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| **SUBMIT BID TO:**<br><br>Seminole County<br>1101 E. 1st Street, Room 3208<br>Sanford, Florida 32771<br><br>**PURCHASING AND CONTRACTS DIVISION** | **INVITATION FOR BID**<br><br>and<br>Bidder Acknowledgment |
| Contact: Jacqui V. Perry, CPPB<br>Sr. Procurement Analyst<br>407-665-7114<br>seminolecountyfl.gov | **Bid-2000-04/JVP**<br>**Purchase and Installation of Generators** |
| Bid Due Date: **May 5, 2004**<br>Bid Due Time: **2:00 P.M.** | **Location of Public Opening:**<br><br>County Services Building, Room #3208<br>1101 E. 1st Street, Sanford, Florida 32771 |
| Bidder Name: | Federal Employer ID Number or SS Number: |
| Mailing Address: | If returning as a "No Submittal", state reason (if so, return only this page): |
| City, State, Zip: | |
| Type of Entity: *(Circle one)*<br>Corporation Partnership<br>Proprietorship Joint Venture | X _____<br>Authorized Signature (Manual) |
| Incorporated in the State of: | |
| Telephone Number: | Typed Name: |
| Toll Free Telephone Number: (800) | Title: |
| Fax Number: | Date: |

## THIS FORM MUST BE COMPLETED AND RETURNED WITH YOUR BID

The Applicant is expected to completely analyze the information contained in this Invitation for Bid as guidance for the preparation of the submittal. The Applicant's submittal shall be sufficiently specific, detailed, and complete to clearly and fully demonstrate the Applicant's understanding of the proposed work requirements.

## Section 1
## Description of Project

Contractor will be responsible for all labor, materials, equipment, transportation, coordination and incidentals necessary to furnish and install generators at Fire Stations 12 & 14. **See Exhibit "A" for detail specifications and technical requirements.**

## Section 2 –
## Instructions to Bidders

**CONTACT:** All prospective Bidders are hereby instructed not to contact any member of the Seminole County Board of County Commissioners, County Manager, or Seminole County Staff members other than the noted contact person regarding this Bid or their bid at any time prior to the posting on the Web Site of the final evaluation and recommended ranking by County staff for this project. Any such contact shall be cause for rejection of your bid.

**PUBLIC OPENING:** Bids shall be received at the Purchasing Division at the above referenced address by the specified time and date. As soon as possible thereafter the names of the Bidders shall be read aloud at the specified location. Persons with disabilities needing assistance to participate in the Public Opening should call the contact person at least 48 hours in advance of the Public Opening at 665-7116.

**DELAYS**: The COUNTY, at its sole discretion, may delay the scheduled due dates indicated above if it is to the advantage of the COUNTY to do so. The COUNTY will notify Bidders of all changes in scheduled due dates by posting the notification in the Purchasing and Contracts Web Site.

**BID SUBMISSION AND WITHDRAWAL:** The COUNTY will receive bids at the above address. The outside of the envelope/container must be identified with the Bid Number and title as stated above. The envelope/container must also include the Bidder's name and return address.

Receipt of the bid in the Purchasing Division after the time and date specified due to failure by the Bidder to provide the above information on the outside of the envelope/container shall result in the rejection of the bid.

**Bids received after the specified time and date shall be returned unopened.** The time and date will be scrupulously observed. The COUNTY will not be responsible for late deliveries or delayed mail. The time/date stamp clock located in the Purchasing Division shall serve as the official authority to determine lateness of any bid.

The COUNTY cautions Bidders to assure actual delivery of mailed or hand-delivered bids prior to the deadline set for receiving bids. Telephone confirmation of timely receipt of the bid may be made by calling (407) 665-7116, before the 2:00 deadline.

Bidders shall submit **FOUR (4) COMPLETE SETS** (one [1] original and three (3) copies) of the complete bid with all supporting documentation in a sealed envelope/container marked as noted above. The Bidder may submit the bid in person or by mail.

Bidders may withdraw their bids by notifying the COUNTY in writing at any time prior to the time set for the bid deadline. Bidders may withdraw their bids in person or through an authorized representative. Bidders and authorized representatives must disclose their identity and provide a signed receipt for the bid. Bids, once opened, become the property of the COUNTY and will not be returned to the Bidders.

**INQUIRIES:** All Bidders shall carefully examine the Bid documents. Any ambiguities or inconsistencies shall be brought to the attention of the County Purchasing and Contracts Division in writing prior to the due date; failure to do so, on the part of the Bidder, will constitute

an acceptance by the Bidder of any subsequent decision. Any questions concerning the intent, meaning and interpretations of the Bid documents including the attached draft agreement, shall be requested in writing, and received by the County Purchasing and Contracts Division at least seven (7) business days prior to the due date. The County will not be responsible for any oral instructions made by any employee(s) of the COUNTY in regard to this Bid. Telephone No. 407-665-7116, Fax No. 407-665-7956.

**ADDENDUM:** Should revisions to the Bid documents become necessary; the COUNTY will post addenda information on the COUNTY's Web Site. All Bidders should check the COUNTY's Web Site or contact the COUNTY's Purchasing and Contracts Division at least seven (7) calendar days before the date fixed to verify information regarding Addenda. Failure to do so could result in rejection of the bid as unresponsive.

Bidder shall sign, date, and return the latest addendum with their Bid. Previous addenda will be deemed received.

Addenda information will be posted on the COUNTY's Web Site at www.seminolecountyfl.gov. It is the sole responsibility of the Bidder to ensure he/she obtains information related to Addenda.

**SELECTION PROCESS AND AWARD:** The award will be made to the lowest priced, responsive, responsible Bidder. The COUNTY anticipates award to the Bidder who submits the bid judged by the COUNTY to be the most advantageous and offers the best value to the County. The Bidder(s) understands that this Bid does not constitute an agreement or a contract with the Bidder. The COUNTY reserves the right to reject all bids, to waive any formalities, and to solicit and re-advertise for new bids, or to abandon the project in its entirety.

In evaluating Bids, the COUNTY shall consider the information provided by the Apparent Low Bidder as described in these "INSTRUCTIONS TO BIDDERS."

Any of the following causes may be considered as sufficient grounds for disqualification of a Bidder or the rejection of a Bid:

(a) Submission of more than one (1) Bid for the same Work by any entity under the same or different names.

(b) Evidence of collusion among Bidders.

(c) Submission of an unbalanced Bid in which prices quoted for some items are out of proportion to the prices quoted for other or similar items in the same Bid.

(d) Lack of responsibility as shown by past Work from the standpoint of life safety including, but not limited to, strict adherence to all maintenance of traffic requirements of COUNTY, workmanship, progress and financial irresponsibility.

(e) Uncompleted Work for which the Apparent Low Bidder is committed by contract which might hinder or prevent the prompt completion of Work under this Bid if an Agreement would have been awarded to the Apparent Low Bidder.

(f) Falsification of any entry made on the Bid Documents shall be deemed a material irregularity and will be grounds, at the COUNTY's option, for disqualification of the Apparent Low Bidder or rejection of the Bid.

(g) This section shall be construed liberally to benefit the public and not the Apparent Low Bidder; however, any other evidence which may hinder or otherwise delay completion of the Project may be grounds for disqualification.

(h) Non-compliance with the submittal requirements of these Instructions To Bidders.

**AWARD CRITERIA: The recommendation of award will be based on, but not limited to the following criteria:**

(a) The ability, capacity and skill of the Apparent Low Bidder to perform the Work.

(b) Whether the Apparent Low Bidder can perform the Work promptly, or within the time specified, without delay or interference.

(c) The character, integrity, reputation, judgment and efficiency of the Apparent Low Bidder.

(d) The quality of performance of previous contracts or services to Seminole County or any other agency or client.

(e) The previous and existing compliance by the Apparent Low Bidder with Chapter 220, Seminole County Purchasing Code & Procedures, the life safety requirements of COUNTY, and other laws and ordinances, regulations.

(f) The sufficiency of the financial resources and ability of the Apparent Low Bidder to perform the Work.

(g) The quantity, availability and adaptability of the Apparent Low Bidder to perform the Agreement or service to the particular needs of the COUNTY.

(h) The ability of the Apparent Low Bidder to retain employees for the purpose of this Work.

(i) The experience of the Apparent Low Bidder performing in a similar manner as required by this Agreement. Minimum of three (3) satisfactory years shall be required.

(j) The type, structure and experience of the local or branch management proposed.

(k) Quality Control Program.

(l) Claims and Litigation filed against the Apparent Low Bidder or filed by the Apparent Low Bidder for equitable adjustment, contract claim or litigation in the past five (5) years.

(m) Reprimand of any nature or suspension by the Department of professional Regulation or any other regulatory agency or professional association within the last five (5) years.

**BID PREPARATION COSTS:** Neither the COUNTY nor its representatives shall be liable for any expenses incurred in connection with preparation of a response to this Bid. Bidders should prepare their bids simply and economically, providing a straightforward and concise description of the Bidder's ability to meet the requirements of the Bid.

**ACCURACY OF BID INFORMATION**: Any Bidder which submits in it's bid to the COUNTY any information which is determined to be substantially inaccurate, misleading, exaggerated, or incorrect, shall be disqualified from consideration.

**INSURANCE:** Misrepresentation of any material fact, whether intentional or not, regarding the Bidder's insurance coverage, policies or capabilities may be grounds for rejection of the bid and rescission of any ensuing contract. **Copy of the insurance certificate shall be furnished to the County prior to commencement of Work.**

**LICENSES:** Bidders, both corporate and individual, must be fully licensed and certified for the type of work to be performed in the **State of Florida** at the time of submittal of Bid. Should the Bidder not be fully licensed and certified, its bid shall be rejected. Any permits, licenses, or fees required shall be the responsibility of the Bidder. No separate or additional payment will be made for these costs. Adherence to all applicable code regulations, Federal, State, County, City, etc., are the responsibility of the Bidder.

**POSTING OF BID AWARD**: Recommendation for award will be posted for review by interested parties at the Purchasing Division bulletin board and the County's Web Page (www.seminolecountyfl.gov) prior to submission through the appropriate approval process. Failure to file protest to the Purchasing Manager within the time prescribed in the COUNTY's Purchasing Code and Procedures shall constitute a waiver of proceedings.

**PUBLIC RECORDS**: Upon award recommendation or ten (10) days after opening, bids become "public records" and shall be subject to public disclosure consistent with Chapter 119, Florida Statutes. Bidders must invoke the exemptions to disclosure provided by law in the response to the Bid, and must identify the data or other materials to be protected, and must state the reasons why such exclusion from public disclosure is necessary.

