

SECTION 26 30 00 - GENERATOR SET

PART 1: SCOPE OF WORK

- 1.1. It is the intent of this specification to procure an engine-driven generator set that has been production-tested, and site-tested together with all accessories necessary for a complete installation as described in the specifications and/or as shown on the plans.
- 1.2. Any and all exceptions to the published plans and specifications shall be subject to prior approval of the engineer.
- 1.3. The generator set system shall be furnished by a single manufacturer who shall be responsible, coordination, and testing of the complete system. The entire system shall be installed as described in the specifications and/or as shown on the plans.
- 1.4. The equipment shall be manufactured by a company who has produced this type of equipment for a period of at least 10 years and who maintains a service organization available 24 hours a day throughout the year.
- 1.5. The equipment shall be produced by a manufacturer who is ISO 9001 certified for the design, development, production, and service of its complete product line.

PART 2: GENERAL REQUIREMENTS

- 2.1. It is the intent of this specification to procure a generator set system that has been tested during design verification, in production, and at the final job site. The generator set will be a commercial design and will be complete with all of the necessary accessories for complete installation as described in the specifications and/or as shown on the plans. The equipment supplied shall meet the requirements of the latest edition of National Electrical Code (NEC) and all applicable codes and regulations.
- 2.2. All equipment shall be new and of current production by a national company that manufactures the generator sets and controls, transfer switches, and switchgear, and assembles the generator sets as a complete and coordinated system. There will be one-source responsibility for warranty, parts, and service through a local representative with factory-trained servicemen.

PART 3: SUBMITTAL

- 3.1. The submittal shall include test certification and specification sheets showing all standard and optional accessories to be supplied; schematic wiring diagrams, dimension drawings, and interconnection diagrams identifying by terminal number each required interconnection between the generator set, the transfer switch, and the remote annunciator panel if it is included elsewhere in these specifications.

PART 4: CODES AND STANDARDS

- 4.1. The generator set shall be listed to UL 2200 or submitted to an independent 3rd party certification process to verify compliance as installed.
- 4.2. The generator set shall conform to the requirements of the following codes and standards:
 - A. CSA C22.2, No. 14-M91 Industrial Control Equipment.
 - B. EN50082-2, Electromagnetic Compatibility-Generic Immunity Requirements, Part 2: Industrial.
 - C. EN55011, Limits and Methods of Measurement of Radio Interference Characteristics of Industrial, Scientific and Medical Equipment.
 - D. IEC8528 part 4, Control Systems for Generator Sets.
 - E. IEC Std 61000-2 and 61000-3 for susceptibility, 61000-6 radiated and conducted electromagnetic emissions.

- F. IEEE 446 Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications.
- G. NFPA 70, National Electrical Code, Equipment shall be suitable for use in systems in compliance to Article 700, 701, and 702.
- H. NFPA 99, Essential Electrical Systems for Health Care Facilities.
- I. NFPA 110, Emergency and Standby Power Systems. The generator set shall meet all requirements for Level 1 systems. Level 1 tests required by this standard shall have been performed on a complete and functional unit.

PART 5: TESTING

- 5.1. To ensure that the equipment has been designed and built to the highest reliability and quality standards, the manufacturer and/or local representative shall be responsible for 2 separate tests: final production tests, and site tests.
- 5.2. Final Production Tests: Each generator set shall be tested under varying loads with guards and exhaust system in place. Tests shall include:
 - A. Single-step load pickup
 - B. Safety shutdown device testing
 - C. Rated Power @ 0.8 PF
 - D. Maximum power
 - E. Upon request, a witness test, or a certified test record sent prior to shipment.
- 5.3. Site Tests: The manufacturer's distribution representative shall perform an installation check, startup, and building load test. The engineer, regular operators, and the maintenance staff shall be notified of the time and date of the site test. The tests shall include:
 - A. Fuel, lubricating oil, and antifreeze shall be checked for conformity to the manufacturer's recommendations, under the environmental conditions present and expected.
 - B. Accessories that normally function while the set is standing by shall be checked prior to cranking the engine. These shall include: block heaters, battery chargers, alternator strip heaters, remote annunciators, etc.
 - C. Generator set start-up under test mode to check for exhaust leaks, path of exhaust gases outside the building, cooling air flow, movement during starting and stopping, vibration during operation, normal and emergency line-to-line voltage and frequency, and phase rotation.
 - D. Automatic start by means of a simulated power outage to test remote-automatic starting, transfer of the load, and automatic shutdown. Prior to this test, all transfer switch timers shall be adjusted for proper system coordination. Engine coolant temperature, oil pressure, and battery charge level along with generator set voltage, amperes, and frequency shall be monitored throughout the test.

