

**TOWN OF TRUMBULL, CONNECTICUT  
REQUEST FOR QUOTATION  
EMERGENCY STANDBY POWER SYSTEMS GENERATOR SET & AUTOMATIC SWITCH  
GENERAL INSTRUCTIONS TO BIDDERS  
BID NUMBER: 5900      DUE:    JUNE 21, 2011 @ 3:00PM**

The Town of Trumbull, Connecticut (hereinafter referred to as Town), through the Office of the Purchasing Agent, will accept sealed bids for the **EMERGENCY STANDBY POWER SYSTEMS GENERATOR SET & AUTOMATIC SWITCH**, to be located at the Trumbull Senior Center, 23 Priscilla Lane, Trumbull, CT, in accordance with the attached specifications and scope of work.

**1.      PREPARATION OF BIDS**

Bids shall be submitted by using the enclosed BID PROPOSAL FORM that accompanies this request. Submit one (1) ORIGINAL and one (1) EXACT COPY. Bidders should submit bids in a clear, concise and legible manner to permit proper evaluation of responsive bids.

Bidders may also submit, under separate cover with their proposal, any samples of reports and documents that are necessary to meet the requirements (deliverables) of this request should a purchase order be awarded

**2.      BID SUBMISSION**

Bids are to be submitted in DUPLICATE in a sealed envelope and addressed as follows:

**Purchasing Agent – BID NUMBER: 5900, DUE: JUNE 21, 2011**  
Town of Trumbull  
5866 Main Street  
Trumbull, CT 06611

Please be advised that the person signing the formal proposal must be authorized by your organization to contractually bind your firm with regard to prices and related contractual obligations for the delivery period requested.

**3.      BID TIME**

- a) Bids shall be received at the office of the Purchasing Agent, Town Hall, prior to the advertised hour of opening, at which time all proposals will be publicly opened and read aloud. Any bid received after the due date and time noted above shall not be accepted or opened.
- b) A bidder may withdraw a proposal at any time prior to the above scheduled date and time. Any bid received after the above scheduled date and time shall not be considered or opened.

**4.      TOWN OPTIONS**

- a) The Town of Trumbull reserves the right to reject any and all bids and does not bind itself to accept the lowest bid or any proposal. The Town reserves the right to ask for new bids in whole or in part, or to reject any or all bids, or any part thereof, and to waive any requirements, irregularities, technical defects or service therein when it is deemed to be in the best interest of the Town.
- b) If a bid proposal does not meet or better the required specifications, requirements, and scope of work requested on all points that must be outlined in a letter attached to the bid proposal otherwise it will be presumed that the bid as proposed is in accordance with the required specifications.

**5.      TAXES**

All purchases made by the Town, and associated with the award of this requirement shall be tax exempt. Any taxes must not be included in bid prices. A Town Tax Exemption Certificate shall be furnished upon request.

**6.      INQUIRIES AND SITE VISITS**

All inquiries regarding this request shall be answered up to the close of business on **June 17, 2011** after which time no additional questions will be accepted. To ensure consistent interpretation of certain items, answers to questions the Town deems to be in the interest of all bidders will be made available in writing or by Fax as appropriate to all bidders. Inquiries of a technical nature or requests for on site visits may be directed to the Dimitri Paris, Public Works Superintendent (203.452.5075 or 203.650.6084); all other questions may be directed to the Robert J. Chimini, Purchasing Agent (203.452.5042).

Additionally, after proposals are received, the Town reserves the right to communicate with any or all of the bidders to clarify the provisions of Proposals. The Town further reserves the right to request additional information from any bidder at any time after proposals are opened.

**7. AWARD AND AUTHORITY**

The Town Purchasing Agent will issue notification of award in writing.

**8. PRICING**

- a) Bidders are requested to quote as a complete "Turn Key" installation.
- b) All prices quoted are to be firm for a period of at least 180 days following bid opening.
- c) Special Consideration will be given to responses with extended firm price dates. The Town is always interested in any and all cost reduction opportunities.

**9. ASSIGNMENT OF RIGHTS, TITLES, AND INTERESTS**

Any assignment or subcontracting by a bidder, vendor, or contractor for work to be performed, or goods and/or services to be provided, in whole or in part, and any other interest in conjunction with a Town procurement shall not be permitted without the express written consent of the Town of Trumbull.

**10. HOLD HARMLESS CLAUSE**

Bidder agrees to indemnify, hold harmless and defend the Town from and against any and all liability for loss, damage or expense which the Town may suffer or for which the Town may be held liable by reason of injury, including death, to any person or damage to any property arising out of or in any manner connected with the operations to be performed under an agreement with the Town, whether or not due in whole or in part of any act, omission or negligence of the Town or any of his representatives or employees.

**11. WORK REGULATIONS AND STANDARDS**

All work activities performed in association with this request must be performed and completed for the Town in accordance with current Federal State and Local regulations. All services performed shall also conform to the latest OSHA standards and/or regulations.

**12. INSURANCE**

The successful bidder shall provide the Town Purchasing Agent with a Certificate of Insurance before work commences. The Town shall be named as an additional insured with an Insurance Company licensed to write such insurance in Connecticut, against the following risks and in not less than the following amounts:

- Worker's Compensation
- Contractor's Public Liability and Property Damage
- Automobile Insurance

General Liability	1. Each Person	Each Occurrence	Aggregate
Bodily Injury Liability	\$1,000,000	\$1,000,000	\$1,000,000
Property Damage Liability	\$1,000,000	\$1,000,000	\$1,000,000
Personal Injury Liability		\$1,000,000	\$1,000,000

Comprehensive Automobile Liability			
Bodily Injury	\$1,000,000	\$1,000,000	\$1,000,000
Property Damage		\$1,000,000	\$1,000,000

Such policies shall provide that no coverage shall be changed or cancelled unless thirty- (30) day's prior notice of such change or cancellation shall be made to the owner. Such notice shall be made by registered mail; postage prepaid, to the Purchasing Agent, Town of Trumbull, Town Hall, Trumbull, Connecticut 06611.

In the event of cancellation, the contractor shall cease all operations on or before the effective date of said cancellation and he shall not commence work again until he has obtained replacement insurance and has delivered a Certificate of Insurance to the office of the Owner's Purchasing Department.

13. **DELIVERY**  
**TIME IS OF THE ESSENCE.** Special consideration may be given to bidders that provide an expedited delivery and installation schedule.
14. **CONFLICT OF INTEREST**  
No purchase shall be made from nor shall services (other than services as an officer, agent, or employee of the Town) be secured from any officer or employee of the Town, or from any partnership or corporation in which such officer or employee is a partner or officer, or holds a substantial interest, unless such relationship and the fact that such purchase is contemplated shall be made known in writing to the agency making such purchase, and notice thereof posted, for at least five (5) days before such purchase be made, in the office of the agency making such purchase and in a public place in the Trumbull Town Hall.
15. **WARRANTY**  
Selected bidder agrees to warranty all work completed for this requirement for a period of at least twelve (12) months.
16. **REFERENCES**  
Bidders must provide three commercial references.
17. **SPECIFICATIONS**
- a) Should any Bidder find discrepancies in the Specifications, or be in doubt as to the exact meaning, notify the Town at once. The Town may then, at their option, issue Addenda clarifying same. The Town shall not be responsible for oral instructions or misinterpretations of Specifications.
  - b) The Town reserves the right to issue Addenda at any time prior to the Bid Opening. All such Addenda become, upon issuance part of the Specification. Each Bidder shall cover such Addenda in the proposal and shall acknowledge receipt of same on the blank provided therefore.
  - c) The Town reserves the right to require any or all Bidders to submit statements as to previous experience in performing comparable work; and as to financial and technical organizations and resources available for this work. The mere opening and reading aloud of a bid shall not constitute or imply the Town's acceptance of the suitability of a Bidder or the bid, nor shall possession of Drawings or Specifications constitute an invitation to bid. The competency and responsibility of Bidders as well as the number of working days required for completion will be considered in making an award.
19. **ADENDUMS**  
**It is the responsibility of the bidder to verify prior to final submittal of a bid or bid if any addenda to this request have been issued. Any addenda to this request shall be posted on the Town of Trumbull website [www.trumbull-ct.gov](http://www.trumbull-ct.gov) under the Purchasing Department's section. Bidders may also call the Purchasing Department directly 203.452.5031 for inquiries regarding addenda.**
20. **PRIOR INSPECTION AND EXISTING CONDITIONS**  
A SITE VISIT TO THE SENIOR CENTER IS REQUIRED to verify all field conditions prior to submitting a bid. Site visits can be arranged by calling the Parks Department (203.452.5075 or 203.650.6084).

