

1997 MISSOURI MINIMUM STANDARDS FOR SCHOOL BUSES

EFFECTIVE DATE

These specifications apply respectively to school buses with a body tag "build date" later than June 30, 1997.

SCOPE

The specifications contained herein shall apply to all school buses, manufactured after the effective date, used to transport Missouri public school students to or from school or any place for educational purposes.

FEDERAL MOTOR VEHICLE SAFETY STANDARDS (FMVSS)

All motor vehicles with a passenger capacity of 10 or more, used to transport school students, are required to meet the Federal Motor Vehicle Safety Standards (FMVSS) school bus specifications.

All school buses shall be equipped as required by the minimum specifications contained herein and as required by applicable FMVSS. In the event of a conflict between the requirements of an applicable FMVSS, as referred to in this section, and the minimum specifications contained in this regulation, the requirements of the FMVSS shall control.

USED SCHOOL BUSES

A used school bus purchased for use in Missouri by or for a public school district shall meet all of the legal requirements of the Missouri Revised Statutes for motor vehicles and shall meet the Missouri Minimum Standards for School Buses that were in effect on the date that the vehicle was manufactured plus any changes made on a retroactive basis.

CHANGES IN SPECIFICATIONS

Any part of these specifications may be changed at any time by addenda adopted by the State Board of Education.

STUDY OF NEW EQUIPMENT

The Missouri Department of Elementary and Secondary Education retains authority for the Director of Pupil Transportation to authorize testing of new equipment on school buses. A written request to test new equipment must be submitted to the Director of Pupil Transportation for approval prior to the installation or use of the new equipment. The request shall specify a period of time for the test not to exceed one school year. After receiving a written request, the Director of Pupil Transportation will analyze the need for the new equipment and the related safety issues involved and issue a written decision within 15 working days to the individual making the request. Upon completion of the test, a written report by the authorized tester shall be submitted to the Director of Pupil Transportation for analysis. If the equipment test provides additional safety for pupils an addendum to these standards will be issued by the Department.

SECTION 2

DEFINITIONS, SCHOOL BUS

TYPE A

The Type "A" school bus is a conversion or body constructed upon a van-type or cutaway front-section vehicle with a left side driver's door, designed for carrying more than 10 persons. This definition shall

include two classifications: Type A-I, with a Gross Vehicle Weight Rating (GVWR) over 10,000 pounds; and Type A-II, with a (GVWR) of 10,000 pounds and under.

TYPE B

A Type "B" school bus is a conversion or body constructed and installed upon a van or front-section vehicle chassis, or stripped chassis, with a gross vehicle weight rating of more than 10,000 pounds, designed for carrying more than 10 persons. Part of the engine is beneath and/or behind the windshield and beside the driver's seat. The entrance door is behind the front wheels.

TYPE C

A Type "C" school bus is a body installed upon a flat back cowl chassis with a gross vehicle weight rating of more than 10,000 pounds, designed for carrying more than 10 persons. All of the engine is in front of the windshield and the entrance door is behind the front wheels.

TYPE D

A Type "D" school bus is a body installed upon a chassis, with the engine mounted in the front, midship, or rear, with a gross vehicle weight rating of more than 10,000 pounds, designed for carrying more than 10 persons. The engine may be behind the windshield and beside the driver's seat; it may be at the rear of the bus, behind the rear wheels, or midship between the front and rear axles. The entrance door is ahead of the front wheels.

SECTION 3

BUS CHASSIS

AIR CLEANER

1. The engine intake air cleaner system shall be furnished and properly installed by the chassis manufacturer to meet engine manufacturer's specifications.
2. The intake air system for diesel engines shall have an air cleaner restriction indicator properly installed by the chassis manufacturer to meet engine specifications.

AXLES

1. The front and rear axle and suspension systems shall have gross axle weight rating (GVWR) at ground commensurate with the respective front and rear weight loads that will be imposed by the bus.

BRAKES

1. The braking system shall include the service brake, an emergency brake that is a part of the service brake system and controlled by the service brake control, and a parking brake.
2. Buses using air or vacuum in the operation of the brake system shall be equipped with warning signals, readily audible and visible to the driver, that will give a continuous warning when the air pressure available in the system for braking is 60 psi (pounds per square inch) or less or the vacuum in the system available for braking is eight (8) inches of mercury or less.

An illuminated gauge shall be provided that will indicate to the driver the air pressure in pounds per square inch or the inches of mercury vacuum available for the operation of the brakes.

- a. Vacuum-assist brake systems shall have a reservoir used exclusively for brakes that shall adequately ensure a full stroke application that loss in vacuum shall not exceed 30 percent with the engine off. Brake systems on gas-powered engines shall include suitable and convenient connections for the installation of a separate vacuum reservoir.
 - b. Any brake system with a dry reservoir shall be equipped with a check-valve or equivalent device to ensure that in the event of failure or leakage in its connection to the source of compressed air or vacuum, the stored dry air or vacuum shall not be depleted by the leakage or failure.
 - c. On vehicles equipped with air brakes, an air dryer is required.
3. Buses using a hydraulic-assist brake shall be equipped with warning signals, readily audible and visible to the driver, that will provide continuous warning in the event of a loss of fluid flow from primary source and in the event of discontinuity in that portion of the vehicle electrical system that supplies power to the backup system.
 4. The brake lines and booster-assist lines shall be protected from excessive heat and vibration and installed in a manner which prevents chafing.
 5. All brake systems shall be designed to permit visual inspection of brake lining wear without removal of any chassis components.
 6. When provided, antilock brake systems for either air or hydraulic brakes shall include control of all axles in compliance with Federal Motor Vehicle Safety Standard (FMVSS) 105 or 121.

BUMPER, FRONT

1. All school buses shall be equipped with a front bumper. The front bumper shall be furnished by the chassis manufacturer as part of the chassis on all types of chassis unless there is a specific arrangement between the chassis manufacturer and body manufacturer that the body manufacturer will furnish the front bumper.
2. Unless an energy absorbing bumper is used, the front bumper shall be of pressed steel channel or equivalent material at least 3/16" thick and not less than 8" wide (high) and shall extend beyond forward-most part of the body, grille, hood, and fenders and shall extend to outer edges of the fenders at the bumper's top line.
3. Front bumper, except breakaway bumper ends, shall be of sufficient strength to permit pushing a vehicle of equal gross vehicle weight without permanent distortion to the bumper, chassis, or body.
4. Tow eyes or hooks may be furnished and attached so as not to project beyond the front bumper. Tow eyes or hooks attached to the frame chassis shall be furnished by the chassis manufacturer. This installation shall be in accordance with the chassis manufacturer's standards.
5. The bumper shall be designed or reinforced so that it will not deform when the bus is lifted by a chain that is passed under the bumper (or through the bumper if holes are provided for this purpose) and attached to both tow eyes. For the purpose of meeting this standard, the bus shall be empty and positioned on a level, hard surface and both tow eyes shall share the load equally.

BUMPER, FRONT-ENERGY ABSORBING (OPTIONAL EQUIPMENT)

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

1. Push another vehicle of similar GVWR without permanent distortion to the bumper, chassis, or body; and
2. Withstand repeated impacts without damage to the bumper, chassis, or body according to the following performance standards:
 - a. 7.5 MPH fixed barrier impact (FMVSS cart & barrier test)
 - b. 4.0 MPH corner impact at 30 degrees (Part 581 CFR Title 49, Ch V)
 - c. 20.0 MPH into parked passenger car (class B, C, and D buses of 18,000 lbs GVWR or more)
3. The manufacturer of the energy absorbing system shall provide evidence from an approved test facility (capable of performing the above FMVSS tests) that their product conforms to the above standards.

CERTIFICATION

Chassis manufacturer will, upon request, certify to the Missouri Department of Elementary and Secondary Education that their product meets minimum standards on items not covered by certification issued under requirements of the National Traffic and Motor Vehicle Safety Act.

CLUTCH

1. Clutch torque capacity shall be equal to or greater than the engine torque output.
2. A starter interlock shall be installed to prevent actuation of the starter if the clutch is not depressed.

COLOR

1. Chassis, including hubs and front bumper, shall be black. Body cowl, hood, and fenders shall be in national school bus yellow. The flat top surface of the hood may be non-reflective black or national school bus yellow. (See Appendix).
2. Rims and wheels may silver, gray, black or white as received from the manufacturer.

DRIVE SHAFT

1. Drive shaft shall be protected by a metal guard or guards around the circumference of the drive shaft to reduce the possibility of its whipping through the floor or dropping to the ground if broken.

ELECTRICAL SYSTEM

1. Battery
 - a. Storage battery shall have minimum cold cranking capacity rating equal to the cranking current required for 30 seconds at 0 degrees Fahrenheit (-17.8/C) and a minimum reserve capacity rating of 120 minutes at 25 amps. Higher capacities may be required depending upon optional equipment and local environmental conditions.

b. Since all batteries are to be secured in a sliding tray in the body, chassis manufacturers shall temporarily mount the battery on the chassis frame, except that van conversion or cutaway front-section chassis may be manufacturer's standard configuration. In these cases, the final location of the battery and the appropriate cable lengths shall be according to the SBMI Design Objectives Booklet, 1990 edition, or as mutually agreed upon by the chassis and body manufacturer. In all cases, however, the battery cable provided with the chassis shall have sufficient length to allow some slack.

2. Alternator

a. All Type A buses and Type B buses up to 15,000 lbs GVWR shall have a minimum 60 ampere alternator.

b. Types A-I and Type B buses over 15,000 lbs GVWR and all types C and D buses shall be equipped with a heavy-duty truck or bus-type alternator meeting SAE J 180, having a minimum output rating of 100 amperes. Alternators of 100 through 145 ampere design shall produce a minimum of 50 amperes output at engine idle speed.

c. All buses equipped with an electrical power lift shall have a minimum 100 ampere alternator.

d. Direct-drive alternator is permissible in lieu of belt drive. Belt drive shall be capable of handling the rated capacity of the alternator with no detrimental effect on other driven components.

e. Refer to SBMI Design Objectives, 1990 edition for estimating required alternator capacity.

3. Wiring

a. All wiring shall conform to current applicable recommended practices of the Society of Automotive Engineers (SAE).

(1) All wiring shall use a standard color and number coding and each chassis shall be delivered with a wiring diagram that illustrates the wiring of the chassis.

b. Chassis manufacturer shall install a readily accessible terminal strip or plug on the body side of the cowl, or in an accessible location in the engine compartment of vehicles designed without a cowl, that shall contain the following terminals for the body connections:

(1) Main 100 amp body circuit

(2) Tail lamps

(3) Right turn signal

(4) Left turn signal

(5) Stop lamps

(6) Back up lamps

(7) Instrument panel lights (rheostat controlled by head lamp switch)

4. Circuits

- a. An appropriate identifying diagram (color and number coded) for electrical circuits shall be provided to the body manufacturer for distribution to the end user.
- b. Headlight system must be wired separately from the body-controlled solenoid.