**PROHIBITION AGAINST CONTINGENT FEES**: It shall be unethical for a person to be retained, or to retain any company or person, other than a bonafide employee working solely for the Consultant to solicit or secure this Agreement and that it has not paid or agreed to pay any person, company, corporation, individual or firm, other than a bonafide employee working solely for the SERVICE PROVIDER, any fee, commission, percentage, gift, or other consideration contingent upon or resulting from award or making of this Agreement. For the breach or violation of this provision, the COUNTY shall have the right to terminate the Agreement at its sole discretion, without liability and to deduct from the Agreement price, or otherwise recover, the full amount of such fee, commission, percentage, gift, or consideration.

**ACCEPTANCE / REJECTION**: Seminole County reserves the right to accept or reject any or all bids and to make the award to those Bidders, who in the opinion of the County will be in the best interest of and/or the most advantageous to the County. Seminole County also reserves the right to reject the bid of any vendor who has previously failed in the proper performance of an award or to deliver on time contracts of a similar nature or who, in the County's opinion, is not in a position to perform properly under this award. Seminole County reserves the right to inspect all facilities of Bidders in order to make a determination as to the foregoing. Seminole

County reserves the right to waive any irregularities, informalities, and technicalities and may, at its discretion, request a re-procurement.

**ADDITIONAL TERMS AND CONDITIONS:** Unless expressly accepted by the County, only the terms and conditions in this document shall apply: No additional terms and conditions included with the bid response shall be considered. Any and all such additional terms and conditions shall have no force and effect, and are inapplicable to this bid if submitted either purposely through intent or design, or inadvertently appearing separately in transmittal letters, specifications, literature, price lists or warranties. It is understood and agreed that the general and/or any special conditions in these Bid Documents are the only conditions applicable to this bid and the Bidder's authorized signature on the Bid Response Form attests to this. Exceptions to the terms and conditions will not be accepted.

**RESPONSIBILITY:** A Bidder must have at the time of bid opening, a manufacturing plant in operation, or be a fully authorized agent or representative of the product bid, and capable of producing or providing the items bid, and follow-up parts and service, including any warranty services as applicable, and so provide such certification upon request. The County reserves the right, before award, to require a Bidder to submit such evidence of his qualifications as it may deem necessary, and may consider any evidence available such as financial, technical, and other qualifications and abilities of the Bidder, including past performance (experience) with the County. This information will be used to determine the Bidder's responsibility.

**BIDS TO REMAIN FIRM.** All Bids shall remain firm for one (1) year after the day of the Bid opening. Extensions of time when Bids shall remain opened beyond the one year period may be made only by mutual agreement between Seminole County and the Selected Bidder

**PURCHASING CODE:** The Purchasing Code and Procedures apply in its entirety with respect to this Bid.

**AFFIRMATION:** By submission of a bid, Bidder affirms that his/her bid is made without prior understanding, agreement or connection with any corporation, firm, or person submitting a bid for the same materials, supplies, equipment or services, and is all respects fair and without collusion or fraud. Bidder agrees to abide by all conditions of this Invitation for Bid and the resulting contract.

**MISTAKES IN BID:** Bidders are expected to examine the terms and conditions, specifications, delivery schedule, bid prices, extensions and all instructions pertaining to supplies and services. Failure to do so will be at Bidder's risk. In the event of extension error(s), the unit price will prevail and the Bidder's total offer will be corrected accordingly. Written amounts shall take precedence over numerical amounts. In the event of addition errors(s), the unit price, and extension thereof, will prevail and the Bidder's total offer will be corrected accordingly. Bids having erasures or corrections must be initialed in ink by the Bidder.

**DISQUALIFICATION OF BIDDER:** More than one bid from an individual, firm, partnership, corporation, or association under the same or different names will not be considered. Reasonable grounds for believing that a Bidder is involved in more than one bid submittal will be cause for rejection of all bids in which such Bidders are believed to be involved. Any or all bids will be rejected if there is reason to believe that collusion exists between Bidders. Bids in which the prices obviously are unbalanced will be subject to rejection.

**METHOD OF ORDERING**. Authorization for performance of services/delivery by the Contractor under this agreement shall be in the form of written Purchase Order(s) issued and executed by the County.

**USE OF TRADE NAMES:** Specifications used are intended to be open and non-restrictive. Any reference to brand name or number shall not be construed as restricting to that manufacturer, but is used as a minimum standard of quality. When no reference or change is made on the bid by a Bidder, it is understood that the specific brand item named on the Bid shall be furnished by the Bidder. If proposing on other than the make, model, brand or number as shown, and offered as an equal, complete technical information, specifications manufacturer's name and catalog reference must be clearly stated on the Bid Response or attach letter. Any deviation between brand offered and brand specified must also be clearly indicated.

**GOVERNMENTAL RESTRICTIONS:** In the event that any governmental restrictions are imposed which would necessitate alteration of the material quality, workmanship or performance of the items offered on this bid prior to their delivery, it shall be the responsibility of the Bidder to notify the Purchasing and Contracts Division at once, indicating in his/her letter the specific regulation which required an alteration, including any price adjustments occasioned thereby. The County reserves the right to accept such alteration or to cancel the contract or purchase order at no further expense to the County.

## Section 3 –
## Instructions for the preparation of Bids

The Bidder(s) warrants its response to this Invitation for Bid to be fully disclosed and correct. The firm must submit a bid complying with this Invitation for Bid, and the information, documents and material submitted in the bid must be complete and accurate in all material aspects.

Bidders are advised to carefully follow the instructions listed below in order to be considered fully responsive to this Bid. Bidders are further advised that lengthy or overly verbose or redundant submissions are not necessary. Compliance with all requirements will be solely the responsibility of the Bidder. Failure to provide requested information may result in disqualification of response.

The bid must be divided into three (3) sections with references to parts of this Bid done on a section number/paragraph number basis. The three (3) sections shall be named:

1. Required Submittals
2. Past Performance
3. Price Proposal

### 1. REQUIRED SUBMITTALS:

***Invitation for Bid – Page #1 of Package***

- Name of Individual, Partnership, Company, or Corporation submitting bid;
- Signature(s) or representative(s) legally authorized to bind the Bidder.
- Address, Telephone Number, Fax Number and all required information.

***Summary of Litigation****:* Provide a summary of any litigation, claim(s), or contract dispute(s) filed by or against the Bidder in the past five (5) years which is related to the services that Bidder provides in the regular course of business. The summary shall state the nature of the litigation, claim or contract dispute, a brief description of the case, the outcome or projected outcome, and monetary amounts involved.

***License Sanctions****:* List any regulatory or license agency sanctions within the past 5 years.

***Bidder's Certification****:* Complete the "Bidder's Certification Form" included in this bid package as indicated.

***Conflict of Interest Statement****:* Complete the "Conflict of Interest Statement" included in this bid package as indicated.

***Compliance with the Public Records Law:*** Complete form included in this package.

## 2. PAST PERFORMANCE:

The Bidder shall include qualifications and past performance of the firm/individual(s) who will provide the services, including resumes. The submission must include:

A. List five (5) references for which your company provided similar services related to those specified in the Scope of Services. List the names of the client (name, address, telephone number, fax numbers and brief description of services provided).

## 3. PRICE BID

The Price Proposal shall use the Price Proposal forms included in the Bid Documents. Price Bids not submitted on the attached form shall render the Bid unresponsive.

## Section 4 –
## Price Submittal

PROJECT: **PURCHASE AND INSTALLATION OF GENERATORS**
COUNTY CONTRACT NO. **BID-2000-04/JVP**

Name of Bidder: _____

Mailing Address: _____

Street Address: _____

City/State/Zip: _____

Phone Number: (_____) _____

FAX Number: (_____) _____

Pursuant to and in compliance with the Invitation for Bid, Instructions to Bidders, and the other documents relating thereto, the undersigned Bidder, having familiarized himself with the terms of the Contract Documents, local conditions delivery of equipment, hereby proposes and agrees to deliver required equipment in connection with the required needs, all in strict conformity Bid Documents, including Addenda, if any, Nos. _____ through_____, on file at the Purchasing and Contracts Division for the amount hereinafter set forth.

The undersigned, as Bidder, declares that the only persons or parties interested in this bid as principals are those named herein; that this bid is made without collusion with any person, firm or corporation; and he proposes and agrees, if the bid is accepted, that he/she will execute an Agreement with the COUNTY in the form set forth in the Contract Documents; that he/she will furnish the Insurance Certificates.

**SUBTOTAL AMOUNT OF BID FOR FIRE STATION #12 (as per specifications): $ _____**

**SUBTOTAL AMOUNT OF BID FOR FIRE STATION #14(as per specifications): $ _____**

**TOTAL AMOUNT OF BID: $ _____**

IN WITNESS WHEREOF, BIDDER has hereunto executed this BID FORM this _____ day of _____, 2004.

_____ (Name of BIDDER)

_____ (Signature of person signing this BID FORM)

_____ (Printed name of person signing this BID FORM)

_____ (Title of person signing this BID FORM)

## Attachment A
## Conflict of Interest Statement

**STATE OF FLORIDA )**
**) ss**
**COUNTY OF _____ )**

Before me, the undersigned authority, personally appeared _____, who was duly sworn, deposes, and states:

1. I am the _____ of _____ with a local office in _____ and principal office in _____.
2. The above named entity is submitting an Expression of Interest for the Seminole County project described as ***Bid-2000-04/JVP – Purchase and Installation of Generators***

3. The Affiant has made diligent inquiry and provides the information contained in this Affidavit based upon his own knowledge.
4. The Affiant states that only one submittal for the above project is being submitted and that the above named entity has no financial interest in other entities submitting bids for the same project.
5. Neither the Affiant nor the above named entity has directly or indirectly entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free competitive pricing in connection with the entity's submittal for the above project. This statement restricts the discussion of pricing data until the completion of negotiations and execution of the Agreement for this project.
6. Neither the entity nor its affiliates, nor any one associated with them, is presently suspended or otherwise ineligible from participating in contract lettings by any local, state, or federal agency.
7. Neither the entity, nor its affiliates, nor any one associated with them have any potential conflict of interest due to any other clients, contracts, or property interests for this project.
8. I certify that no member of the entity's ownership, management, or staff has a vested interest in any aspect of or Department of Seminole County.
9. I certify that no member of the entity's ownership or management is presently applying for an employee position or actively seeking an elected position with Seminole County.
10. In the event that a conflict of interest is identified in the provision of services, I, on behalf of the above named entity, will immediately notify Seminole County in writing.