**TOWN OF TRUMBULL, CONNECTICUT  
REQUEST FOR QUOTATION  
EMERGENCY STANDBY POWER SYSTEMS GENERATOR SET & AUTOMATIC SWITCH  
SPECIFICATIONS AND SCOPE OF WORK  
BID NUMBER: 5900      DUE:    JUNE 21, 2011 @ 3:00PM**

**General Description of Work**

The TOWN is soliciting bids for the **EMERGENCY STANDBY POWER SYSTEMS GENERATOR SET & AUTOMATIC SWITCH** in accordance with the attached specifications.

**General Bid Information**

1. TIME IS OF THE ESSENCE after the bid is awarded the Contractor and representatives from the TOWN shall meet to discuss scheduling of work, safety plans, and the coordination of any work to be provided by the contractor, any subcontractors, and the maintenance staff.
2. Workers must follow all safety protocol while working in or around the building.
3. All bidders must submit a proposed schedule of work. All work MUST be completed prior to the heating season.

**Part 1 GENERAL**

**1.02 Scope**

- A. Provide complete factory assembled generator set equipment with digital (microprocessor-based) electronic generator set controls, digital governor, and digital voltage regulator.
- B. Provide factory test, startup by a supplier authorized by the equipment manufacturer(s), and on-site testing of the system.
- C. The generator set manufacturer shall warrant all equipment provided under this section, whether or not is manufactured by the generator set manufacturer, so that there is one source for warranty and product service. Technicians specifically trained and certified by the manufacturer to support the product and employed by the generator set supplier shall service the generator sets.

**1.03 Codes and Standards**

- A. The generator set installation and on-site testing shall conform to the requirements of the following codes and standards, as applicable. The generator set shall include necessary features to meet the requirements of these standards.
  1. CSA 282, 1989 Emergency Electrical Power Supply for Buildings
  2. IEEE446 – Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications
  3. NFPA37 –
  4. NFPA70 – National Electrical Code. Equipment shall be suitable for use in systems in compliance to Article 700, 701, and 702.
  5. NFPA99 – Essential Electrical Systems for Health Care Facilities
  6. NFPA110 – Emergency and Standby Power Systems. The generator set shall meet all requirements for Level 1 systems. Level 1 prototype 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.
- B. The generator set and supplied accessories shall meet the requirements of the following standards:
  1. NEMA MG1. Alternator shall comply with the requirements of the current version this standard as they apply to AC alternators.
  2. UL142 – Sub-base Tanks
  3. UL1236 – Battery Chargers
  4. UL2200. The generator set shall be listed to UL2200 or submit to an independent third party certification process to verify compliance as installed..
- C. The control system for the generator set shall comply with the following requirements.
  1. CSA C22.2, No. 14 – M91 Industrial Control Equipment.
  2. EN50082-2, Electromagnetic Compatibility – Generic Immunity Requirements, Part 2: Industrial.
  3. EN55011, Limits and Methods of Measurement of Radio Interference Characteristics of Industrial, Scientific and Medical Equipment.
  4. FCC Part 15, Subpart B.
  5. IEC8528 part 4. Control Systems for Generator Sets
  6. IEC Std 801.2, 801.3, and 801.5 for susceptibility, conducted, and radiated electromagnetic emissions.

7. UL508. The entire control system of the generator set shall be UL508 listed and labeled.
  8. UL1236 –Battery Chargers.
- D. The generator set manufacturer shall be certified to ISO 9001 International Quality Standard and shall have third party certification verifying quality assurance in design/development, production, installation, and service, in accordance with ISO 9001.

#### **1.04 Acceptable Manufacturers**

Only approved bidders shall supply equipment provided under this contract. Equipment specifications for this project are based on generator sets manufactured by Cummins Power Generation with microprocessor-based controls. Equipment by other suppliers that meets the requirement of this specification are acceptable, if approved not less than 2 weeks before scheduled bid date. Proposals must include a line by line compliance statement based on this specification.

## **Part 2. PRODUCTS**

### **2.01 Generator set**

#### **Cummins Power Generation model 80 DSFAE**

##### **A. Ratings**

1. The generator set shall operate at 1800 rpm and at a voltage of: 120/208 Volts AC, Three phase, 4-wire, 60 hertz. The generator set shall be rated at 80 kW, 100 kVA at 0.8 PF, standby rating, based on site conditions of : Altitude 500 ft.), ambient temperatures up to 122 degrees F.
2. The generator set rating shall be based on emergency/standby service.

##### **B. Performance**

1. Voltage regulation shall be plus or minus 0.5 percent for any constant load between no load and rated load. Random voltage variation with any steady load from no load to full load shall not exceed plus or minus 0.5 percent.
2. Frequency regulation shall be isochronous from steady state no load to steady state rated load. Random frequency variation with any steady load from no load to full load shall not exceed plus or minus 0.5%.
3. The diesel engine-generator set shall accept a single step load of 100% nameplate kW and power factor, less applicable derating factors, with the engine-generator set at operating temperature. Motor starting capability shall be a minimum of 423 kVA. The generator set shall be capable of recovering to a minimum of 90% of rated no load voltage following the application of the specified kVA load at near zero power factor applied to the generator set. Maximum voltage dip on application of this load, considering both alternator performance and engine speed changes shall not exceed 25%.
4. The alternator shall produce a clean AC voltage waveform, with not more than 5% total harmonic distortion at full linear load, when measured from line to neutral, and with not more than 3% in any single harmonic, and no 3<sup>rd</sup> order harmonics or their multiples. Telephone influence factor shall be less than 40.
5. The generator set shall be certified by the engine manufacturer to be suitable for use at the installed location and rating, and shall meet all applicable exhaust emission requirements at the time of commissioning.

##### **C. Construction**

1. The engine-generator set shall be mounted on a heavy-duty steel base to maintain alignment between components. The base shall incorporate a battery tray with hold-down clamps within the rails.
2. All switches, lamps, and meters in the control system shall be oil-tight and dust-tight. All active control components shall be installed within a UL/NEMA 3R enclosure. There shall be no exposed points in the control (with the door open) that operate in excess of 50 volts.

##### **D. Connections**

1. The generator set load connections shall be composed of silver or tin plated copper bus bars, drilled to accept mechanical or compression terminations of the number and type as shown on the drawings. Sufficient lug space shall be provided for use with cables of the number and size as shown on the drawings.
2. Power connections to auxiliary devices shall be made at the devices, with required protection located at a wall-mounted common distribution panel.
3. Generator set control interfaces to other system components shall be made on a permanently labeled terminal block assembly. Labels describing connection point functions shall be provided.