ENGINE FIRE EXTINGUISHER

1. Manufacturer may provide an automatic fire extinguisher system in the engine compartment.

EXHAUST SYSTEM

1. Exhaust pipe, muffler and tailpipe shall be outside the bus body compartment and attached to the chassis so as not to damage any other chassis component.
2. Tailpipe shall be constructed of a corrosion-resistant tubing material at least equal in strength and durability to 16-gauge steel tubing.
3. Chassis manufacturers shall furnish an exhaust system with tailpipe of sufficient length to exit the rear of the bus or at the left side of the bus body no more than 18 inches forward of the front edge of the rear wheel house opening. If designed to exit at the rear of the bus, the tailpipe shall extend at least five inches beyond the end of the chassis frame. If designed to exit to the side of the bus, the tailpipe shall extend at least 48.5 inches (51.5 inches if the body is to be 102 inches wide) outboard from the chassis centerline.
 - a. On Types C and D vehicles, the tailpipe shall not exit beneath a fuel fill or emergency door exit.
 - b. Type A and B chassis may be furnished with the manufacturer's standard tailpipe configuration.
4. Exhaust system on a chassis shall be adequately insulated from the fuel system.
5. Muffler shall be constructed of corrosion-resistant material.
6. The exhaust system on vehicles equipped with a power lift unit may be routed to the left of the right frame rail to allow for the installation of a power lift unit on the right side of the vehicle.

FENDERS, FRONT-TYPE C VEHICLES

1. Total spread of 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 properly braced and free from any body attachments.

FRAME

1. Frame or equivalent shall be of such design and strength characteristics as to correspond at least to standard practice for trucks of the same general load characteristics which are used for highway service.
2. Any secondary manufacturer that modifies the original chassis frame shall guarantee the performance of workmanship and materials resulting from such modification.
3. Frames shall not be modified for the purpose of extending the wheel base.

4. Holes in top or bottom flanges or side units of the frame, and welding to the frame, shall not be permitted except as provided or accepted by chassis manufacturer.
5. Frame lengths shall be provided in accordance with SBMI Design Objectives, 1990 edition, except where body and chassis manufacturer are the same or have established mutual design criteria for the vehicle.

FUEL TANK

1. Fuel tank or tanks having a 30 gallon capacity with a 25 gallon actual draw shall be provided by the chassis manufacturer. The tank shall be filled and vented to the outside of the body, in a location where accidental fuel spillage will not drip or drain on any part of the exhaust system.
2. No portion of the fuel system which is located outside the engine compartment, except the filler tube, shall extend above the top of the chassis frame rail. Fuel lines shall be mounted to obtain maximum possible protection from the chassis frame.
3. Fuel filter with replaceable element shall be installed between the fuel tank and engine.
4. Fuel tank installation shall be in accordance with SBMI Design Objectives, 1990 edition, and all Federal Motor Vehicle Safety Standards in effect on the date of manufacture of the bus.
 - a. Fuel tank(s) may be mounted between the chassis frame rails or outboard of the frame rails on either the left or right side of the vehicle.
5. The actual draw capacity of each fuel tank shall be 83% of the tank capacity.
6. Unless specific agreement has been made between the body and chassis manufacturers, fuel tanks and filler spouts shall not be located in spaces restricted by SBMI Design Objectives, 1990 edition.
7. Installation of alternative fuel systems, including fuel tanks and piping from tank to engine, shall comply with all applicable fire codes and applicable Federal Motor Vehicle Safety Standards in effect on the date of manufacture of the bus. (See Alternative Fuels in the Appendix).

GOVERNOR

1. An engine governor is permissible. When it is desired to limit road speed, a road speed governor should be installed.
2. When engine is remotely located from driver, the governor shall be set to limit engine speed to maximum revolutions per minute recommended by engine manufacturer, and a tachometer shall be installed so the engine speed may be known to the driver.

HEATING SYSTEM, PROVISION FOR

1. The chassis engine shall have plugged openings for the purpose of supplying hot water for the bus heating system. The openings shall be suitable for attaching 3/4 inch pipe thread/hose connector. The engine shall be capable of supplying water having a temperature of at least 170 degrees Fahrenheit at a flow rate of 50 pounds/per minute at the return end of 30 feet of one inch inside diameter automotive hot water heater hose. (SBMI Standard No. 001--Standard Code for Testing and Rating Automotive Bus Hot Water Heating and Ventilating Equipment.)

HORN

1. Bus shall be equipped with horn or horns of standard make with each horn capable of producing a complex sound in bands of audio frequencies between 250 and 2,000 cycles per second and tested in accordance with SAE J-377.

INSTRUMENTS AND INSTRUMENT PANEL

1. Chassis shall be equipped with the following instruments and gauges. (Lights in lieu of gauges are not acceptable, except as noted):
 - a. Speedometer
 - b. Odometer which will give accrued mileage (to seven digits), including tenths of miles.
 - c. Voltmeter
 - (1) Ammeter with graduated charge and discharge, with ammeter and its wiring compatible with generating capacities, is permitted in lieu of voltmeter.
 - d. Oil pressure gauge
 - e. Water temperature gauge
 - f. Fuel gauge
 - g. Upper beam headlight indicator
 - h. Brake indicator gauge (vacuum or air)
 - (1) Light indicator in lieu of gauge is permitted on vehicle equipped with hydraulic-over-hydraulic brake system.
 - i. Turn signal indicator
 - j. Glow-plug indicator light where appropriate
2. All instruments shall be easily accessible for maintenance and repair.
3. Instruments and gauges shall be mounted on the instrument panel so that each is clearly visible to the driver while seated in a normal driving position in accordance with SBMI Design Objectives, 1990 edition.
4. Instrument panel shall have lamps of sufficient candlepower to illuminate all instruments and gauges and shift selector indicator for automatic transmission.

OIL FILTER

1. An oil filter with a replaceable element shall be provided and connected by flexible oil lines if not a built-in or an engine-mounted design. The oil filter shall have a capacity of at least one (1) quart.

OPENINGS

1. All openings in the floorboard or firewall between chassis and passenger compartment, such as for gearshift selector and parking brake lever, shall be sealed.

PASSENGER LOAD

1. Actual gross vehicle weight (GVW) is the sum of the chassis weight, plus the body weight, plus the driver's weight, plus total seated pupil weight.
 - a. For purposes of calculation, the driver's weight is 150 pounds.
 - b. For purposes of calculation, the pupil weight is 120 pounds per pupil.
2. Actual gross vehicle weight (GVW) shall not exceed the chassis manufacturer's GVWR for the chassis nor shall the actual weight carried on any axle exceed the chassis manufacturer's GVWR.

POWER AND GRADEABILITY

1. GVWR shall not exceed 185 pounds per published net horsepower of the engine at the manufacturer's recommended maximum number of revolutions per minute.

RETARDER SYSTEM (OPTIONAL EQUIPMENT)

1. Retarder system, if used, shall maintain the speed of the fully loaded school bus at 19.0 mph or 30 km/hr on a 7% grade for 3.6 miles or 6 km.

SHOCK ABSORBERS

1. The bus shall be equipped with double-action shock absorbers compatible with manufacturer's rated axle capacity at each wheel location.

SPRINGS

1. The capacity of springs or suspension assemblies shall be commensurate with chassis manufacturer's GVWR rating.
2. Steel leaf rear springs shall be a progressive rate or multi-stage design. Front leaf springs shall have a stationary eye at one end and shall be protected by a wrapped leaf in addition to the main leaf.

STEERING GEAR

1. The steering gear shall be approved by the chassis manufacturer and designed to ensure safe and accurate performance when the vehicle is operated with maximum load and at maximum speed.
2. If external adjustments are required, steering mechanism shall be accessible to accomplish same.
3. No changes shall be made in the steering apparatus which are not approved by the chassis manufacturer.
4. There shall be a clearance of at least 2 inches between the steering wheel and cowl, instrument panel, windshield, or any other surface.

5. Power steering is required and shall be of the integral type with integral valves.
6. The steering system shall be designed to provide a means for lubrication of all wear-points, if wear-points are not permanently lubricated.

THROTTLE

1. The force required to operate the throttle shall not exceed 16 pounds throughout the full range of accelerator pedal travel.

TIRES AND RIMS

1. Tires and rims of the proper size and tires with a load rating commensurate with chassis manufacturer's gross vehicle weight rating shall be provided. The use of multi-piece rims and/or tube-type tires shall not be permitted on any school bus with a "build date" after June 30, 1997.
2. Dual rear tires shall be provided on Type A-I, Type B, Type C, and Type D school buses.
3. All tires on a vehicle shall be of the same size, and the load range of the tires shall meet or exceed the GVWR as required by FMVSS 120.
4. If the vehicle is equipped with a spare tire and rim assembly, it shall be the same size as those mounted on the vehicle.
5. If a tire carrier is required, it shall be suitably mounted in an accessible location outside the passenger compartment.

TRANSMISSION

1. Automatic transmissions shall have no fewer than three forward speeds and one reverse speed. The shift selector shall provide a detent between each gear position when the gear selector quadrant and shift selector are not steering column mounted.
2. In manual transmissions, second gear and higher shall be synchronized except when incompatible with engine power. A minimum of three forward speeds and one reverse speed shall be provided.
3. An electronic control or similar device may be installed to ensure that automatic transmissions cannot accidentally be moved out of the neutral or park gear position while the driver is not in the driver's seat.

TURNING RADIUS

1. A chassis with a wheelbase of 264 inches or less shall have a right and left turning radius of not more than 42 1/2 feet, curb to curb measurement.
2. A chassis with a wheelbase of 265 inches or more shall have a right and left turning radius of not more than 44 1/2 feet, curb to curb measurement.

UNDERCOATING

1. The chassis manufacturers or their agent shall coat the undersides of steel or metallic-constructed front fenders with a rust-proofing compound for which compound manufacturers have issued notarized certification of compliance to chassis builder that the

compound meets or exceeds all performance and qualitative requirements of paragraph 3.4 of Federal Specification TT-C-520B, using modified tests.

SECTION 4

BUS BODY

AISLE

1. All emergency doors shall be accessible by a 12" minimum aisle. Aisle shall be unobstructed at all times by any type of barrier, seat, wheelchair or tiedown, unless a flip seat is installed and occupied. A flip seat in the unoccupied (up) position shall not obstruct the 12" minimum aisle to any side emergency door.
2. The seat backs shall be slanted sufficiently to give aisle clearance of 15" at tops of seat backs.

BACK-UP WARNING ALARM

1. An automatic audible alarm shall be installed behind the rear axle and shall comply with the published Backup Alarm Standards (SAE 994b), providing a minimum of 107 dBA for rubber-tired vehicles.

BATTERY

1. Battery is to be furnished by chassis manufacturer.
2. When the battery is mounted as described in the chassis section, the body manufacturer shall securely attach the battery on a slide-out or swing-out tray in a closed, vented compartment in the body skirt, so that the battery is accessible for convenient servicing from the outside. Battery compartment door or cover shall be hinged at front or top, and secured by an adequate and conveniently-operated latch or other type fastener. On all Type A buses, one or both batteries may be mounted in the engine compartment in an accessible location.
3. Buses may be equipped with a battery shut-off switch. The switch is to be placed in a location not readily accessible to the driver or passengers.

