SECTION 26 32 13 – GENERATOR SET

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Extent of engine-driven generator set work is indicated by Drawings and is hereby defined to include, but not by way of limitation, natural gas spark-ignited engine, electrical generator, engine starting system including batteries, digital instrument control panel, alternator protection relay, transfer switches, phase loss relay cabinet, remote annunciator panel, critical exhaust silencer, exhaust piping, gas train, including regulator, shutoff valves, strainer, etc., fuel filters, condensate drain, concrete foundation, vibration control, battery charger, battery heater, block heater, exterior sound attenuated enclosure, connection to buildings energy management system and any other accessories required.

B. Provide one (1) 80KW natural gas generator set. Generator shall be certified at the factory to meet the current emissions standards and be as set by the EPA for the selected fuel source. Certification on site shall not be an acceptable means of certification.

C. Provide product start-up, testing and training as listed in part 3.

1.2 CODES AND STANDARDS

A. Electrical Code Compliance: Comply with applicable local code requirements of the authority having jurisdiction and NEC Articles 700, 701, and 702 pertaining to construction and installation of emergency and standby systems.

B. NFPA Compliance: Comply with applicable requirements of NFPA 37, "Installation and Use of Stationary Combustion Engines and Gas Turbines," NFPA 101, "Code for Safety to Life from Fire in Buildings and Structures."

C. ANSI/NEMA Compliance: Comply with applicable requirements of ANSI/NEMA MG 1, “Motors and Generators”, and MG-2, “Safety and Use of Electric Motors and Generators.”

1.3 QUALITY ASSURANCE

A. Vendor / Manufacturer's Qualifications:

1. Firms regularly engaged in manufacture of engine-driven generator units and ancillary equipment of types, ratings and characteristics required, whose products have been in satisfactory use in similar service for not less than five (5) years.
2. Firms regularly engaged in the maintenance of both spark-ignited and diesel fired engine-driven generator units and ancillary equipment similar to the specified equipment for not less than five (5) years. And is located within a 100-mile radius.
3. Firm shall be located in same state as project.

B. Testing Agency Qualifications: Testing agency as defined by OSHA in 29 CFR 1910.7 or a member company of the InterNational Electrical Testing Association and that is acceptable to authorities having jurisdiction.

C. Source Limitation: Obtain packaged engine generator and auxiliary components specified in this section through one source from a single manufacturer.

1.4 SUBMITTALS

A. Include the following:

1. Manufacturer’s product literature and performance data, sufficient to verify compliance to specification requirements, including, but not limited to digital control panel, alternator protection relay, engine specifications, exhaust specifications, engine electrical specifications, engine connection points, cooling requirements, gas connection requirements, gas train, and motor starting kVA with selected alternator at specified sustained voltage.
2. Sound attenuated enclosure information, including, but not limited to dimensions and average sound pressure level (dB(A)) of generator with enclosure around the enclosure at a distance of 7 meters.
3. EPA testing information.
4. Information on circuit breaker(s).
5. Manufacturer’s product literature on the phase loss relay cabinet.
6. A paragraph-by-paragraph specification compliance statement, describing the differences between the specified and the proposed equipment.
7. Manufacturer’s certification of prototype testing.
8. Manufacturer’s published warranty documents.
9. Shop drawings showing plan and elevation views with certified overall dimensions, a well as wiring interconnection details.
10. Interconnection wiring diagrams showing all external connections required; with field wiring terminals marked in a consistent point-to-point manner.
11. Manufacturer’s installation instructions.
12. Include, as part of the generator set submittal, automatic transfer switches as specified in Division 26 “Transfer Switches.”
13. E-Stop meeting NFPA 110 requirements.

1.5 MAINTENANCE SERVICE

A. Maintenance: At Substantial Completion at the completion of the entire project, begin 24 months' full maintenance by skilled employees of the manufacturer's designated service organization. Include quarterly exercising to check for proper, starting, load transfer, and running under load. Include routine preventive maintenance as recommended by manufacturer and adjusting as required for proper operation. Include a NFPA 110 compliant, minimum 2 hour, 100% load bank test at the end of the first year and at the end of the maintenance service and tweak generator as necessary for proper operation. Maintenance agreement shall include parts and supplies as used in the manufacture and installation of original equipment.

1. In addition to servicing the generator, the transfer switch(es) installed as part of the project shall be included in the maintenance service agreement.

1.6 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Filters: One set each of lubricating oil, fuel, and combustion air filters.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Kohler. – Base Bid

B. Cummins. – Alternate Bid

2.2 GENERAL

A. The system components shall be new equipment of current design, and consist of a Pennsylvania approved spark-ignited, engine-driven electric plant with mounted start-stop control, and automatic load transfer control, and necessary accessories.

