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**PART 1 GENERAL****1.1 RELATED DOCUMENTS**

- A. The requirements of the General Conditions, Supplementary Conditions and the following specification sections apply to all Work herein:
1. Section 26 00 10 - General Requirements
  2. Section 26 00 20 - Scope of Work
  3. Section 26 05 19 - Electrical Conductors - 600 Volts
  4. Section 26 05 26 - Grounding and Bonding
  5. Section 26 05 48 - Vibration and Seismic Controls
  6. Section 26 08 13 - Testing

**1.2 SUMMARY**

- A. Furnish and install the necessary electrical generating system as herein specified and as shown on the Drawings. The standby electrical generating system shall operate continuously over the period of time specified for the fuel storage system.

**1.3 REFERENCE STANDARDS**

- A. The electric generating system and all components shall be designed, manufactured and tested in accordance with the latest applicable industry standards including the following:
1. EGSA - Standards for Emergency Power/Engine Generator Sets
  2. IEEE 446 - Emergency and Standby Power Systems
  3. NEMA MG1 - Motors and Generators
  4. NFPA 37 - Stationary Combustion Engines and Gas Turbines
  5. NFPA 70 - National Electrical Code (NEC)
  6. NFPA 110 - Emergency and Standby Power Systems
- B. All equipment and material to be furnished and installed on this Project shall be UL or ETL listed, in accordance with the requirements of the authorities having jurisdiction, and suitable for its intended use on this Project.

**1.4 SUBMITTALS AND PROPOSALS**

- A. The following submittal data shall be furnished according to the General Conditions and Section 26 00 10 and shall include, but not be limited to:
1. Electric Generating System\* including complete system descriptive data of all mechanical and electrical components, efficiency data, control data, verification of Division 25 software interface functions, operational characteristics, fuel system, detailed dimensional information, etc.
  2. Layout drawings shall be provided for each generator set indicating its location within the confines of the Project. Layout drawings shall include all appurtenances and accessories.
  3. Calculations shall be provided to demonstrate compliance with the 10% Diesel Engine reserve capacity requirement defined hereinafter. The calculation shall include the full load rating of the alternator, taking into consideration efficiency losses, and all other attached accessories including the cooling fan. The calculations shall demonstrate compliance for the application and conditions defined hereinafter.
  4. Proposed test procedures, recording forms, test equipment, and list of personnel and qualifications for all tests proposed. Refer to Section 26 08 13 titled "Testing" for additional requirements.
  5. Factory Test Schedule.
  6. Factory Test Reports.
  7. Field Test Schedule.
  8. Field Test Reports.
  9. Maintenance Service Agreement for the warranty period if **Alternate (E-5A)** is accepted.
  10. Extended Maintenance Service Agreement if **Alternate (E-5B)** is accepted.
- B. All items or equipment listed above with asterisks (\*) shall be certified by the manufacturer using Manufacturer Certification "MCA" as set forth in Section 26 00 10. See Section 26 00 10 for certification requirements.

**1.5 WARRANTY**

- A. Comply with the requirements of the General Conditions and Section 26 00 10.