BUMPER (FRONT)

1. On a Type "D" school bus, if the chassis manufacturer does not provide a bumper, it shall be provided by the body manufacturer. The bumper will conform to the standards in the chassis section.
2. 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 GVWR 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:
 - (1) 7.5 MPH fixed-barrier impact (FMVSS cart and barrier test)
 - (2) 4.0 MPH corner impact at 30 degrees (Part 581, CFR Title 49)
 - (3) 20.0 MPH into parked passenger car (class B, C, and D buses of 18,000 lbs. GVWR or more)

- c. The manufacturers of the energy-absorbing system shall provide evidence from an approved test facility (capable of performing the above FMVSS tests) that their product conforms to the above standard.

BUMPER (REAR)

1. Bumper shall be pressed steel channel or equivalent material, at least 3/16" thick, and shall be a minimum of 8" wide (high) on Type A-II and a minimum of 9 1/2" wide (high) on Types A-I, B, C and D buses and of sufficient strength to permit being pushed by another vehicle without permanent distortion.
2. Bumper shall be wrapped around back corners of the bus. It shall extend forward at least 12", measured from the rear-most point of the body at the floor line and shall be flush mounted to body side or protected with an end panel.
3. Bumper shall be attached to the chassis frame in such a manner that it may be easily removed. It shall be so braced as to withstand impact from a rear or side impact. It shall be so attached as to discourage hitching of rides.
4. Bumper shall extend at least 1" beyond rear-most part of body surface measured at the floor line.
5. An optional energy-absorbing rear bumper may be used, providing a self-restoring energy absorbing bumper system attached to prevent the hitching of rides and of sufficient strength to:
 - a. Permit pushing by another vehicle without permanent distortion to the bumper, chassis, or body;
 - b. Withstand repeated impacts without damage to the bumper, chassis, or body according to the following FMVSS performance standards.
 - (1) 2.0 MPH fixed barrier impact (FMVSS cart & barrier test)
 - (2) 4.0 MPH corner impact at 30 degrees (Part 581, CFR Title 49)
 - (3) 5.0 MPH center impact (Part 581, CFR Title 49)
 - c. The manufacturer of the energy-absorbing system shall provide evidence from an approved test facility (capable of performing the above FMVSS test) that their product conforms to the above standard.

CEILING

See Insulation and Interior, Body section.

CERTIFICATION

1. Body manufacturer will, upon request, certify to the Missouri Department of Elementary and Secondary Education that their product meets state standards on items not covered by certification issued under requirements of the National Traffic and Motor Vehicle Safety Act.

CHAINS (TIRE)

See Wheelhousing, Body section.

COLOR

1. The school bus body shall be painted National School Bus Yellow (NSBY).

2. The body exterior paint trim shall be black.
3. Optionally the roof of the bus may be painted white extending down to within 6" above the drip rails on the sides of the body, except that front and rear roof caps shall remain National School Bus Yellow (NSBY).

CONSTRUCTION

1. Construction shall be of prime commercial quality steel or other metal or material with strength at least equivalent to all steel, as certified by the bus body manufacturer.
2. Construction shall be reasonably dust-proof and watertight.
3. Body joints present in that portion of the Type A-II school bus body furnished exclusively by the body manufacturer shall conform to the performance requirements of FMVSS 221. This does not include the body joints created when body components are attached to components furnished by the chassis manufacturer.

CROSSING CONTROL ARM (OPTIONAL)

1. Buses may be equipped with a crossing control arm mounted on the right side of the front bumper, which shall not open more than 90 degrees.
2. All components of the crossing control arm and all connections shall be weatherproofed.
3. The crossing control arm shall incorporate system connectors (electrical, vacuum, or air) at the gate and shall be easily removable to allow for towing of the bus.
4. The crossing control arm shall meet or exceed Society of Automotive Engineers standard J1133.
5. The crossing control arm shall be constructed of noncorrosive or nonferrous material or treated in accordance with the body sheet metal standard (see METAL TREATMENT).
6. There shall be no sharp edges or projections that could cause hazard or injury to students.
7. The crossing control arm shall extend approximately 72" from the front bumper when in the extended position.
8. The crossing control arms shall extend simultaneously with the stop arm(s) by means of the stop arm controls.

DEFROSTERS

1. Defrosting and defogging equipment shall direct a sufficient flow of heated air onto the windshield, the window to the left of the driver, and the glass in the viewing area directly to the right of the driver to eliminate frost, fog and snow.
2. The defrosting system shall conform to Society of Automotive Engineers standards J381 and J382.
3. The defroster and defogging system shall be capable of furnishing heated outside ambient air, except the part of the system furnishing additional air to the windshield, entrance door and stepwell may be of the recirculating air type.
4. Auxiliary fans are not considered defrosting or defogging systems.

5. Portable heaters shall not be used.

DOORS

1. Service door
 - a. Service door shall be in the driver's control, and designed to afford easy release and provide a positive latching device on manual operating doors to prevent accidental opening. When a hand lever is used, no part shall come together that will shear or crush fingers. Manual door controls shall not require more than 25 pounds of force to operate at any point throughout the range of operation.
 - b. Service door shall be located on the right side of the bus, opposite and within direct view of driver.
 - c. Service door shall have a minimum horizontal opening of 24" and a minimum vertical opening of 68". Type A-II vehicles shall have a minimum opening area of 1200 square inches.
 - d. Service door shall be a split-type, sedan-type, or jack-knife type. (Split-type door includes any sectioned door which divides and opens inward or outward.) If one section of a split-type door opens inward and the other opens outward, the front section shall open outward.
 - e. Lower, as well as, upper door panels shall be of approved safety glass. Bottom of each lower glass panel shall not be more than 10" from the top surface of bottom step. Top of each upper glass panel shall not be more than 3" from the top of the door. Type A vehicles shall have an upper panel (windows) of safety glass with an area of at least 350 square inches.
 - f. Vertical closing edges on split-type or folding-type entrance doors shall be equipped with flexible material to protect children's fingers. Type A-II vehicles may be equipped with chassis manufacturer's standard entrance door.
 - g. There shall be no door to left of driver on Type B, C or D vehicles. All Type A vehicles may be equipped with chassis manufacturer's standard door.
 - h. All doors shall be equipped with padding at the top edge of each door opening. Padding shall be at least 3" wide and 1" thick and extend the full width of the door opening.

DRIVER COMPARTMENT

1. Driver's seat supplied by the body company shall be a high back suspension seat with a minimum seat back adjustment of 15 degrees, not requiring the use of tools, and with a head restraint to accommodate a 95th percentile adult male, as defined in FMVSS 208. The driver's seat shall be secured with nuts, bolts, and washers or flanged-headed nuts.
2. Driver seat positioning and range of adjustments shall be designed to accommodate comfortable actuation of the foot control pedals by 95% of the male/female adult population.

EMERGENCY EXITS

1. Emergency door(s) and other emergency exits shall comply with the requirements of FMVSS 217 and any of the requirements of these standards that exceed FMVSS 217.

2. Emergency door requirements
 - a. Upper portion of the emergency door shall be equipped with approved safety glazing, exposed area of which shall be at least 400 square inches. The lower portion of the rear emergency doors on Types A-I, B, C, and D vehicles shall be equipped with a minimum of 350 square inches of approved safety glazing.
 - b. There shall be no steps leading to an emergency door.
 - c. The words "EMERGENCY DOOR," in letters at least 2" high, shall be placed at the top of or directly above the emergency door, or on the door in the metal panel above the top glass, both inside and outside the bus.
 - d. A lock may be placed on the emergency door only if the engine starting and operating system will not function if the emergency door is locked from either inside or outside the bus.
 - e. The emergency door(s) shall be equipped with padding at top edge of each door opening. Padding shall be at least 3" wide and 1" thick, and extend the full width of the door opening.
 - f. The side emergency door, if installed, must meet the requirements as set forth in FMVSS 217, regardless of its use with any other combination of emergency exits.
 - g. There shall be no obstruction higher than 1/4" across the bottom of any emergency door opening.
3. Emergency exit requirements
 - a. Types A, B, C, and D vehicles may be equipped with a total number of emergency exits as follows for the indicated capacities of vehicles.
 - (1) 0 to 42 Passenger = 1 emergency exit per side and 1 roof hatch.
 - (2) 43 to 78 Passenger = 2 emergency exits per side and 2 roof hatches.
 - (3) 79 to 90 Passenger = 3 emergency exits per side and 2 roof hatches.
 - b. Each emergency exit above shall comply with FMVSS 217. These emergency exits are in addition to the rear emergency door or exit.
 - c. In addition to the audible warning required on emergency doors by FMVSS 217, additional emergency exits may also be equipped with an audible warning device.

EMERGENCY EQUIPMENT

1. Fire extinguisher
 - a. The bus shall be equipped with at least one Underwriter's Laboratories Inc. approved pressurized, dry chemical fire extinguisher complete with hose. Extinguisher shall be mounted in a bracket, located in the driver's compartment and readily accessible to the driver and passengers. A pressure gauge shall be mounted on the extinguisher and be easily read without moving the extinguisher from its mounted position.

b. The fire extinguisher shall have a total rating of 2A10BC or greater. The operating mechanism shall be sealed with a type of seal which will not interfere with the use of the fire extinguisher.

2. First-aid kit

a. The bus shall have a removable moisture-proof and dust-proof first aid kit in an accessible place in the driver's compartment. It shall be properly mounted and identified as a first aid kit. The location for the first aid kit shall be marked.

b. Suggested contents include:

(1) 2 - 1" x 2 1/2 yards adhesive tape rolls

(2) 24 - sterile gauze pads 3"x 3"

(3) 100 - 3/4" x 3" adhesive bandages

(4) 12 - 2" bandage compress

(5) 12 - 3" bandage compress

(6) 2 - 2" x 6' sterile gauze roller bandages

(7) 2 - non-sterile triangular bandages approximately 40" x 36" x 54" with 2 safety pins

(8) 3 - sterile gauze pads 36" x 36"

(9) 3 - sterile eye pads

(10) 1 - rounded-end scissors

(11) 1 - pair latex gloves

(12) 1 - mouth-to-mouth airway

3. Body fluid clean-up kit (Optional)

a. Each bus may have a removable and moisture-proof body fluid clean-up kit accessible to the driver. When provided, it shall be properly mounted and identified as a body fluid clean-up kit.

b. Suggested contents include:

(1) 1 - 2 oz. infectious liquids spill control powder

(2) 1 - odor mask

(3) 1 - pair latex gloves

(4) 4 - antiseptic wipes

(5) 2 - paper crepe towels

(6) 1 - plastic scraper

- (7) 1 - plastic disposal bag with scoop and tie
 - (8) 1 - other OSHA required Bloodborne Pathogen protection, i.e. protection gown & cap, goggle, red bio-hazard bags w/ties, special decal red w/black print
 - (9) 1 - printed instructions for use of kit contents
4. Warning devices - Each school bus shall contain at least three (3) reflectorized triangle road warning devices mounted in an accessible place. These devices must meet requirements in FMVSS 125.
5. Any of the emergency equipment may be mounted in an enclosed compartment, provided the compartment is labeled in not less than one inch letters, stating the piece(s) of equipment contained therein.

