**Section 435.APPENDIX C Electrical System Wiring through Filter, Oil**

a) ELECTRICAL SYSTEM WIRING

1) All wiring for lamps and other electrical devices shall be as recommended for automobiles, motor coaches, and heavy duty starting motor circuits in SAE Recommended Practices J1292 (October 1981) and J541a (October 1996) and in other practices or standards referenced in those documents, unless preempted by FMVSS. (See the FMVSS (49 CFR 571) for requirements.)

2) All circuits may be divided into independent circuits. Whenever feasible, all other electrical functions (sanders, windshield wipers, heaters, defrosters, etc.) shall be provided with independent and properly protected circuits.

3) Each body circuit shall be coded either by numerals and/or letters at approximately 100 mm (3.9") intervals, or by color and numerals and/or letters, or by colors only. The codes shall appear on a diagram of the circuits in a readily accessible location.

4) A separate fuse, circuit breaker, or electronic circuit protection shall be provided for all circuits, except that components of the engine starter and ignition circuits may be protected by other means.

5) Wires not enclosed within the body shall be fastened securely at intervals of not more than 460 mm (18.1").

6) All terminals and splice clips shall be accessible.

7) The chassis manufacturer shall install a readily accessible electrical terminal so that the net body and chassis electrical current flow can be indicated through a chassis ammeter without dismantling or disassembling the chassis component. The chassis wiring to this terminal shall have a current carrying capacity at least equal to the maximum generator output.

8) A noise suppression switch that is capable of turning off noise producing accessories, including, but not limited to, heater blowers, defroster fans, auxiliary fans and radios, must be installed.

b) EMERGENCY EXITS

Each opening for a required emergency exit window or door must be outlined around its exterior perimeter with, at a minimum, one inch (2.54 cm) wide retroreflective tape. All retroreflective tape must be on the exterior surface of the bus and conform to all requirements of 49 CFR 571.217. Retroreflective tape can be located on the rear bumper or rub rail provided the space under the emergency exit door or emergency exit window is not adequate to accommodate the tape, or, provided rivets are present that prohibit the tape from being applied properly.

Optional emergency roof exits are allowed. Retroreflective tape is also optional.

1) Side

Inside release mechanism must be protected against accidental release; easily accessible; and readily operated manually without the use of remote control, power device, or tool.

2) Rear

Inside release mechanism must be protected against accidental release; easily accessible; readily operated manually without use of remote control, power device, or tool.

Shall have permanently attached inside and outside release handles. Outside release handle must be non-hitchable.

Rear exit shall hinge on right; open outwards; have a 24 inch or more clear horizontal opening and 45 inch or more clear vertical opening above floor. Glazing shall be installed in upper and lower portions. Door and rubber seal must not be defective.

3) Window

Optional emergency windows are allowed. They must be labeled "Emergency Exit" in letters at least two inches high, of a color that contrasts with its background, located at the top of or directly above the window on the inside surface of the bus.

4) Alarms and Locks

Both audible and visible alarms shall alert the driver when engine is running and any emergency exit door either:

A) Is not fully latched, or

B) Is locked.

An audible alarm shall alert the driver when engine is running and any emergency exit window either:

A) Is not fully latched, or

B) Is locked.

The engine starting system shall not operate while any emergency exit door or window (optional or required) is locked (i.e., release mechanism that requires a key or combination, a "hasp lock" or a sliding latch) from either inside or outside the bus.

Alarm cut-off or "squelch" control is prohibited.

On a van conversion, any rear cargo door inside locks of the type installed by the chassis manufacturer (such as commonly used in cars − "push/pull" type) shall be made inoperable. The mechanism cannot, through jarring, vibration, etc., cause the door to become locked and be inoperable from the inside or outside.

No alarm is required for roof hatches.

c) ENTRANCE DOOR

1) Physical Requirements

The service entrance shall have a minimum vertical opening of 1.7 m (67") and a minimum horizontal opening of 610 mm (24").

