

4501-5-02

Standards and specifications for type B, C, and D school bus chassis.

~~(A) Dry element type air cleaner shall be provided. Air cleaner and element shall meet all appropriate society of automotive engineers J726 tests for engine application.~~

~~(B) Axles or other types of suspension:~~

~~(1) The front and rear axles, including suspension assemblies, and all frame to ground components, shall have a gross axle weight rating at ground at least equal to that portion of the load as would be imposed by the chassis manufacturer's maximum gross vehicle weight rating.~~

~~(2) All vehicles shall be equipped with appropriate gross vehicle weight rating axles or suspension systems and tires by the chassis manufacturer.~~

~~(3) Front axle shall be heavy duty bus type.~~

(A) The front and rear axles, including suspension assemblies, and all frame-to-ground components, shall have a gross axle weight rating at ground at least equal to that portion of the load as would be imposed by the chassis manufacturer's maximum gross vehicle weight rating.

(1) Heavy-duty double-acting shock absorbers compatible with the manufacturer's rated axle capacity shall be installed on the front and rear of the school bus chassis.

(2) Suspension assemblies as specified shall maintain/control stability of school bus under all loading conditions.

~~(C)~~(B) Battery.

(1) An eight hundred cold cranking amperes or larger battery shall be used with a gasoline engine. A one thousand two hundred fifty cold cranking amperes or larger battery, depending on additional amperes draw, shall be used with diesel engines.

(2) One-piece non-spliced battery cables shall be provided by the chassis manufacturer. All cables shall conform to society of automotive engineers standard J541 with respect to electrical resistance. ~~All cable assemblies shall conform to American trucking association truck maintenance council RP105.~~

~~Fifty passenger chassis school bus and above with diesel engine, shall have copper wire circuit to and from starter.~~

- (3) Batteries for types B, C, and D school buses shall be mounted in the body skirt by the body manufacturer. In this case the chassis manufacturer shall temporarily mount the battery on the chassis frame, with proper cables of appropriate length for mounting, ~~which shall conform to the school transportation manufacturing technical committee's current objectives.~~ Exception: Type D rear engine bus may have batteries mounted in engine compartment.

~~(D)~~(C) All braking systems and components shall meet or exceed the minimum requirements specified in applicable FMVSS 571.105, 571.121 and the following.

- (1) Air or hydraulic brake systems are acceptable. If brakes are air actuated, they shall be of the cam drum type on front and rear wheels, if brakes are hydraulically actuated, they shall be disc front and drum rear or four wheel disc. Only split type systems are acceptable.
- ~~(2) All brake linings including those used in the parking brake system shall be asbestos free.~~
- ~~(3)~~(2) All air brake systems shall have both visual and audible warning systems that activate when the air pressure drops below sixty pounds per square inch in any service reservoir. Hydraulic brake systems that utilize hydraulic power assist shall have both systems to indicate loss of fluid flow to the power assist unit.
- ~~(4)~~(3) All buses equipped with air brakes shall have oil deflectors installed between the rear hub and drum to divert excessive oil or grease from contaminating the brake lining due to a rear axle seal leak.
- ~~(5)~~(4) Air compressors that supply air to brakes must have a rated capacity of at least thirteen cubic feet per minute and must be pressure oil fed. Clean air to all compressors shall be supplied and filtered through engine air cleaner. Separate compressors that supply air to accessories only and not braking systems, shall be a minimum of nine and one half cubic feet per minute. Air compressor may be gear or belt driven.
- ~~(6)~~(5) All air supplied from the wet, primary, secondary, and accessory air tanks shall be taken at or above the center line of the air tank to avoid water entering the braking system or air operated accessories.
- ~~(7)~~(6) The wet, primary, secondary, and accessory air tanks shall all be equipped with manual air tank drains.

~~(8)~~(7) All school buses equipped with air brakes shall require a desiccant type air dryer with a renewable or replaceable desiccant cartridge (filter). ~~with "Spin Off" replaceable filter element.~~ Dryer shall incorporate an automatic purge and drain cycle with heating element.

~~(9)~~(8) All parking brakes shall be mechanically applied and held. A red indicator light, located in the dashboard with the words "parking brake", shall light whenever the parking brake has been applied.

~~(E)~~(D) Front bumper

(1) Front bumper on all conventional-type buses shall be furnished by the chassis manufacturer.

(2) Front bumper on all transit buses shall be furnished by the body manufacturer.

(3) Front bumper shall be at least three-sixteenths of an inch thick pressed steel channel, one-piece construction, with a minimum width of eight inches after forming.