## 2.02 Engine and Engine Equipment

The engine shall be diesel, 4 cycle, radiator and fan cooled. Minimum displacement shall be 272 cubic inches, with 4 cylinders. The horsepower rating of the engine at its minimum tolerance level shall be sufficient to drive the alternator and all connected accessories. Engine shall be EPA Tier 3 Certified. Two cycle engines are not acceptable. Engine accessories and features shall include:

- A. An electronic governor system shall provide automatic isochronous frequency regulation. The governing system dynamic capabilities shall be controlled as a function of engine coolant temperature to provide fast, stable operation at varying engine operating temperature conditions. The control system shall actively control the fuel rate and excitation as appropriate to the state of the generator set. Fuel rate shall be regulated as a function of starting, accelerating to start disconnect speed, accelerating to rated speed. The governing system shall include a programmable warm up at idle and cooldown at idle function. While operating in idle state, the control system shall disable the alternator excitation system.
- B. Unit mounted vertical core radiator and cooling system rated for full load operation in 50 degrees C ambient as measured at the radiator air inlet. Radiator shall be sized based on a core temperature that is 20F higher than the rated operation temperature. The equipment supplier shall fill the cooling system with a 50/50-propylene glycol/water mixture prior to shipping. Rotating parts shall be guarded against accidental contact. Electric starter(s) capable of three complete cranking cycles without overheating.
- C. Positive displacement, mechanical, full pressure, lubrication oil pump.
- D. Full flow lubrication oil filters with replaceable spin-on canister elements and dipstick oil level indicator.
- E. An engine driven, mechanical, positive displacement fuel pump. Fuel filter with replaceable spin-on canister element. Fuel cooler, suitable for operation of the generator set at full rated load in the ambient temperature specified shall be provided if required for operation due to the design of the engine and the installation.
- F. Replaceable dry element air cleaner with restriction indicator.
- G. Flexible supply and return fuel lines.
- H. Engine mounted battery charging alternator, 65-ampere minimum, and solid-state voltage regulator.
- I. Coolant heater
  - 1. Engine mounted, thermostatically controlled, coolant heater(s) for each engine. Heater voltage shall be 120 volts.
- J. Starting and Control Batteries shall be lead acid type, 12 volt DC, sized as recommended by the engine manufacturer, complete with battery cables and connectors. The batteries shall be capable of a minimum of three complete 15-second cranking cycles at 40F ambient temperature when fully charged.
- K. Provide a single exhaust silencer for each engine of size and type as recommended by the generator set manufacturer and approved by the engine manufacturer. The muffler shall be super critical grade. Exhaust system shall be installed according to the engine manufacturer's recommendations and applicable codes and standards.
- L. Provide a minimum 10 amp battery charger for each generator set battery bank. The charger(s) shall include the following capabilities:
  - 1. Chargers shall be UL 1236-BBHH listed and CSA or CUL certified for use in emergency applications.
  - 2. The charger shall be compliant with UL991 requirements for vibration resistance.
  - 3. The charger shall comply with the requirements of EN61000-4-5 for voltage surge resistance; EN50082-2 for immunity; EN61000-4-2 for ESD; EN61000-4-3 for radiated immunity; ANSI/IEEE C62.41 category B and IN61000-4-4 for electrically fast transient; EN61000-4-6 for conducted emissions; and FCC Part 15 Class A for radiated emissions.
  - 4. The charger shall be capable of charging a fully discharged battery without damage to the charger. It shall be capable of returning a fully discharged battery to fully charged condition within 24 hours. The charger shall be UL-labeled with the maximum battery amp-hour rating that can be recharged within 24 hours. The label shall indicate that the charger is suitable for charging of 200AH batteries per NFPA requirements.
  - 5. The DC output voltage regulation shall be within plus or minus 1%. The DC output ripple current shall not exceed 1 amp at rated output current level.
  - 6. The charger shall include the following features:
    - a) AC input overcurrent, over voltage, and undervoltage protection;
    - b) DC output overcurrent protection;
    - c) Alarm output relay
    - d) Corrosion resistant aluminum enclosure

#### Outdoor Sound Attenuated Weather-Protective Enclosure

The generator set shall be provided with a aluminum factory sound attenuated outdoor enclosure, with the entire package listed under UL2200. The package shall comply with the requirements of the National Electrical Code for all wiring materials and component spacing. Housing shall provide ample airflow for generator set operation at rated load. The housing shall have hinged side-access doors to maintain easy access for all service functions. All doors shall be lockable, and include retainers to hold the door open during service. Enclosure roof shall be cambered to prevent rain water accumulation. All electrical power and control interconnections shall be made within the perimeter of the enclosure. The enclosure shall include provisions to allow for lifting with spreader bars.

Enclosure shall be constructed of aluminum. All hardware and hinges shall be stainless steel.

A factory-mounted critical exhaust silencer shall be installed inside the enclosure. The exhaust shall exit the enclosure through a rain collar and terminate with a rain cap. Exhaust connections to the generator set shall be through seamless flexible connections. Silencer Mounted on the enclosure roof will not be accepted.

The enclosure shall include the following maintenance provisions:

- Flexible coolant and lubricating oil drain lines, that extend to the exterior of the enclosure, with internal drain valves

The generator set shall be provided with a sound-attenuated housing which allows the generator set to operate at full rated load. The enclosure shall reduce the sound level of the generator set while operating at full rated load to a maximum of 71.8 dB(A) at 7 meters from the generator set in a free field environment.

#### 2.1.8 Subbase Fuel Tank-

Provide a dual wall sub-base fuel storage tank with 500 gallons capacity. The tank shall be constructed of corrosion resistant steel and shall be UL listed. The equipment, as installed, shall meet all local and regional requirements for above ground tanks. The fuel tank control shall be provided with Test/Reset Switch:

Low Fuel - Closes N/O dry contacts.

Overflow to basin (red) - closes N/O dry contacts.

#### 2.03 AC Generator

- A. The AC generator shall be; synchronous, four pole, 2/3 pitch, revolving field, drip-proof construction, single prelubricated sealed bearing, air cooled by a direct drive centrifugal blower fan, and directly connected to the engine with flexible drive disc. All insulation system components shall meet NEMA MG1 temperature limits for Class H insulation system and shall be UL1446 listed. Actual temperature rise measured by resistance method at full load shall not exceed 80 degrees Centigrade.
- B. The generator shall be capable of delivering rated output (kVA) at rated frequency and power factor, at any voltage not more than 5 percent above or below rated voltage.
- C. A permanent magnet generator (PMG) shall be included to provide a reliable source of excitation power for optimum motor starting and short circuit performance. The PMG and controls shall be capable of sustaining and regulating current supplied to a single phase or three phase fault at approximately 300% of rated current for not more than 10 seconds.
- D. The subtransient reactance of the alternator shall not exceed 12 percent, based on the standby rating of the generator set.

#### 2.04 Generator set Control.

The generator set shall be provided with a microprocessor-based control system that is designed to provide automatic starting, monitoring, and control functions for the generator set. The control system shall also be designed to allow local monitoring and control of the generator set, and remote monitoring and control as described in this specification.

The control shall be mounted on the generator set, or may be mounted in a free-standing panel next to the generator set if adequate space and accessibility is available. The control shall be vibration isolated and prototype tested to verify the durability of all components in the system under the vibration conditions encountered.