**DATED** this _____ day of _____, 20_____.

_____ Typed
Name of Affiant

_____
Title

**Sworn to and subscribed before me this _____ day of _____, 20_____.**

**Personally known**_____ _____

**OR Produced identification**_____ **Notary Public - State of** _____

_____ **My commission expires**_____
**(Type of identification)**

_____
**(Printed typed or stamped commissioned name of notary public)**

## Attachment B
## Compliance with the Public Records Law

Upon award recommendation or ten (10) days after opening, submittals become "public records" and shall be subject to public disclosure consistent with Chapter 119, Florida Statutes. Bidders must invoke the exemptions to disclosure provided by law in the response to the solicitation, and must identify the data or other materials to be protected, and must state the reasons why such exclusion from public disclosure is necessary. The submission of a bid authorizes release of your firm's credit data to Seminole County.

If the company submits information exempt from public disclosure, the company must identify with specificity which pages/paragraphs of their bid/bid package are exempt from the Public Records Act, identifying the specific exemption section that applies to each. The protected information must be submitted to the County in a separate envelope marked accordingly.

By submitting a response to this solicitation, the company agrees to defend the County in the event we are forced to litigate the public records status of the company's documents.

Company Name: _____

Authorized representative (printed): _____

Authorized representative (signature): _____

Date: _____

Project Number: Bid-2000-04/JVP

THIS FORM MUST BE COMPLETED AND RETURNED WITH YOUR BID

## Attachment C
## BIDDER'S CERTIFICATION

I have carefully examined the Invitation for Bid, Instructions to Bidders, General and/or Special Conditions, Vendor's Notes, Specifications, proposed agreement and any other documents accompanying or made a part of this Bid Documents.

I hereby propose to furnish the goods or services specified in the Invitation for Bid at the prices, rates or discounts quoted in my bid. I agree that my submittal will remain firm for a period of up to one hundred twenty (120) days in order to allow the County adequate time to evaluate the bids.

I agree to abide by all conditions of this proposal and understand that a background investigation may be conducted by the Seminole County Sheriff's Department prior to award.

I certify that all information contained in this bid is truthful to the best of my knowledge and belief. I further certify that I am duly authorized to submit this bid on behalf of the vendor/contractor as its act and deed and that the vendor/contractor is ready, willing and able to perform if awarded the contract.

I further certify, under oath, that this bid is made without prior understanding, agreement, connection, discussion, or collusion with any other person, firm or corporation submitting a proposal for the same product or service; no officer, employee or agent of the Seminole County Government or of any other Bidder interested in said proposal; and that the undersigned executed this Bidder's Certification with full knowledge and understanding of the matters therein contained and was duly authorized to do so.

Name of Business

By:

_____
Signature

_____
Name & Title, Typed or Printed

_____
Mailing Address

_____
City, State, Zip Code

(___)_____
Telephone Number

Sworn to and subscribed before me

This _____ day of

_____ 20____

_____
Signature of Notary

Notary Public, State of _____

Personally Known
-OR-
Produced Identification _____

Type:_____

# Exhibit "A"

### System Specification for Fire Station 12

**SPECIFICATIONS: PACKAGED ELECTRIC SYSTEM**

1) **Scope of Work**

a) This section shall consist of providing a packaged electrical system and associated controls with all required accessories as specified and shown on the plans. The equipment supplier must be the authorized distributor for each component of the products specified herein. The work includes the furnishing of all labor, materials, equipment, test, and training to provide a complete and workable power system, including the generator set and generator set controls, and the transfer switch and transfer switch controls, and installation as shown on the plans, drawings, and specifications herein. It is the intent of these specifications to have a single source responsibility for the generator set, transfer switch and complete installation. The supplier or suppliers contractor will be responsible for all unloading, setting the generator in the agreed location, all permitting and meet all local electrical, and building codes for a turn key installation. The best location of the generator set on the fire station property will be the decision of the Department of Public Safety of Seminole County in agreement with the chosen supplier.
b) The county will supply all fuel for testing and operation of the system.
c) Any and all exceptions to the published specifications shall be subject to the approval.
d) The power system shall be finished by a single manufacturer who shall be responsible for the design, coordination, and testing of the complete system. The entire system shall be installed as shown on the plans, drawings, and specifications herein.
e) The equipment shall be produced by a manufacturer who has produced this type of equipment for a period of at least 10 years and who maintains a service organization available twenty-four hours a day throughout the year.
f) The equipment shall be produced by a manufacturer who is ISO 9001 certified for the design, development, production, installation, and service of the their complete product line.

2) **General Requirements**

a) It is the intent of this specification to secure an electrical power system that has been tested during design verification, production and at the final job site. All finished equipment shall be of the lasted commercial design and will be complete with all of the necessary accessories for complete installation as shown on the plans, drawings, and specifications herein. The equipment supplied and installed shall meet the requirements of the National Electrical Code, along with all applicable local codes and regulations. All equipment shall be new and of current production of a national firm that manufactures generator sets and controls, transfer switches, switchgear, and assembles them as a complete and coordinated system. There will be one source responsibility for warranty, parts, and service through a local representative with factory-trained servicemen.

**3) Related Documents**

a) The following specification section apply to all work herein:
   i) Section 16231 - Generator Set
   ii) Section 16415 - Transfer Switch

END SECTION GENERAL

SECTION 16231

SPECIFICATIONS: GENERATOR SET

1) **Submittal**

a) The submittal shall include prototype test certification and specification sheets showing all standard and optional accessories to be supplied, schematic wiring diagrams, dimension drawings, and interconnection diagrams identifying by terminal number, each required interconnection between the generator set, the transfer switch. 2 sets of these submittals will be submitted with the bid documents for the County's review after the bid opening.

*2) **Codes and Standards***

**a) The generator set shall conform to the requirements of the following codes and standards:**

i) EN55011, Limits and Methods of Measurement of Radio Interference Characteristics of Industrial, Scientific and Medical Equipment.

ii) IEEE446 – Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications

iii) NFPA70 – National Electrical Code. Equipment shall be suitable for use in systems in compliance to Article 700, 701, and 702.

iv) NFPA110 – Emergency and Standby Power Systems. The generator set shall meet all requirements for Level 1 systems. Level 1prototype tests required by this standard shall have been performed on a complete and functional unit, component level type tests will not substitute for this requirement.

v) UL2200. The genset shall be listed to UL2200 or submit to an independent third party certification process to verify compliance as installed

3) **Testing**

a) To assure that the equipment has been designed and built to the highest reliability and quality standards, the manufacturer and/or local representative shall be responsible for three separate tests: design prototype tests, final production tests, and site tests.

i) Design Prototype Tests: Components of the emergency system such as the engine/generator set, transfer switch, and accessories shall not be subjected to prototype tests since the tests are potentially damaging. Rather, similar design prototypes and preproduction models, which will not be sold, shall have been used for the following tests.

(1) Maximum power (kW).

(2) Maximum motor starting (kVA) at 35% instantaneous voltage dip.

(3) Alternator temperature rise by embedded thermocouple and/or by resistance method per NEMA MG1-22.40 and 16.40.

(4) Governor speed regulation under steady-state and transient conditions.

(5) Voltage regulation and generator transient response.

(6) Fuel consumption at 1/4, 1/2, 3/4, and full load.

(7) Harmonic analysis, voltage waveform deviation, and telephone influence factor.

(8) Three-phase short circuit tests.

(9) Alternator cooling air flow.

(10) Torsional analysis to verify that the generator set is free of harmful torsional stresses.

(11) Endurance testing.

b) **Production Tests**

i) Final Production Tests: Each generator set shall be tested under varying loads with guards and exhaust system in place. Tests shall include:

ii) Single-step load pickup.

iii) Transient and steady—state governing.

iv) Safety shutdown device testing.

v) Voltage regulation.

vi) Rated Power @ 0.8 PF

vii) Maximum Power.

viii) Upon request, arrangements to either witness this test will be made, or a certified test record will be sent prior to shipment.

c) **Site Tests**

i) Site Tests: An installation check, start-up, and building load test shall be performed by the manufacturer's local representative. The County, regular operators, and the maintenance staff shall be notified of the time and date of the site test. The tests shall include:

ii) Fuel, lubricating oil, and antifreeze shall be checked for conformity to the manufacturer's recommendations, under the environmental conditions present and expected.

iii) Accessories that normally function while the set is standing by shall be checked prior to cranking the engine. These shall include: block heaters, battery charger, generator strip heaters, remote annunciator, etc.

iv) Start-up under test mode to check for exhaust leaks, path of exhaust gases outside the building, cooling air flow, movement during starting and stopping, vibration during running, normal and emergency line-to-line voltage and frequency, and phase rotation.

v) Automatic start-up by means of simulated power outage to test remote- automatic starting, transfer of the load, and automatic shutdown. Prior to this test, all transfer switch timers shall be adjusted for proper system coordination. Engine coolant temperature, oil pressure, and battery charge level along with generator voltage, amperes, and frequency shall be monitored throughout the test. An external load bank shall be connected to the system if sufficient building load is unavailable to load the generator to the nameplate kW rating for 4 hours. The load will be applied and test results documented for the county per NFPA 110 Section 5-13.

4) **Warranty & Maintenance**

a) A Two year basic extended warranty for the generator set shall be included to guarantee against defective material and workmanship in accordance with the manufacturer's published warranty from date of start-up. Optional warranties shall be available upon request.

b) The generator set manufacturer and its distributor shall maintain a 24-hour parts and service organization.