FLOORS

1. Floor in under-seat area, including tops of wheelhousing, driver's compartment and toeboard, shall be covered with rubber floor covering or equivalent, having a minimum overall thickness of .125". The driver's area on all Type A buses may be manufacturer's standard flooring and floor covering.
2. Floor covering in aisles shall be of aisle-type rubber or equivalent, wear-resistant and ribbed. Minimum overall thickness shall be .187" measured from tops of ribs.
3. Floor covering must be permanently bonded to floor and must not crack when subjected to sudden changes in temperature. Bonding or adhesive material shall be waterproof and shall be a type recommended by the manufacturer of floor-covering material. All seams must be sealed with waterproof sealer.
4. On Types A-I, B, C and D buses a screw-down plate that is secured and insulated shall be provided to access the fuel tank sending unit.

HEATERS

1. Heater shall be hot-water and/or combustion type.
2. If only one heater is used, it shall be fresh-air or combination fresh-air and recirculation type.
3. If more than one heater is used, additional heaters may be recirculating air type.
4. The heating system shall be capable of maintaining bus interior temperatures as specified in Society of Automotive Engineers test procedure J2233.
5. Auxiliary fuel-fired heating systems are permitted, provided they comply with the following:
- a. The auxiliary heating system fuel shall utilize the same type fuel as specified for the vehicle engine.
 - b. Heater(s) may be direct hot air or connected to the engine's coolant system.
 - c. Auxiliary heating system, when connected to the engine's coolant system, may be used to preheat the engine coolant or preheat and add supplementary heat to the bus's heating system.
 - d. Auxiliary heating systems must be installed pursuant to the manufacturer's recommendations and shall not direct exhaust in such a manner that will endanger bus passengers.

- e. Auxiliary heating systems which operate on diesel fuel shall be capable of operating on #1, #2 or blended diesel fuel without the need for system adjustment.
 - f. The auxiliary heating system shall be low voltage.
 - g. Auxiliary heating systems shall comply with all applicable Federal Motor Vehicle Safety Standards and Society of Automotive Engineers test procedures.
6. All heaters installed by body manufacturers shall bear a name plate that indicates the heater rating in accordance with School Bus Manufacturers Institute standard No. 001. The plate shall be affixed by the heater manufacturer and shall constitute certification that the heater performance is as shown on the plate.
7. Heater hoses shall be adequately supported to guard against excessive wear due to vibration. The hoses shall not dangle or rub against the chassis or any sharp edges and shall not interfere with or restrict the operation of any engine function. Heater hoses shall conform to Society of Automotive Engineers standard J20c. Heater lines on the interior of bus shall be shielded to prevent scalding of the occupants.
8. Each hot water system installed by a body manufacturer shall include one shut-off valve in the pressure line and one shut-off valve in the return line with both valves at the engine in an accessible location, except that on all Types A and B buses, the valves may be installed in another accessible location.
9. There shall be a water flow regulating valve installed in the pressure line for convenient operation by the driver while seated.
10. All combustion heaters shall be in compliance with current Federal Motor Carrier Safety Regulations.
11. Accessible bleeder valves shall be installed in an appropriate place in the return lines of body company-installed heaters to remove air from the heater lines.
12. Access panels shall be provided to make heater motors, cores, and fans readily accessible for service. Outside access panel may be provided for the driver's heater.

HINGES

1. All exposed metal door hinges subject to corrosion shall be designed to allow lubrication to be channeled to the center 75% of each hinge loop.

IDENTIFICATION

1. Body shall bear words "SCHOOL BUS" in black letters at least 8 inches high on both front and rear of body or on signs attached thereto. Lettering shall be placed as high as possible without impairment of its visibility. Letters shall conform to "Series B" of Standard Alphabets for highway signs. "SCHOOL BUS" lettering shall have a reflective background, or as an option, may be illuminated by backlighting.
2. Each bus shall have lettered on the rear in plain and distinct black letters: "STATE LAW--STOP--While Bus is Loading and Unloading." The letters in the words "STATE LAW--STOP" shall not be less than 5" in height and letters in the words "While Bus is Loading and Unloading" not less than 3" in height.
3. There shall be displayed on each side of a district owned bus the school district name in black letters not less than 3" in height with a stroke of not less than 3/8" wide. If such lettering is placed on the sides of contracted vehicles, lettering shall be black.
4. Privately-owned school buses shall display, on each side in a conspicuous location, the name and address of the owner in black letters at least 2" in height with a stroke of not less than 1/4" in width.
5. Bus identification number shall be displayed on the sides, on the rear, and on the front.

6. Other lettering, numbering, or symbols which may be displayed on the exterior of the bus, shall be limited to:
 - a. Bus identification number on the top of the bus, in addition to required numbering on sides, rear, and front.
 - b. The location of the battery(ies) identified by the word "BATTERY" or "BATTERIES" on the battery compartment door in 2" lettering.
 - c. Symbols or letters near the service door displaying information for identification by the students of the bus or route served. Such symbols or lettering, if used, shall not exceed 413 square inches in size.
 - d. Manufacturer, dealer or school identification or logos.
 - e. Symbols identifying the bus as equipped for or transporting students with special needs.
 - f. Lettering on the rear of the bus relating to school bus flashing signal lamps, or railroad stop procedures or other safety messages.

INSIDE HEIGHT

1. Inside body height shall be 72" or more, measured metal to metal, at any point on longitudinal center line from front vertical bow to rear vertical bow. Inside body height of Type A-II buses shall be 62" or more.

INSULATION

1. Ceiling and walls shall be insulated with proper material to deaden sound and to reduce vibration to a minimum.
2. If thermal insulation is specified, it shall be fire-resistant, UL approved, and approximately 1 1/2" thick with minimum R-value of 5.5. Insulation shall be installed to prevent sagging.
3. If floor insulation is required, it shall be either 5 ply nominal 5/8" thick plywood, or a material of equal or greater strength and insulation R value, and it shall equal or exceed properties of the exterior-type softwood plywood, C-D Grade as specified in standard issued by U.S. Department of Commerce. When plywood is used, all exposed edges shall be sealed. Type A-II buses may be equipped with nominal 1/2" thick plywood meeting above requirements.

INTERIOR

1. Interior of bus shall be free of all unnecessary projections, which include luggage racks and attendant hand rails, to minimize the potential for injury. This standard requires inner lining on ceilings and walls. If ceiling is constructed to contain lapped joints, forward panel shall be lapped by rear panel and exposed edges shall be beaded, hemmed, flanged, or otherwise treated to minimize sharp edges. Buses may be equipped with a storage compartment for tools, tire chains, and/or tow chains (see Storage Compartment later in this section).
2. Interior overhead storage compartments may be provided if they meet the following criteria:
 - a. Meet head protection requirements of FMVSS 222, where applicable.
 - b. Have a maximum rated capacity displayed for each compartment.
 - c. Be completely enclosed and equipped with latching doors. Doors and latches must be sufficient to withstand a force of five (5) times the maximum rated capacity of the compartment.
 - d. Have all corners and edges rounded with a minimum radius of 1" or padded equivalent to door header padding.

- e. Must be attached to the bus sufficiently to withstand a force equal to twenty (20) times the maximum rated capacity.
 - f. Shall have no protrusions greater than ¼".
3. The driver's area forward of the foremost padded barriers will permit the mounting of required safety equipment and vehicle operation equipment.
4. Every school bus shall be constructed so that the noise level taken at the ear of the occupant nearest to the primary vehicle noise source shall not exceed 85 dBA when measured according to the noise test procedure found in

LAMPS AND SIGNALS

1. Interior lamps shall be provided which adequately illuminate aisle and stepwell. Stepwell light shall be illuminated by a service door operated switch, to illuminate only when headlights and clearance lights are on and service door is open.
2. Body instrument panel lights shall be controlled by an independent rheostat switch.
3. School bus alternately flashing signal lamps:
- a. Bus shall be equipped with two red lamps at the rear of vehicle and two red lamps at the front of the vehicle.
 - b. In addition to the four red lamps described above, four amber lamps shall be installed so that one amber lamp is located near each red signal lamp, at same level, but closer to vertical centerline of bus. The system of red and amber signal lamps shall be wired so that amber lamps are energized manually, and red lamps are automatically energized (with amber lamps being automatically de-energized) when stop signal arm is extended or when bus service door is opened. An amber pilot light and a red pilot light shall be installed adjacent to the driver controls for the flashing signal lamp to indicate to the driver which lamp system is activated.
 - c. Area around lens of each alternately flashing signal lamp and extending outward approximately 3" shall be black in color. In installations where there is no flat vertical portion of body immediately surrounding entire lens of lamp, a circular or square band of black approximately 3" wide, immediately below and to both sides of the lens, shall be black in color on body or roof area against which signal lamp is seen (from distance of 500 feet along axis of vehicle). Visors or hoods, black in color, with a minimum depth of 4" may be provided.
 - d. Red lamps shall flash at any time the stop signal arm is extended.
 - e. All flashers for alternately flashing red and amber signal lamps shall be enclosed in the body in a readily accessible location.
4. Turn signal and stop/tail lamps:
- a. Bus body shall be equipped with amber rear turn signal lamps that are at least 7" in diameter or if a shape other than round, a minimum 38 square inches of illuminated area and meet SAE specifications. These signal lamps must be connected to the chassis hazard warning switch to cause simultaneous flashing of turn signal lamps when needed as vehicular traffic hazard warning. Turn signal lamps are to be placed as wide apart as practical and their centerline shall be approximately 8" below the rear window. Type A-II conversion vehicle lamps must be at least 21 square inches in lens area and be in manufacturer's standard color.
 - b. Buses shall be equipped with amber side-mounted turn signal lights. The turn signal lamp on the left side shall be mounted rearward of the stop signal arm and the turn signal lamp on the right side shall be mounted rearward of the service door.

c. Buses shall be equipped with four combination red stop/tail lamps:

(1) Two combination lamps with a minimum diameter of 7", or if a shape other than round, a minimum 38 square inches of illuminated area shall be mounted on the rear of the bus just inside the turn signal lamps.

(2) Two combination lamps with a minimum diameter of 4", or if a shape other than round, a minimum 12 square inches of illuminated area shall be placed on the rear of the body between the beltline and the floor line. Rear license plate lamp may be combined with one lower tail lamp. Stop lamps shall be activated by the service brakes and shall emit a steady light when illuminated. Type A-II buses with bodies supplied by chassis manufacturer may have manufacturer's standard stop and tail lamps.

d. If turn signal lamps in addition to those supplied on chassis are provided (front of body below windshield or top of fender), they shall be connected to turn signal system without removal or disconnection of turn signal lamps supplied on chassis.

5. On buses equipped with a monitor for the front and rear lamps of the school bus, the monitor shall be mounted in full view of the driver. If the full circuit current passes through the monitor, each circuit shall be protected by a fuse or circuit breaker against any short circuit or intermittent shorts.

6. An optional white flashing strobe light may be installed on the roof of a school bus, not to exceed 1/3 the body length forward from the rear of the roof edge. Light shall have a single clear lens emitting light 360 degrees around its vertical axis and may not extend above the roof more than maximum legal height. A manual switch and a pilot light shall be included to indicate when light is in operation. Optionally, the strobe light may be mounted on the roof in the area directly over the driver's side crash barrier, and may be wired to activate with the amber alternately flashing signal lamps, continuing through the full loading or unloading cycle, with an override switch to allow activation of the strobe at any time.