**1.6 MAINTENANCE SERVICE (Alternate E-5A)**

- A. Initial Maintenance Service: Submit an alternate price for initial maintenance service. Beginning at Substantial Completion, provide full inspection and maintenance by skilled employees of manufacturer's designated service organization during the Warranty period.
1. Include routine preventive maintenance and adjusting as required for proper operation as recommended by the manufacturer. Preventive maintenance shall include periodic inspection of a minimum of four (4) times per year for the duration of the warranty period. Inspection shall include at minimum the following:
    - a. Engine Lubrication System: Visually check for leaks. Change oil and filters once each year of the warranty period or every 150 operating hours, whichever occurs first.
    - b. Engine Air Cleaners: Wet Type: Clean and change oil as needed and at least once per each year of the warranty period. Dry Type: Replace filter as needed and at minimum once per each year of the warranty period.
    - c. Governor: Check and set speed, sensitivity and oil level.
    - d. Engine Cooling System: Check general condition. Check antifreeze and add as needed. Check cooling level. Pressure test system and replace components as required. Add additives to antifreeze once a year as needed. Check belts and hoses and replace as needed.
    - e. Engine Electric System: Hydrometer test battery. Clean and lubricate battery posts and cables. Check alternator belts. Check battery charger for proper operation. Replace components as needed.
    - f. Engine Fuel System: Visually check for leaks. Check all visible connections and flexible hoses and replace if needed. Change fuel filters as needed and at least once per each year of the warranty period. Check for water in the main fuel tank and day tank.
    - g. Engine Exhaust System: Visually check for leaks or corrosion. Check condensation trap and muffler condition. Report abnormal conditions.
    - h. AC Generator: Visually inspect generator. Inspect slip rings and commutator for wear. Check lubrication of generator bearings and add lubricant as needed.
    - i. Miscellaneous: Check all instruments for proper operation. Check timers and relays for proper operation. Check all connections for tightness. Check safety circuits, shutdowns and alarm systems.
    - j. Operation: Run engine unloaded. At the Owner's request and in their presence, transfer load to generator set and make adjustments as needed.
  2. Annual Load Bank Test: At the end of each year of the maintenance and service agreement, a continuous four (4) hour load bank test shall be performed to test the generator. The load bank shall equal 100% of the real power nameplate rating of the generator. The load shall be applied to the generator gradually (in steps) until generator full load rating is reached and then continuously applied for an additional four (4) hours. All cost including providing the temporary load bank and wiring and installation required for hookup shall be included.
  3. The maintenance service shall not include emergency maintenance or the cost of materials that are to be covered by the warranty.
- B. Schedule maintenance, testing and repair work with the Owner's representative to prevent interference with normal building activities.

**1.7 EXTENDED MAINTENANCE SERVICE AND EXTENDED WARRANTY (Alternate E-5B)**

- A. Extended Maintenance Service and Warranty: Submit an alternate price and proposed agreement that would extend the basic warranty coverage and initial maintenance service and load bank test (as described hereinbefore) for a period of one (1) year beginning at the conclusion of the initial warranty period. In addition, include a per annum cost to renew the maintenance service agreement and provide a load bank test for each additional year beginning at the end of the extended warranty for up to an additional three (3) years.

**PART 2 PRODUCTS****2.1 ACCEPTABLE MANUFACTURERS**

- A. This entire electric generating system, shall be completely built, factory tested and shipped by an assembler/manufacturer who has been regularly engaged in the production of such equipment for the past five years and who has parts and service facilities locally or provides service and parts on a national basis subject to approval by the Owner and Engineer. The performance of the electric plant shall be certified by an independent test laboratory acceptable to the Engineer as to the plant's full power rating, voltage and frequency regulation. The engine/alternator shop assembled unit shall be assembled, calibrated and tested by Caterpillar, Stewart & Stevenson, Cummins-Onan, Southern Plains or an Engineer approved equal factory authorized assembler of the engine and alternator manufacturers listed hereinafter.
- B. If it complies with these Specifications, engines manufactured by one of the following manufacturers will be acceptable:
1. Caterpillar
  2. Cummins Onan
  3. Detroit Diesel
- C. If it complies with these Specifications, alternators manufactured by one of the following manufacturers will be acceptable:
1. Caterpillar
  2. Century
  3. Kato
  4. Marathon
  5. Onan/Newage
- D. If it complies with these Specifications, one of the following circuit breaker manufacturers will be acceptable:
1. Cutler Hammer
  2. General Electric
  3. Siemens
  4. Square D

**2.2 RATINGS**

- A. The electric generating system shall consist of an unoused diesel engine driven generator set and shall provide a standby capacity of 2250 kW (not including the radiator cooling fans) at Project altitude, 0.8 power factor, 480Y/277 Volts, three (3) phase, four (4) wire, 60 hertz. See Section 2.04B. for additional engine reserve brake horsepower requirements.