5) **Equipment**

a) The generator set shall be a Detroit Diesel / MTU model 80DSEJB. It shall provide 80 kW, 100 kVA when operating at 120/240 volts, 3 phase @ .8 power factor. The generator set shall be capable of this rating while operating in an ambient condition of 77°F (59.2°C) and 5000 feet above sea level.

b) The generator set shall be capable of starting required motor loads with a maximum voltage dip of 35%.

c) Vibration isolators shall be provided between the engine-generator and heavy-duty steel base

6) **Engine**

a) The 276 cubic-inch-displacement engine shall deliver a minimum of 134 hp at a governed speed of 1800 rpm. The engine shall be equipped with the following:

i) A mechanical governor capable of +0.33% steady-state frequency regulation.

ii) 12 Volt positive engagement solenoid shift-starting motor.

iii) 55-Ampere minimum automatic battery charging alternator with solid-state voltage regulation.

iv) Positive displacement, full pressure lubrication oil pump, cartridge oil filters, dipstick, and oil drain.

v) Dry-type replaceable air cleaner elements for normal applications.

vi) Engine-driven or electric fuel transfer pump capable of lifting fuel 3 feet, fuel filters, and electric solenoid fuel shut-off valve.

b) The turbocharged engine shall be fueled with No. 2 diesel

c) The engine shall have a minimum of 4 cylinders, and be liquid-cooled by a unit-mounted radiator, blower fan, water pump, and thermostats. This system shall properly cool the engine with up to 0.5 inches H20 static pressure on the fan in an ambient temperature up to 122F/50C.

d) The engine shall be EPA certified

7) **Generator**

a) The alternator shall be salient-pole, brushless, 12-lead reconnectable, self-ventilated of drip-proof construction with amortisseur rotor windings and skewed stator for smooth voltage waveform. The insulation shall meet the NEMA standard (MG1-22.40 and 16.40) for Class H and be insulated with epoxy varnish to be fungus resistant per MIL 1-24092. Temperature rise of the rotor and stator shall be limited to 130°C. The excitation system shall be of brushless construction controlled by a solid- state voltage regulator capable of maintaining voltage within +/- 2% at any constant load from 0% to 100% of rating. The regulator must be isolated to prevent tracking when connected to SCR loads, and provide individual adjustments for voltage range, stability and volts-per-hertz operations; and be protected from the environment by conformal coating.

b) The generator set shall meet the transient performance requirements of ISO 8528-5, level G-2.

c) The alternator excitation shall be of a permanent magnet exciter design.

d) The generator shall be inherently capable of sustaining at least 250% of rated current for at least 10 seconds under a 3-phase symmetrical short circuit without the addition of separate current support devices.

e) The generator, having a single maintenance-free bearing, shall be directly connected to the flywheel housing with a semi-flexible coupling between the rotor and the flywheel.

**8) Controller**

a) Set-mounted controller capable of facing right, left, or rear, shall be vibration isolated on the generator enclosure. The controller shall be capable of being remote-mounted. The microprocessor control board shall be moisture proof and capable of operation from -40$^{o}$C to 85$^{o}$C. Relays will only be acceptable in high-current circuits.

b) Circuitry shall be of plug-in design for quick replacement. Controller shall be equipped to accept a plug-in device capable of allowing maintenance personnel to test controller performance without operating the engine. The controller shall include the following features:

i) Fused DC circuit.

ii) Complete 2-wire start/stop control, which shall operate on closure of a remote contact.

iii) Speed sensing and a second independent starter motor disengagement systems shall protect against starter engagement with a moving flywheel. Battery charging alternator voltage will not be acceptable for this purpose.

iv) The starting system shall be designed for restarting in the event of a false engine start, by permitting the engine to completely stop and then re-engage the starter.

v) Cranking cycler with 15-second ON and OFF cranking periods.

vi) Over crank protection designed to open the cranking circuit after 75 seconds if the engine fails to start.

vii) Circuitry to shut down the engine when signal for high coolant temperature, low oil pressure, or over speed are received.

viii) Engine cooldown timer factory set at 5 minutes to permit unloaded running of the standby set after transfer of the load to normal.

ix) 3-position (Automatic-OFF-TEST) selector switch. In the TEST position, the engine shall start and run regardless of the position of the remote starting contacts. In the Automatic position, the engine shall start when contacts in the remote control circuit close and stop 5 minutes after those contacts open. In the OFF position, the engine shall not start even though the remote start contacts close. This position shall also provide for immediate shutdown in case of an emergency. Reset of any fault shall also be accomplished by putting the switch to the OFF position.

x) Alarm horn with silencer switch per NFPA 110.

c) Standard indicating lights to signal the following shall be included:

i) Not-in-Auto (flashing red)
ii) Overcrank (red)
iii) Emergency Stop (red)
iv) High Engine Temperature (red)
v) Overspeed (red)
vi) Low Oil Pressure (red)
vii) Battery Charger Malfunction (red)
viii) Low Battery Voltage (red)
ix) Low Fuel (red)
x) Auxiliary Prealarm (yellow)
xi) Auxiliary Fault (red)
xii) System Ready (green)

d) Test button for indicating lights.

e) Terminals shall be provided for each indicating light above, plus additional terminals for common fault and common pre-alarm.

**9) Instrument Panel**

a) The instrument panel shall include the following:

i) Dual range voltmeter 2 1/2-inch, +/- 2% accuracy

ii) Dual range ammeter 2 1/2-inch, +/- 2% accuracy.

iii) Voltmeter-ammeter phase selector switch.

iv) Lights to indicate high or low meter scale.

v) Direct reading pointer-type frequency meter 2 1/2-inch, 0.5% accuracy, 45 to 65 Hz scale.

vi) Panel-illuminating lights.

vii) Battery charging voltmeter.

viii) Coolant temperature gauge.

ix) Oil pressure gauge.

x) Running-time meter.

xi) Voltage-adjust rheostat

10) **Accessories**

a) Line circuit breaker of 250 amperes @ 120/240 volts 3 phase, 600 volt rated, molded case type, generator mounted.

b) Engine block heater. Thermostatically controlled and sized to maintain manufacturers recommended engine coolant temperature to meet the start-up requirements of NFPA-110, Level 1.

c) A reset-table line current sensing circuit breaker with inverse time versus current response shall be furnished which protects the generator from damage due to its own high current capability. This breaker shall not trip within the 10 seconds specified above to allow selective tripping of down-stream fuses or circuit breakers under a fault condition. This breaker shall not automatically reset, preventing restoration of voltage if maintenance is being performed. a field current-sensing breaker will not be acceptable.

d) Weather housings shall be constructed of rugged galvanized steel or aluminum, with a powder coated baked paint inside and out and the exterior coat will be of the manufacturer's standard color. The enclosure will have easily removable and lockable doors which will have lift off hinges and corrosion proof hardware. The enclosure must be capable of housing all the equipment necessary to make the system operational excluding the fuel tank. The enclosure will include the proper venting and be sized for maximum cooling for the engine and alternator. A critical exhaust silencer as recommended by the manufacturer shall be included and either can be internally or externally mounted. If externally mounted the roof of the enclosure shall be capable of handling the weight of the silencer and mounting hardware.

e) Battery rack and battery cables, capable of holding the manufacturer's recommended batteries, shall be supplied.

f) 12-volt lead-antimony battery capable of delivering the manufacturer's recommended minimum cold-cranking Amps required at $0^{o}F$, per SAE Standard J-537, shall be supplied.

g) 10-Ampere automatic float and equalize battery charger with +/- 1% constant voltage regulation from no load to full load over +/-10% AC input line variation. Current limited during engine cranking and short circuit conditions, temperature compensated for ambient temperatures from $-40^{o}C$ to $+60^{o}C$, 5% accurate voltmeter and ammeter, fused, with reverse polarity and transient protected.

h) Two flexible fuel lines rated $300^{o}F$ and 100 psi ending in pipe thread.

i) Generator pre-alarm senders.

j) Generator skid end caps.

11) **Double Wall Secondary Containment Sub Base Fuel Tank**:

a) A sub base fuel tank used in conjunction with a diesel powered generator set of 80 kW rating will contain a minimum of 325 gallons of fuel to support the generator set for a period of 48 hours at 100% of rated load and 62 hours at 75% of rated load.

b) The sub base fuel system is listed under UL 142, sub section entitled Special Purpose Tanks EFVT category, and will bear their mark of UL Approval according to their particular classification.

c) The above ground steel secondary containment rectangular tank for use as a sub base for the diesel generator will be manufactured and installed in accordance with NFPA 30, NFPA 37 and Emergency and Standby Power Systems—NFPA 110.

d) Construction:
   i) Primary Tank

      (1) It will be rectangular in shape and constructed in clam shell fashion to ensure maximum structural integrity and allow the use of a full throat fillet weld.

   ii) Steel Channel Support System

      (1) Reinforced steel box channel for generator support, with a load rating of 5,000 lbs. per genset mounting hole location. Full height gussets at either end of channel and at genset mounting holes shall be utilized.

   iii) Exterior Finish

      (1) The exterior coating has been tested to withstand continuous salt spray testing at 100 percent exposure for 244 hours to a 5 percent salt solution at 92-97° F. The coating has been subjected to full exposure humidity testing to 100 percent humidity at 100° F for 24 hours. Tests are to be conducted in accordance with The American Standard Testing Methods Society.

e) Venting:

   i) Normal venting shall be sized in accordance with the American Petroleum Institute Standard No 2000, Venting Atmospheric and Low Pressure Storage Tanks not less than 1-1/4” (3 cm.) nominal inside diameter. A 1 -1/4" atmospheric mushroom cap shall be furnished and the installing contractor shall pipe above the highest fill point as a minimum

f) Emergency Venting

   i) The emergency vent opening shall be sized to accommodate the total capacity of both normal and emergency venting and shall be not less than that derived from NFPA 30, table 2-8, and based on the wetted surface area of the tank. The wetted area of the tank shall be calculated on the basis of 100 percent of the primary tank. A zinc plated emergency pressure relief vent cap shall be furnished for the primary tank. The vent is spring-pressure operated: opening pressure is 0.5/psig and full opening pressure is 2.5 psig. Limits are stamp marked on top of each vent. The

emergency relief vent is sized to accommodate the total venting capacity of both normal and emergency vents.

g) Fuel Fill:

i) There shall be a 2" NPT opening within the primary tank with an 8" raised fill pipe and lockable manual fill cap.

h) Fuel Level:

i) A direct reading, UL listed, magnetic fuel level gauge with a hermetically-sealed vacuum tested dial shall be provided to eliminate fogging.

i) Low Fuel Level & Leak Detector Switch

i) Consists of a 50 watt float switch for remote or local annunciation of a (50% standard) low fuel level condition.
ii) A fuel leak detector switch shall be installed between the primary and secondary tanks so as to detect a leak or rupture of the primary tank. This switch shall give a signal to a visual and audible alarm on the generator set controller or unit mounted leak detector panel.

j) 2 Sets of operators manuals with parts lists and exploded views of all equipment supplied.

END SECTION GENERATOR SET

SECTION 16415

SPECIFICATIONS: TRANSFER SWITCH

1) **Submittal**

a) The submittal shall include prototype test certification and specification sheets showing all standard and optional accessories to be supplied, schematic wiring diagrams, dimension drawings, and interconnection diagrams identifying by terminal number, each required interconnection between the generator set and the transfer switch if it is included elsewhere in these specifications.