7. Backup lamps

Bus body shall be equipped with two white rear backup lamp signals that are at least 4" in diameter or, if a shape other than round, a minimum of 13 square inches of illuminated area, meeting SAE specifications. If backup lamps are placed on the same line as the brake lamps and turn signal lamps, they shall be to the inside.

METAL TREATMENT

1. All metal used in construction of bus body shall be zinc-coated or aluminum-coated or treated by equivalent process before bus is constructed. Included are such items as structural members, inside and outside panels, door panels and floor sills. Excluded are such items as door handles, grab handles, interior decorative parts and other interior plated parts.

2. All metal parts that will be painted shall be, in addition to above requirements, chemically cleaned, etched, zinc-phosphate-coat and zinc-chromate or epoxy primed or conditioned by equivalent process.

3. In providing for these requirements, particular attention shall be given lapped surfaces, welded connections of structural members, cut edges punched or drilled hole areas in sheet metal, closed or box sections, unvented or undrained areas and surfaces subjected to abrasion during vehicle operation.

4. As evidence that above requirements have been met, samples of materials and sections used in construction of the bus body subjected to 1,000-hour salt spray test as provided for in latest revision of ASTM Standard B-117 shall not lose more than 10 percent of material by weight.

MIRRORS

1. Interior mirror shall be either clear view laminated glass or clear view glass bonded to a backing which retains the glass in the event of breakage. Mirror shall have rounded corners and protected edges.

All Type A buses shall have a minimum of a 6" x 16" mirror and Types B, C, and D buses shall have a minimum of a 6" x 30" mirror.

2. Each school bus shall be equipped with exterior mirrors meeting the requirements of FMVSS 111.
3. Mirrors shall be easily adjustable, but shall be rigidly braced so as to reduce vibration.

MOUNTING

1. Chassis frame shall support rear body cross member. Bus body shall be attached to chassis frame at each main floor sill, except where chassis components interfere, in such manner as to prevent shifting or separation of the body from the chassis under severe operating conditions.
2. Insulation material shall be placed at all contact points between body and chassis frame on Types A-I, B, C, and D buses, and shall be so attached to the chassis frame or body that it will not move under severe operating conditions.

OVERALL LENGTH

1. Overall length of bus shall not exceed 40 feet, excluding accessories.

OVERALL WIDTH

1. Overall width of bus shall not exceed 102", excluding accessories.

PUBLIC ADDRESS SYSTEM

1. Buses may be equipped with a public address system having interior and exterior speakers.

REFLECTIVE MATERIAL (see also reflective material Appendix B)

1. Front and/or rear bumper may be marked diagonally 45 degrees down to centerline of pavement with 2" \pm 1/4" wide strips of non-contrasting reflective material.
2. Rear of bus body shall be marked with strips of reflective NSBY material to outline the perimeter of the back of the bus using material which conforms with the requirements of FMVSS 571.131 Table 1. The perimeter marking of rear emergency exits per FMVSS 217 and/or the use of reflective "SCHOOL BUS" signs partially accomplish the objective of this requirement. To complete the perimeter marking of the back of the bus, strips of at least 1 3/4" reflective NSBY material shall be applied horizontally above the rear windows and above the rear bumper extending from the rear emergency exit perimeter marking outward to the left and right rear corners of the bus; and vertical strips shall be applied at the corners connecting these horizontal strips.
3. "SCHOOL BUS" signs, if not of lighted design, shall be marked with reflective NSBY material comprising background for lettering of the front and/or rear "SCHOOL BUS" signs.
4. Sides of bus body shall be marked with reflective NSBY material at least 1 3/4" in width, extending the length of the bus body and located (vertically) between the floor line and the bellline.

RUB RAILS

1. There shall be one rub rail located on each side of bus approximately at seat level which shall extend from rear side of entrance door completely around bus body (except emergency door or any maintenance access door) to point of curvature near outside cowl on left side.
2. There shall be one rub rail located approximately at floor line which shall cover the same longitudinal area as upper rub rail, except at wheelhousing, and shall extend only to radii of right and left rear corners.
3. Both rub rails shall be attached at each body post and all other upright structural members.

4. Both rub rails shall be 4" or more in width in their finished form, shall be of 16-gauge steel or suitable material of equivalent strength, and shall be constructed in corrugated or ribbed fashion.
5. Both rub rails shall be applied outside body or outside body posts. Pressed-in or snap-on rub rails do not satisfy this requirement. For Type A-II vehicles using chassis manufacturer's body, or for Types A-I, B, C and D buses using rear luggage or rear engine compartment, rub rails need not extend around rear corners.
6. There shall be a rub rail or equivalent bracing located horizontally at the bottom edge of the body side skirts.

SEAT BELT FOR DRIVER

1. A Type 2 lap belt/shoulder harness seat belt shall be provided for the driver. The assembly shall be equipped with an emergency locking retractor (ELR) for the continuous belt system. On all buses except Type A equipped with standard chassis manufacturer's driver's seat, the lap portion of the belt shall be guided or anchored to prevent the driver from sliding sideways under it. The lap belt/shoulder harness shall be designed to allow for easy adjustment in order to fit properly and effectively protect drivers varying from 5th percentile female to 95th percentile male.

SEAT AND CRASH BARRIERS

1. All seats shall have a minimum depth of 15". All seat backs shall be a minimum of 24" high and a minimum 20" from seating reference point.
2. In determining seating capacity of bus, allowable average rump width shall be:
 - a. 13" where 3-3 seating plan is used.
 - b. 15" where 3-2 seating plan is used.
3. All restraining barriers and passenger seats shall be constructed with materials that enable them to meet the criteria contained in the School Bus Seats Upholstery Fire Block Test (See Appendix).
4. Each seat leg shall be secured to the floor by a minimum of two (2) bolts, washers, and nuts. Flange-head nuts may be used in lieu of nuts and washers, or seats may be track-mounted in conformance with FMVSS 222. If track seating is installed, the manufacturer shall supply minimum and maximum seat spacing dimensions applicable to the bus, which comply with FMVSS 222. This information shall be on a label permanently affixed to the bus.
5. All seat frames attached to the seat rail shall be fastened with two (2) bolts, washers and nuts or flange-headed nuts.
6. Type A-II school bus bodies shall be equipped with restraining barriers conforming to FMVSS 222.
7. Use of a flip seat at any side emergency door location in conformance with FMVSS 222, including required aisle width to side door, is acceptable. Any flip seat shall be free of sharp projections on the underside of the seat bottom. The underside of the flip-up seat bottoms shall be padded or contoured to reduce the possibility of snagged clothing or injury during use. Flip seats shall be constructed to prevent passenger limbs from becoming entrapped between the seat back and the seat cushion when in upright position. The seat cushion shall be designed to rise to a vertical position automatically when not occupied.

STEERING WHEEL

See Chassis section

STEPS

1. First step at service door shall be not less than 10" and not more than 14" from the ground when measured from top surface of the step to the ground, based on standard chassis specifications, except that on Type D vehicles, the first step at the service door shall be 12" to 16" from the ground.
2. Step risers shall not exceed a height of 10". When plywood is used on a steel floor or step, the riser height may be increased by the thickness of the plywood.
3. Steps shall be enclosed to prevent accumulation of ice and snow.
4. Steps shall not protrude beyond the side body line.
5. A suitable device (or devices) shall be designed and installed to prevent injury or fatality to passengers from being dragged. At least one such device shall assist passengers during entry or egress, and be of such design to eliminate entanglement.

STEP TREADS

1. All steps, including floor line platform area, shall be covered with 3/16" rubber floor covering or other materials equal in wear and abrasion resistance to top grade rubber.
2. Metal back of tread, minimum 24-gauge cold roll steel, shall be permanently bonded to ribbed rubber; grooved design shall be such that said grooves run at 90-degree angles to long dimension of step tread.
3. 3/16" ribbed step tread shall have a 1 1/2" white nosing as an integral piece without any joint.
4. Rubber portion of step treads shall have the following characteristics:
 - a. Special compounding for good abrasion resistance and high coefficient of friction.
 - b. Flexibility so that it can be bent around a 1/2" mandrel both at 130 degrees Fahrenheit and 20 degrees Fahrenheit without breaking, cracking, or crazing.
 - c. Show a durometer hardness 85 to 95.

STIRRUP STEPS

1. Unless the windshield and lamps are not easily accessible from the ground, there may be at least one folding stirrup step or recessed foothold and suitably located handles on each side of the front of the body for easy accessibility for cleaning. Steps are permitted in or on the front bumper, in lieu of the stirrup steps, if the windshield and lamps are easily accessible for cleaning from that position.

STOP SIGNAL ARM

1. The stop signal arm(s) shall comply with the requirements of FMVSS 131.

STORAGE COMPARTMENT

1. A storage container for tools, tire chains, and/or tow chains may be located either inside or outside the passenger compartment but, if inside, it shall have a cover (seat cushion may not serve this purpose) capable of being securely latched and fastened to the floor, convenient to either the service or emergency door.

SUN SHIELD

1. Interior adjustable transparent sun shield not less than 6" X 30" for Types B, C, and D vehicles, with a finished edge, shall be installed in a position convenient for use by driver.
2. On all Type A buses the sun shield shall be manufacturer's standard.

TAILPIPE

1. Tailpipe shall extend out to but not more than 2" beyond perimeter of the body or the bumper.
2. Tailpipe shall exit to the left of the emergency exit door in the rear of vehicle or to the left side of the bus. Tailpipe shall not exit beneath any fuel filler location or beneath any emergency door. All Types A and B may be manufacturer's standard.

TOW EYES OR HOOKS

Optional tow eyes or hooks may be furnished on the rear and attached so they do not project beyond the rear bumper. Tow eyes or hooks attached to the chassis frame shall be furnished by either the chassis or body manufacturer. The installation shall be in accordance with the chassis manufacturer's specifications.

TRACTION ASSISTING DEVICES (OPTIONAL)

1. Where required or used, sanders shall:
 - a. Be of hopper cartridge-valve type
 - b. Have metal hopper with all interior surfaces treated to prevent condensation of moisture
 - c. Be of at least 100 pound (grit) capacity
 - d. Have cover on filler opening of hopper, which screws into place, sealing unit airtight
 - e. Have discharge tubes extending to front of each rear wheel under fender
 - f. Have no-clogging discharge tubes with slush-proof, non-freezing rubber nozzles
 - g. Be operated by an electric switch with telltale pilot light mounted on the instrument panel
 - h. Be exclusively driver controlled
 - j. Have gauge to indicate that hopper needs refilling when it is down to one-quarter full
2. Automatic traction chains may be installed.

TRASH CONTAINER AND HOLDING DEVICE

1. Where required or used, the trash container shall:
 - a. Be of UL classified fire resistant polyethylene or equivalent material
 - b. Be no greater than 14 quart capacity

- c. Be secured by a holding device that is designed to prevent movement and to allow easy removal and replacement
- d. Be installed in an accessible location in the driver's compartment, not obstructing passenger use of the service door

UNDERCOATING

1. Entire underside of bus body, including floor sections, cross member and below floor line side panels, shall be coated with rust-proofing compound for which compound manufacturer has issued notarized certification of compliance to the bus body builder that compound meets or exceeds all performance and qualitative requirements of paragraph 3.4 of Federal Specification TT-C-520b using modified test procedures* for following requirements:

- a. Salt spray resistance-pass test modified to 5% salt and 1000 hours
- b. Abrasion resistance-pass
- c. Fire resistance-pass

*Test panels to be prepared in accordance with paragraph 4.6.12 of TT-C-520b with modified procedure requiring that test be made on a 48-hour air cured film at thickness recommended by compound manufacturer.