**2.3 GENERAL**

- A. The engine/generator set shall be a package of new and current equipment consisting of:
1. An unoused diesel engine driven electric plant to provide electric power.
  2. Engine mounted start stop control system, a remote audible/visual annunciator panel located in the Fire Command Center in accordance with the NFPA 110, latest edition for Level 1 Emergency Power Supplies. Refer to Division 28 for additional requirements.
  3. Control system to provide automatic starting and stopping of the plant and switching of the load.
  4. Communication interface panel for monitoring by the Division 25 BMCS. Coordinate requirements with Division 25.
  5. Accessories as specified and/or standard with the specified equipment, including integral frame mounted fuel storage tank with level indicators, cooling water jacket heaters, frame mounted fan cooled radiators, fan cooled fuel cooling system and internal fuel pumping system.
  6. Energy storage batteries.
  7. Critical grade engine silencer with mounting brackets, flexible steel exhaust tubing with flanges, and gaskets (installation by Division 23).

**2.4 DIESEL ENGINE**

- A. The engine shall be of the full diesel, compression ignition, liquid cooled, 4 cycle type. Starting requirements shall be in accordance with the National Electrical Code Article 700 for emergency generators.
- B. The brake horsepower of the engine with all attached accessories as described below shall be not less than that which is required by the full load rating of the generator, taking into consideration efficiency losses, plus a reserve factor of at least ten percent (10 %) under environmental conditions as set out herein. The conditions are as follows:
  - 1. Altitude: 100'.
  - 2. Maximum ambient temperature: 110°F.
  - 3. Minimum ambient temperature: 10°F.
  - 4. If the herein described reserve capacity cannot be demonstrated by the unit manufacturer, a generator set having 10% more overall capacity than that specified must be provided.
- C. The rpm of the engine shall not exceed 1800 rpm and shall be suitable for direct connection to the alternator.
- D. The engine shall be of multicylinder design, either inline or vee arrangement. Removable cylinder liners shall be provided. Cylinder liners may be either dry or wet type.
- E. The pistons shall be trunk type, oil cooled, of either cast iron or aluminum alloy. Pistons shall be fitted with both compression and oil control rings. Piston pins shall be full floating.
- F. The crankshaft shall be drop forged, electrically hardened and statically balanced.
- G. The manufacturer shall furnish a complete prototype torsional analysis on the specific engine/generator set used for this Project.
- H. Connecting rod and main bearing shall be of the precision removable shell type.
- I. The lubrication system shall include a submerged suction, positive displacement oil pump (integral with the engine) to provide a forced feed, constant pressure to all important points. A lubricating oil filter of the replacement element type shall be provided and also a lubricating oil cooler to control oil temperature.
- J. An integral engine driven fuel transfer pump shall be furnished to supply an adequate quantity of fuel under all operating conditions to the engine injection system. A fan cooled fuel cooling system shall be provided to limit fuel temperature to normal operating temperature as required by the manufacturer and in no case higher than 140°F.
- K. All fuel filters shall be conveniently located in one accessible housing ahead of injection pumps so fuel will have been thoroughly filtered before it reaches the pumps. No screens or filters requiring cleaning or replacement shall be used in injection pump or injection valve assemblies.
- L. The governor shall be of the speed sensing or frequency sensing type capable of maintaining frequency stability to within plus or minus 1/4 of one percent (1%), at any steady state condition from no load to full load. Frequency regulation from no load to full load shall be as good as plus or minus 1/4 of one percent (1%). Frequency deviation on transients on applying or removing load shall not exceed ten (10) seconds. The governor shall be a Woodward 2301A electronic governor or equal by Barber Coleman. The engine shall be equipped with an over speed device to prevent runaway in the event of any failure, which may render the governor inoperative.
- M. An electric starting motor with solenoid and either Bendix or Dyer drive shall be furnished on the engine. Starting motor shall be of the required voltage as recommended by the engine manufacturer.
- N. The engine shall be furnished with a cooling system having sufficient capacity for cooling the engine when delivering full rated horsepower with a fifty percent (50%) ethylene glycol solution in the engine cooling system. The cooling system shall have a frame mounted air cooled radiator handling 110°F ambient air and a fan sized for the static pressure loss of the inlet louvers, discharge louvers and discharge ductwork as