B. The combined circuits of the emergency lighting distribution panel shall be interconnected with the control panel of the emergency lighting unit and normal outside current supply by means of an energized switch which shall operate as follows:

1. When the normal outside current supply fails, this energized switch shall automatically connect and operate all emergency and exit lighting circuits to the emergency lighting units.

2.3 RATING

A. The natural gas spark-ignited electric plant shall be minimum 80KW at 0.8 power factor, 277/480 volts, 3-phase, 4 wire, 60 cycle, A.C.

B. The generator set shall be capable of providing a minimum 350kVA (Surge) at 30 percent voltage drop with a 125 degree C temperature rise.

2.4 RESPONSIBILITY

A. The Manufacturer shall have printed literature and brochures describing the standard series specified (not a one-of-a-kind fabrication). The Manufacturer shall furnish schematic and wiring diagrams for the engine-alternator set, automatic transfer switch and an interconnecting diagram showing connections to individual components which constitute the standby power system. To be classified as a Manufacturer, the building of the generator set must manufacture at least the engine or the alternator. The performance test of the generating set series shall be in accordance with the procedures certified by an independent testing laboratory.

2.5 ENGINE

A. The engine shall be spark-ignited, water-cooled with mounted radiator, fan and water pump. The engine shall operate at 1800 RPM, and be direct coupled with the alternator. Intake and exhaust valves shall be heat resisting alloy steel, free rotating. Two (2) cycle engines are not acceptable for this application.

2.6 ALTERNATOR

A. The alternator shall be a 12-lead revolving field type, with static exciter and solid-state voltage regulator. No commutator brushes shall be permitted. The stator shall be directly connected to the engine flywheel

housing, and the rotor shall be driven through a semi-flexible driving flange to insure permanent alignment. Voltage regulation shall be within plus or minus 3% of rated voltage, and frequency regulation shall not exceed 3 cycles, from no-load to full-load. The instantaneous voltage dip shall be less than 20% of rated voltage when full-load and rated power factor is applied to the alternator. Recovery to steady-state operation within plus or minus 1% of rated voltage shall occur within 2 seconds. A rheostat shall provide a minimum of plus or minus 5% voltage adjustment from rated value. Radio interference suppression shall exceed requirements for general civilian and commercial applications.

B. Provide PMG excitation.

2.7 PLANT-MOUNTED DIGITAL CONTROL PANEL

A. The digital engine and instrument panel mounted above the alternator shall contain, at a minimum, oil pressure information, water temperature information, battery charge rate information, start-stop switch, remote start-stop terminals, shut-down for overspeed, high temperature, low oil pressure cranking limiter with manual reset (to open the starting circuit if the plant has not started in approximately 45 seconds), and field circuit breaker with handle lock. The alternator shall be monitored for three phase L-L and L-N voltage and frequency, three phase current, kWh, kVA and PF. LED lamps shall be supplied for engine safeties and common remote alarm terminal. Safeties to include, at a minimum, pre-alarms for low oil pressure and high-water temperature.

B. The control panel shall provide AC protection of the alternator. The protection shall include over current and short-circuit shutdown, single and three phase fault regulation, over and under voltage shut down, over and under frequency shut down, reverse power and Var shut down and excitation fault. With the use of this protection, the alternator shall be properly protected without the need of appropriately sized breakers.

C. The control panel shall be provided with communications module to interface with the building management system. Provide protocol and communications as specified below in Article “Interconnections.”

2.8 ACCESSORIES

A. All accessories needed for proper operation of the system shall be furnished. They shall include for each generator:

1. Complete natural gas train with shutoff valves, regulators, etc.
2. Sound attenuated enclosure capable of reducing the average generator sound pressure level of no more than 71 dB(A), 7 meters from the generator.
3. Battery rack and cables.
4. Battery charger. (120 Volt). Connect to a spare 20A/1P breaker in the nearest normal power panel.
5. Hydrometer.
6. Critical type muffler with minimum sound attenuation of 25 dB at 500 Hz..
7. Minimum three (3) maintenance and operating manuals with parts list (refer to front end specifications for additional information).
8. Contractor shall provide lubrication oil, lubrication, coolant water treatment and 50/50 anti-freeze solution, all per Manufacturer's recommendations.
9. Remote alarm annunciator panels. (Flush mounted where indicated on the drawings or directed by the owner.)
10. E-Stop to be installed adjacent to the remote alarm annunciator (may be part of the remote alarm annunciator if option available). E-Stop shall prevent tampering and meeting NFPA 110 and local jurisdiction requirements.
11. Line circuit breakers as indicated on the drawings.
12. All wiring, circuit breakers etc. for Battery Charger, and Block Heater.

2.9 TRANSFER SWITCHES

A. Refer to Division 26 “Transfer Switches.”

2.10 REMOTE ANNUNCIATOR

A. Provide a remote annunciator at the location indicated on the drawings and provide interconnecting wiring between the annunciator and generator control panel per manufactures requirements. The remote annunciate shall provide, at a minimum, the following visual notifications: generator run, battery charger AC failure, low battery voltage, high battery voltage, over crank, overspeed, low oil pressure, high water temperature, low water temperature, and emergency stop. The annunciator shall provide audible as well as visual alarms for critical items.