2. Undercoating compound shall be applied with suitable airless or conventional spray equipment to recommended film thickness and shall show no evidence of voids in cured film.

VENTILATION

1. Auxiliary fans shall meet the following requirements:

- a. Fans for left and right sides shall be placed in a location where they can be adjusted for maximum effectiveness and do not obstruct vision to any mirror. Note: All Type A buses may be equipped with one fan.
- b. Fans shall be a nominal 6" diameter.
- c. Fan blades shall be covered with a protective cage. Each fan shall be controlled by a separate switch.

2. Body shall be equipped with a suitably controlled ventilating system of sufficient capacity to maintain proper quantity of air under operating conditions, without having to open windows except in extremely warm weather.

3. Static-type non-closeable exhaust ventilation shall be installed in low-pressure area of roof.

4. Roof hatches designed to provide ventilation, regardless of the exterior weather conditions, may be provided.

WHEELHOUSING

1. The wheelhousing opening shall allow for easy tire removal and service.

2. The wheelhousing shall be attached to floor sheets in such a manner as to prevent any dust, water or fumes from entering the body. Wheelhousing shall be constructed of at least 16-gauge steel.

3. The inside height of the wheelhousing above the floor line shall not exceed 12".

4. The wheelhousing shall provide clearance for installation and use of tire chains on single and dual (if so equipped) power-driving wheels.

5. No part of a raised wheelhousing shall extend into the emergency door opening.

WINDOWS

1. Each full side window, other than emergency exits designated to comply with FMVSS 217, shall provide an unobstructed emergency opening of at least 9" but not more than 13" high and 22" wide, obtained by lowering window. One side window on each side of the bus may be less than 22" wide.

2. Optional tinted and/or frost-free glazing may be installed in all doors, windows, and windshields consistent with federal, state, and local regulations.

WINDSHIELD WASHERS

1. A windshield washer system shall be provided.

WINDSHIELD WIPERS

1. A windshield wiping system, two-speed or variable speed, with an intermittent feature, shall be provided.

2. The wipers shall be operated by one or more air or electric motors of sufficient power to operate wipers. If one motor is used, the wipers shall work in tandem to give full sweep of windshield.

WIRING

1. All wiring shall conform to current SAE standards.

2. Circuits:

a. Wiring shall be arranged in circuits, as required, with each circuit protected by a fuse or circuit breaker. A system of color and number coding shall be used and an appropriate identifying diagram shall be provided to the end user along with the wiring diagram provided by the chassis manufacturer. The wiring diagrams shall be specific to the bus model supplied and include any changes to wiring made by the body manufacturer. Chassis wiring diagrams shall also be supplied to the end user. A system of color and number coding shall be used on buses.

The following body interconnecting circuits shall be color coded as noted:

FUNCTION	COLOR
Left Rear Directional Light	Yellow
Right Rear Directional Light	Dark Green
Stoplights	Red
Back-up Lights	Blue
Taillights	Brown
Ground	White
Ignition Feed, Primary Feed	Black

The color of cables shall correspond to SAE J1128.

- b. Wiring shall be arranged in at least six regular circuits as follows:
 - (1) Head, tail, stop (brake) and instrument panel lamps
 - (2) Clearance and stepwell lamps (stepwell lamp shall be actuated when service door is opened)
 - (3) Dome lamp
 - (4) Ignition and emergency door signal
 - (5) Turn signal lamps
 - (6) Alternately flashing signal lamps
 - c. Any of the above combination circuits may be subdivided into additional independent circuits.
 - d. Whenever heaters and defrosters are used, at least one additional circuit shall be installed.
 - e. Whenever possible, all other electrical functions (such as sanders and electric-type windshield wipers) shall be provided with independent and properly protected circuits.
 - f. Each body circuit shall be coded by number or letter on a diagram of circuits and shall be attached to the body in a readily accessible location.
3. The entire electrical system of the body shall be designed for the same voltage as the chassis on which the body is mounted.
4. All wiring shall have an amperage capacity exceeding the design load by at least 25%. All wiring splices are to be done at an accessible location and noted as splices on wiring diagram.
5. A body wiring diagram, of a size which can be easily read, shall be furnished with each bus body or affixed in an area convenient to the electrical accessory control panel.
6. The body power wire shall be attached to a special terminal on the chassis.
7. All wires passing through metal openings shall be protected by a grommet.
8. Wires not enclosed within body shall be fastened securely at intervals of not more than 18 inches. All joints shall be soldered or joined by equally effective connectors, which shall be water-resistant and corrosion-resistant.

SECTION 5

SPECIALLY EQUIPPED SCHOOL BUSES

INTRODUCTION

Equipping buses to accommodate students with special needs is discretionary depending upon the needs of the passengers. While one bus may be fitted with a lift, another may have seat belts installed to secure child seats. Buses so equipped are not to be considered a separate class of school bus, but simply a regular school bus which is equipped for special accommodations.

The specifications in this section are intended to be supplementary to specifications in the chassis and body sections. In general, specially equipped buses shall meet all the requirements of the preceding sections plus those listed in this section. It is recognized by the entire industry that the field of special transportation is characterized by varied needs for individual cases and by a rapidly emerging technology for meeting those needs. A flexible, common-sense approach to the adoption and enforcement of specifications for these vehicles, therefore, is prudent.

As defined by Code of Federal Regulations (CFR) 49 §571.3, "Bus means a motor vehicle with motive power, except a trailer, designed for carrying more than 10 persons" (11 or more including the driver). This definition also embraces the more specific category, school bus. Vehicles with 10 or fewer passenger positions (including the driver) cannot be classified as buses. For this reason, the federal vehicle classification multipurpose passenger vehicle (CFR 49 §571.3), or MPV, must be used by manufacturers for these vehicles in lieu of the classification school bus. This classification system, while requiring compliance with a less stringent set of federal standards for MPVs, does not preclude state or local agencies or these national standards from requiring compliance of school bus-type MPVs with the more stringent federal standards for school buses.

The following standards address modifications as they pertain to school buses that, with standard seating arrangements prior to modification, would accommodate more than 10 persons (11 or more including the driver). If by addition of a power lift, mobile seating device positions or other modifications, the capacity is reduced such that vehicles become MPVs, the intent of these standards is to have these vehicles be required to meet the same standards they would have had to meet prior to such modifications, and such MPVs are included in all references to school buses and requirements for school buses which follow.

DEFINITION

A specially equipped school bus is any school bus which is designed, equipped, or modified to accommodate students with special needs.

GENERAL REQUIREMENTS

1. School buses and multipurpose passenger vehicles (MPV) designed for transporting children with special transportation needs shall comply with 5 CSR 30-261.025 Minimum Requirements for School Bus Chassis and Body incorporated by reference material entitled Missouri Minimum Standards for School Buses and with Federal Motor Vehicle Safety Standards applicable to their gross vehicle weight rating (GVWR) category.
2. Any school bus to be used for the transportation of children who are confined to a wheelchair or other mobile positioning device, or who require life support equipment which prohibits use of the regular service entrance, shall be equipped with a power lift, unless a ramp is needed for unusual circumstances related to passenger needs.

AISLES

1. All school buses equipped with a power lift shall provide a 30" aisle leading from any wheelchair/mobility aid position to at least one emergency door and the lift area.

COMMUNICATIONS

1. All school buses which are used to transport individuals with disabilities should be equipped with a two way electronic voice communication system which can be used at any point in the vehicle's route. Where no such service exists, vehicles would be exempt.

GLAZING

1. Tinted glazing may be installed in all doors, windows, and windshields consistent with federal, state, and local regulations.

IDENTIFICATION

1. Buses with power lifts used for transporting individuals with disabilities shall display below the window line the International Symbol of Accessibility. Such emblems shall be white on blue background, shall not exceed 12 inches in size, and shall be of a high-intensity reflectorized material meeting U.S. Department of Transportation's Federal Highway Administration (FHWA) FP-85 Standards.

PASSENGER CAPACITY RATING

1. In determining the passenger capacity of a school bus for purposes other than actual passenger load (i.e., vehicle classification, or various billing/reimbursement models), any location in a school bus intended for securement of an occupied wheelchair/mobility aid during vehicle operations may be regarded as four designated seating positions. Similarly, each lift area may be regarded as four designated seating positions.

POWER LIFTS AND RAMPS

1. Power lift shall be located on the right side of the bus body when not extended. Exception: The lift may be located on the left side of the bus if, and only if, the bus is primarily used to deliver students to the left side of one way streets.

2. a. A ramp device may be used in lieu of a mechanical lift if the ramp meets all the requirements of the Americans with Disability Act (ADA) as found in 36 CFR §1192.23 Vehicle ramp (See Appendix D).

b. A ramp device which does not meet the specifications of ADA but does meet the specifications of paragraph 3 of this section may be installed and used, when, and only when a power lift system is not adequate to load and unload students having special and unique needs. A readily accessible ramp may also be installed for emergency exit use. If stowed in the passenger compartment, the ramp must be properly secured and located away from general passenger contact. It must not obstruct or restrict any aisle or exit while in its stowed or deployed position.

3. a. All vehicles covered by this specification shall provide a level-change mechanism or boarding device (e.g., lift or ramp) complying with paragraph b. or c. of this section and sufficient clearances to permit a wheelchair or other mobility aid user to reach a securement location.

b. Vehicle lift

(1) The design load of the lift shall be at least 600 pounds. Working parts, such as cables, pulleys, and shafts, which can be expected to wear, and upon which the lift depends for support of the load, shall have a safety factor of at least 6 (six), based on the ultimate strength of the material. Nonworking parts, such as platform, frame, and attachment hardware which would not be expected to wear, shall have a safety factor of at least 3 (three), based on the ultimate strength of the material.

(2) The lifting mechanism and platform shall be able to lift a minimum 800 pounds.

(3) Controls

(a) Requirements

Controls shall be provided that enable the operator to activate the lift mechanism from either inside or outside the bus. The controls should be interlocked with the vehicle brakes, transmission, or door, or shall provide other appropriate mechanisms or systems to ensure the vehicle cannot be moved when the lift is not stowed and so the lift cannot be deployed unless the interlocks or systems are engaged. The lift shall deploy to all levels (i.e., ground, curb, and intermediate positions) normally encountered in the operating environment. Where provided, each control for deploying, lowering, raising, and stowing the lift and lowering the roll-off barrier shall be of a momentary contact type requiring continuous manual pressure by the operator and shall not allow improper lift sequencing when the lift platform is occupied. The controls shall allow reversal of the lift operation sequence, such as raising or lowering a platform that is part way down,

without allowing an occupied platform to fold or retract into the stowed position.

(b) Exception

Where the lift is designed to deploy with its long dimension parallel to the vehicle axis and which pivots into or out of the vehicle while occupied (i.e., "rotary lift"), the requirements of this paragraph prohibiting the lift from being stowed while occupied shall not apply if the stowed position is within the passenger compartment and the lift is intended to be stowed while occupied.