The generator set mounted control shall include the following features and functions:

##### A. Control Switches

1. Mode Select Switch. The mode select switch shall initiate the following control modes. When in the RUN or MANUAL position the generator set shall start, and accelerate to rated speed and voltage as directed by the operator. A separate push-button to initiate starting is acceptable. In the OFF position the generator set shall immediately stop, bypassing all time delays. In the AUTO position the generator set shall be ready to accept a signal from a remote device to start and accelerate to rated speed and voltage.
  2. EMERGENCY STOP switch. Switch shall be Red "mushroom-head" push-button. Depressing the emergency stop switch shall cause the generator set to immediately shut down, and be locked out from automatic restarting.
  3. RESET switch. The RESET switch shall be used to clear a fault and allow restarting the generator set after it has shut down for any fault condition.
  4. PANEL LAMP switch. Depressing the panel lamp switch shall cause the entire panel to be lighted with DC control power. The panel lamps shall automatically be switched off 10 minutes after the switch is depressed, or after the switch is depressed a second time.
- B. Generator Set AC Output Metering. The generator set shall be provided with a metering set including the following features and functions:**
1. Digital metering set, 1% accuracy, to indicate generator RMS voltage and current, frequency, output current, output KW, KW-hours, and power factor. Generator output voltage shall be available in line-to-line and line-to-neutral voltages, and shall display all three-phase voltages (line to neutral or line to line) simultaneously.
  2. Analog voltmeter, ammeter, frequency meter, power factor meter, and kilowatt (KW) meter. Voltmeter and ammeter shall display all three phases. Meter scales shall be color coded in the following fashion: green shall indicate normal operating condition, amber shall indicate operation in ranges that indicate potential failure, and red shall indicate failure impending. Metering accuracy shall be within 1% at rated output. Both analog and digital metering are required.
  3. The control system shall monitor the total load on the generator set, and maintain data logs of total operating hours at specific load levels ranging from 0 to 110% of rated load, in 10% increments. The control shall display hours of operation at less than 30% load and total hours of operation at more than 90% of rated load.
  4. The control system shall log total number of operating hours, total kWH, and total control on hours, as well as total values since reset.
- C. Generator Set Alarm and Status Display.**
1. The generator set control shall include LED alarm and status indication lamps. The lamps shall be high-intensity LED type. The lamp condition shall be clearly apparent under bright room lighting conditions. Functions indicated by the lamps shall include:
    - The control shall include five configurable alarm-indicating lamps. The lamps shall be field adjustable for any status, warning, or shutdown function monitored by the genset. They shall also be configurable for color, and control action (status, warning, or shutdown).
    - The control shall include green lamps to indicate that the generator set is running at rated frequency and voltage, and that a remote start signal has been received at the generator set. The running signal shall be based on actual sensed voltage and frequency on the output terminals of the generator set.
    - The control shall include a flashing red lamp to indicate that the control is not in automatic state, and red common shutdown lamp.
    - The control shall include an amber common warning indication lamp.
  2. The generator set control shall indicate the existence of the warning and shutdown conditions on the control panel. All conditions indicated below for warning shall be field-configurable for shutdown. Conditions required to be annunciated shall include:
    - low oil pressure (warning)
    - low oil pressure (shutdown)
    - oil pressure sender failure (warning)
    - low coolant temperature (warning)
    - high coolant temperature (warning)
    - high coolant temperature (shutdown)
    - high oil temperature (warning)
    - engine temperature sender failure (warning)
    - low coolant level (warning)



- fail to crank (shutdown)
- fail to start/overcrank (shutdown)
- overspeed (shutdown)
- low DC voltage (warning)
- high DC voltage (warning)
- weak battery (warning)
- low fuel-daytank (warning)
- high AC voltage (shutdown)
- low AC voltage (shutdown)
- under frequency (shutdown)
- over current (warning)
- over current (shutdown)
- short circuit (shutdown)
- over load (warning)
- emergency stop (shutdown)
- (4) configurable conditions

3. Provisions shall be made for indication of four customer-specified alarm or shutdown conditions. Labeling of the customer-specified alarm or shutdown conditions shall be of the same type and quality as the above-specified conditions. The non-automatic indicating lamp shall be red, and shall flash to indicate that the generator set is not able to automatically respond to a command to start from a remote location.

**D. Engine Status Monitoring.**

1. The following information shall be available from a digital status panel on the generator set control :
  - engine oil pressure (psi or kPA)
  - engine coolant temperature (degrees F or C)
  - engine oil temperature (degrees F or C)
  - engine speed (rpm)
  - number of hours of operation (hours)
  - number of start attempts
  - battery voltage (DC volts)
2. The control system shall also incorporate a data logging and display provision to allow logging of the last 10 warning or shutdown indications on the generator set, as well as total time of operation at various loads, as a percent of the standby rating of the generator set.

**E. Engine Control Functions.**

1. The control system provided shall include a cycle cranking system, which allows for user selected crank time, rest time, and # of cycles. Initial settings shall be for 3 cranking periods of 15 seconds each, with 15-second rest period between cranking periods.
2. The control system shall include an idle mode control, which allows the engine to run in idle mode in the RUN position only. In this mode, the alternator excitation system shall be disabled.
3. The control system shall include an engine governor control, which functions to provide steady state frequency regulation as noted elsewhere in this specification. The governor control shall include adjustments for gain, damping, and a ramping function to control engine speed and limit exhaust smoke while the unit is starting.
4. The control system shall include time delay start (adjustable 0-300 seconds) and time delay stop (adjustable 0-600 seconds) functions.
5. The control system shall include sender failure monitoring logic for speed sensing, oil pressure, and engine temperature which is capable of discriminating between failed sender or wiring components, and an actual failure conditions.
6. Provide an audible alarm module that will sound upon any generator shutdown or warning condition.

**F. Alternator Control Functions:**

1. The generator set shall include a full wave rectified automatic digital voltage regulation system that is matched and prototype tested by the engine manufacturer with the governing system provided. It shall be immune from misoperation due to load-induced voltage waveform distortion and provide a pulse width modulated output to the alternator exciter. The voltage regulation system shall be equipped with three-phase line to neutral RMS sensing and shall control buildup of AC generator voltage to provide a linear rise and limit overshoot. The system shall include a torque-matching characteristic, which shall

reduce output voltage in proportion to frequency below an adjustable frequency threshold. Torque matching characteristic shall be adjustable for roll-off frequency and rate, and be capable of being curve-matched to the engine torque curve with adjustments in the field. The voltage regulator shall include adjustments for gain, damping, and frequency roll-off. Adjustments shall be broad range, and made via digital raise-lower switches, with an alphanumeric LED readout to indicate setting level. Rotary potentiometers for system adjustments are not acceptable.

2. A microprocessor-based protection device shall be provided to individually monitor all phases of the output current of the generator set and initiate an alarm (over current warning) when load current exceeds 110% of the rated current of the generator set on any phase for more than 60 seconds. The device shall shut down and lock out the generator set when output current level approaches the thermal damage point of the alternator (over current shutdown). The protective functions provided shall be in compliance to the requirements of NFPA70 article 445.
3. A microprocessor-based protection device shall be provided to monitor all phases of the output current for short circuit conditions. The control/protection system shall monitor the current level and voltage. The controls shall shut down and lock out the generator set when output current level approaches the thermal damage point of the alternator (short circuit shutdown). The protective functions provided shall be in compliance to the requirements of NFPA70 article 445.
4. Controls shall be provided to monitor the KW load on the generator set, and initiate an alarm condition (over load) when total load on the generator set exceeds the generator set rating for in excess of 5 seconds. Controls shall include a load shed control, to operate a set of dry contacts (for use in shedding customer load devices) when the generator set is overloaded.
5. A microprocessor-based AC over/under voltage monitoring system that responds only to true RMS voltage conditions shall be provided. The system shall initiate shutdown of the generator set when alternator output voltage exceeds 110% of the operator-set voltage level for more than 10 seconds, or with no intentional delay when voltage exceeds 130%. Under voltage shutdown shall occur when the output voltage of the alternator is less than 85% for more than 10 seconds. The system shall monitor individual phases and be connected line to neutral on 3-phase 4-wire generator sets, and for systems that are solidly grounded.