PART 6: WARRANTY, MAINTENANCE AND TRAINING

- 6.1. The generator set shall include a standard 1 year warranty to guarantee against defective material and workmanship in accordance with the manufacturer's published warranty from date of generator set system installation acceptance by the University Project Engineer. Optional warranties shall be available upon request.
- 6.2. The generator set manufacturer and its distributor shall maintain a 24 hour parts and service organization.
- 6.3. The generator set supplier shall train University's field personnel on the operation and maintenance of the entire emergency power system that includes, ATS, annunciator, controller, etc.

Training shall consist of at least 2 separate sessions, including field and classroom training that are video recorded and passed to the Owner.

PART 7: EQUIPMENT

- 7.1. The generator set shall be a Cummins, Kohler, Caterpillar, or approved equal with models [XXX] as described in the specifications and/or as shown in the plans.
 - A. The generator set shall provide [XXX] kW/[XXX] kVA as described in the specifications and/or as shown in the plans, when operating at 277/480 volts, 60 Hz, 0.8 power factor.
 - B. The generator set shall be capable of a Standby 130° C rating while operating in an ambient condition of less than or equal to 77° F and a maximum elevation of 10,000 feet above sea level.
- 7.2. Motor starting performance and voltage dip determinations shall be based on the complete generator set. The generator set shall be capable of supplying [XXX] LRKVA, as described in the specifications and/or as shown in the plans, for starting motor loads with a maximum instantaneous voltage dip of 35%, as measured by a digital RMS transient recorder in accordance with IEEE standard 115. Motor starting performance and voltage dip determination that does not account for all components affecting total voltage dip, i.e. engine, alternator, voltage regulator and governor will not be acceptable.
- 7.3. Vibration isolators shall be provided between the engine-alternator and heavy-duty steel base.

PART 8: ENGINE

- 8.1. The [XXX]-cubic-inch displacement engine shall deliver a minimum of [XXX] HP as described in the specifications and/or as shown in the plans, at a governed engine speed of 1800 rpm, and shall be equipped with the following:
 - A. Electronic isochronous governor capable of 0.5% steady-state frequency regulation.
 - B. 24-volt positive-engagement solenoid shift-starting motor.
 - C. 60-ampere automatic battery charging alternator with a solid-state voltage regulation.
 - D. Positive displacement, full-pressure lubrication oil pump, cartridge oil filters, dipstick, and oil drain.
 - E. Dry-type replaceable air cleaner elements for normal applications.
 - F. Engine-driven or electric fuel-transfer pump including fuel filter and electric solenoid fuel shutoff valve capable of lifting fuel.
- 8.2. The turbocharged, air-cooled engine shall be fueled by Diesel #2
- 8.3. The engine shall have a minimum of 6 cylinders and be liquid-cooled by Unit Mounted Radiator 122° F/50° C.
- 8.4. The engine shall be Tier [3], EPA-certified for Stationary Emergency Applications from the factory or per latest code.

PART 9: ALTERNATOR

- 9.1. The alternator shall be salient-pole, brushless, 2/3-pitch, 12 lead, self-ventilated with drip-proof construction and amortisseur rotor windings and skewed for smooth voltage waveform. The ratings shall meet the NEMA standard (MG1-32.40) temperature rise limits. The insulation shall be class H per UL1446 and the varnish shall be a fungus resistant epoxy. Temperature rise of the rotor and stator shall be limited to Standby 130° C. The excitation system shall be of brushless construction controlled by a solid-state voltage regulator capable of maintaining voltage within ±.25% at any constant load from 0% to 100% of rating. The AVR shall be capable of proper operation under severe nonlinear loads and provide individual adjustments for voltage range, stability and volts-per-hertz operations. The AVR shall be protected from the environment by conformal coating. The waveform harmonic distortion shall not exceed 5% total RMS measured line-to-line at full rated load. The TIF factor shall not exceed 50.