(4) Front bumper shall be contoured to offer maximum protection of fender lines without permitting snagging or hooking.

(5) Front bumper shall be attached to the frame and extended forward of grille, head lamps, fender, or hood sections and extend the entire width of the bus to provide maximum protection.

(6) Front bumper unless an energy-absorbing bumper, shall be of sufficient strength to permit lifting the bus with a bumper type lift for servicing and pushing a vehicle of equal weight without permanent distortion to bumper, chassis, or body.

(7) An optional energy-absorbing front bumper may be used, providing its design shall incorporate a self-restoring energy absorbing system of sufficient strength to:

(a) Push another vehicle of similar gross vehicle weight without permanent distortion to the bumper, chassis, or body; and

(b) Withstand repeated impacts without damage to the bumper, chassis, or

body according to the following performance standards:

- (i) Seven and one half miles per hour fixed-barrier impact (FMVSS cart and barrier test)
- (ii) Four miles per hour corner impact at thirty degrees (49 CFR, Chapter 5, Part 581)
- (iii) Twenty miles per hour into parked passenger car (class B, C, and D buses of eighteen thousand pounds gross vehicle weight rating or more)

~~(F)~~(E) The manufacturer of the energy-absorbing system shall provide evidence from an approved test facility capable of performing the above standards tests that their product conforms to the above.

~~(G)~~(F) Clutch - chassis using manual transmission shall be equipped with a clutch which shall have a rated capacity in a range from equal to the maximum net engine torque up to ten percent greater than the maximum net engine torque.

~~(H)~~(G) Color of chassis.

- (1) Bumper shall be painted black.
- (2) Cowl and fender shall be painted national school bus yellow.
- (3) Hood shall be painted non-reflective national school bus yellow or flat black.
- (4) Frame shall be painted black.
- (5) Grille may be painted national school bus yellow or may also be chrome or anodized aluminum finish.
- (6) Wheels, spokes and rims shall be painted black, ~~except rims that are natural unpainted iron and/or gray need not be painted black.~~
- (7) Paint finish coats to bus body, hood, cowl, and all attaching sheet metal and fiberglass parts shall be warranted for sixty months with no mileage limit, one hundred percent parts and labor, for adhesion and color retention.
- (8) Paint shall be applied for a total dry thickness at a minimum of one and eight

tenths mils over all painted surfaces.

~~(H)~~(H) Cooling system.

- (1) The cooling system radiator shall be of sufficient capacity to cool the engine at all speeds in all gears. Thermostatic controls shall keep the engine at the manufacturer's recommended operating temperature.
- (2) Permanent ethylene-glycol or propylene-glycol base antifreeze shall be provided by chassis manufacturer. ~~anti-freeze~~ Anti-freeze shall be compatible with the cooling system and engine.
- (3) The cooling system shall be equipped with a coolant recovery or a deaeration system. The system shall be of sufficient size to allow for the added expansion from the added coolant needed for the body heating system. The cooling system shall have a means of checking the coolant without having to remove the radiator cap.
- (4) A chassis equipped with an automatic transmission shall have a heavy duty cooling system to provide additional cooling required by the automatic transmission.
- (5) The fan shall be a viscous, air operated, or electromagnetic drive type. The fan, alternator, and water pump may be driven by matched dual belts or a single multiple groove serpentine belt of equivalent capacity.

~~(I)~~(I) Drive shaft and differential

- (1) Drive shafts and universal joints are to be original equipment manufacturer standard.
- (2) Metal drive shaft guards are required for each drive shaft section to prevent projecting through the floor or dropping to the ground if broken.
- (3) The rear axle ratio shall be compatible with engine, transmission, and tire size.

~~(K)~~(J) Electrical system

(1) Alternator

- (a) School buses with designed maximum capacity of thirty-five passengers

or larger shall be provided with a minimum of one hundred forty-five ampere alternator with a matched regulator. Transit buses with a designed maximum capacity of more than seventy passengers shall be equipped with a one hundred forty-five ampere alternator minimum. Output must be approximately sixty amperes at engine manufactures recommended idle speed.

(b) All school buses of twenty-four through thirty-four designed capacity shall be provided with a minimum of one hundred five ampere alternator. School buses with twenty-four through thirty-four capacity equipped with a lift shall be provided with a one hundred forty-five ampere alternator.

(c) Alternator shall be driven by dual belts with matched pulleys and matched belts. A single multiple-grooved serpentine belt of equivalent or greater horsepower capacity may be used.

