciate a visual "Critical Low Fuel level" alarm on the generator control panel..

n. Provide and install all required generator set /sub base tank fuel system interconnection piping and make all connections between the sub base tank and the generator set fuel supply and return, including all required vent piping. All fuel piping shall be properly cleaned of debris and corrosion, and pressure tested to confirm no leakage prior to any fueling of the tank. All fuel system interface wiring for remote monitoring and annunciation shall be furnished and installed by the Installing CONTRACTOR.

o. The Installing CONTRACTOR shall be responsible to furnish diesel fuel to fill the generator sub base tank to 75% full with new diesel fuel oil as recommended by the EG Vendor for use with the furnished generator set prior to generator system startup and testing. Upon satisfactory completion of all of the EG system testing and ENGINEER final acceptance of the complete EG system, the Installing CONTRACTOR shall be responsible to provide additional fuel to refill the sub base tank to 100% full fuel level with new diesel fuel oil as recommended by the EG Manufacturer.

p. The sub base tank shall be manufactured only after the ENGINEER has reviewed and approved the EG vendor's equipment Shop Drawing Submittals.

q. Provide sub base tank manufacturer's thirty (30) year warranty against defects in material and workmanship, including structural failures for the furnished sub base tank

r. The generator sub base tank shall be furnished by the EG vendor as designed and manufactured by Advanced Manufacturing & Power Systems, Inc., Deland, Florida or approved equal. Detailed documentation and certifications by the enclosure manufacturer and EG vendor indicating complete compliance with these Specifications and the Drawings are to be included in the EG vendor's submitted Shop Drawing Submittals.

E. Governor

1. The engine governor shall be an electronic isochronous speed controller. Speed droop shall be externally adjustable from 0 to 10% from no load to full rated load and shall automatically adjust generator frequency from within a maximum of 0.25% of rated frequency under steady state

operating no load and loaded conditions. Speed shall be sensed by a magnetic pickup off the engine flywheel ring gear. A provision for remote speed adjustment shall be included. The governor shall incorporate provisions for limiting fuel during start-up, and included capability for r compensation adjustment. The use an of electronic engine control system to perform the governor functions of controlling fuel and engine speed is acceptable.

F. Cooling System

1. The engine jacket water-cooling system shall be a pressurized closed circuit design with provision for manual filling, thermal expansion, and coolant de-aeration. The radiator blower fan and engine cooling water centrifugal type transfer pump shall be driven by the engine and circulate the engine jacket water through the entire engine cooling water system including the radiator. Any auxiliary coolant transfer pumps required for separate circuit after cooling of the engine through the radiator must also be engine driven. Air to air aftercooled engines shall be sufficiently cooled as required by the furnished radiator system. The radiator shall be of sufficient capacity to allow continuous generator set full rated operation within a 110 degrees F outside ambient air temperature. The radiator shall be furnished and installed on the generator set by the generator set manufacturer prior to shipment.

2. The radiator shall be furnished with a duct flange for use with a radiator air discharge duct or shroud as required to be installed by the enclosure manufacturer between the radiator and the enclosure's radiator air discharge opening. The radiator shall be furnished with a painted perforated metal grill to protect the radiator core.

3. Heat rejected to the engine jacket water and after cooler shall be radiator driven air discharged to the atmosphere through a close-coupled radiator. The radiator shall properly cool the engine jacket water and after cooler water while the engine is operating at full load capacity within the generator room at maximum specified site temperature.

4. The radiator fan, fan drive, and fan belts shall be totally enclosed and covered with 14 gauge punched steel mesh guarding for personnel protection and shall be OSHA approved.

5. The radiator-cooling fan shall be a blower type and be mechanically direct driven from the engine. Air shall be drawn from the engine sides and top and exhausted through the radiator core to the radiator air discharge plenum.

6. Coolant lines shall be high temperature, strength reinforced and with flexible connections. Provide a removable radiator pressure cap and radiator overflow line installed on the radiator.

7. Provide a flexibly connected coolant water drain line with stainless steel construction manual shutoff valve terminated on the outside of the generator set outdoor weather protective enclosure with a stainless steel N.P.T fitting and a threaded stainless steel cap. Provide a permanently installed "Radiator Drain" nameplate secured to the enclosure wall next to the drain fitting.

8. An electronic coolant level sensor / alarm switch shall be furnished and installed in the radiator by the engine manufacturer for coolant level monitoring of coolant level within the radiator and interfaced with the generator set control circuitry to automatically shutdown the generator set in the event of a critical low coolant level condition..

9. UL recognized engine coolant electric Jacket water heater(s) shall be provided and installed on the engine by the EG manufacturer. The heater(s) shall be complete with automatic thermostatic

control suitable sized so as to maintain uniform engine coolant temperature of adjustable (90 - 175°F) while the engine is idle. The heater(s) shall be 120 volt AC single-phase controlled for automatic on/off operation by the heater thermostats and shall be connected to a heater contactor, installed and wired by generator set manufacturer. The heater(s) shall be automatically de-energized by the generator set controls anytime that the engine runs. The engine manufacturer shall install the heater with manual isolation shutoff valves at each heater hose connection at the engine in order to facilitate heater/heater hose maintenance without having to drain the engine coolant water.

10. Provide the engine / radiator closed loop type cooling system with a water/ethylene glycol based coolant mixture as per the engine manufacturer's recommendations.

G. Combustion Air System

1. The engine intake air system shall include engine mounted, dry element, intake air filters with an installed air filter restriction indicator for each filter.

H. Exhaust System

1. The engine exhaust system shall be installed to discharge combustion gases quickly and silently with minimum restriction. The exhaust system including the generator exhaust silencer shall be designed for minimum restriction, and in no case shall the total exhaust system backpressure restriction imposed on the engine at full operating load exceed the engine manufacturer’s maximum allowable exhaust backpressure limits.

2. All exhaust piping shall be Schedule 40 steel piping. The exhaust silencer and the exhaust piping shall be covered with appropriate high temperature insulation and shielding inside of the generator enclosure.

3. The generator exhaust silencer is to be installed inside of the generator outdoor weather protective enclosure. The generator exhaust silencer exhaust outlet piping shall be terminated vertically outside of the enclosure roof with an installed aluminum or stainless steel rain skirt and terminated with a counter weighted aluminum construction exhaust rain cap. The exhaust silencer and associated piping shall be installation supported and braced to prevent weight or thermal growth from being transferred to the engine. Flexible expansion fittings shall be provided to accommodate thermal growth. Support dampers and springs shall be included where necessary to isolate damaging vibrations. All exhaust system piping, insulation materials, and the complete installation of the entire exhaust system shall be provided by the enclosure manufacturer / EG vendor.

4. The silencer shall be furnished with inlet and outlet weld on type ANSI companion flanges, gaskets and bolts / nuts, and an appropriately sized stainless steel bellows type engine expansion flex connector for connection to the engine. The silencer shall be furnished with a NPT drain fitting. Suitable rated high temperature resistant gaskets shall be utilized for all exhaust system flanged connections.

5. The silencer body shall be furnished with a N.P.T. drain fitting and shall be piped to the outside of the generator outdoor enclosure with a stainless steel construction manual shutoff isolation valve installed inside of the generator enclosure. The muffler water drain line shall be flexibly terminated on the outside of the generator enclosure with a stainless steel N.P.T fitting and

stainless steel threaded cap. Provide a "Muffler Drain" nameplate permanently installed on the enclosure exterior next to the silencer drain fitting.

I. Starting System

1. The engine shall be equipped with a 24 VDC electric starting motor system which shall include one (1) solenoid shift positive engagement starting motors, starter relay, battery charging alternator, starting / control batteries, an automatic battery charger and automatic reset circuit breaker to protect against butt engagement. The starting motor shall be capable of providing engine cranking for 90 consecutive second without damage to any component of the engine starting system or engine. The system shall be capable of crank starting a properly equipped engine so as to allow crank/rest termination to occur as necessary for the generator set to consistently achieve proper rated operating speed within 10 seconds minimum at maximum site ambient temperatures. Automatic adjustable crank cycle and termination control logic and circuitry shall be furnished on the engine.

2. Furnish an engine manufacturer installed 24 VDC, 45 ampere, battery charging alternator with a transistorized voltage regulator. The engine mounted battery-charging alternator and belt assembly is to be furnished with installed OSHA approved metal guards.

3. Batteries for starting and control shall be a heavy duty, low-maintenance, lead acid type, and housed in a hard rubber or polypropylene case with provisions for venting. Starting batteries shall be rated 24 volt DC, minimum of 140 AH, and sized as based on specific application requirements of engine oil viscosity, minimum ambient starting temperature, control voltage, overcharging and vibration. Battery capacity shall be sufficient for cranking the engine for a minimum of 15 seconds per each specified cranking cycle to achieve engine-firing speed with ambient temperature of 32 degrees F. The furnished batteries shall also have sufficient engine starting cranking amperage capacity for a minimum of ninety (90) seconds of continuous cranking with an ambient temperature range of 32 to 110 degrees F.

4. Batteries shall be located as close to the starting motor as practical, away from spark sources, in a relatively cool location, and permit easy inspection and maintenance. Non metallic, polyethylene type battery electrolyte impervious battery cases with matching covers allowing full flow air ventilation shall be provided for the batteries and shall provide positive electrolyte containment. Required insulated battery cables shall be provided and sized to satisfy engine generator set starting and control circuit requirements.

5. An engine mounted key operated starting / control battery disconnect switch shall be furnished. Provide an alarm light on the generator set control panel to activate when the battery disconnect switch is in the "off battery " position.

6. A solid state, constant voltage automatic battery charger, UL1564 Listed, designed for use with lead acid batteries shall be provided of the current limiting type, designed for float charging, with an automatic and manual digital equalize charge timer adjustable from 1 to 144 hours with selectable timing modes. It shall accept 120 volt AC, single-phase input power to provide 24 volt DC, minimum of 10-Ampere output and shall provide 100 % battery recharge per NFPA 110, Level 1 requirements. The Installing CONTRACTOR shall connect AC service to the charger and the enclosure manufacturer shall wire the charger DC power output and alarms to the generator set in EMT conduit with compression fittings. It shall be fused on the AC input and DC output, and incorporates current limiting circuitry. A power switch shall be mounted on the face of the charger and shielded from accidental switching. The charger shall include an AC power

monitor with light, a digital 1% accuracy DC ammeter to monitor the battery charging current, a digital 1% accuracy DC voltmeter with selector switch. The charger shall be furnished with alarms for input AC failure, charger failure/malfunction, low battery voltage, high battery voltage, low DC amperage, critical low DC voltage, and combined summary alarm monitoring with individual local alarm light indications and dry alarm contacts for each alarm wired to the generator DC control interconnection junction box for remote annunciation use. The charger shall be housed in a NEMA 1 enclosure suitable for wall mounting. The battery charger shall comply with all of the requirements of NFPA 110, Level 1. The battery charger shall be model no. A46 of current design and manufacture by LaMarche Manufacturing Company, Des Plaines, Illinois, or approved equal. The charger's alarms shall be wired to the generator set for generator control panel alarm annunciation and to the DC junction box for remote annunciation use. The charger shall be located and installed within the generator enclosure and located so as to allow charger front panel viewing and charger door full open swing for maintenance / service access.