- 9.2. The alternator shall have a single maintenance-free bearing, designed for 40,000 hour B10 life. The alternator shall be directly connected to the flywheel housing with a semi-flexible coupling between the rotor and the flywheel.
- 9.3. The generator shall be inherently capable of sustaining at least 250% of rated current for at least 10 seconds under a 3-phase symmetrical short circuit without the addition of separate current-support devices.

PART 10: CONTROLLER

10.1 Controller

- A. The generator set controller shall meet NFPA 110 Level 1 requirements and shall include an integral alarm horn as required by NFPA.
- B. The controller shall meet NFPA 99 and latest edition of the NEC requirements.
- C. The controller shall be UL 508 listed.

10.2. Applicability

- A. The controller shall be a standard component on the generator set.
- B. The controller shall support 24-volt starting systems.
- C. The controller's environmental specification shall be: -40° C to 70° C operating temperature range and 5-95% humidity, non-condensing.
- D. The controller shall mount on the generator or remotely within 40' with viewable access.

10.3. Hardware Requirements

- A. Control Panel shall include:
 - 1. The control shall have a run-off/reset-auto 3-position selector switch.
 - 2. Controller-mounted, latch-type emergencies stop pushbutton.
 - 3. 5 indicating lights:

System Ready	Green
Not in Auto	Yellow
Programming Mode	Yellow
System Warning	Yellow
System Shutdown	Red

10.4. Control Functional Requirements

- A. Field-programmable time delay for engine start. Adjustment range 0-5 minutes in 1 second increments.
- B. Field-programmable time delay engine cool down. Adjustment range 0-10 minutes in 1 second increments.
- C. Capability to start and run at user-adjustable idle speed during warm-up for a selectable time period (0-10 minutes), until engine reaches preprogrammed temperature and as supported by ECM-equipped engine.
- D. The idle function including engine cool down at idle speed.
- E. Real-time clock and calendar for time stamping of events.
- F. Output with adjustable timer for an ether injection starting system. Adjustment range, 0-10 seconds.

- G. Output for shedding of loads if the generator set reaches a user programmable percentage of its kW rating. Load shed shall also be enabled if the generator set output frequency falls below 59 Hz.
- H. Programmable cyclic cranking that allows up to 6 crank cycles and up to 35 seconds of crank time per crank cycle.
- I. The capability to reduce controller current battery draw, for applications where no continuous battery charging is available. The controller vacuum fluorescent display should turn off automatically after the controller is inactive for 5 minutes.
- J. Control logic with alternator protection for overload and short circuit matched to each individual alternator and duty cycle.
- K. Control logic with RMS digital voltage regulation. A separate voltage regulator is not acceptable. The digital voltage regulator shall be applicable to single or 3-phase systems.
- L. The capability to exercise the generator set by programming a running time into the controller. This feature shall also be programmable through the PC software.
- M. Control function shall include output voltage adjustment.
- N. Battle switch function selection to override normal fault shutdowns, except emergency stop and over speed shutdown.
- O. The control shall detect the following conditions and display on control panel:
 - 1. Customer programmed digital auxiliary input ON any of the inputs available
 - 2. Customer programmed analog auxiliary input out of bounds on any of the inputs available
 - 3. Emergency stop
 - 4. High coolant temperature
 - 5. High oil temperature
 - 6. Controller internal fault
 - 7. Locked rotor – fail to rotate
 - 8. Low coolant level
 - 9. Low oil pressure
 - 10. Master switch error
 - 11. NFPA common alarm
 - 12. Over crank
 - 13. Over speed with user-adjustable level, range 60-70 Hz.
 - 14. Overvoltage with user adjustable level, range 105%-135%
 - 15. Over frequency with user adjustable level, range 102% to 140%
 - 16. Under frequency with user adjustable level, range 80% to 90%
 - 17. Under voltage with user adjustable level, range 70% to 95%
 - 18. Coolant temperature signal loss
 - 19. Oil pressure gauge signal loss

Conditions resulting in generator warning (generator shall continue to operate):

- 1. Battery charger failure
- 2. Customer programmed digital auxiliary input on any of the inputs available
- 3. Customer programmed analog auxiliary input on any of the inputs available
- 4. Power system supplying load
- 5. Ground fault detected – detection by others
- 6. High battery voltage – Level shall be user adjustable
- 7. Range 29-33 volts for 24-volt systems
- 8. High coolant temperature