~~(2) Voltage regulators shall be full transistor matching capacity type.~~

~~(3)(2)~~ Chassis manufacturer shall provide an adequate electric power source terminal for bus body power connection. This terminal shall be connected by number eight wire or larger wire of adequate gauge running from the power supply. ~~The terminal shall be of the single post type, a minimum of one-fourth inch stud, and located on the fire wall above the toe board on the left hand side.~~

~~(4) All buses shall be equipped with a voltmeter with graduated scale to sixteen volts.~~

(3) All wiring shall conform to current society of automotive engineers standards.

~~(L)~~(K) Exhaust system

(1) Exhaust pipe, muffler, and tailpipe shall be outside bus body and attached to chassis.

(2) Muffler shall be heavy-duty truck type of aluminized or stainless steel or ceramic coated to offer maximum resistance to corrosion or oxidation.

(3) All exhaust pipes and tailpipes shall be constructed of sixteen gauge aluminized steel tubing or better. ~~Tailpipe shall extend at least five inches beyond chassis frame with sufficient length to reach, but not to extend beyond the rear bumper.~~ Short sections of flexible pipe for gas and diesel engines are

permitted. ~~When the frame extends to the rear bumper, five inch extension is not required.~~

- (4) Diameter of tailpipe shall not be reduced after it leaves the muffler.
- (5) The tailpipe shall extend to but not beyond the rear bumper. The rear end of tailpipe must be located at least twenty inches to the right or left of the center line of the chassis. A left side exit is permitted for gas and diesel-powered buses. The tailpipe, if a left side exit, must shall be located at least three inches and not more than eighteen inches in front of the rear wheel and bent downward at a forty-five degree angle six inches from the end of the pipe. Right side exhaust systems are not permitted.
- (6) The exhaust system on a gas-powered chassis shall be insulated from the rear fuel tank and fuel tank connections by a securely attached metal shield at any point where it is twelve inches or less from the fuel tank. Metal shield is not required on diesel-powered buses.

~~(M)~~(L) Fenders

- (1) Total spread at outer edges of front fenders, measured at fender line, shall exceed total spread of front tires when front wheels are in straight ahead position.
- (2) Front fenders shall be braced and free from any body attachment. Trailing edge of front fender shall extend to bottom of front body section. Fender extensions are acceptable.
- (3) Chassis sheet metal shall not extend beyond rear face of cowl.

~~(N)~~(M) Frame

- (1) Frame shall be designed to correspond with or exceed standard practice performance criteria for trucks of same general load specifications used for highway service.
- (2) Frame side members shall be one-piece construction with the following exceptions:
 - (a) Extension of these members shall be designed, furnished, and guaranteed by chassis or body manufacturer. Installation shall be guaranteed by the

company installing extension. Extension of frame lengths shall not be for the purpose of extending wheel base.

- (b) No holes shall be permitted in the chassis rails except those drilled at the chassis plant or authorized by the chassis manufacturer.
- (c) Welding to chassis rails is permitted only when guaranteed by the company making the modifications.

~~(O)~~(N) All fuel tank specifications shall conform with FMVSS 571.301.

- (1) Fuel tank shall have a minimum capacity of ~~thirty-five~~ thirty-three gallons with a thirty gallon actual draw, for school buses up to and including fifty-nine passengers. School buses of sixty passengers and above shall have a minimum capacity of sixty gallons with a fifty-five gallon actual draw. It shall be filled and vented outside of the body. Construction will prevent the spillage or drainage of fuel on any part of the exhaust system. Type B ~~buses~~ buses fuel tank shall have a minimum capacity of thirty gallons with a twenty-five gallon actual draw.
- (2) Fuel filter with replaceable element shall be installed between the fuel tank and injector pump. A flexible connection which is gasoline and oil-proof shall be provided at the engine end of the fuel line.
- (3) A water separator shall be installed between fuel tank and all diesel engine fuel and/or fuel injector pumps. The fuel/water separator shall not serve as the only fuel filter.
- (4) Drain plug of at least one-fourth inch pipe thread shall be located in center of bottom of tank.
- ~~(5) Fuel tank installation shall be in accordance with school transportation manufacturing technical committee's current objectives.~~

~~(P)~~(O) Engine speed governor shall be installed on all school buses. Setting shall comply with manufacturer's maximum recommended governed speed and be set by the chassis manufacturers.

~~(Q)~~(P) ~~Horn(s)~~ Horns

School bus shall be equipped with dual horns of standard make, each horn capable of producing complex sound in band of audio frequencies from two hundred fifty to

two thousand hertz and having total sound level of one hundred to one hundred twenty decibels within these frequency limits when measured at fifty feet from the vehicle.