**G. Other Control Functions**

1. The generator set shall be provided with a network communication module to allow LonMark compliant communication with the generator set control by remote devices. The control shall communicate all engine and alternator data, and allow starting and stopping of the generator set via the network in both test and emergency modes.
2. A battery monitoring system shall be provided which initiates alarms when the DC control and starting voltage is less than 25VDC or more than 32 VDC. During engine cranking (starter engaged), the low voltage limit shall be disabled, and DC voltage shall be monitored as load is applied to the battery, to detect impending battery failure or deteriorated battery condition.

**H. Control Interfaces for Remote Monitoring:**

1. The control system shall provide four programmable output relays. These relay outputs shall be configurable for any alarm, shutdown, or status condition monitored by the control. The relays shall be configured to indicate: (1) generator set operating at rated voltage and frequency, (2) common warning, (3) common shutdown, (4) load shed command.
2. A fused 10 amp switched 24VDC power supply circuit shall be provided for customer use. DC power shall be available from this circuit whenever the generator set is running.
3. A fused 10 amp 24VDC power supply circuit shall be provided for customer use. DC power shall be available from this circuit at all times from the engine starting/control batteries.
4. The control shall be provided with a direct serial communication link for the LonWorks communication network interface as described elsewhere in this specification and shown on the drawings.

**2.05 Other equipment to be provided with the generator set**

- A. Provide and install a 20-light LED type remote alarm annunciator with horn, located as shown on the drawings or in a location that can be conveniently monitored by facility personnel. The remote annunciator shall provide all the audible and visual alarms called for by NFPA Standard 110 for level 1 systems for the local generator control panel. Spare lamps shall be provided to allow future addition of other alarm and status functions to the annunciator. Provisions for labeling of the annunciator in a fashion consistent with the specified functions shall be provided. Alarm silence and lamp test switch(es) shall be provided. LED lamps

shall be replaceable, and indicating lamp color shall be capable of changes needed for specific application requirements. Alarm horn shall be switchable for all annunciation points. Alarm horn (when switched on) shall sound for first fault, and all subsequent faults, regardless of whether first fault has been cleared, in compliance with NFPA110 3-5.6.2. The interconnecting wiring between the annunciator and other system components shall be monitored and failure of the interconnection between components shall be displayed on the annunciator panel.

- B. The annunciator shall include the following alarm labels, audible annunciation features, and lamp colors:

<u>Condition</u>	<u>Lamp Color</u>	<u>Audible Alarm</u>
Normal Power (to Loads)	Green	No
Genset Supplying Load	Amber	No
Genset Running	Green	No
Not in Auto	Red (Flashing)	Yes
High Battery Voltage	Red	Yes
Low Battery Voltage	Red	Yes
Charger AC Failure	Red	Yes
Fail to Start	Red	Yes
Low Engine Temperature	Amber	Yes
Pre-High Engine Temperature	Amber	Yes
High Engine Temperature	Red	Yes
Pre-Low Oil Pressure	Amber	Yes
Low Oil Pressure	Red	Yes
Overspeed	Red	Yes
Low Coolant Level	Amber	Yes
Low Fuel Level	Amber	Yes
Network OK	Green	Yes
(4) Spares	Configurable	Configurable

Low battery voltage lamp shall also be lighted for low cranking voltage or weak battery alarm.

- C. The generator set shall be provided with a set mounted 350 amp main line circuit breaker. The circuit breaker shall incorporate an electronic trip unit that operates to protect the alternator under all overcurrent conditions, or a thermal-magnetic trip with other overcurrent protection devices that positively protect the alternator under overcurrent conditions. The supplier shall submit time overcurrent characteristic curves and thermal damage curve for the alternator, demonstrating the effectiveness of the protection provided.

### **Part 3. OPERATION**

#### **3.01 Sequence of Operation**

- A. Generator set shall start on receipt of a start signal from remote equipment. The start signal shall be via hardwired connection to the generator set control and a redundant signal over the required network connection.
- B. The generator set shall complete a time delay start period as programmed into the control.
- C. The generator set control shall initiate the starting sequence for the generator set. The starting sequence shall include the following functions:
- D. The control system shall verify that the engine is rotating when the starter is signaled to operate. If the engine does not rotate after two attempts, the control system shall shut down and lock out the generator set, and indicate "fail to crank" shutdown.
- E. The engine shall fire and accelerate as quickly as practical to start disconnect speed. If the engine does not start, it shall complete a cycle cranking process as described elsewhere in this specification. If the engine has not started by the completion of the cycle cranking sequence, it shall be shut down and locked out, and the control system shall indicate "fail to start".
- F. The engine shall accelerate to rated speed and the alternator to rated voltage. Excitation shall be disabled until the engine has exceeded programmed idle speed, and regulated to prevent over voltage conditions and oscillation as the engine accelerates and the alternator builds to rated voltage.
- G. On reaching rated speed and voltage, the generator set shall operate as dictated by the control system in isochronous state.
- H. When all start signals have been removed from the generator set, it shall complete a time delay stop sequence. The duration of the time delay stop period shall be adjustable by the operator.
- I. On completion of the time delay stop period, the generator set control shall switch off the excitation system and shall shut down.
- J. Any start signal received after the time stop sequence has begun shall immediately terminate the stopping sequence and return the generator set to isochronous operation.

#### **2.2 Transfer Switch Equipment:**

### **Part 4. PRODUCTS**

#### **Part 1. GENERAL**

##### **1.01 Scope**

- A. Provide complete factory assembled power transfer equipment with field programmable digital electronic controls designed for fully automatic operation and including: surge voltage isolation, voltage sensors on all phases of both sources, linear operator, permanently attached manual handles, positive mechanical and electrical interlocking, and mechanically held contacts for both sources.
- B. The generator set manufacturer shall warrant transfer switches to provide a single source of responsibility for all the products provided. Technicians specifically trained to support the product and employed by the generator set supplier shall service the transfer switches.

##### **1.02 Codes and Standards**

- A. The automatic transfer switch installation and application shall conform to the requirements of the following codes and standards:
  - 1. CSA 282, Emergency Electrical Power Supply for Buildings
  - 2. NFPA70 – National Electrical Code. Equipment shall be suitable for use in systems in compliance to Article 700, 701, and 702.
  - 3. NFPA99 – Essential Electrical Systems for Health Care Facilities
  - 4. NFPA110 – Emergency and Standby Power Systems. The transfer switch shall meet all requirements for Level 1 systems.
  - 5. IEEE446 – Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications.
  - 6. NEMA ICS10-1993 – AC Automatic Transfer Switches.
- B. The transfer switch assembly shall comply with the following standards:
  - 1. CSA C22.2, No. 14 – M91 Industrial Control Equipment.
  - 2. EN55011, Class B Radiated Emissions
  - 3. EN55011, Class B Conducted Emissions

4. IEC 1000-4-5 (EN 61000-4-5); AC Surge Immunity.
  5. IEC 1000-4-4 (EN 61000-4-4) Fast Transients Immunity
  6. IEC 1000-4-2 (EN 61000-4-2) Electrostatic Discharge Immunity
  7. IEC 1000-4-3 (EN 61000-4-3) Radiated Field Immunity
  8. IEC 1000-4-6 Conducted Field Immunity
  9. IEC 1000-4-11 Voltage Dip Immunity.
  10. IEEE 62.41, AC Voltage Surge Immunity.
  11. IEEE 62.45, AC Voltage Surge.
  12. UL1008 – Transfer Switches. Transfer switches shall be UL1008 listed. UL1008 transfer switches may be supplied in UL891 enclosures if necessary to meet the physical requirements of the project.
- C. The transfer switch manufacturer shall be certified to ISO 9001 International Quality Standard and shall have third party certification verifying quality assurance in design/development, production, installation, and service, in accordance with ISO 9001.