J. Generator

1. The generator set's alternating current synchronous generator shall be minimally rated for continuous standby service at 80KW, 100KVA Standby Power, at 0.80 power factor, 120/240 volt AC, 1-phase, 3-wire, 60 hertz for the Airfield Vault and 40KW, 50KVA Standby Power, at 0.80 power factor, 120/240 volt AC, 1-phase, 3-wire, 60 hertz for the Air Traffic Control Tower (ATCT). The generator set's rating shall be based on a 130 degrees C temperature rise when operated at the generator's Standby power rating within a 40 degrees C ambient. Generator shall be capable of supplying power to solid state switching devices and non-linear loads such as variable frequency drives, and solid state soft starters and associated harmonics.

2. As manufactured, furnished, and installed, the generator shall meet or exceed these Specifications and the applicable sections of the following standards:

   a. National Electrical Manufacturers Association (NEMA) - NEMA MG1, Motors and Generators

   b. Institute of Electrical and Electronic Engineers (IEEE) - IEEE 43, Recommended Practice for Insulation Testing of Large AC Rotating Machinery

   c. United States military Standards for Generators and Controls – (MIL-STD)

3. The generator shall be four (4) poles, twelve (12) lead re-connectable brushless, revolving field design with rotating rectifier system sized for maximum motor starting, air cooled, with an open drip proof enclosure, single or two bearing.

4. The generator housing shall be one piece and mounted directly to the engine flywheel housing. Engine torque shall be transmitted through a torsional coupling to the generator rotor. The torsional coupling shall be designed such the engine-generator set coupled package shall be free from objectionable vibration in any mode of operation. Provide generator set manufacturer's torsional vibration testing analysis for the engine generator set model to confirm that it has been designed, constructed and assembled so as to be free from objectionable or harmful vibrations in any operational mode. The manufacturer's detailed torsional report for the factory testing of a similar production unit shall demonstrate that the generator set model to be furnished shall operate free from excessive torsional vibrations and is to be submitted to the ENGINEER for review prior to generator set manufacture.

5. The generator set shall be furnished with a permanent magnet and shall be capable of maintaining field forcing of the generator during generator set operation to sustain 300% of rated generator current for 10 seconds when a 3 phase symmetrical short circuit is applied at the generator terminals.

6. Stator and rotor insulation system shall all be NEMA Class H as defined by NEMA MG1-1.65. The alternator insulation must be certified under UL 1446 Standard. The generator shall be vacuum impregnated with epoxy resin, which after complete curing shall have additional treatment of epoxy for resistance to an environment of moisture and salt air.

7. All generator mounted potential transformers and current transformers shall be U.L. labeled and recognized.

8. The generator's permanent magnet generator (PMG) excitation system shall provide power to the automatic voltage regulator. The exciter shall be high frequency, direct connected, rotating brushless type, three-phase, full wave rectified, completely compatible with the furnished automatic voltage regulator. The rotating part of the exciter, including the rectifier assembly, shall rotate together with the generator rotor as a complete assembly on one shaft. Surge suppressors shall be included to protect the rotating diodes from abnormal transient voltage conditions.

9. The generator shall comply with the requirements of NEMA MG 1-22, IEC 34-1, ISO-8528-3. Radio frequency noise suppression shall meet or exceed the requirements of MIL-STD-461. Total Harmonic Distortion (THD) shall be less than 5%.

10. The generator shall be designed, prototype tested and manufactured for 150% of rated generator set speed without incurring damage.

11. The generator shall be equipped by the generator manufacturer with internally installed, UL Listed, 120 volt AC single-phase alternator anti-condensation space heater(s) appropriately sized to minimize condensation while the generator is not operating. The heater shall be capable of being readily removed from the assembled generator and shall be field replaceable. The heater shall be energized when the generator is off and automatically cut off when the generator is running via generator controls. The Installing CONTRACTOR shall connect electrical AC service power to the generator space heaters.

12. Provide an installed appropriately selected ground fault sensing system utilizing current transformer and UL Listed ground fault alarm monitoring relay installed and wired inside of the generator for ground fault alarm indication only on the generator mounted control panel. Provide a ground fault relay dry alarm contact wired to terminal points inside of the generator DC control interconnection junction box for remote annunciation use.

13. Provide, install, and appropriately wire three-phase fused UL Listed lightning arrestor (GE p/n 9L15ECC001) and UL Listed surge capacitor (GE p/n 9L18BBB301) inside of the generator housing.

K. Generator Voltage Regulator

1. The generator voltage regulator shall be furnished by the engine generator manufacturer and shall be automatic to maintain generator output voltage by controlling the current applied to the exciter

field of the generator during generator set operation at all levels of the generator set's operating range.

2. The regulator shall be a digital design with microprocessor control to allow for programmability based on the type of load connected.

3. The regulator shall be mounted within the generator assembly, and shall be manually adjustable from the generator mounted control panel. The supplied voltage regulator shall be tested with the furnished generator set at the manufacturer's factory during the factory generator set testing as specified herein prior to shipment.

4. The automatic voltage regulator shall be programmable, microprocessor based, and shall incorporate the following characteristics/features:

   a. True RMS Line to line, three phase sensing of the generator output.

   b. Generator output voltage maintained within 0.25% at steady state conditions for any load variation between no load and full load.

   c. Generator output voltage drift no more than 0.25% of rated value within a 40° change over ambient temperature range of -40°C to 70°C.

   d. Telephone Influence Factor (TIF) of less than 50.

   e. Electronic Interference/Radio Frequency Interference (EMI/RFI) suppressed to commercial standards.

   f. Maintain voltage control with 20% total harmonic distortion.

L. Generator Circuit Breaker

1. Provide one (1) generator mounted UL Listed main line, solid-state trip, three-pole generator output circuit breaker for the purpose of providing an AC electrical load circuit interrupting and protection device on the generator. The circuit breaker shall be an LSI unit of the amperage size and rating as shown on the Contract Drawings. The circuit breaker's electronic trip current sensors shall monitor each phase It shall have adjustable long time and long time delay during overload conditions, instantaneous magnetic tripping for short circuit protection, adjustable short time and short time delay features. Generator exciter field circuit breakers do not meet this requirement and are not acceptable in lieu of the generator mounted circuit breaker.

2. A generator DC battery control voltage operated circuit breaker shunt trip coil shall be furnished to automatically trip open the circuit breaker concurrently with any generator set fault, emergency shutdown condition, and generator set diagnostic detection of an event that could cause catastrophic failure of the generator.

3. The circuit breaker shall be furnished with a minimum of one (1) set of circuit breaker installed auxiliary circuit breaker open / close status dry contacts for remote signal annunciation purposes. Auxiliary contacts shall be wired to the generator DC junction interface box.

4. Provide a generator neutral conductor bus bar arrangement inside of an adequately sized generator mounted circuit breaker enclosure connected to the generator neutral leads. The circuit

breaker and generator neutral bar assembly shall be furnished with mechanical lugs suitable for proper connections with the quantities and sizes of the generator AC power conductors / conduits as shown on the Contract Drawings. AC power cable and conduit entry into the generator for connection to the circuit breaker shall be from the bottom through the opening of the sub-base fuel tank.

M. Engine Generator Set Control

1. The generator set shall be provided with an open protocol, digital microprocessor-based, environmentally sealed control system which is designed to allow generator set automatic starting and stopping, monitoring and control functions for the generator set. The control system shall also be designed and provided to allow local and remote start and stop control and monitoring of the generator set. The generator control panel shall be vibration isolated and mounted on the generator set. The control panel shall UL508A Listed and shall be NEMA 12, dust proof enclosure with all control panel switches, lamps and meters gasketed to be oil-tight and dust-tight and furnished with a lockable hinged door cover. The control panel and generator set controls shall operate from the EG vendor furnished 24 VDC starting / control battery for the generator set which shall be integrated with the required generator start / stop control circuitry from the remote transfer control equipment.

2. The generator mounted control panel shall include, as a minimum, the following features and functions.

   a. Operational switches or keys to provide RUN/STOP/AUTO/OFF RESET operations for the generator set. In the RUN position the generator set shall automatically start, and accelerate to rated speed and voltage and maintain operation. In the STOP position the generator set shall stop after a programmable cool down period has elapsed. In the AUTO position the generator set shall be ready to accept a signal from the remote generator start / stop control transfer equipment. When the remote signal is received, the generator set shall start and accelerate to rated speed and voltage and maintain operation until the signal is removed whereby, the generator set shall shut down after a programmable cool down period has elapsed. In the OFF RESET position, the generator set is immediately shutdown and generator control panel fault lights/controls are reset.

   b. Provide minimum adjustable cycle cranking of 15 seconds on and 15 seconds off for three cycle cranking attempts (total of 90 seconds). If the engine fails to start at the completion of the three cranking attempts, the generator set shall shutdown, lockout the engine and indicate overcrank on alarm status panel and provide a signal for remote annunciation use. The generator controls shall also be selectable and adjustable to allow one continuous 90-second engine crank attempt before generator shutdown and lockout occurs.

   c. A red EMERGENCY STOP maintained push button switch to cause the generator set to immediately shut down, and be locked out from automatic restarting. The generator set controls shall also accept a contact closure signal from additional remote emergency generator shutdown switches resulting in immediate shutdown of the generator set. A common safety shutdown relay with dry contacts for remote annunciation use shall be provided.

   d. A reset switch to clear a fault and allow restarting the generator set after it has shut down for any fault condition unless the fault condition continues to exist.

e. A lamp test switch to cause the entire control panel to be lighted with DC control power. The panel lamps shall automatically be switched off within 15 minutes after the switch is depressed, or after the switch is depressed a second time.

f. Panel illumination lights (24 VDC operated) with panel mounted on / off switch shall be furnished for the control panel.

g. Unlimited event logging of generator alarms, events, and trips accessible from an LED or liquid crystal display screen for event or alarm or repair diagnosis. Events, alarms or trips shall be recorded by calendar date and time of occurrence, not on engine running time. The event log shall be able to be downloaded to a laptop computer for printing and analysis.

3. The control panel shall include a true RMS sensing with 0.5% electrical characteristic accuracy metering package with the following monitoring and display parameters:

4. Digital (LCD) indications for each of the following:

   a. AC voltage – 1 phase (L-L, & L-N).

   b. AC Amps (1 Phase & Total)

   c. KW (total and per phase)

   d. KVA (total)

   e. PF (average total and per phase)

   f. Frequency

   g. DC voltage

   h. Coolant temperature

   i. Oil pressure

   j. Engine operating RPM

   k. Engine running hours

5. The generator control system shall automatically shut down and lock out the generator set from starting upon each of the following conditions:

   a. Overcrank

   b. Overspeed

   c. Low lubricating oil pressure

   d. High engine coolant temperature

   e. Low coolant level

f. Operation of a local or remote manual stop station wired to the generator set.