2) **Testing**

a) To assure that the equipment has been designed and built to the highest reliability and quality standards, the manufacturer and/or local representative shall be responsible for three separate tests: design prototype tests, final production tests, and site tests.

i) Design Prototype Tests: Components of the emergency system such as the engine/generator set, transfer switch, and accessories shall not be subjected to prototype tests since the tests are potentially damaging. Rather, similar design prototypes and preproduction models, which will not be sold, shall have been used for the following tests.

b) **Production Tests**

i) Final Production Tests: Each transfer switch shall be tested under load with all guards in place. Tests shall include:

(1) The complete automatic transfer switch shall be tested to ensure proper operation of the individual components and correct overall sequence of operation and to ensure that the operating transfer time, voltage, frequency, and time delay settings are in compliance with the specification requirements.

(2) The complete automatic transfer switch shall be subjected to a dielectric strength test per NEMA Standard ICS 1-109.05.

(3) The control panel shall meet or exceed the voltage surge withstand capability in accordance with ANSI C37.90a-2978 and the impulse withstand voltage test in accordance with NEMA Standard ICS 1-109.

ii) Upon request, arrangements to either witness this test will be made, or a certified test record will be sent prior to shipment.

c) **Site Tests**

i) Site Tests: The manufacturer's local representative shall perform an installation check, start-up, and building load test. The engineer, regular operators, and the maintenance staff shall be notified of the time and date of the site test.

3) **Warranty & Maintenance**

a) A two year basic extended warranty for the automatic transfer switch shall be included to guaranteed against defective material and workmanship in accordance with the manufacturer's published warranty from date of start-up. Optional warranties shall be available upon request.

b) The automatic transfer switch manufacturer and its distributor shall maintain a 24-hour parts and service organization. This organization shall be regularly engaged in a maintenance contract program to perform preventive maintenance and service on equipment similar to that specified

4) **Compliance With Codes and Standards**

a) The ATS shall conform to the requirements of:

i) UL 1008--Standard for Automatic Transfer Switches

ii) NFPA 70--National Electrical Code, including use in emergency and standby systems in accordance with Articles 517, 700

iii) NFPA 110--Standard for Emergency and Standby Power Systems

iv) NEMA Standard IC10 (formerly ICS 2-447) Automatic Transfer Switches.

v) EN61000-4-5 Surge Immunity Class 4 (voltage sensing and programmable inputs only)

5) **Electrical Requirements**

a) Automatic transfer switches not intended for continuous duty or repetitive load transfer switching are not acceptable.

b) The automatic transfer switch shall be rated in amperes for total system transfer including control of motors, electric-discharge lamps, electric heating, and tungsten-filament lamp load. Switches rated 400 amperes and below shall be suitable for 100% tungsten-filament lamp load. Switches rated above 400 amperes shall be suitable for 30% tungsten-filament load.

c) The automatic transfer switch shall be rated to withstand the rms symmetrical short circuit current available at the automatic transfer switch terminals, with the type of overcurrent protection shown on the plans.

6) **Equipment**

a) The automatic transfer switch shall be a Detroit Diesel / MTU model SCT-AFTC-0800S.

b) The transfer switch shall have the following characteristics:

i) 800 amp current rating

ii) 3 Pole

iii) 4 wire, 3 phase

iv) 240 Volt-60Hz

v) Solid Neutral

vi) The withstand and closing ratings with a current-limiting fuse shall be 200,000 Amps

vii) The withstand and closing ratings with any overcurrent protective device shall be 65,000 Amps

c) The ATS shall be furnished in a NEMA 3R enclosure.

d) The switch shall be a 600 volt class.

7) **Mechanical Requirements**

a) All main contacts shall be of silver composition. The main contacts shall be protected by arcing contacts in sizes 400 amperes and above. The main contacts shall be of the blow-on configuration and of segmented construction in ratings 600 amperes and above.

b) All contacts, coils, springs, and control elements shall be conveniently removable from the front of the transfer switch without major disassembly or disconnection of power conductors.

c) The contact transfer time shall not exceed one-sixth of a second.

d) All moveable parts of the operating mechanism shall remain in positive mechanical contact with the main contacts during the transfer operation without the use of separate mechanical interlocks.

e) All contacts, coils, springs, and control elements shall be conveniently removable from the front of the transfer switch without major disassembly or disconnection of power conductors.

f) The neutral conductor shall be solidly connected as shown on the plans, a neutral conductor terminal plate with fully rated AL-CU pressure connectors shall be provided.

8) **Transfer Switch Control System**

a) The control module shall direct the operation of the transfer switch. The module's sensing and logic shall be a built-in microprocessor-based system for maximum reliability, minimum maintenance, and inherent digital communications capability. The control settings shall be stored in nonvolatile EEPROM. The module shall contain an integral battery-backed programmable clock and calendar. The control module shall have a keyed disconnect plug to enable the control module to be disconnected from the transfer mechanism for routine maintenance.

b) The control module shall be mounted separately from the transfer mechanism unit for safety and ease of maintenance. Interfacing relays shall be industrial control grade plug-in type with dust cover.

c) The control module shall include a user interface keypad with tactile feedback pushbuttons and light-emitting diode status indication. These features shall be user accessible when the enclosure door is closed:

i) Keypad pushbuttons:
   (1) Start/end system test
   (2) Set/end exercise
   (3) End time delay
   (4) Lamp test/service reset

ii) Light-emitting diode status indicators:
   (1) Contactor Position: Normal, Off, Emergency
   (2) Source Available: Normal, Emergency
   (3) Service required: immediate, maintenance
   (4) Not in automatic mode
   (5) Four stage time delay remaining
   (6) Exercise: load, no load, set/disabled
   (7) Test: load, no load
   (8) Load control active: peak shave, load shed, pre/post-transfer signal
   (9) In-phase monitor active

d) Outputs:

i) Generator engine start gold flashed contact rated 2 amps @ 30 VDC/250VAC.
ii) Pre-transfer load control, one normally open contact rated 10 amps @ 30 VDC/250 VAC
iii) One Programmable output, factory-set to load bank control rated 2 amps @ 30 VDC/250 VAC.

9) **Operation**

a) All phases of normal and all phases of emergency shall be monitored for over and under voltage and single phase of normal and emergency for over- and under-frequency. In addition, the controller shall use anti-single phasing protection that detects regenerative voltage (using the phase angle of the source) to determine a failed source condition.

b) Voltage and frequency sensing:

i) Undervoltage pick-up set at 90% of nominal voltage, adjustable 85% - 100% of nominal voltage.

ii) Undervoltage dropout set at 90% of pickup voltage, adjustable 75% - 98% of pickup voltage.

iii) Overvoltage dropout set at 110% of nominal voltage, adjustable 105% - 135% of nominal voltage.

iv) Overvoltage pick-up set at 95% of dropout voltage, adjustable 85% - 100% of nominal voltage.

v) Voltage dropout time set at 0.5 seconds adjustable 0.1 – 9.9 seconds.

vi) Voltage accuracy: 2%.

vii) Under frequency pick-up set at 90% of nominal frequency, adjustable 85% - 95% of nominal frequency.

viii) Under frequency dropout set at 99% of pick-up frequency, adjustable 95% - 99% of pick-up frequency.

ix) Over frequency dropout set at 101% of pick-up frequency, adjustable 101% - 105% of nominal frequency.

x) Over frequency pick-up set at 110% of nominal frequency, adjustable 105% - 120% of nominal frequency.

xi) Frequency accuracy: 1%

c) Time Delays:

i) Time delay for engine start to delay initiation of transfer for momentary source outages: Range 0-6 seconds. Factory set at 3 seconds.

ii) Time delay for transfer to standby: Range 0-60 minutes. Factory set at 1 second.

iii) Time delay for transfer back to normal: Range 0-60 minutes. Factory set at 15 minutes.

iv) Time delay for engine cool down: Range 0-60 minutes. Factory set at 0 minutes.

v) Failure to acquire standby source: Range 0-60 minutes. Factory set at 1 minute.

vi) Pre-transfer to normal signal: Range 0-60 minutes. Factory set at 3 second.

vii) Pre-transfer to standby signal: Range 0-60 minutes. Factory set at 3 second.

viii) Post-transfer to normal signal: Range 0-60 minutes. Factory set at 0 minute.

ix) Post-transfer to standby signal: Range 0-60 minutes. Factory set at 0 minute.

d) User terminals shall be available to connect a normally open contact that, when closed, signals the control module to start and transfer load to the engine-generator. Opening these contacts shall initiate a retransfer and engine cool down sequence. The load shall be transferred to an available utility source immediately if the generator source should fail.

e) The following features shall be built into the control module logic. These features shall be enabled at the factory or in the field.

i) Phase rotation sensing programmable ABC or CBA.

ii) In-phase monitoring shall continuously monitor the contactor transfer times, source voltage, frequency and phase angle to provide a self-adjusting, zero crossing contactor transfer signal. A flashing LED on the user interface panel shall indicate active in-phase monitoring.

iii) Plant Exerciser: Programmable seven-day or fourteen-day exerciser with user selectable load or no-load operation. An LED, on the user interface, shall indicate the type of exercise (load or no load). The time remaining on the exercise shall be indicated. The exercise time may be reset at any time with a single keystroke. The engine shall be allowed to run when the exercise period is terminated. The exerciser may be disabled for maintenance purposes. An amber LED shall flash on the user interface if the exerciser has been disabled.

The exerciser shall have the capability of being programmed, using up to twenty-one (21) event for a calendar mode.