9. Load shed
10. Loss of AC sensing
11. Under frequency
12. Low battery voltage – level shall be user adjustable, range 20-25 volts for 24-volt systems
13. Low coolant temperature
14. Low fuel level or pressure
15. Low oil pressure
16. NFPA common alarms
17. Overcurrent
18. Speed sensor fault
19. Weak battery
20. Alternator protection activated

10.5. Control Monitoring Requirements

- A. All monitored functions must be viewable on the control panel display.
- B. The following generator set functions shall be monitored:
 1. All output voltages – single phase, 3-phase, line-to-line, and line-to-neutral, 0.25% accuracy
 2. All single phase and 3-phase currents, 0.25% accuracy
 3. Output frequency, 0.25% accuracy
 4. Power factor by phase with leading/lagging indication
 5. Total instantaneous kilowatt loading and kilowatts per phase, 0.5% accuracy
 6. kVARS total and per phase, 0.5% accuracy
 7. kVA total and per phase, 0.5% accuracy
 8. kW hours
 9. A display of percent generator set duty level (actual kW loading divided by the kW rating)
- C. Engine parameters listed below shall be monitored:
 1. Coolant temperature both in English and metric units
 2. Oil pressure in English and metric units
 3. Battery voltage
 4. RPM
 5. Lube oil temperature
 6. Lube oil level
 7. Crankcase pressure
 8. Coolant level
 9. Coolant pressure
 10. Fuel pressure
 11. Fuel temperature
 12. Fuel rate
 13. Fuel used during the last run
 14. Ambient temperature
- D. Operational records shall be stored in the control beginning at system startup.
 1. Run time hours
 2. Run time loaded hours
 3. Run time unloaded hours
 4. Number of starts
 5. Factory test date
 6. Last run data including date, duration, and whether loaded or unloaded
 7. Run time kilowatt hours

E. The following operational records shall be a resettable for maintenance purposes:

1. Run time hours
2. Run time loaded hours
3. Run time unloaded hours
4. Run time kilowatt hours
5. Days of operation
6. Number of starts
7. Start date after reset

F. The controller shall store the last one hundred generator set system events with date and time of the event.

G. For maintenance and service purposes, the controller shall store and display on demand the following information:

1. Manufacturer's model and serial number
2. Battery voltage
3. Generator set kilowatt rating
4. Rated current
5. System voltage
6. System frequency
7. Number of phases

10.6. Inputs and Outputs

A. Inputs

1. There shall be 21 dry contact inputs that can be user-configured to shut down the generator or provide a warning.
2. There shall be 7 user-programmable analog inputs for ECM-equipped engines (5 for non-ECM engines) for monitoring and control.
3. Each analog input can accept 0-5 volt analog signals
4. Resolution shall be 1:10,000
5. Each input shall include range settings for 2 warnings and 2 shutdowns.
6. All values shall be on the control panel display.
7. Shall be user-assigned.
8. Additional standard inputs required:
 - a. Input for an external ground fault detector. Digital display shall show "ground fault" upon detection of a ground fault.
 - b. Reset of system faults.
 - c. Remote 2-wire start.
 - d. Remote emergency stop
9. Idle mode enable.

B. Outputs

1. All NFPA 10 Level 1 outputs shall be available.
2. 30 outputs shall be available for interfacing to other equipment:
 - a. All outputs shall be user-configurable from a list of 25 functions and faults.
 - b. These outputs shall drive optional dry contacts.
3. A programmable user-defined common fault output with over 40 selections shall be available.

10.7. Communications

- A. The generator set engine shall be equipped with an ECM (engine control module); the controller shall communicate with the ECM for control, monitoring, diagnosis, and meet SAE J1939 standards.
- B. An Industry standard Modbus for communication shall be standard electronic device of the generator set.
- C. A Modbus master shall able to monitor and alter parameters, and start or stop a generator set.
- D. The controller shall have the capability to communicate to a personal computer (IBM or compatible) running the latest University's supported Windows OS version at the time it is installed.
- E. Communications shall be available for serial, CAN, and Ethernet bus networks.
- F. A variety of connections shall be available as described in the specifications and/or as shown in the plans, including, but it shall not be limited to:
 1. A single control connection to a PC.
 2. Multiple controls on an intranet network connected to a PC.
 3. A single control connection to a PC via telephone line.
 4. Multiple controls to a PC via telephone line.
- G. Generator and transfer switch controls shall be equipped with communications modules capable of connecting to the same University communication network.
- H. The capability to connect up to 128 controls (any combination of generator sets and transfer switches) on a single network shall be supported.
- I. Cabling shall not be limited to the controller location.
- J. Network shall be self-powered.