- ~~(1) School bus shall be equipped with dual horns of standard make, each horn capable of producing complex sound in band of audio frequencies from two hundred fifty to two thousand hertz and having total sound level of one hundred to one hundred twenty decibels within these frequency limits when measured at fifty feet from the vehicle.~~
- ~~(2) Sound level measurements shall be made with meter that complies with american national standards institute. Measurement shall be made with meter set to flat response.~~
- ~~(3) All school buses shall be equipped with an audible electrical warning device, automatically actuated when the bus is in reverse gear. Device shall be one hundred seven decibels or equivalent, meeting society of automotive engineers J994. Device shall be mounted behind rear axle, between frame rails, and shall emit intermittent sound. Device to be provided and installed by body manufacturer.~~

~~(R)~~(Q) Instruments and instrument panel.

- (1) Chassis shall be equipped with the following instruments and gauges. Lights in lieu of gauges are not acceptable.
 - (a) Speedometer
 - (b) Odometer which will give accrued mileage up to nine hundred ninety nine thousand and nine hundred ninety nine.
 - (c) A voltmeter with a graduated scale of sixteen volts. Voltmeter shall show the battery voltage. It shall be off when the key is in the off position.
 - (d) Electrical or mechanical oil pressure gauge.
 - (e) Electrical water temperature gauge.
 - (f) Fuel gauge.
 - ~~(g) Upper beam head lamp indicator light.~~

~~(h) Left and right turn signal indicator.~~

~~(i)(g)~~ Rear engine transit type ~~& D~~ chassis shall be equipped with an electrical tachometer.

- (2) ~~All diesel powered buses shall have a~~ All buses shall have a warning system consisting of a light and optional buzzer to notify driver of low engine oil pressure, low engine coolant level, and coolant overheating. System shall not automatically shut off engine.
- (3) All instruments shall be easily accessible for maintenance and repair.
- (4) The above instruments and gauges shall be mounted on instrument panel in such a manner that each is clearly visible to driver in a seated position. The visibility of the instruments must comply with FMVSS 571.101.
- (5) All instrument faces shall be illuminated.
- (6) The chassis manufacturer shall provide and cover instrument panel with plastic covering or equivalent in order to provide protection from precipitation from the time of manufacture until the body is mounted.

~~(S)(R)~~ Chassis lamps and signals

- (1) All lamps and their installation shall conform to current FMVSS 571.108.
- (2) ~~Chassis shall be equipped with sealed beam head lamps;~~ High beams are to be controlled by a column mounted dimmer switch.
- (3) A self-canceling turn signal shall be installed by the manufacturer as an integral part of the steering column assembly, ~~and shall have circuit wires of sufficient length for the connection of the bus turn signals by the school bus body manufacturers.~~
- (a) ~~Turn signal system shall be independent units and the chassis manufacturer shall provide a four-way hazard warning switch to cause simultaneous flashing of turn signal lamps when needed as vehicular traffic hazard warning.~~
- (b) ~~The chassis manufacturer shall install a left and right turn signal direction indicator on the instrument panel plainly visible to the driver.~~

~~(e)~~ Front turn signals shall be supplied by the chassis manufacturer in compliance with requirements of FMVSS 57.108. Placement shall be in an area most visible to other motorists.

~~(F)~~(S) Oil filter of replaceable element or cartridge type shall be provided and shall be connected by flexible high-pressure type hose with wire braid reinforcement that will withstand pressure and heat if it is not of built-in or engine-mounted design. Hose must meet ~~FMVSS 57.106~~ SAE J1019 and ~~society of automotive engineers~~ SAE J1402. ~~Diesel oil filter shall be manufacturer's standard capacity.~~

~~(U)~~(T) All openings made by the chassis manufacturer in the floorboard and fire-wall shall be sealed by the chassis manufacturer to prevent gases from entering driver's compartment. Boots for the accelerator pedal, gearshift, and emergency brake, when required, shall be supplied by the chassis manufacturer.

~~(V)~~(U) Power train

~~(1)~~ Under gross vehicle weight conditions the power train shall be capable of maintaining a speed of fifty five miles per hour of a road grade of one percent when the engine is operating at ninety percent of the engine manufacturer's recommended maximum governed revolutions per minute.