- shown on the Drawings. Provide jacket water heaters to maintain an engine temperature of 90°F in a 10°F minimum ambient.
- O. A high degree, critical grade silencing type muffler with end or side inlet shall be furnished for overhead mounting. The muffler shall not be directly welded to its supports but shall be supported on a saddle type carrier. The carrier shall be braced to securely support the weight of the muffler with no weight on the exhaust pipe. A minimum 36" long length of flexible steel exhaust tubing with flanges and gaskets on both ends shall be provided by the Division 26 Subcontractor to the Division 23 Subcontractor to be installed between the engine exhaust manifold and the muffler. Exhaust piping shall be Schedule 20 black steel pipe and shall be extended from the muffler by the Division 23 Subcontractor, as indicated on the Drawings. Refer to Division 23 Section 23 21 13 titled "Pipe, Valves, Fittings and Accessories". Exhaust piping shall be supported on Amber-Booth or approved equal, spring isolators with a deflection capability of four times the expansion encountered at the support points. See Division 23 Section 23 07 00 titled "Thermal Insulation" for exhaust and muffler insulation and isolation for expansion. The engine/generator manufacturer shall review the exhaust piping size and routing indicated on the Drawings and certify that the engine will operate satisfactorily and meet the performance criteria specified with the exhaust system indicated. The engine/generator manufacturer shall send the spring constant of the flexible steel exhaust tubing to the Acoustical Consultant through the Mechanical and Electrical Subcontractor unit mounting.
- P. An oil bath or dry type air cleaner and silencer shall be furnished.
- Q. The following engine gauges and controls are to be furnished on the engine control panel:
1. Water outlet temperature gauge.
  2. Oil pressure gauge.
  3. Push button start control.
- R. Engine protective devices shall be supplied in accordance with the descriptions indicated below:
1. Alarm system for high water temperature and low oil pressure.
  2. Engine over speed shutdown device.
  3. Indicating lights for use with the above protective systems.
- S. The flywheel shall be both statically and dynamically balanced.
- T. Engine shall give satisfactory performance on ASME classified commercial grade of petroleum fuels Designation D-975 Grades 1-D and 2-D. Diesel engines requiring premium fuel will not be considered. Engine shall be capable of operating at light loads for extended periods of time and shall provide for precombustion of the fuel or a similar means for prevention of carbonization.
- U. State guaranteed fuel consumption at one hundred percent (100%), seventy-five percent (75%) and fifty percent (50%) rated load. Also state guaranteed lubrication oil consumption when submitting test report.
- V. Provide necessary dry contacts for alarm, monitoring and control as required in Divisions 15 and 16.
- W. Provide a factory mounted communication interface panel in the unit control panel for monitoring by the Division 25 BMCS.
1. Interface shall include a digital Modbus RTU RS-485 open protocol interface port for connection to the BMCS interface. Refer to Division 25 for specific interface requirements.
  2. The software communications interface shall be set up so as to provide, at minimum, the following monitoring and control points:
    - a. Normal power active.
    - b. Genset supplying load.
    - c. Genset running status.
    - d. Not in auto mode.
    - e. High battery voltage.
    - f. Low battery voltage.
    - g. Charger AC failure.
    - h. Fail to start.
    - i. Low coolant temperature
    - j. Pre-high engine temperature.
    - k. High engine temperature.