6. The generator mounted control panel shall include alarm and individual status indications for each of the following:

a. Overspeed shutdown (red)

b. Low engine oil pressure shutdown (red)

c. Overcrank shutdown (red)

d. High coolant temperature shutdown (red)

e. High coolant temperature pre-alarm (yellow)

f. Low engine oil pressure pre-alarm (yellow)

g. Low coolant temperature pre-alarm (yellow)

h. Low coolant level shutdown (red)

i. Controls not in automatic (flashing red)

j. Battery charger malfunction (red)

k. High/Low battery voltage (red)

l. Ground fault (yellow)

m. Emergency Stop (red) (from generator control panel E-Stop switch and from remote breakglass station activation).

n. Common fault shutdown (red) (10A, 120V dry contact for all monitored fault conditions).

o. Common fault pre-alarm (yellow) (10A, 120V dry contact for all monitored fault conditions). Common pre-fault alarm is the combination of all the pre-alarm stated above.

N. The generator mounted control panel shall incorporate true RMS sensing of electrical parameters and immediately trip open the generator breaker and simultaneously stop generator set operation for occurrence of any of the following conditions (provide adjustable level settings and time delays for each):

a. Undervoltage.

b. Overvoltage.

c. Phase Over current.

d. Phase loss.

e. Overfrequency.

f. Underfrequency.

g. Overload KW.

h. Fault Conditions.

O. The generator control panel shall be provided with dry contact (10 amp at 120VAC) outputs wired to the generator mounted low voltage/DC junction box for the following signal conditions:

1. Generator RUNNING status.

2. Generator PRE-FAIL warning alarm.

3. Generator FAIL shutdown alarm.

4. Fuel System TROUBLE alarm.

5. Generator circuit breaker OPEN status alarm.

6. Battery system TROUBLE alarm

P. Electrical interconnection of all wiring between the EG system equipment, the transfer switch equipment, plant PLC system and other required remote annunciation requirements shall be furnished by the Installing CONTRACTOR. The EG vendor shall provide project specific electrical wiring schematics with numbered terminal point wiring interface connections clearly indicated for ENGINEER review and for the Installing CONTRACTOR'S wiring information and use.

2.3 ENGINE-GENERATOR BASE

A. Engine generator base requirements

1. The engine and generator shall be assembled to a common base to provide suitable mounting on any solid level surface. The base shall be constructed of heavy-duty structural steel, designed, and built to resist deflection and maintain alignment during skidding, lifting and operation and minimize resonant linear vibration during any range of normal generator set operation.

2. Both sides of the generator set mounting base assembly shall be bolt and nut secured to the top of the furnished generator set sub base tank prior to delivery. The EG vendor shall confirm proper securement of the generator set to the sub base tank after installation on the site and prior to generator equipment startup. The Installing CONTRACTOR shall be responsible to provide and install all hardware required to properly secure the sub base tank to the site foundation.

2.4 WEATHER PROTECTED ENCLOSURE (NON-WALK-IN TYPE)

A. The EG Vendor shall furnish two (2) generator outdoor weather protective enclosures installed on top of the generator fuel oil sub base tanks as specified herein and as shown on the Drawings. The enclosure shall be aluminum construction and shall completely enclose the generator set and all generator system auxiliary equipment. The enclosure is to be installed and secured on top of the diesel fuel oil sub base tank. The enclosure shall be sized large enough so as to allow personnel adequate reach-in access to the equipment installed within the enclosure for operation

and normal maintenance purposes and shall provide all NEC and OSHA required clearances. The engine exhaust silencer shall be mounted inside of the enclosure.

B. The enclosure as mounted on the sub base tank shall be designed, rated, and built to reduce generator set mechanical and exhaust transmitted noise.

C. The enclosure, engine-generator set, and sub base tank assembly shall be complete in every detail and requiring no additional in field modifications. It will be the responsibility of the Installing CONTRACTOR to properly install the enclosure/sub base tank package on the site foundation, as coordinated with and supervised by the EG vendor, and as approved by the Engineer.

D. The entire enclosure, installed generator set and accessory equipment, and sub base fuel tank assembly shall be in compliance with the Florida Building Code (FBC), the National Electrical Code (NEC) and the National Fire Protection Association (NFPA) including physical space clearances around electrical equipment. The enclosure and sub base fuel tank assembly shall conform to the equipment design criteria as specified herein and as shown on the Drawings. The manufacturer shall be listed as an approved vendor by the Florida Department of Community Affairs Building Codes.

E. The enclosure design and construction shall bear the UL label "Commercial Building Classified by Underwriter's Laboratories in Accordance with the National Electric Code". The label shall also indicate compliance with UL2200 for enclosures and high velocity hurricane zone (HVHZ) rated. The enclosure shall be certified by a Professional Engineer (P. E.) licensed in the state of Florida, to be designed and constructed to withstand a constant wind load resistance up to 180 MPH. Provide an electronic P. E. signed and sealed wind load calculations and report, and drawings indicating compliance for the specific enclosure to be furnished for this Project to the Engineer prior to site delivery. The enclosure's design and construction compliance with the specified wind load rating are to be included on the Manufacturer's enclosure drawings, and included in the EG system Shop drawing submittals and the EG system As Built drawings included in the generator equipment parts, operation and maintenance manuals.

F. Enclosure construction shall include individual components generally consisting of a roof, two (2) side walls, and two (2) end walls using prepainted white epoxy formed aluminum. Contractor shall verify the color of the owner preference. Enclosure mounted intake and discharge air acoustic hoods or plenums, with fiberglass (non asbestos) acoustical insulation and securement linings, and all hardware shall be stainless steel.

G. The roof shall be constructed of 5052 marine grade mill finish 0.125 in. minimum thickness formed aluminum panels using an interlocking seam design. The roof top skin shall be painted the same color (white) as the enclosure. A weatherproof mastic / sealant shall be used along the roof perimeter and any roof skin joints. The roof rail perimeter shall have internally installed two (2) roof lifting rings per side (a total of 4 lifting points) of 10,000 pound lifting capacity each for lifting of the complete enclosure. All external roof attaching hardware shall be stainless steel screw type mechanical fastener utilizing neoprene watertight washers. The roof shall be designed and built for 75 pounds per square foot, which shall be substantiated by the enclosure Manufacturer on the enclosure drawings. The enclosure roof shall incorporate an internally installed and removable aluminum or stainless steel construction rain collar and rain shield for the generator exhaust silencer piping at the roof penetration point to prevent the entry of rainwater into the enclosure and allow for expansion and vibration of the exhaust piping without stress to the exhaust system. Installed removable aluminum or stainless steel construction rain

collars and shields shall also be furnished for all sub base tank UL approved screened vents / caps that penetrate the enclosure roof.

H. The walls shall be manufactured utilizing formed 3105 grade 0.080 minimum thickness prepainted aluminum modular panels utilizing an interlocking seam design. Thermal acoustic insulation with fire retardant properties shall be installed on all of the interior sidewalls and roof of the enclosure.

I. All external attaching hardware shall be stainless steel screw type mechanical fasteners. The enclosure shall be fastened to the sub base tank by the enclosure manufacturer by means of an aluminum base channel and stainless steel clips that are welded to the sub base tank and bolted to the base channel with stainless steel bolts, washers, and nuts. The base channel shall include enclosure water drainage construction.

J. Thermal acoustic insulation shall be fiberglass and shall not include any asbestos materials, with fire retardant properties. The insulation shall be installed on all of the interior sidewalls and roof of the enclosure. The insulation will be completely covered with mill finish 0.032 inch thick perforated aluminum lining secured to the enclosure interior. Provide thickness of sound attenuation material as required to meet the noise level requirements specified herein Provide thickness of sound attenuation material as required to meet the noise level requirements specified in Paragraph 2.7 NOISE LEVEL REQUIREMENTS.

K. The generator intake air shall enter the end of the enclosure through the bottom of an enclosure installed ventilation air intake hood / plenum section with removable 1” by 1” galvanized wire cloth attached at the intake air opening,. The ventilation intake air assembly shall be constructed of the same materials as the enclosure. The ventilation intake and discharge assemblies as installed on the enclosure shall also be 180 MPH wind resistance rated, same as the enclosure and shall be included in the P.E. wind load analysis and certifications provided. The enclosure air intake system shall be designed and constructed to minimize water penetration into the enclosure during heavy rainfall and be constructed for automatic drainage of falling rain water into the plenum to the outside of the enclosure.

L. The radiator discharge end wall section shall incorporate a properly sized opening for the furnished generator set radiator discharge core / opening and shall include appropriately furnished and installed shroud or baffle assemblies to prevent the recirculation of radiator discharge air into the enclosure. The radiator air shall be vertically discharged from the enclosure end wall through the top of an enclosure mounted discharge air acoustic plenum with sound baffles and shall be of the same materials as the enclosure. Provide removable 1” by 1” galvanized wire cloth attached to the discharge plenum opening. The air discharge plenum shall be furnished with a deflector plate and a bottom drain extension line for prevention of falling water entry into the enclosure and for rainwater removal from the plenum. The discharge plenum shall incorporate a side installed access door for plenum cleanout maintenance access.

M. The combined air inlet and discharge system shall be designed to maintain a combined total static pressure restriction of no more than 0.5 inches of water gauge through the enclosure with the generator set operating at full rated load and duty. Maximum design enclosure air flow velocity through the enclosure shall not exceed 1250 FPM. The enclosure manufacturer shall submit EG system / enclosure ventilation airflow calculations for confirmation of these requirements.

N. The generator set exhaust silencer exhaust discharge shall be piped to the outside of the enclosure through the enclosure roof for vertical discharge of engine exhaust gases. Provide an installed

aluminum construction counter balanced exhaust piping raincap at the exhaust piping termination point and an aluminum or stainless steel construction counter balanced piping raincap for the exhaust piping termination.

O. The enclosure shall incorporate two (2) personnel doors located on each side of the enclosure for a total of four (4) enclosure personnel access doors. The rear doors shall allow personnel reach-in access to the generator set and enclosure installed equipment. Provide adequate operational and access space, and NEC and OSHA compliant clearances for all equipment. The doors shall be 36 inches wide. All doors shall be constructed of 3105 prepainted aluminum to match the enclosure exterior color, and installed into 3/16 inch mill finish aluminum frames that are structurally integrated into the enclosure wall using heavy duty continuous stainless steel hinges constructed with stainless steel hinge pins of a diameter not less than 0.25 inch. Provide gasketing to prevent entry of water into the enclosure through the closed doors. The door passage latches shall be stainless steel and all doors shall be padlockable from the outside. Each passage latch shall each incorporate an operator with interior release handle for ease of egress in the event of an emergency and shall allow escape from within the enclosure while the door is externally locked. Each door shall include "holdback" hardware and restraints to secure the door to the enclosure side wall when the door is opened fully. Include door handle strike plates on the enclosure walls adjacent to the door to provide impact protection from the door handle. Rain gutters that shall channel rainwater away from the top of the enclosure door opening shall be provided for the top of all doors. Generator shall be provided with aluminum stairs, handrails and platforms at all personnel doors to provide per NEC and OSHA compliance.

P. All components of the enclosure shall be assembled utilizing 0.375 inch minimum stainless steel bolts or screw fasteners, nuts, and lock washers. In addition, watertight neoprene flat washers shall be used on all roof bolts.

Q. The enclosure manufacturer shall provide all required hangars, supports, mounting materials and hardware for the generator exhaust silencer and exhaust piping installed inside of the enclosure. Provide insulation blankets on the entire exhaust system physically located inside of the enclosure with the exception of the engine flexible exhaust connection.