Door shall be located to right of operator and operated by an over-center control. Upper portions of door shall be safety glass or equivalent. Vertical closing edges shall be equipped with flexible material for a proper seal and to prevent injury.

Each door on the right side of the vehicle, hinged or sliding, except the service door shall be made permanently inoperable by means other than the rub rail on the outside of the body.

The service door shall be either manually or power operated by the seated driver. When in the closed and secured position, the door operating mechanism shall prevent accidental opening but shall afford prompt release and opening by the driver. No exposed parts of a door operating mechanism shall come together so as to shear or crush fingers. The vertical closing edges of a service door shall be padded to lessen chance of injury.

A power operated door shall be equipped for emergency manual operation in case of power failure. Instructions for emergency operation of a power operated door shall be affixed permanently on the interior of the door in letters at least 12 mm (.5") high.

2) Locks and Alarms

A service door lock is not required, but if any type of service door locking system is installed on the bus, the system shall conform to at least one of the following:

A) The locking system shall not be capable of preventing the driver from easily and quickly opening the service door from inside the vehicle; or

B) A locking system that is capable of preventing the bus driver from easily and quickly opening the service door shall include an audiovisual alarm. The alarm shall be audible and visible and must alert the driver when the engine is running and the service door is locked. An alarm disconnect, "squelch control", or other alarm defeating or weakening device shall be prohibited; or

C) A locking system shall not be capable of preventing the bus driver from easily and quickly opening the service door except when a person outside the bus uses a key that is not capable of locking more than one of at least 1000 of the door manufacturer's key locking systems.

d) EXHAUST SYSTEM

1) General

"Exhaust system" includes each component used to conduct gas from an engine exhaust port (manifold) to an authorized exit point, including each sealing, connecting, and supporting component. Exhaust system shall be outside body and attached to chassis. Size of tail pipe shall not be reduced after it leaves muffler. Any flexible component that contains exhaust gas shall be of stainless steel. System shall not leak. System shall have an outlet at its discharge ends only.

Exhaust system shall be shielded from either accidental contact, "hitching to", or "standing on", except that no shielding is required at the discharge end. A chassis or body component may provide required shield.

AGENCY NOTE: As mandated by the United States Environmental Protection Agency (USEPA), diesel-powered engines manufactured after December 31, 2006 are required to meet stricter standards that will reduce emissions of particulate matter and nitrogen oxides into the atmosphere. School bus manufacturers may be required to modify exhaust systems to meet the USEPA requirements, e.g., mufflers may be replaced with after-treatment devices that significantly reduce toxins released into the atmosphere. Modifications to exhaust systems made in compliance with the USEPA requirements are acceptable, provided they do not impact the safe operation of the school bus.

2) Discharge

The exhaust pipe, muffler and tail pipe shall be outside the bus body and attached to the chassis.

The exhaust system shall be insulated from any insulated wire, flammable material, brake hose or line, or fuel system component by a securely attached metal shield at any point where the exhaust system is 11.8 inches (300 mm) or less (four inches (101.6 mm) or less if diesel powered engine) from the components listed in this subsection (d)(2).

The tail pipe may meet the chassis manufacturer's standard configuration. However, the tail pipe shall not exit beneath any fuel filler location or beneath any emergency exit door.

The tail pipe shall extend out to, but not more than, 1 inch beyond the perimeter of the body, the bumper or the rub rail.

The shielding of engine compartment components shall be governed by the chassis manufacturer's standards.

Each gas conducting component that is not of stainless steel shall be of commercial heat and corrosion resistant exhaust system material and shall be nonflexible.

e) FILTER, OIL

A "full flow" replaceable element or cartridge type engine oil filter of approximately 1 liter (1 quart) capacity shall be installed. The purchaser may specify additional "full flow" or "by-pass" type filters, or oil treatment devices.