PART 11: Accessories

- 11.1. Air Restriction Indicator. The air cleaner restriction indicator shall indicate the need for maintenance of the air cleaners.
- 11.2. Battery Charger. A 10-ampere automatic float to equalize battery charger with the following features:
 - A. 12 or 24 VDC output.
 - B. Voltage regulation of 1% from no to full load over 10% AC input line voltage variations.
 - C. Ammeter and voltmeter with 5% full-scale accuracy.
 - D. LED lamp for power indication.
 - E. Current limited during engine cranking, short circuit, and reverse polarity conditions.
 - F. Temperature compensated for ambient temperatures for -40° C to 60° C.
 - G. UL Listed.

- 11.3. **Battery Rack and Cables.** Battery rack and battery cables capable of holding the manufacturer's recommended batteries shall be supplied.
- 11.4. **Block Heater.** The block heater shall be thermostatically controlled and sized to maintain manufacturers recommended engine coolant temperature to meet the start-up requirements of NFPA 99 and NFPA 110, Level 1.
- 11.5. **Critical Muffler/Silencer.** The engine exhaust silencer shall be temperature and rust resistant, and rated for critical applications. The silencer will reduce total engine exhaust noise by 35 dB(A).
- 11.6. **Circuit Breaker.** The generator shall come with a primary, factory installed, 100% rated line circuit breaker of 600 amperes that is UL2200 listed. Line circuit breakers shall be sized for the rated ampacity of the generator set. Load side lugs shall be provided from the factory. The line circuit breaker shall include auxiliary contacts, shunt trip, under-voltage trip, alarm switch, and overcurrent switch functionality. Load side breaker connections made at the factory shall be separated from field connections. GFI breakers are required; therefore, additional neutral wires shall be installed at the factory.
- 11.7. **Failure Relay.**
 - A. The common failure relay shall remotely signal auxiliary faults, emergency stop, high engine temperature, low oil pressure, over crank, and over speed via one single-pole, double-throw relay with 10 amps at 120 VAC contacts.
 - B. The relay contacts shall be gold flashed to allow use of low current draw devices (100ma @ 28VDC min.).
 - C. Once energized the relay shall remain latched until the system is reset by the main controller switch.
- 11.8. **Flex Exhaust Tube.** The exhaust piping shall be gas proof, seamless, stainless steel, flexible exhaust bellows with threaded NPT connection.
- 11.9. **Flexible Fuel Lines.** The 2 fuel lines shall have fittings for the engine inlet/return and threaded pipe fittings for connection to the sub-base fuel tank (or stationary piping).
- 11.10. **Pre-alarm Senders.** The generator pre-alarm senders shall provide signals for local and/or remote annunciation for engine conditions approaching critical/shutdown parameters required in NFPA 110. Pre-alarms warn of low water (engine) temperature, approaching low oil pressure, and approaching high engine temperature.
- 11.11. **Remote Annunciator Panel.** The remote annunciator shall meet NFPA 110, Level 1 requirements and enable remote viewing of the generator status. The panel shall be connected to the generator controller via either network communication wires or via hard wired connections. Options shall be available to provide ATS source position, loaded test, and retransfer. The panel shall have the capability to be either flush- mounted or surface-mounted. The annunciator shall meet UL508 requirements.
- 11.12. **Run Relay.** The run relay shall provide a 3-pole, double-throw relay with 10-amp/250 VAC contacts to indicate that the generator is running. The relay provides 3 sets of dry contacts for energizing or de-energizing customer devices while the generator is running (e.g. louvers, indicator lamps, etc.).
- 11.13. **Standard Air Cleaner.** The air cleaner shall provide engine air filtration which meets the engine manufacturer's specifications under typical operating conditions.

PART 12: Double Wall Secondary Containment Sub Base Fuel Tank

- 12.1. A sub-base fuel tank used in conjunction with a diesel powered generator set of [XXX] kW shall contain a Tank with [XXX] gallons of Diesel fuel as described in the specifications and/or as shown in the plans to support the generator set for a period of 24 hours at 100% of rated load and 33 hours at 75% of rated load.
- 12.2. The sub-base fuel system is listed under UL 142, subsection entitled Special Purpose Tanks EFVT category, and will bear their mark of UL Approval according to their particular classification.