R. The generator set high sound attenuation exhaust muffler and associated piping system size and type is to be furnished so as not to exceed the engine manufacturer's published maximum exhaust flow restriction values and to provide attenuation so as to not allow more than the specified maximum enclosure sound and noise levels at any range of generator set operation.

S. The enclosure shall be manufactured to be finish coated with a long lasting epoxy coating finish to prevent oxidation and maintain the paint finish.

T. The enclosure sidewalls shall incorporate externally located threaded stainless steel N.P.T. fittings with stainless steel caps for connection with enclosure interior installed piping and flexible hoses and shut-off valves at the generator set for connection to the engine's lubricating oil, coolant, and exhaust silencer drains. All drain connections to the generator set and muffler shall be flexible. The engine's crankcase fumes disposal hoses shall be routed to inside of the radiator air discharge plenum by the enclosure manufacturer. Install permanently secured weather resistant "Engine Oil Drain", "Radiator Drain", and "Muffler Drain", nameplates on the outside of the enclosure next to each respective drain fitting.

U. The enclosure manufacturer shall install the specified generator emergency shutdown breakglass station on the outside of the enclosure and wire to the generator emergency shutdown controls.

The breakglass station shall be located on the exterior side of the enclosure, next to the enclosure door closest to the generator end of the enclosure.

V. Provide one (2) commercially available DC powered light bulb installed within a protective covered fixture and mounted on the interior roof of the enclosure above the generator's control panel, away from damaging heat, and secured against harmful vibrations. The light is to be connected to a manually operated automatic timer switch, labeled "DC Light", installed inside the enclosure adjacent to a rear door of the enclosure. The DC light shall be appropriately fused and wired to the generator set's starting/control battery power in conduit by the enclosure manufacturer. The light shall be large enough to provide adequate illumination for the generator control panel in an emergency situation yet not such that overburdening drain shall be placed on the generator set starting battery system. Provide two (2) spare DC light bulbs with generator set spare parts provisions.

W. The enclosure manufacturer shall be responsible to electrically wire the following items in the interior and on the exterior of the enclosure as indicted herein. All enclosure electrical equipment shall be installed and electrically wired and interconnected between the required equipment items and AC 60amp Panel board by the enclosure manufacturer in accordance with National Electric Code (NEC) and National Fire Protection Association (NFPA) requirements, including proper clearance around all electrical equipment. All wiring will be in EMT or liquid-tight conduit, utilizing compression fittings and all connections at the generator set shall be flexible:

a. Generator anti-condensation space heater.

b. Engine jacket water heater.

c. Automatic battery charger.

d. Generator E-Stop

e. Sub base tank fuel alarm panel.

X. The enclosure manufacturer shall provide the necessary electrical interconnection wiring and conduit for all generator set equipment, DC power, controls, and alarms to the generator set, battery charger, sub base tank fuel level switches and fuel alarm panel, and emergency shutdown break glass station.

Y. The enclosure manufacturer shall provide the necessary DC electrical interconnection wiring and conduits for all generator set equipment, including sub base tank, the emergency shutdown break glass station. Generator AC power conductors, AC service, control and remote annunciation wiring, and AC service power wiring and conduits shall enter the enclosure from the bottom of the subbase tank through the sub base tank cable stub up opening which shall be located directly under the installed generator mounted circuit breaker. All of the generator system electrical wiring interface requirements, including AC power, AC service, control and signal wiring for interface with the remote electrical transfer and remote monitoring and annunciation equipment shall be furnished, installed, and terminated by the Installing CONTRACTOR. Refer to the Drawings for additional wiring requirements. Ground the engine generator frame and enclosure in accordance with the NEC.

2.5 GENERATOR VIBRATION ISOLATORS

A. The engine and generator shall be assembled to a common base frame to provide suitable mounting on any solid level surface. The base shall be constructed of heavy-duty structural steel, designed, and built to resist and prevent deflection and maintain alignment during skidding, lifting and operation and minimize resonant linear vibration during any range of normal generator set operation.

B. The generator set shall be provided with Manufacturer furnished resilient linear vibration isolators installed between the generator set and the generator set mounting base providing over 95% efficiency in reducing vibration transmissions. The isolators must be deflection restraint limiting, able to withstand high loads in any plane, and comply with Seismic Zone 4 requirements. The isolators shall be resistant to heat and age, and impervious to oil, coolant, diesel fuel, and cleaning compounds.

2.6 TORSIONAL VIBRATION

A. The complete engine generator set shall be so designed, constructed, and installed as to be free from objectionable vibration in any mode. Freedom from torsional vibration shall be demonstrated by torsion graph records taken during factory test of this or a similar unit. Copies of the generator set manufacturer's torsional compatibility analysis report for the model generator set furnished shall be provided to the ENGINEER prior to site delivery of the generator set.

2.7 NOISE LEVEL REQUIREMENTS

A. The average overall sound pressure level on the A scale produced by the furnished equipment operating as specified herein shall not exceed 70 decibels (dBA), at a distance of 20 feet from the weatherproof enclosure, measured in accordance with NEMA standards.

PART 3 - EXECUTION

3.1 FACTORY TESTING AND INSPECTION

A. Engine-Generator Set

1. The engine-generator set manufacturer shall perform factory testing and quality control inspections on the specific engine-generator set to be provided prior to being shipped from the factory. The manufacturer's certified report of these tests and inspections shall be submitted to the ENGINEER prior to delivery of the unit to the site.

2. The engine, generator, and engine-generator set shall be subjected to the factory testing and quality control inspections to insure proper and reliable operation. The Manufacturer's certified report of these tests and inspections shall be submitted to the ENGINEER prior to delivery of the new generator equipment to the project site These tests and inspections shall include, but not necessarily be limited to, the following:

   a. Specific observances and corrective actions for any excessive engine blow-by, combustion gas leaks, inlet air leaks, excessive vibration, and unusual noises.

   b. Retest the generator set after any change affecting airflow through the engine, fuel injected into the engine, engine combustion, or any reassembly which potentially affects mechanical integrity.

   c. Perform Factory testing of the generator set to be furnished to confirm baseline data with recording of each of the following:

1) Voltage (each of the phases and average)

2) Amperage (each of the phases and average)

3) KW output

4) Power factor

5) Frequency

6) Rated engine speed

3. Prior to delivery the engine-generator set shall be Factory tested to show it is free of any defects and will start automatically and carry full rated electrical load.

4. The Factory furnished generator set load testing shall be performed with reactive load banks capable of definite and precise incremental loading of the generator set at 0.8 power factor. The testing shall be performed at the generator set's rated load and rated power factor.

5. The load banks utilized for Factory testing of the generator set shall not be dependent on the generator control instruments to read amperage and voltage on each phase. Rather, the test instrumentation shall serve as a check of the generator set meters. Confirmation of comparable readings of the generator control panel display parameters with the load bank testing instrumentation shall be indicated on the furnished Factory test reports.

6. The engine generator Manufacturer's certified Factory test report of the Factory testing and inspection shall be submitted to the ENGINEER for approval prior to delivery of the unit to the project site. Copies of the factory test reports shall also be included in the EG vendor furnished generator set equipment Parts, Operation and Maintenance manuals.

7. Any generator equipment defects that become evident during the Factory testing shall be corrected by the engine Manufacturer at his own expense prior to Factory shipment of the generator set, no exceptions.

8. All consumables necessary for testing shall be furnished by the engine generator Manufacturer. All generator equipment defects which become evident during the Factory testing shall be corrected by the engine Manufacturer at his own expense prior to Factory shipment.

9. Confirm through actual testing, and include verification in the testing report, that the generator set physically shuts down in the event of simulation of each of the following generator set shutdown conditions:

a. Overspeed

b. Overcrank

c. High water temperature

d. Low oil pressure

e. Low water level

f. Emergency shutoff switch

g. Overcurrent

10. The reactive load banks utilized for testing of the generator set at the factory shall not be dependent on the generator control instruments to read amperage and voltage on each phase. Rather, the test instrumentation shall serve as a check of the generator set meters. Confirmation of comparable readings of the generator control panel display parameters with the load bank testing instrumentation shall be indicated on the furnished factory test reports.

11. The EG manufacturers certified Factory test report of the factory testing and inspection shall be submitted to the ENGINEER for approval prior to delivery of the unit to the project site. Copies of the factory test report for the furnished generator set shall also be included in the EG vendor furnished generator set equipment Parts, Operation and Maintenance manuals.

3.2 INSPECTION

A. Examine the area to receive the EG equipment to assure adequate clearance for installation.

B. Check to confirm that the generator concrete foundation pad is level, free of unacceptable irregularities, and adequate for generator equipment installation.

C. Provide adequate information to ensure that the delivered generator equipment will be properly offloaded, rigged, stored, installed, and protected by the Installing CONTRACTOR.

D. Start work only after all unsatisfactory conditions are corrected.

3.3 INSTALLATION

A. The generator set equipment shall be installed by the Installing CONTRACTOR as indicated on the Drawings and per the manufacturer's required and recommended procedures and guidelines. The Installing CONTRACTOR shall properly protect and store the delivered generator equipment as recommended by the generator set manufacturer and the EG vendor.

B. The EG vendor will be responsible for providing a qualified field service technician to oversee the Installing CONTRACTOR'S installation of the EG system equipment, including setting, alignment, assembly, piping, mechanical and electrical connections.

C. The EG vendor shall be responsible for providing the coordinating wiring diagrams indicating all required the Project specific point to point electrical interconnection information between all of the generator set equipment, including interconnection identification for interface to the automatic transfer and annunciation equipment (furnished by others) for use by the Installing CONTRACTOR during installation, wiring and checkout of the equipment.

D. After installation by others, the EG vendor shall provide the services of competent factory trained and experienced service engineers to provide installation instructions to the Installing CONTRACTOR, and to coordinate the installation completion of the equipment. They shall assist in placing the equipment into operation and provide instruction, as required, to the persons who are delegated to

operate the equipment. EG vendor services shall include a minimum of six (6) visits by the factory service engineers as follows:

1. Pre-installation coordination meeting to coordinate the installation and interconnection of the automatic transfer equipment with the engine-generator equipment and all interface equipment.

2. Initial checkout of the installation of the equipment prior to start up and testing.

3. Post-installation start-up and testing to confirm proper operation prior to system turnover. This trip may include multiple, not necessarily consecutive days and shall include all services required to checkout, startup, load bank test and test the emergency power system at the facility.

4. Generator set equipment operation demonstration for the ENGINEER and OWNER'S representatives and any other applicable approval Jurisdictions.

5. Initial Instruction period for initial EG system operating personnel.

6. Within four (4) months after generator system turnover, provide an additional one (1) day instructional period for the OWNER'S engineering, operating, and maintenance personnel on complete operation and maintenance of the EG system equipment as described herein and as coordinated with the OWNER.

E. The EG vendor shall maintain a local competent and responsible factory authorized service and parts organization that is available to the OWNER for service and parts procurement on a 24-hour / 365 day call basis.