~~(2)~~(1) Diesel engines

Passengers	Minimum Horse Power	Minimum Torque	Maximum Revolutions Per Minute
24 - 48	160	350 foot/pounds	3000
49 - 54	165	350 foot/pounds	3000
55 - 59	175	400 foot/pounds	3000
60 - 84	185	400 foot/pounds	3000

~~(3)~~(2) Gasoline engine

Passengers	Minimum Horse Power	Minimum Torque	Maximum Revolutions Per Minute
24 - 48	160	275 foot/pounds	3800

49 - 54	180	290 foot/pounds	3800
55 - 59	180	290 foot/pounds	3800
60 - 84	190	310 foot/pounds	3800

~~(4)~~(3) All diesel engines shall be equipped with a turbocharger and air to air intercooler.

~~(5)~~(4) All diesel engines shall be equipped with a block heater. Heater shall be a minimum of seven hundred fifty watts.

~~(6)~~ A primary fuel filter and a fuel water separator shall be installed between fuel tank and engine transfer/injection pump on diesel engines. Fuel water separator shall not serve as the only fuel filter.

~~(7)~~(5) Dry type air cleaner with an air filter restriction indicator is required.

~~(8)~~ A warning system shall consist of light/buzzer to alert the driver of low oil pressure, low coolant level, and high coolant temperature conditions. System shall not automatically shut off engine.

~~(9)~~(6) Engine shall be equipped with a fast idle (air, electronic, or manual) throttle.

~~(W)~~ Heavy duty double acting shock absorbers compatible with the manufacturer's rated axle capacity shall be installed on the front and rear of the school bus chassis.

~~(X)~~ Springs

~~(1)~~ Suspension assemblies as specified shall maintain control stability of school bus under all loading conditions.

~~(2)~~ Spring or suspension assemblies shall be designed to carry their proportioned share of gross vehicle weight in accordance with the weight distribution as stated in paragraph (CC) of this rule.

~~(3)~~ If leaf type front springs are used, stationary eyes shall be protected by full wrapper leaf in addition to main leaf.

~~(4)~~ If leaf type rear springs are used, they shall be of progressive type. Wrapper leaves on rear springs are permissible.

~~(Y)~~(V) Steering gear assembly system.

(1) All school ~~bus chassis in all passenger capacities~~ buses shall be equipped with heavy-duty, truck-type integral power steering. ~~Power steering components shall be compatible with the gross vehicle weight for each capacity as shown in chassis manufacturer's owner's manual.~~

(2) Steering mechanism shall provide for easy adjustment for lost motion.

~~(3) Steering gear assembly shall be so constructed and guaranteed by chassis manufacturer to provide maximum safety and steering performance of school bus under all conditions of load and speed.~~

~~(4)~~(3) No changes shall be made in the steering mechanism unless approved by chassis manufacturer.

~~(5)~~(4) There shall be a clearance of at least two inches between steering wheel and any other surface or control.

~~(6)~~(5) Chassis manufacturer shall provide and cover steering wheel and column with a temporary plastic covering or equivalent in order to provide protection from precipitation from the time of manufacture until body is mounted.

~~(Z)~~(W) Tires, rims, and wheels

(1) Chassis manufacturer or authorized dealer shall balance all wheels and make necessary alignments prior to delivery.

(2) Dual rear tires and wheels shall be provided on all type B, C and D school buses.

(3) All tires on a given vehicle shall be of same size, construction, and capacity.

(4) All school buses shall be equipped with tubeless radial tires of proper size and load range for chassis gross vehicle weight ratings and body combinations as required by FMVSS 571.120. Disc or spoke wheels may be used.

~~(AA)~~ Tow hooks are optional on front of bus

~~(BB)~~(X) Transmission.

(1) Chassis manufacturer shall furnish an automatic transmission unless the school bus owner specifies a manual transmission.

~~(2) The automatic transmission shall include an external spin-on filter installed in the transmission oil cooler return line. External filter not required on Allison MD-3060 transmission.~~

~~(3)~~(2) The torque rating of the automatic transmission shall meet or exceed the maximum torque output of the engine.

~~(4)~~(3) Manual transmissions shall be full synchromesh in all forward gears except first and reverse. Manual transmissions shall conform to the following designed maximum chassis capacities.

(a) Ten through forty-nine passenger requires a minimum of four forward speeds and one reverse.

(b) Fifty ~~through eighty-four~~ and above passenger requires a minimum of five forward speeds and one reverse. ~~Six speed transmission is optional.~~

~~(CC)~~(Y) All school bus chassis serial number identification plates shall be attached to the bus and be clearly identifiable and legible for the entire life of the bus.

~~(DD) Wiring~~

~~(1) All wiring shall conform to current society of automotive engineers standards.~~

~~(2) Tail light and stop light electrical connections shall be supplied by the chassis manufacturer through the main electrical terminal block, to be connected by the school bus body manufacturer.~~

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