

SECTION 26 32 13i
ENGINE GENERATORS - INSTALL

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Installation of the engine generator.
 - 2. Installation of the engine generator enclosure.
 - 3. The engine generator unit shall include all essential and desirable appurtenances whether specifically mentioned in this specification or not. Provide all components and accessories required.
 - 4. Refer to drawings, including details for additional requirements.
 - 5. Install above enclosure generator exhaust piping furnished with enclosure.
- B. Meet the following performance requirements:
 - 1. Engine generator system to provide source of standby power.
 - 2. Description: NFPA 110, engine generator system to provide source of power for Level 1 applications.
 - 3. Wind, snow, ice, flood and earthquake Performance: In accordance with Section 26 00 10 1.5.
- C. System Description:
 - 1. Engine-generator system located outdoors suitable to support non linear loads and to be operated as a separately derived electrical system with the neutral grounded at the generator.
 - 2. The operation of the units shall be automatic such that upon closing of a remote starting contact, the engines shall start and attain rated voltage and frequency within ten seconds.

1.2 RELATED WORK

- A. Section 26 00 10 – Basic electrical requirements, is an integral part of this section. Requirements and work indicated in 26 00 10 are not repeated in this Section.
- B. Section 26 08 00 – Electrical General Commissioning Requirements. Provide Installer's and Manufacturer's support as required to coordinate with the Commissioning Agent and support all commissioning efforts and paperwork, Acceptance and Integrated Systems Testing.
- C. Section 26 32 15 – Generator Field Startup Requirements.

1.3 COORDINATION

- A. Coordinate work under provisions indicated in Section 26 00 10.
- B. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:
 - 1. Notify Construction Manager, Contractor and Owner no fewer than five days in advance of proposed interruption of electrical service.
 - 2. Do not proceed with interruption of electrical service without Construction Manager's. Contractor's and Owner's written permission.
- C. Coordinate all work related to the engine generator and enclosure, provide labor and all components necessary, and schedule deliveries to provide a complete operational system within the contract schedule and requirements.

- D. Coordinate delivery of diesel engine-driven generator, its enclosure and its components. Delivery should be coordinated to coincide with the area of final installation being ready to accept the equipment. Otherwise, Installer shall store equipment as recommended by the manufacturer.
- E. Coordinate with the engine - generator and enclosure manufacturer performance parameters required for unit to operate at 100 percent of its capabilities.
- F. Coordinate shipment of completely enclosed, factory tested generator to the enclosure manufacturer. Coordinate size and weights of shipping units with the method to lift the unit.
- G. Unloading and setting in place at the job site will be the responsibility of the Installer.

1.4 QUALIFICATIONS / QUALITY ASSURANCE

- A. Conform to requirements indicated in Section 26 00 10.
- B. Safety Features – the engine generator unit shall be installed to minimize the danger of accidents to operating and maintenance personnel.

1.5 REGULATORY REQUIREMENTS AND STANDARDS

- A. Conform to requirements indicated in Section 26 00 10:
- B. Electrical Code Compliance: Comply with applicable local code requirements of the authority having jurisdiction and NFPA 70 pertaining to construction and installation of engine-generator systems.
- C. NFPA Compliance: Comply with applicable requirements of NFPA 30 "Flammable and Combustible Liquids Code", NFPA 37, "Installation and Use of Stationary Combustion Engines and Gas Turbines," and NFPA 110 "Standard for Emergency and Standby Power Systems" for a level 1 system.
- D. UL Compliance: Comply with applicable requirements of the Underwriter's Laboratories including UL2200 – "Stationary Engine Generator Assemblies". UL 142 "Steel Above Ground Tanks". UL 2085 "Protected Above Ground Tanks for flammable and combustible liquids with secondary containment".
- E. 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."
- F. IEEE Compliance: Comply with applicable portions of IEEE Std 446, "IEEE Recommended Practice for Emergency and Standby Power Systems for Industrial and Commercial Applications."
- G. Insurance Underwriters Compliance: Comply with applicable requirements of the Owner's insurance underwriter Factory Mutual.
- H. Environmental Compliance: Comply with all federal and local applicable noise, hazardous materials, and emissions control standards and any authorities having jurisdiction.

1.6 SUBMITTALS

- A. Submit as required here in and under Section 26 00 10.
- B. Submit written test results.

1.7 EXTRA MATERIALS

- A. Furnish under provisions indicated in Section 26 00 10
- B. Coordinate turnover to the Owner the following additional materials furnished under Section 26 32 13p:
 - 1. One spare set of consumables such as fuses, filters, etc.
 - 2. One spare set of air, fuel and oil filters in addition to those to be installed after acceptance and integrated systems testing.

1.8 PROJECT RECORD DOCUMENTS

- A. Submit under provisions indicated in Section 26 00 10.

1.9 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions indicated in Section 26 00 10.

1.10 WARRANTY

- A. Provide under provisions indicated in Section 26 00 10.

PART 2 - PRODUCTS

- A. Refer to shop drawings for details of pre-purchased engine generators and engine generator set enclosures.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, equipment bases, and conditions, with Installer present, for compliance with requirements for installation and other conditions affecting packaged engine-generator performance.
- B. Examine roughing-in of piping systems and electrical connections. Verify actual locations of connections before packaged engine-generator installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with packaged engine-generator manufacturers' written installation and alignment instructions and with NFPA 110.
- B. Install packaged engine generator to provide access, without removing connections or accessories, for periodic maintenance.
- C. Install packaged engine generator with elastomeric isolator pads and restrained spring isolators having a minimum deflection of 1 inch (25 mm) between generator and base fuel tank.
- D. Install base fuel tank on elastomeric isolator pads on 4-inch- (100-mm-) thick minimum concrete base. Secure sets to anchor bolts installed in concrete bases. Concrete base construction is specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."