- l. Pre-low oil pressure.
  - m. Overspeed.
  - n. Low coolant level.
  - o. Low fuel level
  - p. Frequency.
  - q. Total PF.
  - r. Total KW.
  - s. Total KVA.
  - t. Percent KW.
  - u. Battery voltage.
  - v. Oil pressure.
  - w. Coolant temperature.
  - x. Engine RPM.
  - y. Engine runtime.
  - z. General alarm.
  - aa. Overload.
  - bb. Overcurrent.
  - cc. Generator breaker position (open/closed).
  - dd. Generator breaker tripped.
  - ee. Generator breaker ground fault alarm (breakers 1000A or larger).
  - ff. Engine fail to start.
3. The Electrical Subcontractor is to coordinate all hardware and software interfaces necessary for a complete and compatible system. Refer to testing in this section for additional requirements. Refer to Section 26 00 10 for requirements related to testing and documentation of the Division 25 BMCS interfaces.
- X. The entire unit(s) shall be mounted on engine rails with vibration isolating mountings of steel spring construction as required. The unit rails shall be of sufficient depth to house the frame mounted fuel tank specified herein. See Section 16630 titled "Vibration Isolation" for requirements.
- Y. The design and construction of the unit shall be such that no rotating or hazardous components are exposed and adjustments, repairs and normal maintenance can be conveniently performed without the use of special tools.
- Z. All exposed metal parts shall be primed with a rust inhibitor and finished in durable machinery enamel.

## 2.5 ALTERNATOR

- A. The engine driven synchronous type alternator shall be direct connected by means of a coupling to the engine and conform to applicable NEMA Standards.
- B. Alternator to be open drip proof type, four (4) pole, revolving field with amortisseur copper windings and heavy duty ball bearings.
- C. Alternator shall be self-excited type providing ample excitation under all normal load conditions. Exciter shall be direct connected and shall employ three-phase RMS voltage sensing. A static excited, magnetic amplifier controlled type machine will be acceptable.
- D. Each alternator shall be rated as follows: 2250 kW standby capacity, 0.80 power factor, 480Y/277 Volts, three (3) phase, 60 hertz, four (4) wire, Class H insulation, 150°C (standby) temperature rise over a 40°C ambient. Space heater(s) shall be installed in the alternator to prevent formation of moisture.

## 2.6 CONTROL PANEL

- A. Generator control panel shall be unit mounted and the top of the control panel shall be not more than 7'-0" above the finished floor adjacent to the engine/generator set. Where control panel may be above the specified 7'-0", the Electrical Subcontractor shall provide a working platform adjacent to the engine/generator set which will allow a minimum of three feet of access or more where required by code for maintenance personnel (control panel within 7'-0" above platform). Equipment shall include an AC ammeter, AC voltmeter, frequency meter, automatic voltage regulator, elapsed time meter, current and

potential transformers as required and necessary wiring and interconnections in accordance with standard commercial electrical practices.

## 2.7 GENERATOR OUTPUT BREAKER

- A. Generator output circuit breaker(s) shall be furnished by the generator manufacturer. Circuit breaker shall be:
- Circuit breakers 1200 amps and smaller shall be molded case circuit breaker, General Electric Spectra Series or approved equal, 100% rated (40°C ambient), suitable for use on a system with 35,000 amperes rms symmetrical short circuit potential at 480 Volts and shall be sized as shown on the Drawings.
- Circuit breakers larger than 1200 amps shall be insulated case breaker, General Electric Power Break II or approved equal, stationary mounted, manually operated industrial molded case circuit breaker equipped with stored energy closing and opening mechanisms, suitable for use on a system with 50,000 amperes rms symmetrical short circuit potential at 480 Volts and specifically designed to carry 100% of their nameplate values in a 40°C ambient. Refer to Section 26 24 13 titled "Switchboards – 600 Volts" for ground fault sensing system specifications.
- Tripping mechanisms shall be solid state type, rms current sensing having the following characteristics:
1. Adjustable long time pickup and delay.
  2. Adjustable short time pickup and delay.
  3. Adjustable instantaneous pickup.
  4. Adjustable ground fault pickup and delay (indication only) for breakers rated 1000 amps or more with contact wired to the generator control panel for monitoring by the BMCS.
- B. Generator output circuit breaker(s) shall have an auxiliary contact and bell alarm both wired to digital inputs in the generator control panel to provide the ability to monitor these points by the BMCS through ModBUS RTU via the generator control panel.