### **1.03 Acceptable Manufacturers**

Only approved bidders shall supply equipment provided under this contract. Equipment specifications for this project are based on microprocessor-based transfer switches manufactured by Cummins Onan. Equipment by other suppliers that meets the requirement of this specification are acceptable, if approved not less than 2 weeks before scheduled bid date. Proposals must include a line by line compliance statement based on this specification.

## **Part 2. PRODUCTS**

### **2.01 Power Transfer Switch**

- A. Ratings
1. Transfer Switch shall be Cummins model OTPC 600, Rated 600 amp, 3 pole, 120/208 volt, 3 phase, 4 wire in a NEMA 1 Cabinet.
  2. Main contacts shall be rated for 600 Volts AC minimum.
  3. Transfer switches shall be rated to carry 100 percent of rated current continuously in the enclosure supplied, in ambient temperatures of -40 to +60 degrees C, relative humidity up to 95% (non-condensing), and altitudes up to 10,000 feet (3000M).
  4. Transfer switch equipment shall have withstand and closing ratings (WCR) in RMS symmetrical amperes greater than 65,000 amps. The transfer switch shall be third party listed and labeled for use with the specific protective device(s) installed in the application.
- B. Construction
1. Transfer switches shall be double-throw, electrically and mechanically interlocked, and mechanically held in the source 1 and source 2 positions. The transfer switch shall be specifically designed to transfer to the best available source if it inadvertently stops in a neutral position.
  2. Transfer switches rated through 1000 amperes shall be equipped with permanently attached manual operating handles and quick-break, quick-make over-center contact mechanisms. Transfer switches over 1000 amperes shall be equipped with manual operators for service use only under de-energized conditions.
  3. Main switch contacts shall be high-pressure silver alloy. Contact assemblies shall have arc chutes for positive arc extinguishing. Arc chutes shall have insulating covers to prevent inter-phase flashover.
  4. Transfer switch internal wiring shall be composed of pre-manufactured harnesses that are permanently marked for source and destination. Harnesses shall be connected to the control system by means of locking disconnect plug(s), to allow the control system to be easily disconnected and serviced without disconnecting power from the transfer switch mechanism.
  5. Power transfer switch shall be provided with flame retardant transparent covers to allow viewing of switch contact operation but prevent direct contact with components that could be operating at line voltage levels.
  6. Transfer switches that are designated on the drawings as 3-pole shall be provided with a neutral bus and lugs. The neutral bus shall be sized to carry 100% of the current designated on the switch rating.
- C. Connections
1. Field control connections shall be made on a common terminal block that is clearly and permanently labeled.
  2. Transfer switch shall be provided with AL/CU mechanical lugs sized to accept the full output rating of the switch. Lugs shall be suitable for the number and size of conductors shown on the drawings.

## 2.02 Transfer Switch Control

- A. Operator Panel. Each transfer switch shall be provided with a control panel to allow the operator to view the status and control operation of the transfer switch. The operator panel shall be a sealed membrane panel rated NEMA 3R/IP53 or better (regardless of enclosure rating) that is permanently labeled for switch and control functions. The operator panel shall be provided with the following features and capabilities.
1. High intensity LED lamps to indicate the source that the load is connected to (source 1 or source 2); and which source(s) are available. Source available LED indicators shall operate from the control microprocessor to indicate the true condition of the sources as sensed by the control.
  2. High intensity LED lamps to indicate that the transfer switch is "not in auto" (due to control being disabled or due to bypass switch (when used) enabled or in operation) and "Test/Exercise Active" to indicate that the control system is testing or exercising the generator set.
  3. "OVERRIDE" pushbutton to cause the transfer switch to bypass any active time delays for start, transfer, and retransfer and immediately proceed with its next logical operation.
  4. "TEST" pushbutton to initiate a preprogrammed test sequence for the generator set and transfer switch. The transfer switch shall be programmable for test with load or test without load.
  5. "RESET/LAMP TEST" pushbutton that will clear any faults present in the control, or simultaneously test all lamps on the panel by lighting them.
  6. The control system shall continuously log information on the number of hours each source has been connected to the load, the number of times transferred, and the total number of times each source has failed. This information shall be available via a PC-based service tool and an operator display panel.
  7. Vacuum fluorescent alphanumeric display panel with push-button navigation switches. The display shall be clearly visible in both bright (sunlight) and no light conditions. It shall be visible over an angle of at least 120 degrees. The Alphanumeric display panel shall be capable of providing the following functions and capabilities:
    - a) Display source condition information, including AC voltage for each phase of normal and emergency source, frequency of each source. Voltage for all three phases shall be displayed on a single screen for easy viewing of voltage balance. Line to neutral voltages shall be displayed for 4-wire systems.
    - b) Display source status, to indicate source is connected or not connected.
    - c) Display load data, including 3-phase AC voltage, 3-phase AC current, frequency, KW, KVA, and power factor. Voltage and current data for all phases shall be displayed on a single screen.
    - d) The display panel shall allow the operator to view and make the following adjustments in the control system, after entering an access code:
      - i. *Set nominal voltage and frequency for the transfer switch.*
      - ii. *Adjust voltage and frequency sensor operation set points.*
      - iii. *Set up time clock functions.*
      - iv. *Set up load sequence functions.*
      - v. *Enable or disable control functions in the transfer switch, including program transition.*
      - vi. *Set up exercise and load test operation conditions, as well as normal system time delays for transfer time, time delay start, stop, transfer, and retransfer.*
    - e) Display Real time Clock data, including date, and time in hours, minutes, and seconds. The real time clock shall incorporate provisions for automatic daylight savings time and leap year adjustments. The control shall also log total operating hours for the control system.
    - f) Display service history for the transfer switch. Display source connected hours, to indicate the total number of hours connected to each source. Display number of times transferred, and total number of times each source has failed.
    - g) Display fault history on the transfer switch, including condition, and date and time of fault. Faults to include controller checksum error, low controller DC voltage, ATS fail to close on transfer, ATS fail to close on retransfer, battery charger malfunction, network battery voltage low, network communications error.
- B. Internal Controls
1. The transfer switch control system shall be configurable in the field for any operating voltage level up to 600VAC. Provide RMS voltage sensing and metering that is accurate to within plus or minus 1% of nominal voltage level. Frequency sensing shall be accurate to within plus or minus 0.2%. Voltage sensing shall be monitored based on the normal voltage at the site. Systems that utilize voltage monitoring based on standard voltage conditions that are not field configurable are not acceptable.