3.4 FIELD QUALITY CONTROL

A. Technical representatives of the engine-generator set vendor shall check the complete installation of the EG system equipment for installation acceptance and procedural and operational compliances. The Installing CONTRACTOR shall note any installation deficiencies for prompt correction or appropriate remedial action. Any EG equipment operational deficiencies shall be promptly corrected by the EG vendor.

B. The EG vendor shall be available to assist the Installing CONTRACTOR during installation delivery of the generator system equipment.

C. The EG vendor shall perform EG system start-up procedures, systems checks, provide necessary adjustments, and provide site testing required after the installation is complete as coordinated with the ENGINEER.

D. The proper initial service fill of engine lubricating oil and ethylene glycol based antifreeze coolant solution, as recommended by the engine manufacturer, shall be provided and installed by the generator set manufacturer or EG vendor.

3.5 SYSTEM START-UP AND OPERATIONAL TESTING

A. The EG vendor's manufacturer trained field service technician shall be responsible for field start-up and testing of the furnished generator system. The manufacturer shall furnish the ENGINEER with written certification assuring that each item of equipment is complete, in good condition, free from damage and properly installed, connected, adjusted and operating properly.

B. The installing CONTRACTOR shall provide the required and immediate assistance to the EG manufacturer's field service technician during start-up and testing. This assistance shall be generally limited to tasks directly associated with the installation of the EG and interface wiring, not with the internal components or inherent function of the EG equipment.

C. The Installing CONTRACTOR shall be responsible to fill the furnished generator sub base fuel tank to 75% full capacity with new acceptable quality on road diesel fuel, engine manufacturer recommended and approved for use with furnished generator set engine, immediately prior to generator set equipment site startup initiation.

D. The EG vendor shall coordinate the operation of the engine-generator with the automatic transfer control and remote annunciation control equipment suppliers so that automatic and manual operation and annunciation of the complete emergency power system functions as described and as required by these Specifications.

E. System start-up and operational testing procedures shall not be limited to those specified herein. Others shall be performed as required to prove that the system functions as described and required by these specifications.

F. EG operational testing shall be performed by the EG vendor in conjunction with technical representatives of the transfer equipment, controls equipment, and the Installing CONTRACTOR in the presence of the ENGINEER and OWNER. The same aforementioned personnel shall perform system start-up but it is not necessary to perform start-up functions and procedures in the presence of the ENGINEER unless specifically noted or required otherwise. Two (2) weeks advance written notice shall be given to the ENGINEERS for all EG system start-up and testing procedures.

G. Operational Testing

1. The EG vendor shall provide temporary dry type, resistive load banks and appropriate power conductor cables for the specified and required generator set site testing. The Installing CONTRACTOR shall be responsible for connection and disconnection of the temporary load bank cables to the equipment. Building load shall not be used to supplement load bank testing of the generator equipment.

2. Load testing - Cold start block load the generator set at the full load 100% standby rating in one step and operate sustained load for two (2) hours continuous. Remove the load from the generator set and allow to cool down for five (5) minutes, then immediately reapply full standby 100% standby rating block load onto the generator set in one step and operate sustained load for additional two (2) hours continuous for a combined load testing period of four (4) hours. Record each of the generator block loading transient high and low voltage and frequency levels and actual recovery time to achieve to steady state operation and stabilized voltage and frequency levels, Record the following readings in five (5) minute increments for the first fifteen (15 minutes at the initiation of each block load testing and at fifteen (15) minute increments thereafter for the duration of the testing.

   a. Voltage (each phase)

   b. Amperage (each phase)

   c. Frequency

d. Kilowatts

e. Power Factor

f. Fuel pressure, oil pressure and water temperature

g. Exhaust gas temperature at engine exhaust outlet

h. Ambient temperature

i. Battery charger amperage rate

j. Time at each recorded measurement

3. Check and demonstrate proper operation of the EG system controls, generator set alarms and shutdowns, and safety devices in the presence of the ENGINEER.

4. Provide generator equipment testing including, but not limited to, generator set cycle cranking and overcrank shutdown testing and other EG system safety alarm / shutdown testing.

5. Should these tests fail or indicate that the equipment does not meet the specified performance requirements, the cost of all corrective measures shall be borne by the EG vendor if equipment related and by the Installing CONTRACTOR if installation related. Once corrective measures are implemented, the operational testing shall be repeated at the cost of the responsible party, whether EG vendor or Installing CONTRACTOR.

6. Provide eight (8) copies of Certified test reports of the complete generator equipment field testing as required herein after satisfactory completion of startup and testing of the generator set equipment by the EG vendor. The certified generator equipment testing documentation and reports to be furnished to the ENGINEER must be include all recorded EG system testing information as required by NFPA 110, for Level 1 generator systems and as required by these Specifications. Approved copies of the generator equipment test reports shall additionally be included in the generator equipment operation and maintenance manuals as furnished by the EG vendor.

7. The Installing CONTRACTOR shall refill the sub base fuel tank to 100% full level with engine manufacturer recommended and approved on road diesel fuel oil after completion of all testing and demonstration and the generator equipment has been accepted by the ENGINEER for substantial completion.

H. Engine-Generator Pre-start Checks

1. Engine oil level

2. Engine coolant system and coolant water level

3. All generator equipment heater operations

4. Equipment fluid leakage

5. Vibration isolator adjustment

6. Battery connections, voltage and charge conditions

7. Engine to controls and all equipment electrical interface interconnections

8. Engine-generator intake /exhaust air obstructions

9. EG system AC power connections

10. Removal of all packing materials

11. EG system installation acceptance

3.6 SPARE PARTS

A. The EG vendor shall furnish the following spare parts at the time of completion of satisfactory generator set startup to be maintained at the facility by the OWNER:

1. One (1) set of air filters and gaskets.

2. One (1) set of fuel filters and gaskets.

3. One (1) set of lubricating oil filters and gaskets.

4. Two (2) sets of water separator fuel filter elements.

5. Two (2) fuses for each type and size used in the generator controls.

6. Two (2) fuses for each type and size used in the generator voltage regulator circuitry.

7. One (1) set of generator rotating positive and negative rectifier diodes, exciter resistor, voltage regulator surge suppressor diodes/varistors, and one container of electrical heat sink compound.

8. One (1) engine coolant antifreeze test hydrometer.

9. One (1) battery post-cleaner brush.

10. One (1) battery electrolyte test hydrometer.

11. Two (2) spare DC light bulbs (for outdoor enclosure)

3.7 INSTALLATION, OPERATION AND MAINTENANCE

A. Parts, Operation Instructions, and Maintenance Manuals

1. After completion of work, and satisfactory start-up and testing of the equipment at the project site, deliver to the ENGINEER, five (5) copies of the generator equipment Parts, operation instructions, maintenance manuals and drawings presenting full details for care and maintenance of each item of equipment provided under this Contract.

2. Each manual shall contain the information and documentation for the generator system equipment as indicated in other sections of these Specifications and must include operating and

maintenance information and parts lists for all equipment provided under this Contract. When necessary, provide supplemental drawings to show system operation and servicing and maintenance points. For all electrical components, provide complete, as field installed and wired electrical wiring and connection diagrams. Manuals shall include instructions required to accomplish specified operation and functions. Data shall be neat, clean, legible copies. Drawings larger than standard size notebook paper shall be accordion folded. Non-applicable information shall not be included or must be sufficiently crossed out.

3. In general the manual shall include, but not necessarily be limited to, the following:

   a. Operating Instructions - with description and illustration of the engine-generator set, engine and generator controls and any other controls and indicators.

   b. Parts Books / information- that illustrate and list all assemblies, subassemblies and components, including gaskets, hoses and fastening hardware (nuts, bolts, washers, etc.). All EG system parts shall be clearly identified by description and associated part numbers.

   c. Detailed sequence of operation instructions for both manual and automatic operation of the complete EG system equipment.

   d. Preventative Maintenance Instructions - on the complete system that cover daily, weekly, monthly, and annual maintenance requirements and schedules including a complete lubrication chart and information.

   e. Routine Test Procedures - for all EG system equipment including all electronic and electrical circuits and for the main AC generator.

   f. Troubleshooting Chart - covering the complete engine-generator set showing description of trouble, probable cause, and suggested remedy.

   g. Recommended Spare Parts List - showing all consumables anticipated to be required during normal operation, routine maintenance and testing, including pricing and quantities recommended to be maintained on hand at the OWNER'S facility.

   h. Project specific as field installed and EG system tested electrical schematics including Wiring Diagrams with point to point interconnection diagrams for all interface equipment - showing function and operational sequences of all electrical components and electrical systems.

4. Manuals shall be furnished in suitably sized, maximum three inch, three ring binders, each binder shall be adequately labeled on the outside and inside with the project name and location and the contents clearly indexed. Include model, arrangement, and serial number identification for all equipment furnished. Manuals not containing all of the information as indicated herein shall be returned to the EG vendor for compliance provision. Five (5) sets of approved manuals shall be transmitted to the ENGINEER for final distribution to the OWNER.

3.8 OWNER TRAINING

A. The EG vendor shall provide for complete training for the OWNER'S engineering, operation, and maintenance personnel. Training shall include hands-on instructions. Topics covered shall include complete EG system manual and automatic operation, control operation, schematics, wiring

diagrams, metering operations, indicators, warning lights, shutdown system, remote annunciation, routine maintenance, remedial trouble shooting procedures, maintenance contract and warranty explanations and details. Allow two (2) complete separate man-days for this OWNER'S training.

PART 4 - METHODS OF MEASUREMENT

4.1 GENERAL

A. The quantity of units to be paid for under this item shall be the number of each type installed, adjusted, removed or replaced, complete in place, ready for operation, and accepted by the Engineer.

PART 5 - BASIS OF PAYMENT

5.1 GENERAL

A. No direct payment shall be made for the work described in this section. The work described in this section is incidental to bid items in section 260000 and shall be paid for in the respective bid item of which it is a component part.