B. Provide a recessed unit on new construction walls, and a surface unit on new construction walls, unless noted otherwise.

2.11 REMOTE E-STOP

A. Provide remote E-Sop for generator meeting all NFPA 110 and local jurisdiction requirements. E-Stop shall be provided that prevents tampering and inadvertent activation (i.e. if mushroom button provided, provide clear cover over button).

B. Remote E-Stop shall be installed adjacent to remote annunciator. It may also be an integral part of the remote annunciator, if available from the manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions under which generator units are to be installed and notify Contractor in writing of conditions detrimental to proper completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

3.2 INSTALLATION

A. Install generator units as indicated, in accordance with the equipment Manufacturer's written instructions, and with recognized industry practices, to ensure that engine-generator units fulfill requirements. Comply with NFPA and NEMA standards pertaining to installation of engine-generator sets and accessories.

B. The plant shall be mounted on anti-vibration mounts to a welded steel base which shall be securely fastened to a concrete base. Concrete foundation shall be provided by this Contractor. The starting battery shall be placed on a rack within the welded steel base. The exhaust line shall contain a pipe union between the flexible connection and the muffler, as well as a condensate trap with solenoid valve at the first point of rise in the line from the engine.

C. Clearance between the bottom of the engine and the concrete pad must be adequate for engine servicing such as dropping the oil pan without raising the engine or disturbing the conduit, oil or exhaust connections.

D. Critical exhaust muffler shall be sized per manufacturer's recommendations for this installation and shall be mounted horizontally in the exhaust line.

E. Coordinate with other work, including raceways, electrical boxes and fittings, fuel tanks, piping and accessories, as necessary to interface installation of engine-generator equipment work with other work.

F. Tighten connectors and terminals, including screws and bolts, in accordance with equipment Manufacturer's published torque tightening values for equipment connectors. Where Manufacturer's torque requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Stds 486A, B and the National Electrical Code.

G. Align shafts of engine and generator within tolerances recommended by engine-generator unit Manufacturer.

H. Connect generator start circuits from the ATS's to the generator to start generator upon loss of power. In addition to loss of power, wire such that, in the event the start circuit wiring is interrupted, the generator automatically starts.

3.3 GROUNDING

A. Provide equipment grounding connections for generator units as indicated. Tighten connections to comply with tightening torques specified in UL Std 486A to assure permanent and effective grounding.

B. For exterior installations, provide ground rods at the four (4) corners and connect with a grounding ring, 30" from the generator, 30" under finished grade. The ground wire shall be bare, sized to match the generator grounding indicated on the drawing, but no smaller than #6 AWG. For interior installation, generator shall be connected to building steel with copper ground wire, sized to match the generator grounding indicated on the drawings, but no smaller than #6 AWG.

3.4 POWER WIRING TO BATTERY CHARGER, BLOCK HEATER

A. The Contractor shall provide all power wiring, circuit breakers for panels required to battery charger, block heater for a complete and operational system.

3.5 START-UP, TESTING AND TRAINING

A. Engage local equipment Manufacturer's representative to perform start-up and building load tests upon completion of installation, with the Architect/Engineer in attendance; provide certified test record. Tests are to include the following:

1. Check fuel, lubricating oil, and antifreeze in liquid cooled models for conformity to the Manufacturer's recommendations under environmental conditions present.
2. Test prior to cranking engine for proper operation, accessories that normally function while the set is in a standby mode. Accessories include: engine heaters, battery charger, generator strip heater, remote annunciator.
3. Check, during start-up test mode, for exhaust leaks, path of exhaust gases outside the building, cooling air flow, movement during starting and stopping, vibration during running, normal and emergency line-to-line voltage and phase rotation.
4. Test, by means of simulated power outage, automatic start-up by remote-automatic starting, transfer of load, and automatic shut-down. Prior to this test adjust, for proper system coordination, transfer switch timers. Monitor throughout the test, engine temperature, oil pressure, battery charge level, generator voltage, amperes, and frequency.
5. Upon completion of installation demonstrate capability and compliance of system with requirements. Where possible, correct malfunctioning units at site, then retest to demonstrate compliance;

otherwise, remove and replace with new units, and proceed with retesting. Initial testing and retesting to be at no cost to Owner.

6. 100% load bank testing shall be provided to achieve above start-up testing, and verify capacity of generator set per NFPA 110. Load bank testing shall be provided for a minimum of 2 hours.

B. Building Operating Personnel Training: Train Owner's building personnel in procedures for starting-up, testing and operating generator sets. In addition, train Owner's personnel in periodic maintenance of the generator and batteries.

END OF SECTION 26 32 13