(4) Emergency operation

The lift shall incorporate an emergency method of deploying, lowering to ground level with a lift occupant, and raising and stowing the empty lift if the power to the lift fails. No emergency method, manual or otherwise, shall be capable of being operated in a manner that could be hazardous to the lift occupant or to the operator when operated according to manufacturer's instructions and shall not permit the platform to be stowed or folded when occupied, unless the lift is a rotary lift and is intended to be stowed while occupied. No manual emergency operation shall require more than 2 (two) minutes to lower an occupied wheelchair to ground level.

(5) Power or equipment failure

Platforms stowed in a vertical position, and deployed platforms when occupied, shall have provisions to prevent their deploying, falling, or folding any faster than 12" per second or their dropping of an occupant in the event of a single failure of any load carrying component.

(6) Platform barriers

The lift platform shall be equipped with barriers to prevent any of the wheels of a wheelchair or mobility aid from rolling off the platform during its operation. A movable barrier or inherent design feature shall prevent a wheelchair or mobility aid from rolling off the edge closest to the vehicle until the platform is in its fully raised position. Each side of the lift platform which extends beyond the vehicle in its raised position shall have a barrier a minimum 1½" high. Such barriers shall not interfere with maneuvering into or out of the aisle. The loading-edge barrier (outer barrier), which functions as a loading ramp when the lift is at ground level, shall be sufficient when raised or closed, or a supplementary system shall be provided, to prevent a power wheelchair or mobility aid from riding over or defeating it. The outer barrier of the lift shall automatically raise or close, or a supplementary system shall automatically engage, and remain raised, closed, or engaged at all times that the platform is more than 3" above the roadway or sidewalk and the platform is occupied. Alternatively, a barrier or system may be raised, lowered, opened, closed, engaged, or disengaged by the lift operator, provided an interlock or inherent design feature prevents the lift from rising unless the barrier is raised or closed or the supplementary system is engaged.

(7) Platform surface

The platform surface shall be free of any protrusions over 1/4" high and shall be slip resistant. The platform shall have a minimum clear width of 28½" at the platform, a minimum clear width of 30" measured from 2" above the platform surface to 30" above the surface of the platform, and a minimum clear length of 48" measured from 2" above the surface of the platform to 30" above the surface of the platform. (See "Wheelchair or Mobility Aid Envelope" figure in Appendix D).

(8) Platform gaps

Any openings between the platform surface and the raised barriers shall not exceed 5/8" in width. When the platform is at vehicle floor height with the inner barrier (if applicable) down or retracted, gaps between the forward lift platform edge and the vehicle floor shall not exceed 1/2" horizontally and 5/8" vertically. Platforms on semi-automatic lifts may have a hand hold not exceeding 1 1/2" by 4 1/2" located between the edge barriers.

(9) Platform entrance ramp

The outboard entrance ramp or loading-edge barrier used as a ramp and the transition plate from the inboard edge of the platform to the vehicle floor shall not exceed a slope of 1:8, measured on level ground, for a maximum rise of 3", and the transition from roadway or sidewalk to ramp may be vertical without edge treatment up to 1/4". Thresholds between 1/4" and 1/2" high shall be beveled with a slope no greater than 1:2.

(10) Platform deflection

The lift platform (not including the entrance ramp) shall not deflect more than 3 degrees (exclusive of vehicle roll or pitch) in any direction between its unloaded position and its position when loaded with 600 pounds applied through a 26" by 26" test pallet at the centroid of the platform.

(11) Platform movement

No part of the platform shall move at a rate exceeding 6" per second during lowering and lifting an occupant, and shall not exceed 12" per second during deploying or stowing. This requirement does not apply to the deployment or stowage cycles of lifts that are manually deployed or stowed. The maximum platform horizontal and vertical acceleration when occupied shall be 0.3 g.

(12) Boarding direction

The lift shall permit both inboard and outboard facing of wheelchair and mobility aid users.

(13) Use by standees

Lifts shall accommodate persons using walkers, crutches, canes or braces, or who otherwise have difficulty using steps. The platform may be marked to indicate a preferred standing position.

(14) Handrails

Platforms on lifts shall be equipped with handrails on two sides, which move in tandem with the lift, and which shall be graspable and provide support to standees throughout the entire lift operation. Handrails shall have a usable component at least 8" long with the lowest portion a minimum 30" above the platform and the highest portion a maximum 38" above the platform. The handrails shall be capable of withstanding a force of 100 pounds concentrated at any point on the handrail without permanent deformation of the rail or its supporting structure. The handrail shall have a cross-sectional diameter between 1 1/4" and 1 1/2" or shall provide an equivalent grasping surface, and have eased edges with corner radii of not less than 1/8". Handrails shall be placed to provide a minimum 1 1/2" knuckle clearance from the nearest adjacent surface. Handrails shall not interfere with wheelchair or mobility aid maneuverability when entering or leaving the vehicle.

(15) Circuit breaker

A re-settable circuit breaker shall be installed between power source and lift motor if electrical power is used. It shall be located as close to the power source as possible, but not within the passenger/driver compartment.

(16) Excessive pressure

Lift design shall prevent excessive pressure that could damage the lift system when the platform is fully lowered or raised, or that could jack the vehicle.

(17) Documentation

The following information shall be provided with each vehicle equipped with a lift:

(a) A phone number where information can be obtained about installation, repair, and parts. (Detailed written instructions and a parts list shall be available upon request.)

(b) Detailed instructions regarding use of the lift and readily visible when the lift door is open, including a diagram showing the proper placement and positioning of wheelchair/ mobility aids on lift.

(18) Training materials

The lift manufacturer shall make available training materials to ensure the proper use and maintenance of the lift. These may include instructional videos, classroom curriculum, system test results, or other related materials.

(19) Identification and certification

Each lift shall be permanently and legibly marked or incorporate a non-removable label or tag which states that it conforms to all applicable requirements of the current National Standards for School Buses. In addition, the lift manufacturer, or an authorized representative, upon request of the original titled purchaser, shall provide a notarized Certificate of Conformance, either original or photocopied, which states that the lift system meets all the applicable requirements of the current National Standards for School Buses.

c. Vehicle ramp

(1) If a ramp is used, it shall be of sufficient strength and rigidity to support the special device, occupant, and attendant(s). It shall be equipped with a protective flange on each longitudinal side to keep special device on the ramp.

(2) Floor of ramp shall be constructed of non-skid material.

(3) Ramp shall be equipped with handles and be of weight and design to permit one person to put ramp in place and return it to its storage place.

(4) Ramps installed in raised floor buses by manufacturers may be used for emergency evacuation purposes. They shall not be used as a substitute for a lift when a lift is capable of servicing the need.

REGULAR SERVICE ENTRANCE

1. On power-lift equipped vehicles, step shall be the full width of the stepwell, excluding the thickness of doors in open position.

2. A suitable device shall be provided to assist passengers during entry or egress. This device shall allow for easy grasping or holding and shall have no openings or pinch points which might entangle clothing, accessories or limbs.

RESTRAINING DEVICES

1. On power-lift equipped vehicles, seat frames may be equipped with attachments or devices to which belts, restraining harnesses or other devices may be attached. Attachment framework or anchorage devices, if installed, shall conform to FMVSS 210.
2. Seat belt assemblies, if installed, shall conform to FMVSS 209.
3. Child restraint systems, which are used to facilitate the transportation of children who in other modes of transportation would be required to use a child, infant, or booster seat, shall conform to FMVSS 213 and 222.

SEATING ARRANGEMENTS

1. Flexibility in seat spacing to accommodate special devices shall be permitted to meet passenger requirements. All seating shall be forward-facing.

SECUREMENT AND RESTRAINT SYSTEM FOR WHEELCHAIR/MOBILITY AID AND OCCUPANT

For purposes of better understanding the various aspects and components of this section, the term securement or phrase securement system is used exclusively in reference to the device(s) which secure the wheelchair/mobility aid. The term restraint or phrase restraint system is used exclusively in reference to the device(s) used to restrain the occupant of the wheelchair/mobility aid. The phrase securement and restraint system is used to refer to the total system which secures and restrains both the wheelchair/mobility aid and the occupant.

1. Securement and restraint system--general
 - a. The Wheelchair/Mobility Aid Securement and Occupant Restraint System shall be designed, installed, and operated to accommodate passengers in a forward-facing orientation within the bus and shall comply with all applicable requirements of FMVSS 222. Gurney-type devices shall be secured parallel to the side of each bus.
 - b. The securement and restraint system, including the system track, floor plates, pockets, or other anchorages shall be provided by the same manufacturer, or be certified to be compatible by manufacturers of all equipment/systems used.
 - c. When a wheelchair/mobility aid securement device and an occupant restraint share a common anchorage, including occupant restraint designs that attach the occupant restraint to the securement device or the wheelchair/mobility aid, the anchorage shall be capable of withstanding the loads of both the securement device and occupant restraint applied simultaneously, in accordance with FMVSS 222. (See §2 and §3 of this section.)
 - d. When a wheelchair/mobility aid securement device (webbing or strap assembly) is shared with an occupant restraint, the wheelchair/ mobility aid securement device (webbing or strap assembly) shall be capable of withstanding a force twice the amount as specified in §4.4(a) of FMVSS 209. (See §2 and §3 of this section.)
 - e. The bus body floor and sidewall structures where the securement and restraint system anchorages are attached shall have equal or greater strength than the load requirements of the system(s) being installed.
 - f. The occupant restraint system shall be designed to be attached to the bus body either directly or in combination with the wheelchair/ mobility aid securement system, by a method which prohibits the transfer of weight or force from the wheelchair/mobility aid to the occupant in the event of an impact.

- g. When an occupied wheelchair/mobility aid is secured in accordance with the manufacturer's instructions, the securement and restraint system shall limit the movement of the occupied wheelchair/mobility aid to no more than 2" in any direction under normal driving conditions.
- h. The securement and restraint system shall incorporate an identification scheme which will allow for the easy identification of the various components and their functions. It shall consist of one of the following, or combination thereof:
- (1) The wheelchair/mobility aid securement (webbing or strap assemblies) and the occupant restraint belt assemblies shall be of contrasting color or color shade.
 - (2) The wheelchair/mobility aid securement device (webbing or strap assemblies) and occupant restraint belt assemblies shall be clearly marked to indicate the proper wheelchair orientation in the vehicle, and the name and location for each device or belt assembly, i.e., front, rear, lap belt, shoulder belt, etc.
- i. All attachment or coupling devices designed to be connected or disconnected frequently shall be accessible and operable without the use of tools or other mechanical assistance.
- j. All securement and restraint system hardware and components shall be free of sharp or jagged areas and shall be of a non-corrosive material or treated to resist corrosion in accordance with §4.3(a) of FMVSS 209.
- k. The securement and restraint system shall be located and installed such that when an occupied wheelchair/mobility aid is secured, it does not block access to the lift door.
- l. A device for storage of the securement and restraint system shall be provided. When the system is not in use, the storage device shall allow for clean storage of the system, shall keep the system securely contained within the passenger compartment shall provide reasonable protection from vandalism, and shall enable the system to be readily accessed for use.
- m. The entire securement and restraint system, including the storage device, shall meet the flammability standards established in FMVSS 302.
- n. Each securement device (webbing or strap assembly) and restraint belt assembly shall be permanently and legibly marked or incorporate a non-removable label or tag which states that it conforms to all applicable FMVSS requirements, as well as, the current National Standards for School Buses. In addition, the system manufacturer, or an authorized representative, upon request by the original titled purchaser, shall provide a notarized Certificate of Conformance, either original or photocopied, which states that the wheelchair/mobility aid securement and occupant restraint system meets all of the requirements as specified in FMVSS 222 and the current National Standards for School Buses.
- o. The following information shall be provided with each vehicle equipped with a securement and restraint system:
- (1) A phone number where information can be obtained about installation, repair, and parts. (Detailed written instructions and a parts list shall be available upon request).
 - (2) Detailed instructions regarding use, including a diagram showing the proper placement of the wheelchair/mobility aids and positioning of securement devices and occupant restraints, including correct belt angles.
- p. The system manufacturer shall make available training materials to ensure the proper use and maintenance of the wheelchair/mobility aid securement and occupant restraint system. These may include instructional videos, classroom curriculum, system test results, or other related materials.