END OF SECTION 263200

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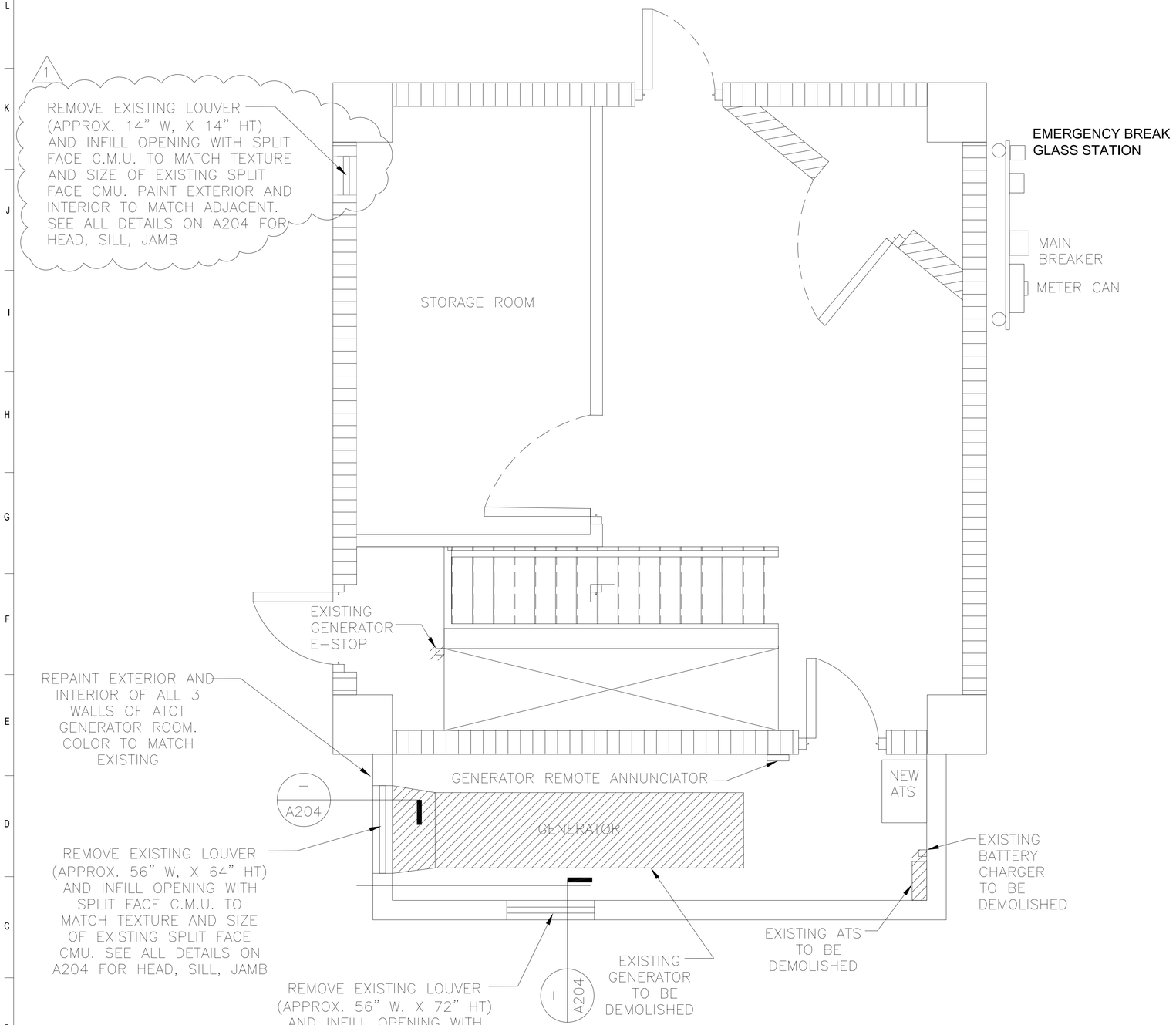

ATCT GENERATOR ROOM PLAN

BOCA RATON AIRPORT

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HDg Project No.	23708
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design by:	CWH
checked by:	CWH

CRAIG W. HANSON
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Revision Schedule

No.	Description	Date
1	ADDENDUM NO. 1	8/9/23

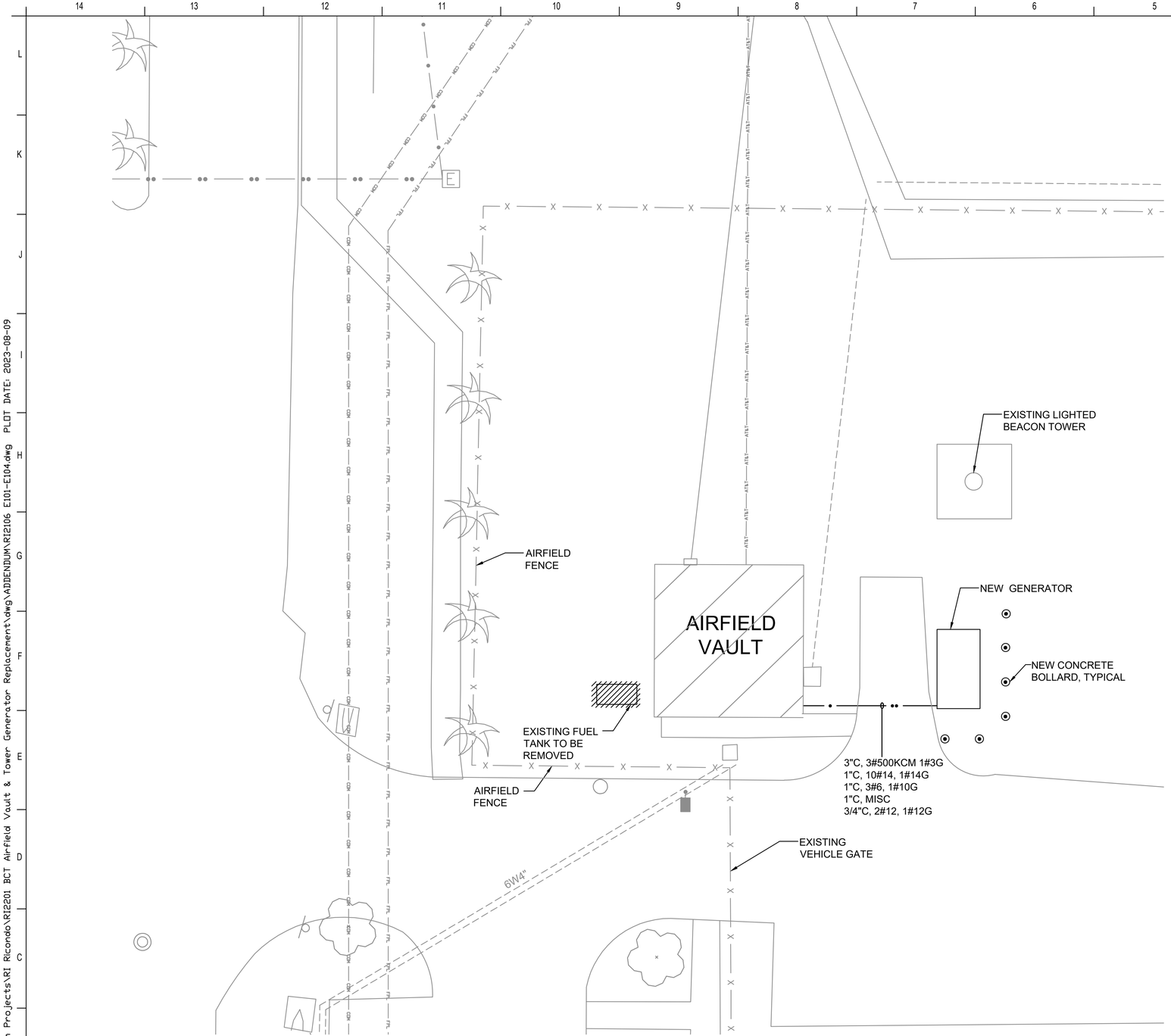
AIRFIELD AND ATCT GENERATOR REPLACEMENT AND UPGRADES

BOCA RATON AIRPORT
BOCA RATON, FL 33431

ATCT GEN. ROOM ARCH FLOOR PLAN

A202

Submittal:	Issue Date:
BID DOCUMENTS	JULY 18, 2023



AIRFIELD VAULT ELECTRICAL SITE PLAN

NOTES:

1. CONTRACTOR SHALL VISIT THE SITE BEFORE BIDDING TO BECOME FAMILIAR WITH THE EXISTING AIR FILED, EQUIPMENT LAYOUT AND EXISTING SITE CONDITIONS AND INCLUDE IN THE BID ALL MATERIAL, LABOR AND EQUIPMENT REQUIRED TO INSTALL THE ELECTRICAL EQUIPMENT AND ASSOCIATED CONDUIT AND CABLE AS SHOWN ON THE DRAWINGS TO INCLUDE ALL MISCELLANEOUS HARDWARE NOT SHOWN BUT REQUIRED FOR A COMPLETE AND WORKING SYSTEM.
2. NOT ALL CONDUITS SHOWN ON PLAN VIEW. CONTRACTOR SHALL INSTALL CONDUITS AND CABLES AS SHOWN ON ONE LINE AND RISER DIAGRAMS
3. CONTRACTOR SHALL DEMOLISH EXISTING FUEL TANK COMPLETE ONLY AFTER THE NEW GENERATOR SYSTEM HAS BEEN PLACED INTO SERVICE. THIS INCLUDES BUT IS NOT LIMITED TO DEMO OF EXISTING FUEL PIPING, DEMO OF EXISTING CONCRETE SLAB, BACKFILL, AND SOD RESTORATION OF THE AREA.
4. CONTRACTOR SHALL REMOVE AND DISPOSE OF FUEL AND FUEL TANK, COMPLETE. ⚠1
5. CONTRACTOR SHALL PROVIDE AND INSTALL NEW BOLLARDS IN THE LOCATIONS SHOWN. COORDINATE WITH OWNER FOR EXACT LOCATION OF BOLLARD.
6. CONTRACTOR SHALL PROVIDE AND INSTALL A GENERATOR CONCRETE FOUNDATION PER GENERATOR MANUFACTURER REQUIREMENTS. AT A MINIMUM THE FOUNDATION SHALL BE CONCRETE (4000 PSI), EXTEND 6" ABOVE FINISHED GRADE WITH A 1" CHAMFERED EDGE AND EXTEND 6" FROM GENERATOR ENCLOSURE/TANK. ⚠1

BOCA RATON AIRPORT

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R & A Project No.	
drawn by:	BJC
design by:	ALC
checked by:	JWK

JAMES W. KAPPES LICENSE No. 71499 STATE OF FLORIDA PROFESSIONAL ENGINEER

JAMES W. KAPPES
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Revision Schedule

