



DESIGN REQUIREMENTS

ENGINE GENERATORS AND ACCESSORIES

GENERAL INFORMATION

- 1.1 This section applies to engine generators and accessories.

DESIGN REQUIREMENTS

- 2.1 The Engineer of Record will consult with the University's Engineering Department to coordinate design activities with the emergency power master plan which dictates that a central paralleled system be installed in the Mudd Building basement at the location of the former chiller plant. New generators, similar to the unit installed for the Northwest Corner Building, will be designed to be relocated to the central system.
- 2.2 All new generators will be 4160 Volts per our emergency generator master plan.
- 2.3 Provide a complete generator electric supply system, fully coordinated and compatible, which will automatically furnish power complete with all equipment, controls, wiring, conduit, outlets, fixtures and devices
- 2.4 The engine and starting equipment shall be designed to ensure the engine-generator is up to speed, on line, and capable of accepting the full generator load within a period of ten (10) seconds after the initiation of the starting signal, by automatic devices hereinafter specified, upon loss of normal AC supply to the system.
- 2.5 All ATS's are bypass-isolation type, 4-pole or switched neutral to suit application.
- 2.6 Provide battery-powered emergency lighting in the generator area connected to circuits serving the normal area lighting. All normal lighting circuits serving areas with equipment generator power system shall be secured from panels connected to the load side of the transfer switch.
- 2.7 Generators shall be installed with a minimum 4-foot working clearance on all sides.
- 2.8 Provide a minimum of two (2) receptacles located near the generator fed with generator power and labeled to indicate so.
- 2.9 Fuel oil systems shall be in accordance with NYC Code requirements.
- 2.10 Fuel oil piping shall be double wall and in rated enclosures where required by Code.



DESIGN REQUIREMENTS

- 2.11 Fuel oil system shall be provided with leak detection system.
- 2.12 The fuel oil system will utilize a day tank or main tank and day tank and will be sized to have a minimum of two (2) days of full load capacity – taking into consideration the working volume of the tank not the labeled capacity.
- 2.13 There will be a fully alarmed fuel system including hi/low levels, overflow, leak detection, pressure alarms and any other system dependent requirement.
- 2.14 The day tanks or headers will be automatically fed with fill pumps and floats or pressure sensors. The Engineer will provide key bypasses for the floats so the pumps can be worked manually from the central control location.
- 2.15 The fuel system will be filtered with water separators integral to the engine.
- 2.16 Provide a circuit breaker and bus connection detail to facilitate the connection of a portable load bank.
- 2.17 Generator and each ATS shall be connected to power monitoring system.

CONSTRUCTION REQUIREMENTS

- 3.1 Required factory unit tests include:
 - a. Maximum power (kW).
 - b. Maximum starting (kVA).
 - c. Time lag from signal to start, to operation at rated voltage and frequency for a cold engine having only the jacket coolant heater in operation.
 - d. A minimum six (6) Hour Load Test: 1 hour at 50 percent load; 2 hours at 75 percent load; 1 hour at 100 percent load, and a 2 hour test running the generator continuously at 100 percent rated load at 0.8 power factor and a short run at 110 percent capacity. A full set of operating data will be recorded in real time and submitted to the contractor, the Engineer of Record and University for their approval.
 - e. A complete functional test of all pre alarms and shutdowns.
 - f. Full and partial rated load step applications and rejections shall be conducted and the frequency and voltage deviations and recovery times shall be within the performance requirements specified herein.

DESIGN REQUIREMENTS

- 3.2 Provide alarm indication for the following conditions, utilizing either a solid state panel with LED or LCD readout or a panel with indicator lights and integral lamp test capability:
- a. Engine high-temperature pre-alarm [yellow].
 - b. Engine high-temperature shutdown [red].
 - c. Low lube oil pressure pre-alarm [yellow].
 - d. Low lube oil pressure shutdown [red].
 - e. Low coolant temperature alarm [red].
 - f. Low coolant level shutdown [red].
 - g. Battery charger malfunction [red].
 - h. Low battery voltage alarm [red].
 - i. High battery voltage alarm [red].
 - j. Over-speed shutdown [red].
 - k. Over-voltage shutdown [red].
 - l. Over-crank shutdown [red].
 - m. Fuel tank low level [red].
 - n. Fuel tank leak alarm [red].
 - o. Day tank low level [red].
 - p. Day tank leak alarm [red].
 - q. Control switch not in "Auto" position [flashing red].
 - r. Remote emergency stop [red].
 - s. Air damper closed [red].
 - t. Ground fault indication [red].
 - u. Generator supplying load [green].
 - v. Alarm horn with silencer switch.

DESIGN REQUIREMENTS

- 3.3 Coolant Heaters: The engine shall be provided with thermostatically controlled tank type coolant heaters to maintain engine block coolant temperatures in the range of 100-120 degrees
- 3.4 Remote Annunciator: Provide a remote audible alarm panel to signal the occurrence of any of the events listed below at a remote panel, located as directed by Columbia. Utilize either a solid-state panel with LED or LCD readout or a panel with indicator lights and integral lamp test capability. Provide visual and audible indications and horn silence switch for the following functions:
- a. Engine high-temperature pre-alarm [yellow].
 - b. Engine high-temperature shutdown [red].
 - c. Low lube oil pressure pre-alarm [yellow].
 - d. Low lube oil low-pressure shutdown [red].
 - e. Low coolant temperature alarm [red].
 - f. Low coolant level shutdown [red].
 - g. Control switch not in "Auto" position [flashing red].
 - h. Battery charger malfunction [red].
 - i. Battery low/high voltage alarm [red].
 - j. Over-speed shutdown [red].
 - k. Over-crank shut down [red].
 - l. Main tank fuel oil low level [red].
 - m. Day tank fuel oil low level [red].
 - n. Main circuit breaker tripped [red].
 - o. Generator running [green].
 - p. Fault shutdown circuits.
- 3.5 Remote emergency-stop switch: Provide wall mounted emergency stop switch at each entry to generator room/enclosure arranged to shut down generator with protective cover to prevent accidental operation.



DESIGN REQUIREMENTS

- 3.6 Where radiators cannot be unit mounted, provide closed loop, liquid cooled system with remote mounted radiator and with integral engine-driven coolant pump.
- 3.7 All fill and vent lines shall be brought to the exterior.
- 3.8 After successful test, the tank shall be marked with a UL approved label that states as a minimum: "Special Purpose Flammable Liquid Tank, Secondary Containment Generator Base Tank" with UL serial number, and the UL Mark. In addition, provide labels that contain the following:
 - a. Fuel oil sub-base tank shall be double wall construction, a minimum of 30 percent larger than that required for 24 hours of fuel at continuous 100 percent load operation. A minimum of 4 feet shall be maintained on all sides of the sub-base fuel tank

REFERENCE

- 4.1 The applicable CSI Specification Section is 263213.