- 12.3. The above ground steel secondary containment rectangular tank for use as a sub base for diesel generators is manufactured and intended to be installed in accordance with the Flammable and Combustible Liquids Code—NFPA 30, the Standard for Installation and Use of Stationary Combustible Engine and Gas Turbines—NFPA 37, and Emergency and Standby Power Systems—NFPA 110.
- 12.4. Primary Tank. It will be rectangular in shape and constructed in clam shell fashion to ensure maximum structural integrity and allow the use of a full throat fillet weld.
 - A. Steel Channel Support System. Reinforced steel box channel for generator support with a load rating of 5,000 lbs. per generator mounting hole location. Full height gussets at either end of channel and at generator mounting holes shall be utilized. The reinforced steel box shall be constructed with small drain holes to avoid liquid accumulation.
 - B. Exterior Finish. The exterior coating has been tested to withstand continuous salt spray testing at 100% exposure for 244 hours to a 5% salt solution at 92-97° F. The coating has been subjected to full exposure humidity testing to 100% humidity at 100° F for 24 hours. Tests are to be conducted in accordance with The American Standard Testing Methods Society.
- 12.5. Venting. Normal venting shall be sized in accordance with the American Petroleum Institute Standard No 2000, Venting Atmospheric and Low Pressure Storage Tanks not less than 1¼" (3 cm.) nominal inside diameter.
- 12.6. Emergency Venting. The emergency vent opening shall be sized to accommodate the total capacity of both normal and emergency venting and shall be not less than that derived from NFPA 30, table 2-8, and based on the wetted surface area of the tank. The wetted area of the tank shall be calculated on the basis of 100% of the primary tank. The vent is spring-pressure operated: opening pressure is 0.5/psig and full opening pressure is 2.5 psig. The emergency relief vent is sized to accommodate the total venting capacity of both normal and emergency vents.
- 12.7. Fuel Fill. There shall be a 2" NPT opening within the primary tank and lockable manual fill cap.
- 12.8. Fuel Level. A direct reading, UL listed, magnetic fuel level gauge with a hermetically sealed vacuum tested dial shall be provided to eliminate fogging.
- 12.9. Low Fuel Level Switch. Consists of a 30 watt float switch for remote or local annunciation of a (50% standard) low fuel level condition.

PART 13: Sound Enclosure

- 13.1. All enclosures are to be constructed from high strength, low alloy steel, aluminum or galvanized steel.
- 13.2. The enclosure shall be finish coated with powder baked paint for superior finish, durability and appearance. Enclosures will be finished in the manufacturer's standard color.
- 13.3. The enclosures shall allow the generator set to operate at full load in an ambient of 40° C - 45° C with no additional derating of the electrical output.
- 13.4. Enclosures shall be equipped with sufficient side and end doors to allow access for operation, inspection, and service of the unit and all options. Minimum requirements are two doors per side. When the generator set controller faces the rear of the generator set, an additional rear facing door is required. Access to the controller and main line circuit breaker must meet the requirements of the National Electric Code (NEC).
- 13.5. Doors must be hinged with stainless steel hinges and hardware. The doors shall be removable by 1 person without tools.
- 13.6. Doors shall be equipped with lockable latches. Locks must be keyed alike. The doors shall be equipped with a lock mechanism to maintain the door opened securely at several angles (one of which shall be 135°).
- 13.7. The enclosure roof shall be pitched to prevent accumulation of water.

- 13.8. A duct between the radiator and air outlet shall be provided to prevent re-circulation of hot air.
- 13.9. The complete exhaust system shall be internal to the enclosure or optional with external mounted silencer.
- 13.10. The enclosure shall not allow entry of any kind of animals. It shall be vandal resistant, weatherproof and withstand wind speed of up to 100MPH.
- 13.11. All acoustical insulation shall be fixed to the mounting surface with pressure sensitive adhesive or mechanically fastened. In addition, all acoustical insulation mounted on a horizontal plane shall be mechanically fastened. The acoustical insulation shall be flame retardant.
 - A. The sound generated by the engine exhaust and other generator set components, after installation, shall not exceed 85 dB(A) measured at a distance of 10' in any direction from the generator set location.
- 13.12. The enclosures shall include an exhaust scoop to direct the cooling air in a vertical direction.

End of 23 30 00