No.	Description	Date
⚠1	ADDENDUM NO.1	8/9/23

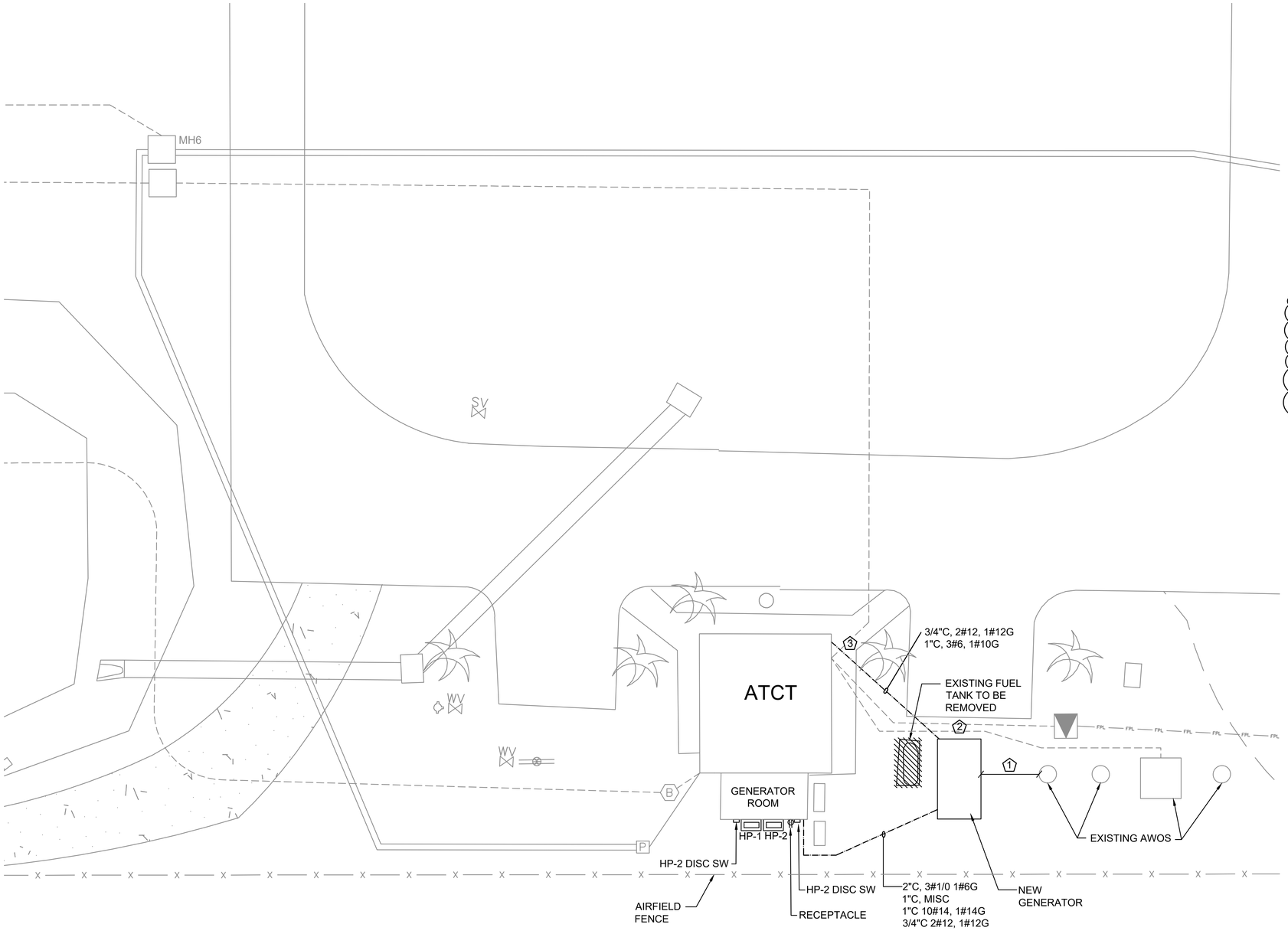
AIRFIELD AND ATCT GENERATORS REPLACEMENT AND UPGRADES

BOCA RATON AIRPORT
BOCA RATON, FL 33431

AIRFIELD VAULT ELECTRICAL SITE PLAN

E101

Submittal: BID DOCUMENTS
Issue Date: JULY 18, 2023



1"=10'-0"

10 5 0 10'

ATCT ELECTRICAL SITE PLAN

NOTES:

1. CONTRACTOR SHALL VISIT THE SITE BEFORE BIDDING TO BECOME FAMILIAR WITH THE EXISTING AIRFIELD AND EQUIPMENT LAYOUT AND EXISTING SITE CONDITIONS AND INCLUDE IN THE BID ALL MATERIAL, LABOR AND EQUIPMENT REQUIRED TO INSTALL THE ELECTRICAL EQUIPMENT AND ASSOCIATED CONDUIT AND CABLE AS SHOWN ON THE DRAWINGS TO INCLUDE ALL MISCELLANEOUS HARDWARE NOT SHOWN BUT REQUIRED FOR A COMPLETE AND WORKING SYSTEM. ⚠1
2. NOT ALL CONDUITS SHOWN ON PLAN VIEW. CONTRACTOR SHALL INSTALL CONDUITS AND CABLES AS SHOWN ON ONE LINE AND RISER DIAGRAMS.
3. CONTRACTOR SHALL DEMOLISH EXISTING FUEL TANK COMPLETE ONLY AFTER THE NEW GENERATOR SYSTEM HAS BEEN PLACED INTO SERVICE. THIS INCLUDES BUT IS NOT LIMITED TO DEMO OF EXISTING FUEL PIPING, DEMO OF EXISTING CONCRETE SLAB, BACKFILL, AND SOD RESTORATION OF THE AREA.
4. CONTRACTOR SHALL REMOVE AND DISPOSE OF FUEL AND FUEL TANK, COMPLETE.
5. CONTRACTOR SHALL PROVIDE AND INSTALL A GENERATOR CONCRETE FOUNDATION PER GENERATOR MANUFACTURER REQUIREMENTS. AT A MINIMUM THE FOUNDATION SHALL BE CONCRETE (4000 PSI), EXTEND 6" ABOVE FINISHED GRADE WITH A 1" CHAMFERED EDGE AND EXTEND 6" FROM GENERATOR ENCLOSURE/TANK. ⚠1

KEY NOTES:

1. CONTRACTOR MUST MAINTAIN AT LEAST A 10' DISTANCE FROM THE AWOS SENSOR.
2. CONTRACTOR SHALL HAND EXCAVATE, LOCATE, AND PROTECT EXISTING POWER AND COMMUNICATION CONDUITS.
3. CONTRACTOR SHALL SAW CUT EXISTING CONCRETE SIDEWALK FOR INSTALLATION OF CONDUITS AND RESTORE SIDEWALK TO MATCH EXISTING CONDITIONS. ⚠1

BOCA RATON AIRPORT

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design by:	ALC
checked by:	JWK

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Revision Schedule

No.	Description	Date
⚠1	ADDENDUM NO.1	8/9/23

AIRFIELD AND ATCT GENERATORS REPLACEMENT AND UPGRADES

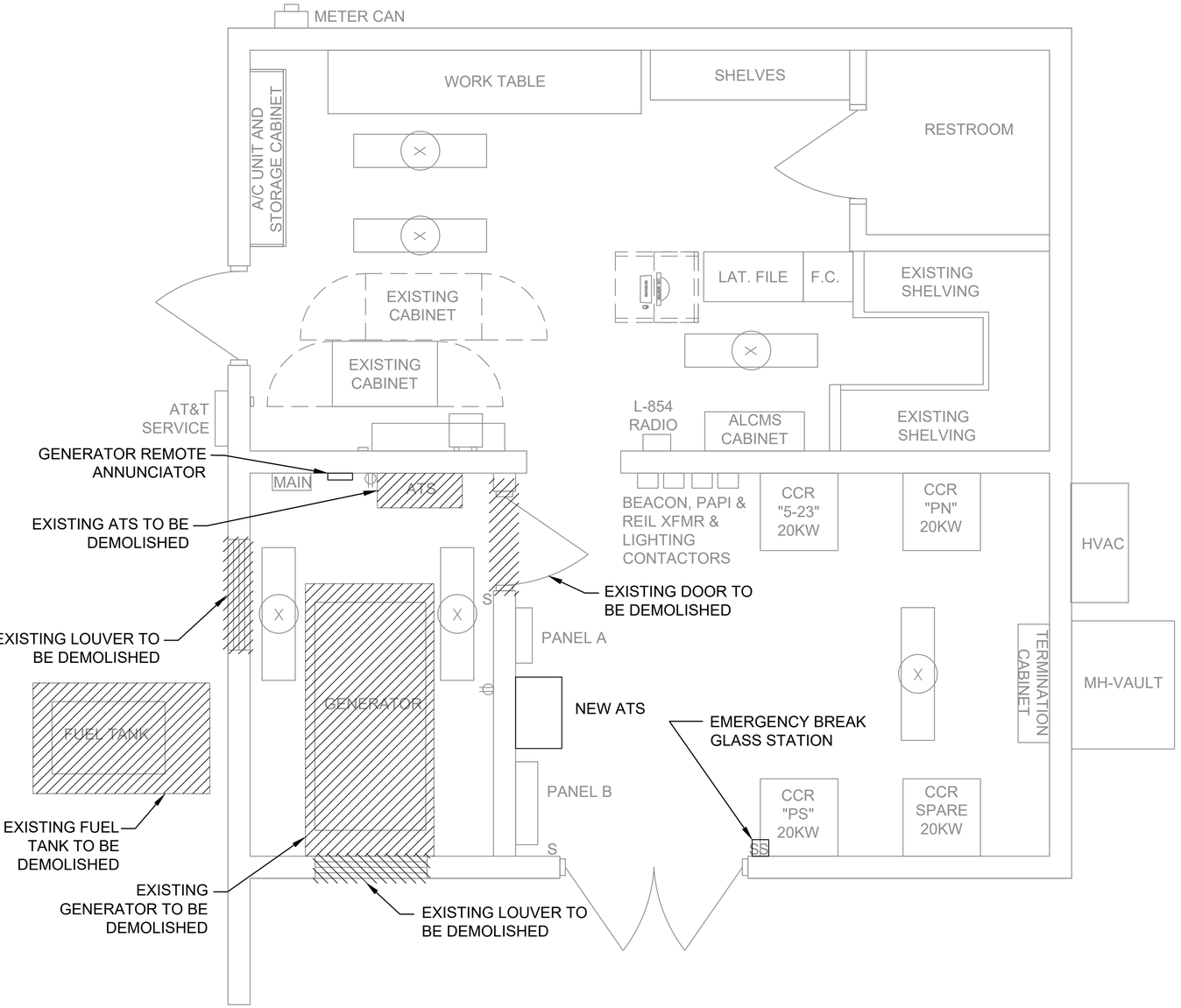
BOCA RATON AIRPORT
BOCA RATON, FL 33431

ATCT ELECTRICAL SITE PLAN

E103

Submittal: BID DOCUMENTS
Issue Date: JULY 18, 2023

FILENAME: D:\QEE Dropbox\Quantum Projects\RI Ricondo\RI2201 BCT Airfield Vault & Tower Generator Replacement\dwg\ADDENDUM\RI2106 E101-E104.dwg PLOT DATE: 2023-08-09



AIRFIELD VAULT ELECTRICAL ROOM PLAN

1/2"=1'-0"

12" 0 1 3'

NOTES:

1. CONTRACTOR SHALL VISIT THE SITE BEFORE BIDDING TO BECOME FAMILIAR WITH THE EXISTING EQUIPMENT LAYOUT AND EXISTING SITE CONDITIONS AND INCLUDE IN THE BID ALL MATERIAL, LABOR AND EQUIPMENT REQUIRED TO INSTALL THE ELECTRICAL EQUIPMENT AND ASSOCIATED CONDUIT AND CABLE AS SHOWN ON THE DRAWINGS TO INCLUDE ALL MISCELLANEOUS HARDWARE NOT SHOWN BUT REQUIRED FOR A COMPLETE AND WORKING SYSTEM.
2. NOT ALL CONDUITS SHOWN ON PLAN VIEW. CONTRACTOR SHALL INSTALL CONDUITS AND CABLES AS SHOWN ON ONE LINE AND RISER DIAGRAMS.
3. CONTRACTOR SHALL PROVIDE, INSTALL AND MAINTAIN A TEMPORARY CONDUIT AND CONDUCTOR SYSTEMS TO MAINTAIN THE POWER TO THE AIRFIELD VAULT AT ALL TIMES DURING CONSTRUCTION. AT NO TIME SHALL THE AIRFIELD VAULT BE WITHOUT POWER AND/OR OUT OF OPERATION
4. CONTRACTOR SHALL INSTALL THE EMERGENCY BREAK GLASS STATION ON THE INSIDE OF THE AIRFIELD VAULT ELECTRICAL ROOM.
5. CONTRACTOR SHALL DEMOLISH EXISTING FUEL TANK COMPLETE ONLY AFTER THE NEW GENERATOR SYSTEM HAS BEEN PLACED INTO SERVICE. THIS INCLUDES BUT IS NOT LIMITED TO EXISTING FUEL PIPING, EXISTING CONCRETE SLAB, BACKFILL, AND SOD RESTORATION OF THE AREA.
6. CONTRACTOR SHALL REMOVE AND DISPOSE OF FUEL AND FUEL TANK, COMPLETE. ⚠1
7. CONTRACTOR SHALL DEMOLISH EXISTING GENERATOR, BATTERY CHARGER, AND ATS COMPLETE ONLY AFTER THE NEW GENERATOR SYSTEM HAS BEEN PLACED INTO SERVICE. THIS INCLUDES BUT IS NOT LIMITED TO CONDUIT, WIRE, EXHAUST SYSTEM, AND GENERATOR SHROUD.
8. THE EXISTING ATS IS CURRENTLY MONITORED BY THE ALCMS. CONTRACTOR SHALL INSTALL NEW CONDUIT AND WIRE SO THAT NEW ATS CAN BE MONITORED BY ALCMS. CONTRACTOR SHALL ASBUILT EXISTING CONNECTIONS TO THE ALCMS FROM EXISTING ATS AND RECONNECT NEW ATS TO MATCH EXISTING. SEE DRAWING E401 FOR ADDITIONAL INFORMATION.