The controller shall have provisions for disconnecting a load bank (during exercise) if there is a loss of normal power.

iv) The controller must have the capability to communicate to a personal computer (IBM or compatible) running Windows 9X or Windows NT through an RS-232 communication format (in addition to the Modbus® connection).

v) The software shall be Windows® based

vi) The programming capability shall be password protected

f) It shall be possible to start the generator and transfer the loads to the generator.

g) Event monitoring shall be accessible using either a personal computer with the personal computer software to view the following:

i) Historical data (total and resettable)

(1) Days in operation
(2) Hours in standby
(3) Hours not in preferred
(4) Switch transfers
(5) Failure to transfer
(6) Transfers due to loss of preferred
(7) Start up date
(8) Last maintenance date
(9) Switch transfer count since last maintenance

ii) Transfer switch information

(1) ATS serial number
(2) Controller serial number
(3) Contactor serial number
(4) Load description
(5) Location
(6) Branch
(7) Network connection ID
(8) Baud rate
(9) Parity bit

iii) System events (time and date stamped) of the last 100 events which include all failures of the sources, transfer switch and all functions of the controller and contactor:

iv) Line to line voltage

v) System frequency

vi) Time delay active

vii) Time delay remaining

viii) System status

ix) Source available

x) Contactor position

xi) Exerciser schedule, mode and time remaining on active exercise.

h) Programmable features may be viewed, selected or adjusted as follows:

i) System voltage
ii) System frequency
iii) Single/three-phase operation
iv) Open/closed-transition operation
v) ABC or CBA phase rotation
vi) In-phase monitor
vii) Commit/no commit transfer mode
viii) User defined password

i) Programmable inputs shall be defined using either a personal computer with the personal computer software
i) End time delay input
ii) Inhibit transfer
iii) Low external battery fault
iv) Peak shave/area protection input
v) Remote common fault
vi) Remote test

j) Programmable outputs shall be defined using either a personal computer with the personal computer software

i) Auxiliary switch fault
ii) Common fault
iii) Contactor position
iv) Exercise active
v) Failure to acquire standby source
vi) Failure to transfer fault
vii) Generator engine start
viii) Load bank control
ix) Los of phase fault
x) Low backup battery
xi) No in automatic mode
xii) Non-emergency transfer
xiii) Over and undervoltage faults
xiv) Over and under frequency faults
xv) Peak shave/area protection active
xvi) Phase rotation error

xvii) Source available
xviii) Test active

## System Specification
## For Seminole County Fire Station #14
### SPECIFICATIONS: PACKAGED ELECTRIC SYSTEM
### SECTION 16050

1) **Scope of Work**

a) This section shall consist of providing a packaged electrical system and associated controls with all required accessories as specified and shown on the plans. The equipment supplier must be the authorized distributor for each component of the products specified herein. The work includes the furnishing of all labor, materials, equipment, test, and training to provide a complete and workable power system, including the generator set and generator set controls, and the transfer switch and transfer switch controls, and installation as shown on the plans, drawings, and specifications herein. It is the intent of these specifications to have a single source responsibility for the generator set, transfer switch and complete installation. The supplier or suppliers contractor will be responsible for unloading, setting the generator in the agreed location, all permitting and meet all local electrical, and building codes for a turn key installation. The best location of the generator set on the fire station property will be the decision of the Public Safety Division of Seminole County in agreement with the chosen supplier.
b) The county will supply all fuel for testing and operation of the system.
c) Any and all exceptions to the published specifications shall be subject to the approval.
d) The power system shall be finished by a single manufacturer who shall be responsible for the design, coordination, and testing of the complete system. The entire system shall be installed as shown on the plans, drawings, and specifications herein.
e) The equipment shall be produced by a manufacturer who has produced this type of equipment for a period of at least 10 years and who maintains a service organization available twenty-four hours a day throughout the year.
f) The equipment shall be produced by a manufacturer who is ISO 9001 certified for the design, development, production, installation, and service of the complete product line.

2) **General Requirements**

a) It is the intent of this specification to secure an electrical power system that has been tested during design verification, production and at the final job site. All finished equipment shall be of the lasted commercial design and will be complete with all of the necessary accessories for complete installation as shown on the plans, drawings, and specifications herein. The equipment supplied and installed shall meet the requirements of the National Electrical Code, along with all applicable local codes and regulations. All equipment shall be new and of current production of a national firm that manufactures generator sets and controls, transfer switches, switchgear, and assembles them as a complete and coordinated system. There will be one source responsibility for warranty, parts, and service through a local representative with factory-trained servicemen.

3) **Related Documents**

a) The following specification section apply to all work herein:
   i) Section 16231 - Generator Set
   ii) Section 16415 - Transfer Switch

END SECTION GENERAL

**SPECIFICATIONS: GENERATOR SET**
**SECTION 16231**

1) **Submittal**

a) The submittal shall include prototype test certification and specification sheets showing all standard and optional accessories to be supplied, schematic wiring diagrams, dimension drawings, and interconnection diagrams identifying by terminal number, each required interconnection between the generator set, the transfer switch. 2 sets of these submittals will be submitted with the bid documents for the County's review after the bid opening.

*2) **Codes and Standards***

**a) The generator set shall conform to the requirements of the following codes and standards:**

i) EN55011, Limits and Methods of Measurement of Radio Interference Characteristics of Industrial, Scientific and Medical Equipment.

ii) IEEE446 – Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications

iii) NFPA70 – National Electrical Code. Equipment shall be suitable for use in systems in compliance to Article 700, 701, and 702.

iv) NFPA110 – Emergency and Standby Power Systems. The generator set shall meet all requirements for Level 1 systems. Level 1prototype tests required by this standard shall have been performed on a complete and functional unit, component level type tests will not substitute for this requirement.

v) UL2200. The genset shall be listed to UL2200 or submit to an independent third party certification process to verify compliance as installed

3) **Testing**

a) To assure that the equipment has been designed and built to the highest reliability and quality standards, the manufacturer and/or local representative shall be responsible for three separate tests: design prototype tests, final production tests, and site tests.

i) Design Prototype Tests: Components of the emergency system such as the engine/generator set, transfer switch, and accessories shall not be subjected to prototype tests since the tests are potentially damaging. Rather, similar design prototypes and preproduction models, which will not be sold, shall have been used for the following tests.

(1) Maximum power (kW).

(2) Maximum motor starting (kVA) at 35% instantaneous voltage dip.

(3) Alternator temperature rise by embedded thermocouple and/or by resistance method per NEMA MG1-22.40 and 16.40.

(4) Governor speed regulation under steady-state and transient conditions.

(5) Voltage regulation and generator transient response.

(6) Fuel consumption at 1/4, 1/2, 3/4, and full load.

(7) Harmonic analysis, voltage waveform deviation, and telephone influence factor.

(8) Three-phase short circuit tests.

(9) Alternator cooling air flow.

(10) Torsional analysis to verify that the generator set is free of harmful torsional stresses.

(11) Endurance testing.

b) **Production Tests**

i) Final Production Tests: Each generator set shall be tested under varying loads with guards and exhaust system in place. Tests shall include:

ii) Single-step load pickup.

iii) Transient and steady—state governing.

iv) Safety shutdown device testing.

v) Voltage regulation.

vi) Rated Power @ 0.8 PF

vii) Maximum Power.

viii) Upon request, arrangements to either witness this test will be made, or a certified test record will be sent prior to shipment.

c) **Site Tests**

i) Site Tests: An installation check, start-up, and building load test shall be performed by the manufacturer's local representative. The County, regular operators, and the maintenance staff shall be notified of the time and date of the site test. The tests shall include:

ii) Fuel, lubricating oil, and antifreeze shall be checked for conformity to the manufacturer's recommendations, under the environmental conditions present and expected.

iii) Accessories that normally function while the set is standing by shall be checked prior to cranking the engine. These shall include: block heaters, battery charger, generator strip heaters, remote annunciator, etc.

iv) Start-up under test mode to check for exhaust leaks, path of exhaust gases outside the building, cooling air flow, movement during starting and stopping, vibration during running, normal and emergency line-to-line voltage and frequency, and phase rotation.

v) Automatic start-up by means of simulated power outage to test remote- automatic starting, transfer of the load, and automatic shutdown. Prior to this test, all transfer switch timers shall be adjusted for proper system coordination. Engine coolant temperature, oil pressure, and battery charge level along with generator voltage, amperes, and frequency shall be monitored throughout the test. An external load bank shall be connected to the system if sufficient building load is unavailable to load the generator to the nameplate kW rating for 4 hours. The load will be applied and test results documented for the county per NFPA 110 Section 5-13.

4) **Warranty & Maintenance**

a) A Two year basic extended warranty for the generator set shall be included to guarantee against defective material and workmanship in accordance with the manufacturer's published warranty from date of start-up. Optional warranties shall be available upon request.

b) The generator set manufacturer and its distributor shall maintain a 24-hour parts and service organization.

5) **Equipment**

a) The generator set shall be a Detroit Diesel / MTU model 60DSEJB. It shall provide 62 kW, 77.5 kVA when operating at 120/208 volts, 3 phase @ .8 power factor. The generator set shall be capable of this rating while operating in an ambient condition of 77°F (59.2°C) and 5000 feet above sea level.

b) The generator set shall be capable of starting required motor loads with a maximum voltage dip of 35%.

c) Vibration isolators shall be provided between the engine-generator and heavy-duty steel base

6) **Engine**

a) The 276 cubic-inch-displacement engine shall deliver a minimum of 94 hp at a governed speed of 1800 rpm. The engine shall be equipped with the following:

i) A mechanical governor capable of +0.33% steady-state frequency regulation.

ii) 12 Volt positive engagement solenoid shift-starting motor.

iii) 55-Ampere minimum automatic battery charging alternator with solid-state voltage regulation.

iv) Positive displacement, full pressure lubrication oil pump, cartridge oil filters, dipstick, and oil drain.

v) Dry-type replaceable air cleaner elements for normal applications.

vi) Engine-driven or electric fuel transfer pump capable of lifting fuel 3 feet, fuel filters, and electric solenoid fuel shut-off valve.

b) The turbocharged engine shall be fueled with No. 2 diesel

c) The engine shall have a minimum of 4 cylinders, and be liquid-cooled by a unit-mounted radiator, blower fan, water pump, and thermostats. This system shall properly cool the engine with up to 0.5 inches H20 static pressure on the fan in an ambient temperature up to 122F/50C.

d) The engine shall be EPA certified

7) **Generator**

a) The alternator shall be salient-pole, brushless, 12-lead reconnectable, self-ventilated of drip-proof construction with amortisseur rotor windings and skewed stator for smooth voltage waveform. The insulation shall meet the NEMA standard (MG1-22.40 and 16.40) for Class H and be insulated with epoxy varnish to be fungus resistant per MIL 1-24092. Temperature rise of the rotor and stator shall be limited to 130°C. The excitation system shall be of brushless construction controlled by a solid- state voltage regulator capable of maintaining voltage within +/- 2% at any constant load from 0% to 100% of rating. The regulator must be isolated to prevent tracking when connected to SCR loads, and provide individual adjustments for voltage range, stability and volts-per-hertz operations; and be protected from the environment by conformal coating.

b) The generator set shall meet the transient performance requirements of ISO 8528-5, level G-2.

c) The alternator excitation shall be of a permanent magnet exciter design.

d) The generator shall be inherently capable of sustaining at least 250% of rated current for at least 10 seconds under a 3-phase symmetrical short circuit without the addition of separate current support devices.

e) The generator, having a single maintenance-free bearing, shall be directly connected to the flywheel housing with a semi-flexible coupling between the rotor and the flywheel.