2. Transfer switch voltage sensors shall be close differential type, providing source availability information to the control system based on the following functions:
    - a) Monitoring all phases of the normal service (source 1) for under voltage conditions (adjustable for pickup in a range of 85 to 98% of the normal voltage level and dropout in a range of 75 to 98% of normal voltage level).
    - b) Monitoring all phases of the emergency service (source 2) for under voltage conditions (adjustable for pickup in a range of 85 to 98% of the normal voltage level and dropout in a range of 75 to 98% of pickup voltage level).
    - c) Monitoring all phases of the normal service (source 1) and emergency service (source 2) for loss of a single phase.
  3. All transfer switch sensing shall be configurable from a Windows 95, 98, or NT PC-based service tool, to allow setting of levels, and enabling or disabling of features and functions. Selected functions including voltage sensing levels and time delays shall be configurable using the operator panel. Designs utilizing DIP switches or other electromechanical devices are not acceptable. The transfer control shall incorporate a series of diagnostic LED lamps.
  4. The transfer switch shall be configurable to control the operation time from source to source (program transition operation). The control system shall be capable of enabling or disabling this feature, and adjusting the time period to a specific value. A phase band monitor or similar device is not an acceptable alternate for this feature.
  5. The transfer switch shall incorporate adjustable time delays for generator set start (adjustable in a range from 0-15 seconds); transfer (adjustable in a range from 0-120 seconds); retransfer (adjustable in a range from 0-30 minutes); and generator stop (cooldown) (adjustable in a range of 0-30 minutes).
  6. The transfer switch shall be configurable to accept a relay contact signal and a network signal from an external device to prevent transfer to the generator service.
  7. The control system shall be designed and prototype tested for operation in ambient temperatures from -40C to +70C. It shall be designed and tested to comply with the requirements of the noted voltage and RFI/EMI standards.
  8. The control shall have optically isolated logic inputs, high isolation transformers for AC inputs, and relays on all outputs, to provide optimum protection from line voltage surges, RFI and EMI.
- C. Control Interface**
1. The transfer switch will provide an isolated relay contact for starting of a generator set. The relay shall be normally held open, and close to start the generator set. Output contacts shall be form C, for compatibility with any generator set.
  2. Provide one set Form C auxiliary contacts on both sides, operated by transfer switch position, rated 10 amps 250 VAC.
  3. The transfer switch shall provide relay contacts to indicate the following conditions: source 1 available, load connected to source 1, source 2 available, source 2 connected to load.

### **2.03 Enclosure**

- A. Enclosures shall be UL listed. The enclosure shall provide wire bend space in compliance to the latest version of NFPA70. The cabinet door shall include permanently mounted key type latches.
- B. Transfer switch equipment shall be provided in a NEMA 1 or better enclosure.
- C. Enclosures shall be the NEMA type specified. The cabinet shall provide code-required wire bend space at point of entry as shown on the drawings. Manual operating handles and all control switches (other than key-operated switches) shall be accessible to authorized personnel only by opening the key-locking cabinet door. Transfer switches with manual operating handles and/or non key-operated control switches located on outside of cabinet do not meet this specification and are not acceptable.

## **Part 3. OPERATION**

### **3.01 Open Transition Sequence of Operation**

- A. Transfer switch normally connects an energized utility power source (source 1) to loads and a generator set (source 2) to the loads when normal source fails. The normal position of the transfer switch is source 1 (connected to the utility), and no start signal is supplied to the genset.
- B. Generator Set Exercise (Test) With Load Mode. The control system shall be configurable to test the generator set under load. In this mode, the transfer switch shall control the generator set in the following sequence:

1. Transfer switch shall initiate the exercise sequence at a time indicated in the exercise timer program, or when manually initiated by the operator.
  2. When the control systems senses the generator set at rated voltage and frequency, it shall operate to connect the loads to the generator set by opening the normal source contacts, and closing the alternate source contacts a predetermined time period later. The timing sequence for the contact operation shall be programmable in the controller.
  3. The generator set shall operate connected to the load for the duration of the exercise period. If the generator set fails during this period, the transfer switch shall automatically reconnect the generator set to the normal service.
  4. On completion of the exercise period, the transfer switch shall operate to connect the loads to the normal source by opening the alternate source contacts, and closing the normal source contacts a predetermined time period later. The timing sequence for the contact operation shall be programmable in the controller.
  5. The transfer switch shall operate the generator set unloaded for a cooldown period, and then remove the start signal from the generator set. If the normal power fails at any time when the generator set is running, the transfer switch shall immediately connect the system loads to the generator set.
- C. Generator Set Exercise (Test) Without Load Mode.** The control system shall be configurable to test the generator set without transfer switch load connected. In this mode, the transfer switch shall control the generator set in the following sequence:
1. Transfer switch shall initiate the exercise sequence at a time indicated in the exercise timer program, or when manually initiated by the operator.
  2. When the control systems senses the generator set at rated voltage and frequency, it shall operate the generator set unloaded for the duration of the exercise period.
  3. At the completion of the exercise period, the transfer switch shall remove the start signal from the generator set. If the normal power fails at any time when the generator set is running, the transfer switch shall immediately connect the system loads to the generator set.

**Part 4. OTHER REQUIREMENTS**

- 4.01 Factory Testing. The transfer switch manufacturer shall perform a complete operational test on the transfer switch prior to shipping from the factory. A certified test report shall be available on request. Test process shall include calibration of voltage sensors.
- 4.02 Service and support
- A.** The manufacturer of the transfer switch shall maintain service parts inventory at a central location which is accessible to the service location 24 hours per day, 365 days per year.
  - B.** The transfer switch shall be serviced by a local service organization that is trained and factory certified in both generator set and transfer switch service. The supplier shall maintain an inventory of critical replacement parts at the local service organization, and in service vehicles. The service organization shall be on call 24 hours per day, 365 days per year.
  - C.** The manufacturer shall maintain model and serial number records of each transfer switch provided for at least 20 years.

**Part 5. OTHER REQUIREMENTS**

**5.01 Submittals.**

- A.** Within 10 days after award of contract, provide six sets of the following information for review:
  - Manufacturer's product literature and performance data, sufficient to verify compliance to specification requirements.
  - A paragraph by paragraph specification compliance statement, describing the differences between the specified and the proposed equipment.
  - Manufacturer's certification of prototype testing.
  - Manufacturer's published warranty documents.
  - Shop drawings showing plan and elevation views with certified overall dimensions, as well as wiring interconnection details.
  - Interconnection wiring diagrams showing all external connections required; with field wiring terminals marked in a consistent point-to-point manner.
  - Manufacturer's installation instructions.



## 5.02 Factory Testing.

- A. The generator set manufacturer shall perform a complete operational test on the generator set prior to shipping from the factory. Equipment supplied shall be fully tested at the factory for function and performance.
- B. Generator set factory tests on the equipment shall be performed at rated load and rated power factor. Generator sets that have not been factory tested at rated power factor will not be acceptable. Tests shall include: run at full load, maximum power, voltage regulation, transient and steady-state governing, single step load pickup, and function of safety shutdowns.

## 5.03 Installation

**Important Notes:** The Town of Trumbull is planning to change the Electrical Service feeding the Senior Center. The current electrical service provided by the United Illuminating Co. (UI) feeding the Senior Center is rated at 600Ampere, 120/240VAC, 3 phase system. The electrical service is being changed to provide properly balanced loads across all 3 phases. The new electric service rating will be 600Ampere, 120/208VAC, 3 phase. This new service change will be performed simultaneously with the installation of the new Emergency Standby Generator System.

The owner is responsible for the electrical service change and all cost associated with it, directly to United Illuminating Co. (UI).

The owner is responsible to ensure that all existing three (3) phase equipment/motors are compatible with the new electrical service rating 120/208VAC.

The owner shall call all service companies or manufacturers of equipment, such as elevators, Heat/A/C, pumps, motors, etc. for compatibility from the original 240VAC rating to the new 208VAC rating.

Contractor will need to coordinate all power shut downs or interruptions with the Town of Trumbull, Senior Center personnel and also the UI.

The contractor is responsible to check and confirm proper phase rotation of all 3 phase motors.

Contractor must obtain all necessary electrical permits.

Owner is responsible to obtain all planning and zoning, including the Building Department's approval and permits.

Electrical contractor must be fully licensed and insured.

Owner is responsible to remove Qty 1 tree completely, including stump and roots, which is located next to the newly proposed concrete pad for the Gen Set location.