2. Wheelchair/mobility aid securement system

- a. Each securement system location shall consist of a minimum of four anchorage points. A minimum of two anchorage points shall be located in front of the wheelchair/mobility aid and a minimum of two anchorage points shall be located in the rear. The securement anchorages shall be attached to the floor of the vehicle and shall not interfere with passenger movement or present any hazardous condition.
- b. Each securement system location shall have a minimum clear floor area of 30" by 48". Additional floor area may be required for some applications. Consultation between the user and the manufacturer is recommended to ensure adequate area is provided.
- c. The securement system shall secure common wheelchair/mobility aids and shall be able to be attached easily by a person having average dexterity and who is familiar with the system and wheelchair/mobility aid.
- d. As installed, each securement anchorage shall be capable of withstanding a minimum force of 3,000 pounds (13,344 Newtons) when applied as specified in FMVSS 222. When more than one securement device share a common anchorage, the anchorage shall be capable of withstanding the force indicated above, multiplied by the number of securement devices sharing that anchorage.
- e. Each securement device, if incorporating webbing or a strap assembly, shall comply with the requirements for Type 1 safety belt systems, in accordance with §4.2, §4.3, and §4.4(a) of FMVSS 209.
- f. The securement system shall secure the wheelchair/mobility aid in such a manner that the attachments or coupling hardware will not become detached when any wheelchair/mobility aid component deforms, when one or more tires deflate, and without intentional operation of a release mechanism (e.g., a spring clip on a securement hook).
- g. Each securement device (webbing or strap assembly) shall be capable of withstanding a minimum force of 2,500 pounds when tested in accordance with FMVSS 209.
- h. Each securement device (webbing or strap assembly) shall provide a means of adjustment, of manufacturer's design, to remove slack from the device or assembly.

3. Occupant restraint system

- a. A Type 2A occupant restraint system which meets all applicable requirements of FMVSSs 209 and 210 shall provide for restraint of the occupant.
- b. The occupant restraint system shall be made of materials which do not stain, soil, or tear an occupant's clothing, and which are resistant to water damage and fraying.
- c. Each restraint system location shall have not less than one anchorage, of manufacturer's design, for the upper end of the upper torso restraint.

(1) The anchorage for each occupant's upper torso restraint shall be capable of withstanding a minimum force of 1,500 pounds (6,672 Newtons) when applied as specified in FMVSS 222.

d. Each wheelchair/mobility aid location shall have not less than two floor anchorages for the occupant pelvic and the connected upper torso restraint.

(1) Each floor anchorage shall be capable of withstanding a minimum force of 3,000 pounds (13,344 Newtons) when applied as specified in FMVSS 222.

(2) When more than one occupant restraint share a common anchorage, the anchorage shall be capable of withstanding a minimum force of 3,000 pounds (13,344 Newtons) multiplied by the number of occupant restraints sharing the common anchorage in accordance with FMVSS 222.

e. Each floor and wall anchorage which secures the occupant restraint to the vehicle and which is not permanently attached, shall be of a "positive latch" design, and shall not allow for any accidental disconnection.

4. Dynamic testing

a. The wheelchair/mobility aid securement and occupant restraint system shall be subjected to, and successfully pass, a dynamic sled test at a minimum impact speed/deceleration of 30 mph/20g's.

b. The dynamic test shall be performed by experienced personnel using an impact simulator with proven ability to provide reliable, accurate, and test results which can be replicated.

c. The dynamic test shall be performed in accordance with the procedures set forth in Appendix A of SAE J2249 "Test for Frontal Impact Crash Worthiness."

d. The wheelchair/mobility aid used for testing purposes shall be a rigid, reusable surrogate wheelchair that complies with the requirements of Appendix D of SAE J2249 "Specification for Surrogate Wheelchair."

e. The dynamic test shall be performed using system assemblies, components and attaching hardware which are identical to the final installation in type, configuration and positioning. The body structure at the anchorage points may be simulated for the purpose of the sled test.

f. When tested, the wheelchair/mobility aid securement and occupant restraint system shall pass the criteria specified in Section 6.2 of SAE J2249 "Performance Requirements of Frontal Sled Impact Test." Following is an abridged summary of the criteria. (See appendix D).

(1) Retain the test dummy in the test wheelchair and on the test sled with the test wheelchair in an upright position.

(2) Not show any fragmentation or complete separation of any load carrying part.

(3) Not allow the horizontal excursions of the test dummy and the test wheelchair to exceed specified limits.

(4) Prevent the test wheelchair from imposing forward loads on the test dummy.

(5) Allow removal of the test dummy and the test wheelchair, subsequent to the test, without the use of tools.

SPECIAL LIGHT

1. Doorways in which lifts are installed, shall have, when lift is to be used, at least 2 foot-candles of illumination measured on the floor of the bus immediately adjacent to the lift, and on the lift, when deployed at the vehicle floor level.

SPECIAL SERVICE ENTRANCE

1. Power lift-equipped bodies shall have a special service entrance to accommodate the power lift.

Exception: If the lift is designed to operate within the regular service entrance, and is capable of stowing such that the regular service entrance is not blocked in any way, and that persons entering or exiting the bus are not impeded in any way, a special service entrance shall not be required.

2. The special service entrance and door shall be located on the right side of the bus and shall be designed so as not to obstruct the regular service entrance.

Exception: A special service entrance and door may be located on the left side of the bus if, and only if, the bus is used primarily to deliver students to the left side of one way streets and its use is limited to that function.

3. The opening may extend below the floor through the bottom of the body skirt. If such an opening is used, reinforcements shall be installed at the front and rear of the floor opening to support the floor and give the same strength as other floor openings.
4. A drip molding shall be installed above the opening to effectively divert water from entrance.
5. Door posts and headers from entrance shall be reinforced sufficiently to provide support and strength equivalent to the areas of the side of the bus not used for special service entrance.

SPECIAL SERVICE ENTRANCE DOORS

1. A single door or double doors may be used for the special service entrance.
2. A single door shall be hinged to the forward side of the entrance unless doing so would obstruct the regular service entrance. If, due to the above condition, the door is hinged to the rearward side of the doorway, the door shall utilize a safety mechanism which will prevent the door from swinging open should the primary door latch fail. If double doors are used the system shall be designed to prevent the door(s) from being blown open by the wind resistance created by the forward motion of the bus, and/or incorporate a safety mechanism to provide secondary protection should the primary latching mechanism(s) fail.
3. All doors shall have positive fastening devices to hold doors in the open position.
4. All doors shall be weather sealed.
5. When manually-operated dual doors are provided, the rear door shall have at least a one-point fastening device to the header. The forward-mounted door shall have at least three-point fastening devices. One shall be to the header, one to the floor line of the body, and the other shall be into the rear door. The door and hinge mechanism shall be of a strength that is greater than or equivalent to the emergency exit door.
6. Door materials, panels and structural strength shall be equivalent to the conventional service and emergency doors. Color, rub rail extensions, lettering and other exterior features shall match adjacent sections of the body.
7. Each door shall have windows set in rubber which are visually similar in size and location to adjacent non-door windows. Glazing shall be of same type and tinting (if applicable) as standard fixed glass in other body locations.

8. Door(s) shall be equipped with a device that will actuate an audible or flashing signal located in the driver's compartment when door(s) is not securely closed and ignition is in "on" position.
9. A switch shall be installed so that the lifting mechanism will not operate when the lift platform door(s) is closed.
10. Special service entrance doors shall be equipped with padding at the top edge of the door opening. Padding shall be at least 3" wide and 1" thick and extend the full width of the door opening.

SUPPORT EQUIPMENT AND ACCESSORIES

1. Each bus which is set up to accommodate wheelchair/mobility aids or other assistive or restraint devices which utilize belts, shall contain at least one belt cutter properly secured in a location within reach of the driver while belted into his/her driver's seat. The belt cutter shall be durable and designed to eliminate the possibility of the operator or others being cut during use.
2. Special equipment or supplies which are used on the bus for mobility assistance, health support, or safety purposes shall meet any local, federal, or engineering standards which may apply, including proper identification.

Equipment which may be used for these purposes includes, but is not limited to:

- a. Wheelchairs and other mobile seating devices. (See section on Securement System for Mobile Seating Devices/Occupant.)
 - b. Crutches, walkers, canes, and other ambulating devices.
 - c. Medical support equipment. This may include respiratory devices such as oxygen bottles (which should be no larger than 22 cubic feet for liquid oxygen and 38 cubic feet for compressed gas), or ventilators. Tanks and valves should be located and positioned to protect them from direct sunlight, bus heater vents, or other heat sources. Other equipment may include intravenous, and fluid drainage apparatus.
3. All portable equipment and special accessory items, including the equipment listed above, shall be secured at the mounting location to withstand a pulling force of five times the weight of the item, or shall be retained in an enclosed, latched compartment. The compartment shall be capable of withstanding forces applied to its interior equal to five times the weight of its contents without failure to the box's integrity and securement to the bus.

Exception: If these standards provide specific requirements for securement of a particular type of equipment, the specific standard shall prevail (i.e., wheelchairs).

TECHNOLOGY AND EQUIPMENT, NEW

It is the intent of these standards to accommodate new technologies and equipment which will better facilitate the transportation of students with special needs. When a new technology, piece of equipment, or component is desired to be applied to the school bus, and it meets the following criteria, it may be acceptable.

1. It (the technology, equipment or component) shall not compromise the effectiveness or integrity of any major safety system, unless it completely replaces the system. (Examples of safety systems include, but are not limited to, compartmentalization, the eight light warning system, emergency exit opportunity, and the uncluttered yellow color scheme.)
2. It shall not diminish the safe environment of the interior of the bus.
3. It shall not create additional risk to students who are boarding or exiting the bus or are in or near the school bus loading zone.

4. It shall not create undue additional activity and/or responsibility for the driver.

It shall generally increase efficiency and/or safety of the bus, or generally provide for a safer or more pleasant experience for the occupants and pedestrians in the vicinity of the bus, or generally assist the driver or make his/her many tasks easier to perform.