**8) Controller**

a) Set-mounted controller capable of facing right, left, or rear, shall be vibration isolated on the generator enclosure. The controller shall be capable of being remote-mounted. The microprocessor control board shall be moisture proof and capable of operation from -40$^{o}$C to 85$^{o}$C. Relays will only be acceptable in high-current circuits.

b) Circuitry shall be of plug-in design for quick replacement. Controller shall be equipped to accept a plug-in device capable of allowing maintenance personnel to test controller performance without operating the engine. The controller shall include the following features:

i) Fused DC circuit.

ii) Complete 2-wire start/stop control, which shall operate on closure of a remote contact.

iii) Speed sensing and a second independent starter motor disengagement systems shall protect against starter engagement with a moving flywheel. Battery charging alternator voltage will not be acceptable for this purpose.

iv) The starting system shall be designed for restarting in the event of a false engine start, by permitting the engine to completely stop and then re-engage the starter.

v) Cranking cycler with 15-second ON and OFF cranking periods.

vi) Overcrank protection designed to open the cranking circuit after 75 seconds if the engine fails to start.

vii) Circuitry to shut down the engine when signal for high coolant temperature, low oil pressure, or overspeed are received.

viii) Engine cooldown timer factory set at 5 minutes to permit unloaded running of the standby set after transfer of the load to normal.

ix) 3-position (Automatic-OFF-TEST) selector switch. In the TEST position, the engine shall start and run regardless of the position of the remote starting contacts. In the Automatic position, the engine shall start when contacts in the remote control circuit close and stop 5 minutes after those contacts open. In the OFF position, the engine shall not start even though the remote start contacts close. This position shall also provide for immediate shutdown in case of an emergency. Reset of any fault shall also be accomplished by putting the switch to the OFF position.

x) Alarm horn with silencer switch per NFPA 110.

c) Standard indicating lights to signal the following shall be included:

i) Not-in-Auto (flashing red)
ii) Overcrank (red)
iii) Emergency Stop (red)
iv) High Engine Temperature (red)
v) Overspeed (red)
vi) Low Oil Pressure (red)
vii) Battery Charger Malfunction (red)
viii) Low Battery Voltage (red)
ix) Low Fuel (red)
x) Auxiliary Prealarm (yellow)
xi) Auxiliary Fault (red)
xii) System Ready (green)

d) Test button for indicating lights.

e) Terminals shall be provided for each indicating light above, plus additional terminals for common fault and common pre-alarm.

**9) Instrument Panel**

a) The instrument panel shall include the following:

i) Dual range voltmeter 2 1/2-inch, +/- 2% accuracy

ii) Dual range ammeter 2 1/2-inch, +/- 2% accuracy.

iii) Voltmeter-ammeter phase selector switch.

iv) Lights to indicate high or low meter scale.

v) Direct reading pointer-type frequency meter 2 1/2-inch, 0.5% accuracy, 45 to 65 Hz scale.

vi) Panel-illuminating lights.

vii) Battery charging voltmeter.

viii) Coolant temperature gauge.

ix) Oil pressure gauge.

x) Running-time meter.

xi) Voltage-adjust rheostat

10) **Accessories**

a) Line circuit breaker of 200 amperes @ 120/240 volts 3 phase, 600 volt rated, molded case type, generator mounted.

b) Engine block heater. Thermostatically controlled and sized to maintain manufacturers recommended engine coolant temperature to meet the start-up requirements of NFPA-110, Level 1.

c) A reset table line current sensing circuit breaker with inverse time versus current response shall be furnished which protects the generator from damage due to its own high current capability. This breaker shall not trip within the 10 seconds specified above to allow selective tripping of down-stream fuses or circuit breakers under a fault condition. This breaker shall not automatically reset, preventing restoration of voltage if maintenance is being performed. a field current-sensing breaker will not be acceptable.

d) Weather housings shall be constructed of rugged galvanized steel or aluminum, with a powder coated baked paint inside and out and the exterior coat will be of the manufacturer's standard color. The enclosure will have easily removable and lockable doors which will have lift off hinges and corrosion proof hardware. The enclosure must be capable of housing all the equipment necessary to make the system operational excluding the fuel tank. The enclosure will include the proper venting and be sized for maximum cooling for the engine and alternator. A critical exhaust silencer as recommended by the manufacturer shall be included and either can be internally or externally mounted. If externally mounted the roof of the enclosure shall be capable of handling the weight of the silencer and mounting hardware.

e) Battery rack and battery cables, capable of holding the manufacturer's recommended batteries, shall be supplied.

f) 12-volt lead-antimony battery capable of delivering the manufacturer's recommended minimum cold-cranking Amps required at $0^{o}F$, per SAE Standard J-537, shall be supplied.

g) 10-Ampere automatic float and equalize battery charger with +/- 1% constant voltage regulation from no load to full load over +/-10% AC input line variation. Current limited during engine cranking and short circuit conditions, temperature compensated for ambient temperatures from $-40^{o}C$ to $+60^{o}C$, 5% accurate voltmeter and ammeter, fused, with reverse polarity and transient protected.

h) Two flexible fuel lines rated $300^{o}F$ and 100 psi ending in pipe thread.

i) Generator prealarm senders.

j) Generator skid end caps.

11) **Double Wall Secondary Containment Sub Base Fuel Tank**:

a) A sub base fuel tank used in conjunction with a diesel powered generator set of 62 kW rating will contain a minimum of 266 gallons of fuel to support the generator set for a period of 48 hours at 100% of rated load and 65 hours at 75% of rated load.

b) The sub base fuel system is listed under UL 142, sub section entitled Special Purpose Tanks EFVT category, and will bear their mark of UL Approval according to their particular classification.

c) The above ground steel secondary containment rectangular tank for use as a sub base for the diesel generator will be manufactured and installed in accordance with NFPA 30, NFPA 37 and Emergency and Standby Power Systems—NFPA 110.

d) Construction:
   i) Primary Tank

      (1) It will be rectangular in shape and constructed in clam shell fashion to ensure maximum structural integrity and allow the use of a full throat fillet weld.

   ii) Steel Channel Support System

      (1) Reinforced steel box channel for generator support, with a load rating of 5,000 lbs. per genset mounting hole location. Full height gussets at either end of channel and at genset mounting holes shall be utilized.

   iii) Exterior Finish

      (1) The exterior coating has been tested to withstand continuous salt spray testing at 100 percent exposure for 244 hours to a 5 percent salt solution at 92-97° F. The coating has been subjected to full exposure humidity testing to 100 percent humidity at 100° F for 24 hours. Tests are to be conducted in accordance with The American Standard Testing Methods Society.

e) Venting:

   i) Normal venting shall be sized in accordance with the American Petroleum Institute Standard No 2000, Venting Atmospheric and Low Pressure Storage Tanks not less than 1-1/4” (3 cm.) nominal inside diameter. A 1 -1/4" atmospheric mushroom cap shall be furnished and the installing contractor shall pipe above the highest fill point as a minimum

f) Emergency Venting

   i) The emergency vent opening shall be sized to accommodate the total capacity of both normal and emergency venting and shall be not less than that derived from NFPA 30, table 2-8, and based on the wetted surface area of the tank. The wetted area of the tank shall be calculated on the basis of 100 percent of the primary tank. A zinc plated emergency pressure relief vent cap shall be furnished for the primary tank. The vent is spring-pressure operated: opening pressure is 0.5/psig and full opening pressure is 2.5 psig. Limits are stamp marked on top of each vent. The

emergency relief vent is sized to accommodate the total venting capacity of both normal and emergency vents.

g) Fuel Fill:

i) There shall be a 2" NPT opening within the primary tank with an 8" raised fill pipe and lockable manual fill cap.

h) Fuel Level:

i) A direct reading, UL listed, magnetic fuel level gauge with a hermetically-sealed vacuum tested dial shall be provided to eliminate fogging.

i) Low Fuel Level & Leak Detector Switch

i) Consists of a 50 watt float switch for remote or local annunciation of a (50% standard) low fuel level condition.
ii) A fuel leak detector switch shall be installed between the primary and secondary tanks so as to detect a leak or rupture of the primary tank. This switch shall give a signal to a visual and audible alarm on the generator set controller or unit mounted leak detector panel.

j) 2 Sets of operator's manuals with parts lists and exploded views of all equipment supplied.

END SECTION GENERATOR SET

## Section 16415
## SPECIFICATIONS: TRANSFER SWITCH

1) **Submittal**

a) The submittal shall include prototype test certification and specification sheets showing all standard and optional accessories to be supplied, schematic wiring diagrams, dimension drawings, and interconnection diagrams identifying by terminal number, each required interconnection between the generator set and the transfer switch if it is included elsewhere in these specifications.

2) **Testing**

a) To assure that the equipment has been designed and built to the highest reliability and quality standards, the manufacturer and/or local representative shall be responsible for three separate tests: design prototype tests, final production tests, and site tests.

i) Design Prototype Tests: Components of the emergency system such as the engine/generator set, transfer switch, and accessories shall not be subjected to prototype tests since the tests are potentially damaging. Rather, similar design prototypes and preproduction models, which will not be sold, shall have been used for the following tests.

b) **Production Tests**

i) Final Production Tests: Each transfer switch shall be tested under load with all guards in place. Tests shall include:

(1) The complete automatic transfer switch shall be tested to ensure proper operation of the individual components and correct overall sequence of operation and to ensure that the operating transfer time, voltage, frequency, and time delay settings are in compliance with the specification requirements.

(2) The complete automatic transfer switch shall be subjected to a dielectric strength test per NEMA Standard ICS 1-109.05.

(3) The control panel shall meet or exceed the voltage surge withstand capability in accordance with ANSI C37.90a-2978 and the impulse withstand voltage test in accordance with NEMA Standard ICS 1-109.

ii) Upon request, arrangements to either witness this test will be made, or a certified test record will be sent prior to shipment.

c) **Site Tests**

i) Site Tests: The manufacturer's local representative shall perform an installation check, start-up, and building load test. The engineer, regular operators, and the maintenance staff shall be notified of the time and date of the site test.