## 2.8 VOLTAGE REGULATOR

- \* A. Voltage regulator shall be such that it will provide generator output within  $\pm 3\%$  of rated value from no load to full load at 0.8 power factor and vice versa. Voltage stability shall be within 1/2 to one percent (1%) of its average rms value at any steady state load condition from no load to full load. Stable voltage operation shall be reestablished within four (4) seconds following any sudden load change between no load and full load.

## 2.9 FUEL SYSTEM

- A. Fuel supply system shall be a separate 250 gallon day tank provided by division 22. See Section 22 13 23 for information.

## 2.10 CONTROL SYSTEM

- A. Controls for automatically starting and stopping the engine shall be furnished and incorporated in the generator control panel. The generator control panel shall be mounted to provide access from the floor adjacent to the generator set. The automatic controls shall consist of the following:
1. Crank control to provide approximately five (5) intermittent crank and rest periods. The crank and rest periods shall be adjustable from ten (10) to twenty-four (24) seconds and the overall crank period is to be adjustable from sixty (60) seconds to approximately one hundred and twenty (120) seconds before lockout. Crank control shall be the static type.
  2. An over crank light shall be provided to indicate when the engine fails to start due to any engine malfunction. Cranking cycle is to be terminated immediately when the engine starts by means of a speed sensing switch. Automatic start stop controls must include safety shutdown provisions for high jacket water temperature, low oil pressure and over speed. Included with a shutdown control are indicating lights for signaling the cause of the shutdown. The system must be arranged so that any malfunction will lock out automatic controls until the operator manually resets them after correction of the trouble.
  3. Reset switch shall serve as an "OFF" position of the three (3) position switch, which is to be provided and further described.
  4. A time delay shall be incorporated in the low oil pressure safety circuit to prevent premature shutdown of the engine before reaching operating speed.

5. The signal for starting and stopping the engine is to be sensed through an auxiliary dry contact located in the automatic load transfer switch. Refer to Section 26 36 23 titled "Automatic Transfer Switches" for requirements.
6. A three (3) position control switch shall be mounted on the front cover of the automatic engine control panel with the following positions provided and labeled: AUTO - to set up circuits for automatic start and stop on demand of the load transfer switch. OFF - to disconnect control circuits for prevention of startup of engine during maintenance. MANUAL - to permit starting of the engine by the push button start control for test purposes without transfer of the load.
7. Provide N.O. and N.C. auxiliary contacts as required for annunciation of status and alarm to the remote annunciator at the fire command room.

### 2.11 ACCESSORIES

- A. Batteries shall be rated at a minimum of 205 amperes hour, lead in acid wet cell rechargeable type, marked and grouped to provide full rated engine starting power at four (4) hour discharge rate.
- B. A battery charger system shall be furnished and installed. Charger shall have a minimum rating of 10 Amps/hour. Charger shall be served by 120 Volts, 60 hertz, single phase current.
- C. Remote audible and visual alarm annunciators shall be furnished and installed in locations as described herein and as shown on the Drawings. Annunciators shall comply with the latest requirements of NFPA 110 for Level 1 Emergency Power Supplies, have a battery back-up, be LED or LCD display, include a silence switch, and be designed for field modification of alarm point designations.