- A. Equipment shall be installed by the contractor in accordance with final submittals and contract documents. Installation shall comply with applicable state and local codes as required by the authority having jurisdiction. Install equipment in accordance with manufacturer's instructions and instructions included in the listing or labeling of UL listed products.
- B. The Emergency Generator and subbase fuel tank shall be bolted together and installed on a concrete pad. Dimensions for the concrete pad shall be, Length 152" x Width 52" x Depth 11.5" and leaving 2" above grade to shed rain and snow. Concrete mix shall be 3,500 PSI with 1/2 inch stone. A rebar grid shall be made the same size as the total pad with grid spacing at 12" on center and wire tied at each point. The rebar shall be submerged in concrete 5" off the bottom of the pad. A solid piece of no.10 wire mesh shall be cut to fit the complete pad size and be submerged 3" down from the top of the pad. Concrete pad shall be troweled smooth with a brush finish then all sides & corners rounded over with corner tool. All electrical conduits shall go through the concrete pad but not be poured tight & shall have 1" Styrofoam between pad & conduits. Equipment shall be permanently fastened to the concrete pad in accordance with manufacturer's instructions and seismic requirements of the site. The location of the Generator concrete pad will be marked out and staked off by the owner.
- C. Installation of equipment shall include furnishing and installing all interconnecting wiring between all major equipment provided for the on-site power system. The contractor shall also perform interconnecting wiring between equipment sections (when required), under the supervision of the equipment supplier.

**D.** Complete Electrical Installation of all associated Generator Equipment to include the following:

Mount and install the new 600Amp Automatic Transfer Switch (ATS) in the electrical room locate it to the left of the existing electric meter at an appropriate working height. Mount and install the new Remote annunciator alarm panel and locate it next to existing fire alarm panel in main lobby.

Electrical conduits and wiring, also replacement of Load Center.

Install and connect new conduit and conductors for 600Amp feed from the existing 600Amp building main circuit breaker to the new 600Amp ATS normal source lugs.

Remove existing 600amp, MLO, single phase, 3 wire load center in electrical room with a new G.E. brand 400Amp, main breaker, 3 phase, 4 wire load center and balance all loads across all three phases.

Install and connect all new conduit and conductors for 350Ampere feed from Generator main circuit breaker to ATS Emergency Lugs. All new conduits to be run from ATS in electrical room on ceiling through storage room on ceiling then exit building and go under ground then up through new concrete pad and through fuel tank electrical stub up area.

**Note:** No conduits or wiring are permitted outside the concrete pad and Gen Set enclosure.

Install and connect all new conduit and conductors to refeed the new 400Amp, 3 phase load center from the ATS load lugs.

Install and connect all new conduit and conductors to refeed the existing 100Amp elevator disconnect switch from the ATS load lugs.

Install and connect all new conduit and conductors to refeed the existing 300Amp load center from the ATS load lugs.

Install and connect all new conduit and conductors for a dedicated 120VAC, 20Amp circuit from the new 400Amp load center to a GFCI receptacle to be located in the Gen Set enclosure for the coolant block heater.

Install and connect all new conduit and conductors for the low voltage Auto start, remote annunciator and battery charger output from the generator to the ATS.

Install and connect all new conduit and conductors including a multi conductor Cat 5 cable from ATS to the new Remote Annunciator Panel located in main lobby.

Install and connect all new liquid tight flex conduits on Gen Set for low fuel level and leak detection switches from the subbase fuel tank to Gen Set control panel.

**Notes:**

All cable and wire conductors must be stranded copper only. Aluminum is not acceptable.

All conduit in building shall be PVC type only, with PVC outdoors and liquid tight flex conduit at all generator connection points.

All wire and cable conductors must be installed inside conduits located within the fuel tank electrical stub up area and the Gen Set.

All equipment, conduits, and wiring shall be installed per NEC standards.

All equipment shall be properly grounded per NEC standards.

All trenching and back filling including reseeding of lawn is required for all outdoor conduits from the building to Gen Set.

The new Generator and ATS shall be completely mounted, installed and also piped with all conduits, cables, and wires prior to the cut in of the "Normal Power Source," to minimize down time.

**E.** Equipment shall be initially started and operated by representatives of the manufacturer.

- F. All equipment shall be physically inspected for damage. Scratches and other installation damage shall be repaired prior to final system testing. Equipment shall be thoroughly cleaned to remove all dirt and construction debris prior to initial operation and final testing of the system.

**5.04 On-Site Acceptance Test:**

- A. The complete installation shall be tested for compliance with the specification following completion of all site work. Testing shall be conducted by representatives of the manufacturer, with required fuel supplied by owner. The Engineer shall be notified in advance and shall have the option to witness the tests.
- B. Installation acceptance tests to be conducted on-site shall include a "cold start" test, a two hour full load test, and a one step rated load pickup test in accordance with NFPA 110. Provide a resistive load bank and make temporary connections for full load test.
- C. Perform a power failure test on the entire installed system. This test shall be conducted by opening the power supply from the utility service, and observing proper operation of the system. Coordinate timing and obtain approval for start of test with site personnel.

**5.05 Training**

- A. The equipment supplier shall provide training for the facility operating personnel covering operation and maintenance of the equipment provided. The training program shall be not less than 4 hours in duration. Training date shall be coordinated with the facility owner.

**5.06 Service and support**

- A. The manufacturer of the generator set shall maintain service parts inventory at a central location which is accessible to the service location 24 hours per day, 365 days per year.
- B. The generator set shall be serviced by a local service organization that is trained and factory certified in generator set service. The supplier shall maintain an inventory of critical replacement parts at the local service organization, and in service vehicles. The service organization shall be on call 24 hours per day, 365 days per year.
- C. The manufacturer shall maintain model and serial number records of each generator set provided for at least 20 years.

**5.07 Warranty**

- A. The generator set and associated equipment shall be warranted for a period of not less than 2 years from the date of commissioning against defects in materials and workmanship.
- B. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, etc.

**TOWN OF TRUMBULL, CONNECTICUT  
REQUEST FOR QUOTATION  
EMERGENCY STANDBY POWER SYSTEMS GENERATOR SET & AUTOMATIC SWITCH  
BID PROPOSAL FORM  
BID NUMBER: 5900      DUE:    JUNE 21, 2011 @ 3:00PM**

**THE UNDERSIGNED AFFIRMS AND DECLARES** that this proposal is executed with full knowledge and acceptance of the specifications, requirements, terms and conditions contained herein and with complete understanding and full compliance of system requirements and hereby submits this proposal for the request noted above and certifies that this proposal meets all the specifications and conditions requested herein. Any substitutions to the specifications requested are clearly and completely noted. Any alternate proposals are presented in a similar format to those requested and are attached herein. It is understood that the Town reserves the right to reject any or all proposals or waive any formalities in this request. The proposed rates and discounts as follows:

Total Lump sum bid for Installation of the **EMERGENCY STANDBY POWER SYSTEMS GENERATOR SET & AUTOMATIC SWITCH** as specified herein:

\_\_\_\_\_ Dollars  
Written  
\$ \_\_\_\_\_

**ATTACH ALL DETAILED SPECIFICATIONS FOR PROPOSED PRODUCTS TO BE USED AND ANY ALTERNATE PROPOSALS**

Anticipated time for completion: \_\_\_\_\_ Days after receipt of order (ARO)

Above Price Shall Remain Firm for: \_\_\_\_\_ Days

**Work shall commence \_\_\_\_\_ days after receipt of Purchase Order**

The quality of workmanship is guaranteed for a period of \_\_\_\_\_ year(s) from acceptance.

**Note any and all exceptions or clarifications :( use additional pages as necessary)**

\_\_\_\_\_  
Company Name

\_\_\_\_\_  
By (Signature)

\_\_\_\_\_  
Address

\_\_\_\_\_  
Print Name

\_\_\_\_\_  
Company Name

\_\_\_\_\_  
Title

\_\_\_\_\_  
Date

\_\_\_\_\_  
Telephone/Fax

\_\_\_\_\_  
email

\_\_\_\_\_  
24 Hour Telephone