3) **Warranty & Maintenance**

a) A two year basic extended warranty for the automatic transfer switch shall be included to guaranteed against defective material and workmanship in accordance with the manufacturer's published warranty from date of start-up. Optional warranties shall be available upon request.

b) The automatic transfer switch manufacturer and its distributor shall maintain a 24-hour parts and service organization. This organization shall be regularly engaged in a maintenance contract program to perform preventive maintenance and service on equipment similar to that specified

4) **Compliance With Codes and Standards**

a) The ATS shall conform to the requirements of:

i) UL 1008--Standard for Automatic Transfer Switches

ii) NFPA 70--National Electrical Code, including use in emergency and standby systems in accordance with Articles 517, 700

iii) NFPA 110--Standard for Emergency and Standby Power Systems

iv) NEMA Standard IC10 (formerly ICS 2-447) Automatic Transfer Switches.

v) EN61000-4-5 Surge Immunity Class 4 (voltage sensing and programmable inputs only)

5) **Electrical Requirements**

a) Automatic transfer switches not intended for continuous duty or repetitive load transfer switching are not acceptable.

b) The automatic transfer switch shall be rated in amperes for total system transfer including control of motors, electric-discharge lamps, electric heating, and tungsten-filament lamp load. Switches rated 400 amperes and below shall be suitable for 100% tungsten-filament lamp load. Switches rated above 400 amperes shall be suitable for 30% tungsten-filament load.

c) The automatic transfer switch shall be rated to withstand the rms symmetrical short circuit current available at the automatic transfer switch terminals, with the type of overcurrent protection shown on the plans.

6) **Equipment**

a) The automatic transfer switch shall be a Detroit Diesel / MTU model SCT-ACTA-0400S.

b) The transfer switch shall have the following characteristics:

i) 400 amp current rating

ii) 3 Pole

iii) 4 wire, 3 phase

iv) 208 Volt-60Hz

v) Solid Neutral

vi) The withstand and closing ratings with a current-limiting fuse shall be 200,000 Amps

vii) The withstand and closing ratings with any overcurrent protective device shall be 35,000 Amps

c) The ATS shall be furnished in a NEMA 1 enclosure.

d) The switch shall be a 600 volt class.

7) **Mechanical Requirements**

a) All main contacts shall be of silver composition. The main contacts shall be protected by arcing contacts in sizes 400 amperes and above. The main contacts shall be of the blow-on configuration and of segmented construction in ratings 600 amperes and above.

b) All contacts, coils, springs, and control elements shall be conveniently removable from the front of the transfer switch without major disassembly or disconnection of power conductors.

c) The contact transfer time shall not exceed one-sixth of a second.

d) All moveable parts of the operating mechanism shall remain in positive mechanical contact with the main contacts during the transfer operation without the use of separate mechanical interlocks.

e) All contacts, coils, springs, and control elements shall be conveniently removable from the front of the transfer switch without major disassembly or disconnection of power conductors.

f) The neutral conductor shall be solidly connected as shown on the plans, a neutral conductor terminal plate with fully rated AL-CU pressure connectors shall be provided.

8) **Transfer Switch Control System**

a) The control module shall direct the operation of the transfer switch. The module's sensing and logic shall be a built-in microprocessor-based system for maximum reliability, minimum maintenance, and inherent digital communications capability. The control settings shall be stored in nonvolatile EEPROM. The module shall contain an integral battery-backed programmable clock and calendar. The control module shall have a keyed disconnect plug to enable the control module to be disconnected from the transfer mechanism for routine maintenance.

b) The control module shall be mounted separately from the transfer mechanism unit for safety and ease of maintenance. Interfacing relays shall be industrial control grade plug-in type with dust cover.

c) The control module shall include a user interface keypad with tactile feedback pushbuttons and light-emitting diode status indication. These features shall be user accessible when the enclosure door is closed:

i) Keypad pushbuttons:
   (1) Start/end system test
   (2) Set/end exercise
   (3) End time delay
   (4) Lamp test/service reset

ii) Light-emitting diode status indicators:
   (1) Contactor Position: Normal, Off, Emergency
   (2) Source Available: Normal, Emergency
   (3) Service required: immediate, maintenance
   (4) Not in automatic mode
   (5) Four stage time delay remaining
   (6) Exercise: load, no load, set/disabled
   (7) Test: load, no load
   (8) Load control active: peak shave, load shed, pre/post-transfer signal
   (9) In-phase monitor active

d) Outputs:

i) Generator engine start gold flashed contact rated 2 amps @ 30 VDC/250VAC.
ii) Pre-transfer load control, one normally open contact rated 10 amps @ 30 VDC/250 VAC
iii) One Programmable output, factory-set to load bank control rated 2 amps @ 30 VDC/250 VAC.

9) **Operation**

a) All phases of normal and all phases of emergency shall be monitored for over and under voltage and single phase of normal and emergency for over- and under-frequency. In addition, the controller shall use anti-single phasing protection that detects regenerative voltage (using the phase angle of the source) to determine a failed source condition.

b) Voltage and frequency sensing:

i) Undervoltage pick-up set at 90% of nominal voltage, adjustable 85% - 100% of nominal voltage.

ii) Undervoltage dropout set at 90% of pickup voltage, adjustable 75% - 98% of pickup voltage.

iii) Overvoltage dropout set at 110% of nominal voltage, adjustable 105% - 135% of nominal voltage.

iv) Overvoltage pick-up set at 95% of dropout voltage, adjustable 85% - 100% of nominal voltage.

v) Voltage dropout time set at 0.5 seconds adjustable 0.1 – 9.9 seconds.

vi) Voltage accuracy: 2%.

vii) Under frequency pick-up set at 90% of nominal frequency, adjustable 85% - 95% of nominal frequency.

viii) Under frequency dropout set at 99% of pick-up frequency, adjustable 95% - 99% of pick-up frequency.

ix) Over frequency dropout set at 101% of pick-up frequency, adjustable 101% - 105% of nominal frequency.

x) Over frequency pick-up set at 110% of nominal frequency, adjustable 105% - 120% of nominal frequency.

xi) Frequency accuracy: 1%

c) Time Delays:

i) Time delay for engine start to delay initiation of transfer for momentary source outages: Range 0-6 seconds. Factory set at 3 seconds.

ii) Time delay for transfer to standby: Range 0-60 minutes. Factory set at 1 second.

iii) Time delay for transfer back to normal: Range 0-60 minutes. Factory set at 15 minutes.

iv) Time delay for engine cool down: Range 0-60 minutes. Factory set at 0 minutes.

v) Failure to acquire standby source: Range 0-60 minutes. Factory set at 1 minute.

vi) Pre-transfer to normal signal: Range 0-60 minutes. Factory set at 3 second.

vii) Pre-transfer to standby signal: Range 0-60 minutes. Factory set at 3 second.

viii) Post-transfer to normal signal: Range 0-60 minutes. Factory set at 0 minute.

ix) Post-transfer to standby signal: Range 0-60 minutes. Factory set at 0 minute.

d) User terminals shall be available to connect a normally open contact that, when closed, signals the control module to start and transfer load to the engine-generator. Opening these contacts shall initiate a retransfer and engine cool down sequence. The load shall be transferred to an available utility source immediately if the generator source should fail.

e) The following features shall be built into the control module logic. These features shall be enabled at the factory or in the field.

i) Phase rotation sensing programmable ABC or CBA.

ii) In-phase monitoring shall continuously monitor the contactor transfer times, source voltage, frequency and phase angle to provide a self-adjusting, zero crossing contactor transfer signal. A flashing LED on the user interface panel shall indicate active in-phase monitoring.

iii) Plant Exerciser: Programmable seven-day or fourteen-day exerciser with user selectable load or no-load operation. An LED, on the user interface, shall indicate the type of exercise (load or no load). The time remaining on the exercise shall be indicated. The exercise time may be reset at any time with a single keystroke. The engine shall be allowed to run when the exercise period is

terminated. The exerciser may be disabled for maintenance purposes. An amber LED shall flash on the user interface if the exerciser has been disabled.

The exerciser shall have the capability of being programmed, using up to twenty-one (21) event for a calendar mode.

The controller shall have provisions for disconnecting a load bank (during exercise) if there is a loss of normal power.

iv) The controller must have the capability to communicate to a personal computer (IBM or compatible) running Windows 9X or Windows NT through an RS-232 communication format (in addition to the Modbus® connection).

v) The software shall be Windows® based

vi) The programming capability shall be password protected

f) It shall be possible to start the generator and transfer the loads to the generator.

g) Event monitoring shall be accessible using either a personal computer with the personal computer software to view the following:

i) Historical data (total and reset table)

(1) Days in operation
(2) Hours in standby
(3) Hours not in preferred
(4) Switch transfers
(5) Failure to transfer
(6) Transfers due to loss of preferred
(7) Start up date
(8) Last maintenance date
(9) Switch transfer count since last maintenance

ii) Transfer switch information

(1) ATS serial number
(2) Controller serial number
(3) Contactor serial number
(4) Load description
(5) Location
(6) Branch
(7) Network connection ID
(8) Baud rate
(9) Parity bit

iii) System events (time and date stamped) of the last 100 events which include all failures of the sources, transfer switch and all functions of the controller and contactor:

iv) Line to line voltage

v) System frequency

vi) Time delay active

vii) Time delay remaining

viii) System status

ix) Source available

x) Contactor position

xi) Exerciser schedule, mode and time remaining on active exercise.

h) Programmable features may be viewed, selected or adjusted as follows:

i) System voltage
ii) System frequency
iii) Single/three-phase operation
iv) Open/closed-transition operation
v) ABC or CBA phase rotation
vi) In-phase monitor
vii) Commit/no commit transfer mode
viii) User defined password

i) Programmable inputs shall be defined using either a personal computer with the personal computer software
i) End time delay input
ii) Inhibit transfer
iii) Low external battery fault
iv) Peak shave/area protection input
v) Remote common fault
vi) Remote test

j) Programmable outputs shall be defined using either a personal computer with the personal computer software

i) Auxiliary switch fault
ii) Common fault
iii) Contactor position
iv) Exercise active
v) Failure to acquire standby source
vi) Failure to transfer fault
vii) Generator engine start
viii) Load bank control
ix) Los of phase fault
x) Low backup battery
xi) No in automatic mode
xii) Non-emergency transfer
xiii) Over and undervoltage faults
xiv) Over and under frequency faults

xv) Peak shave/area protection active
xvi) Phase rotation error
xvii) Source available
xviii) Test active

END OF SECTION ATS