### 2.12 PROVISIONS FOR PORTABLE GENERATOR OR LOAD BANK

- A. Provide portable generator and load bank connection into generator power distribution and generator control systems.
- B. Power Connections: Provide bus bars in tap box drilled for connection of mechanical cable lugs from temporary cables extended from a portable load bank or a portable generator. Provide and install size and quantity of mechanical lugs as indicated on the drawings. Connection to the tap box from the permanent generator distribution system shall be made with compression connectors.
- C. Portable Generator and Load Bank Connection:
  1. Provide terminal strip for connection of start/stop controls for portable engine generator from automatic transfer switches serving all branches of the building generator system including but not limited to the fire pump transfer switches. Label all terminals to identify interconnections between building generator system and portable generator.
  2. Provide a 2-position control switch, lockable in each position, to rearrange control circuiting used for the generator start signal and the shunt trip signal to the portable generator/load bank breaker in the Emergency Switchboard. Provide control switch and contactors as required to implement control and annunciation schemes. Label switch positions "Building Generator" and "Portable Generator." Install switch, terminal strips and all required contactors in a metal enclosure with a hinged cover.
  3. Sequence of Operation:
    - a. "Building Generator" position:
      - 1) Normal operation: The control switch shall be in the "Building Generator" position. The portable generator/load bank breaker shall be a manually operated "Normally Open" shunt trip breaker in the open position. The generator main breaker shall be a manually operated breaker in the closed position. Upon loss of normal power to any automatic transfer switch the automatic transfer sequence shall be initiated by sending a signal via contact closure at the ATS to start the building generator.
      - 2) Load bank testing: When testing the generator via connection of a load bank at the tap box, the portable generator/load bank breaker shall be manually closed. Upon loss of normal power to any automatic transfer switch the automatic transfer sequence shall be initiated by sending a signal via contact closure at the ATS to shunt trip the portable generator/load bank breaker and to start the building generator.
    - b. "Portable Generator" position:
      - 1) The generator main breaker shall be manually open and locked off. A portable generator shall be connected to the tap box. The portable generator/load bank breaker shall be manually



closed. The portable Generator 24 DC control power, and remote generator start signal wiring shall be connected to the terminal strip transferring the control power source from the building generator batteries to the portable generator batteries. This shall also transfer the ATS engine start signal from the building generator to the portable generator when the control switch is placed in the "Portable Generator" position. Upon loss of normal power to any automatic transfer switch the automatic transfer sequence shall be initiated by sending a signal via contact closure at the ATS to start the portable generator.

### **PART 3 EXECUTION**

#### **3.1 INSTALLATION**

- A. The electric generating system shall be installed in accordance with the equipment manufacturer/assembler's written instructions and recommendations to ensure that the system complies with these specifications and serve the intended purpose.
- B. The engine/generator set shall be anchored to a nominal 6" high concrete equipment pad with vibration isolators. See Section 26 00 10 and Section 26 05 48 titled "Vibration and Seismic Controls" for additional requirements.

#### **3.2 FACTORY TESTING**

- A. Before shipment, the complete engine/generator unit shall be tested at the factory under actual full load conditions utilizing a load bank to verify the performance and proper functioning of component parts. The load bank test shall be conducted by the manufacturer at the factory at the rated power factor specified for the engine. The certified factory load bank test data shall be forwarded to the Engineer for review. Test may be witnessed by the Engineer and Owner at their option. At least three (3) weeks written notice of the proposed test date shall be forwarded to the Engineer.

#### **3.3 FIELD TESTING**

- A. Installation acceptance testing of the engine generator shall be performed in compliance with the requirements of NFPA 110. The generator full load test shall exceed NFPA 110 and shall be conducted in accordance with Section 26 08 13. Test shall be witnessed by the Engineer. At least two (2) weeks written notice of the proposed test date shall be forwarded to the Engineer.
- B. Provide field testing of the communication interface to the BMCS as specified in Division 25.
- C. Refer to Section 26 08 13 for additional testing requirements for the electric generating system.

**END OF SECTION**