- E. Install exhaust piping furnished with packaged engine generator from top of enclosure towards radiator exhaust.
- F. Install condensate drain piping to muffler drain outlet full size of drain connection with a shutoff valve, stainless-steel flexible connector, and Schedule 40, black steel pipe with threaded joints. Extend to outside of enclosure.
- G. Electrical Wiring: Install electrical devices furnished by equipment manufacturers but not specified to be factory mounted.
- H. Provide wiring to building for alarms, controls, monitoring, etc as required and indicated herein and on drawings.

3.3 CONNECTIONS

- A. Piping installation requirements are specified in Division 23 Sections. Drawings indicate general arrangement of piping and specialties.
- B. Connect fuel, cooling-system, and exhaust-system piping to packaged engine generator to allow service and maintenance.
- C. Ground equipment according to Division 26 Section "Grounding."
 - 1. Connect neutral to frame and grounding electrode to create a separately derived power source. Refer to Section 26 05 26 - Grounding
 - 2. Provide bonding of generator, engine frame, neutral and equipment grounds to the Building Service ground electrode, structural steel, and to three copperweld 3/4" x 20 ground rods outside the building with No. 4/0 AWG bare copper.
- D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.4 IDENTIFICATION

- A. Identify system components according to Division 23 Section "Identification for HVAC Piping and Equipment" and Section 26 05 53 "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Assist qualified testing agency to perform tests and inspections and prepare test reports. Coordinate with Sections 26 08 00 and 26 32 15.
- B. Manufacturer's Field Service: Assist factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections and to assist in testing. Report results in writing.
- C. Tests and Inspections:
 - 1. Perform tests recommended by manufacturer and each electrical test and visual and mechanical inspection for "AC Generators and for Emergency Systems" specified in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 2. NFPA 110 Acceptance Tests: Perform tests required by NFPA 110 that are additional to those specified here including, but not limited to, single-step full-load pickup test.
 - 3. Battery Tests: Equalize charging of battery cells according to manufacturer's written instructions. Record individual cell voltages.
 - a. Measure charging voltage and voltages between available battery terminals for full-charging and float-charging conditions. Check electrolyte level and specific gravity under both conditions.

- b. Test for contact integrity of all connectors. Perform an integrity load test and a capacity load test for the battery.
 - c. Verify acceptance of charge for each element of the battery after discharge.
 - d. Verify that measurements are within manufacturer's specifications.
- 4. Battery-Charger Tests: Verify specified rates of charge for both equalizing and float-charging conditions. Verify all alarms are connected to generator control panel and to remote monitoring systems.
- 5. System Integrity Tests: Methodically verify proper installation, connection, and integrity of each element of engine-generator system before and during system operation. Check for air, exhaust, and fluid leaks.
- 6. Exhaust Emissions Test: Comply with applicable government test criteria.
- 7. Voltage and Frequency Transient Stability Tests: Use recording oscilloscope to measure voltage and frequency transients for 50 and 100 percent step-load increases and decreases, and verify that performance is as specified.
- 8. Harmonic-Content Tests: Measure harmonic content of output voltage under 25 percent and at 100 percent of rated linear load. Verify that harmonic content is within specified limits.
- 9. Noise Level Tests: Measure A-weighted level of noise emanating from generator-set installation, including engine exhaust and cooling-air intake and discharge, at four locations on the property line, and compare measured levels with required values.
- D. Coordinate tests with tests for transfer switches or switchboard or switchgear control systems and run them concurrently.
- E. Test instruments shall have been calibrated within the last 12 months, traceable to standards of NIST, and adequate for making positive observation of test results. Make calibration records available for examination on request.
- F. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
- G. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
- H. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- I. Remove and replace malfunctioning units and retest and reinspect as specified above.
- J. Retest: Correct deficiencies identified by tests and observations and retest until specified requirements are met.
- K. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation resistances, time delays, and other values and observations. Attach a label or tag to each tested component indicating satisfactory completion of tests.

3.6 DEMONSTRATION

- A. Coordinate and assist Factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain packaged engine generators. Refer to Division 01 Section "Demonstration and Training."

3.7 INSTALLATION AND SITE STARTUP AND ACCEPTANCE TESTING

- A. Provide support for site startup and Acceptance testing as required to achieve a completed fully functional installation per startup schedule.

- B. Supervise work and assemble engine- generator, base mounted fuel tank and enclosure at the site.
- C. Set generator base frequency at 60.03 Hz to assist in passive paralleling with the utility source.

3.8 INTEGRATED SYSTEMS TESTING

- A. After completion of satisfactory start up and acceptance testing, Installer shall provide support for Integrated Systems Testing, per the commissioning schedule. Assume two 12 hour days on site per engine generator.

3.9 RESPONSE TIME

- A. During testing and startup provide any required components or repairs within 24 hours.

3.10 TRAINING

- A. Training: Coordinate and assist a factory-authorized service representative to provide one man-day of on-site training per engine generator to demonstrate adjustment, operation, and maintenance of the system to Owner's personnel. An additional one man-day of on-site training per engine generator will be provided within 4-6 months after initial training. Training will be scheduled at mutually convenient dates and times with the Owner.

END OF SECTION