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design by:	ALC
checked by:	JWK

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Revision Schedule

No.	Description	Date
⚠1	ADDENDUM NO.1	8/9/23

AIRFIELD AND ATCT GENERATORS REPLACEMENT AND UPGRADES

BOCA RATON AIRPORT
BOCA RATON, FL 33431

AIRFIELD VAULT ELECTRICAL ROOM PLAN

E201

Submittal: BID DOCUMENTS
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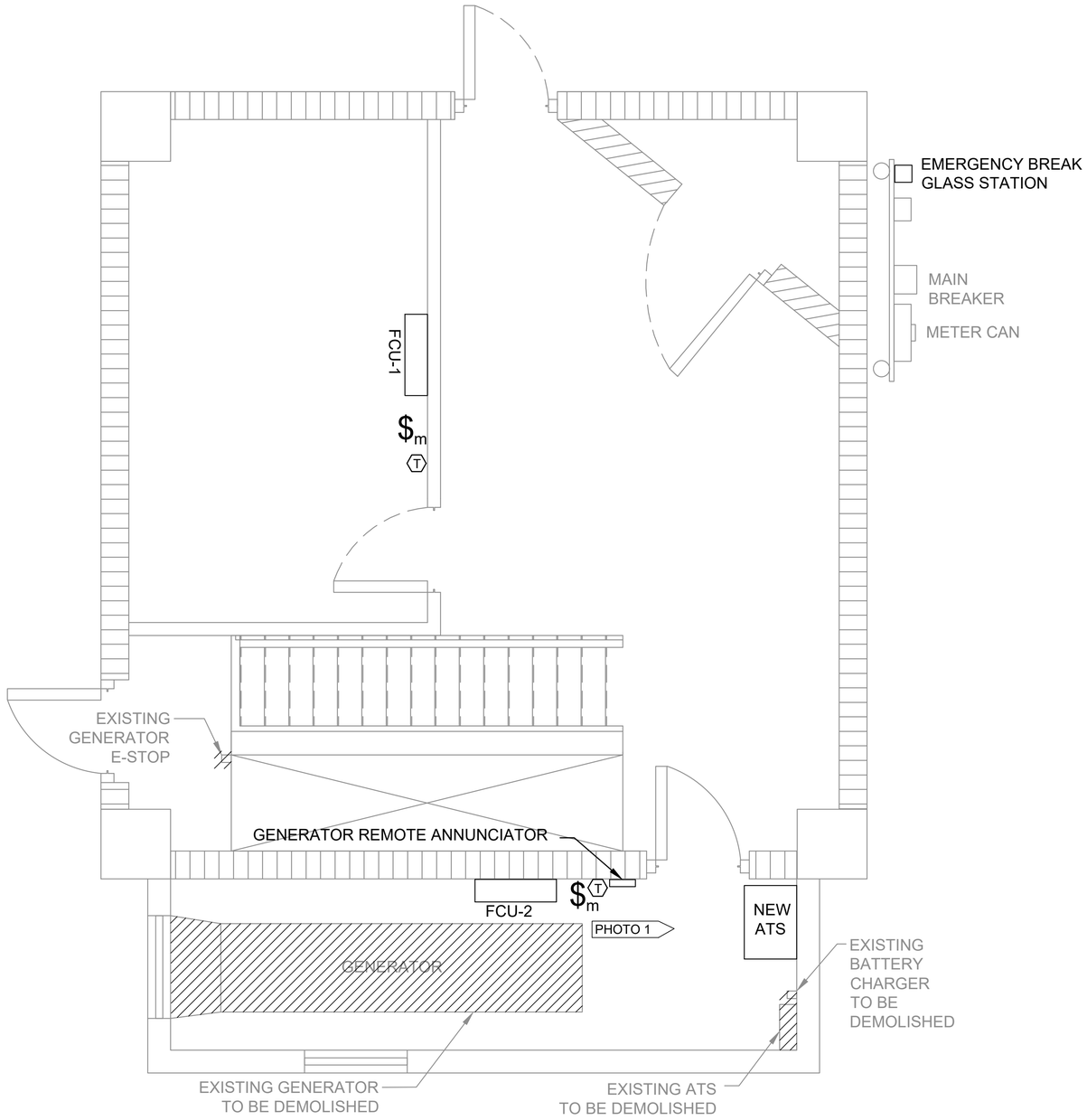

ATCT ELECTRICAL ROOM PLAN

1/2"=1'-0"

12" 0 1 3'

NOTES:

1. CONTRACTOR SHALL VISIT THE SITE BEFORE BIDDING TO BECOME FAMILIAR WITH THE EXISTING EQUIPMENT LAYOUT AND EXISTING SITE CONDITIONS AND INCLUDE IN THE BID ALL MATERIAL, LABOR AND EQUIPMENT REQUIRED TO INSTALL THE ELECTRICAL EQUIPMENT AND ASSOCIATED CONDUIT AND CABLE AS SHOWN ON THE DRAWINGS TO INCLUDE ALL MISCELLANEOUS HARDWARE NOT SHOWN BUT REQUIRED FOR A COMPLETE AND WORKING SYSTEM.
2. NOT ALL CONDUITS SHOWN ON PLAN VIEW. CONTRACTOR SHALL INSTALL CONDUITS AND CABLES AS SHOWN ON ONE LINE AND RISER DIAGRAMS
3. CONTRACTOR SHALL INSTALL THE EMERGENCY BREAK GLASS STATION ON EXISTING UNISTRUT RACK. PROVIDE ALL MATERIALS NECESSARY FOR A WORKING SYSTEM.
4. CONTRACTOR SHALL DEMOLISH EXISTING GENERATOR E-STOP WITHIN FIRE PUMP ROOM. CONTRACTOR SHALL REMOVE ALL CONDUIT AND WIRE BACK TO THE SOURCE.
5. FURNISH AND SHALL INSTALL A NEW WIRE GUTTER UNDERNEATH THE EXISTING ATS TO FACILITATE THE USE OF THE EXISTING CONDUITS TO THE MAIN BREAKER AND PANEL L1. CONTRACTOR SHALL SIZE GUTTER SO THAT IT IS LONG ENOUGH TO INSTALL CONDUITS INTO THE NEW ATS.
6. CONTRACTOR SHALL PROVIDE, INSTALL AND MAINTAIN A TEMPORARY CONDUIT AND CONDUCTOR SYSTEMS TO MAINTAIN THE POWER TO THE ATCT AT ALL TIMES DURING CONSTRUCTION. AT NO TIME SHALL THE ATCT BE WITHOUT POWER AND/OR OUT OF OPERATION
7. CONTRACTOR SHALL DEMOLISH EXISTING FUEL TANK COMPLETE ONLY AFTER THE NEW GENERATOR SYSTEM HAS BEEN PLACED INTO SERVICE. THIS INCLUDES BUT IS NOT LIMITED TO EXISTING FUEL PIPING, EXISTING CONCRETE SLAB, BACKFILL, AND SOD RESTORATION OF THE AREA.
8. CONTRACTOR SHALL REMOVE AND DISPOSE OF FUEL AND FUEL TANK, COMPLETE. (1)
9. CONTRACTOR SHALL DEMOLISH EXISTING GENERATOR, BATTERY CHARGER, AND ATS COMPLETE ONLY AFTER THE NEW GENERATOR SYSTEM HAS BEEN PLACED INTO SERVICE. THIS INCLUDES BUT IS NOT LIMITED TO CONDUIT, WIRE, EXHAUST SYSTEM, AND GENERATOR SHROUD.

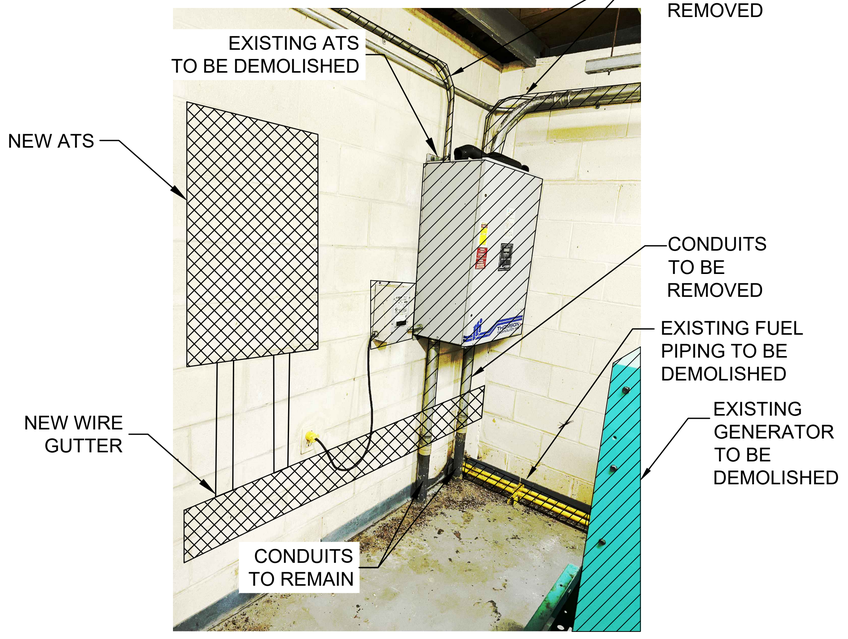

PHOTO 1
NOT TO SCALE

BOCA RATON AIRPORT

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Revision Schedule

No.	Description	Date
(1)	ADDENDUM NO.1	8/9/23

AIRFIELD AND ATCT GENERATORS REPLACEMENT AND UPGRADES

BOCA RATON AIRPORT
BOCA RATON, FL 33431

ATCT ELECTRICAL ROOM PALM

E202

Submittal: BID DOCUMENTS
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