

Transportation

1102 Standards for School Bus Chassis and Bodies Placed in Production on or after March 1, 2002 and on or after March 1, 2003 with Specific Changes for Buses Placed in Production after January 1, 2004 (Terminology and School Bus Types are those described in the *National School Transportation Specifications and Procedures (NSTSP)*, May 2000

1.0 Bus Chassis Standards

1.1 Air Cleaner

1.1.1 A dry element type air cleaner shall be provided.

1.1.2 All diesel engine air filters shall include a latch type restriction indicator that retains the maximum restriction developed during operation of the engine. The indicator should include a reset control so the indicator can be returned to zero when desired.

1.2 Axles: The front and rear axle and suspension systems shall have a Gross Axle Weight Rating (GVWR) at ground commensurate with the respective front and rear weight loads that will be imposed by the bus.

1.2.1 For bus chassis and bodies produced after March 1, 2003, all buses with a capacity of 66 passengers or greater shall have a 9,000 pound front axle minimum.

1.3 Brakes, General

1.3.1 The chassis brake system shall conform to the provisions of Federal Motor Vehicle Safety Standards (FMVSS) 105, 106 and 121 as applicable.

1.3.2 The anti lock brake system (ABS), provided in accordance with FMVSS 105 and 121, shall provide wheel speed sensors for each front wheel and for each wheel on at least one rear axle. The system shall provide anti lock braking performance for each wheel equipped with sensors. (Four Channel System).

1.3.3 All brake systems shall be designed to permit visual inspection of brake lining wear without removal of any chassis component(s).

1.3.4 The brake lines, booster assist lines, and control cables shall be protected from excessive heat, vibration, and corrosion and installed in a manner which prevents chafing.

1.3.5 The parking brake system for either air or hydraulic service brake systems may be of a power assisted design. The power parking brake actuator should be a push pull device located on the instrument panel within a seated reach of a 5th percentile female driver. As an option, the parking brake may be set by placing the automatic transmission shift control mechanism in the "park" position.

1.3.6 The power operated parking brake system may be interlocked to the engine key switch. Once the parking brake has been set and the ignition switch turned to the "off" position, the parking brake cannot be released until the key switch is turned back to the "on" position.

1.4 Brakes, Hydraulic: Buses using a hydraulic assist brake shall be equipped with audible and visible warning signals that provide a continuous warning to the driver of a loss of fluid flow from the primary source and of a failure of the back up pump system.

1.5 Brakes, Air

1.5.1 The air pressure supply system shall include a desiccant type air dryer installed according to the manufacturers' recommendations. The air pressure storage tank system may incorporate an automatic drain valve.

1.5.2 The chassis manufacturer shall provide an accessory outlet for air operated systems installed by the body manufacturer. This outlet shall include a pressure protection valve.

1.5.3 For air brake systems, an air pressure gauge shall be provided in the instrument panel capable of complying with CDL pre trip inspection requirements.

1.5.4 All air brake equipped buses may be equipped with a service brake interlock. The parking brake cannot be released until the brake pedal is depressed.

1.5.5 Air brake systems may include a system for anti compounding of the service brakes and parking brakes.

1.5.6 Air brakes shall have both a visible and audible warning device whenever the air pressure falls below the level where warnings are required under FMVSS 121.

1.6 Bumper Front

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- 1.6.1 School buses shall be equipped with a heavy duty front bumper. The front bumper shall be furnished by the chassis manufacturer for all school bus types unless there is a specific agreement between the chassis manufacturer and body manufacturer.
- 1.6.2 The front bumper shall be of pressed steel channel or equivalent material (except Type A buses having a GVWR of 14,500 pounds or less which may be Original Equipment Manufacturer supplied) at least 3/16" thick and not less than 8" wide (high). It 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.
- 1.6.3 The 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.
- 1.6.4 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.
- 1.7 Certification: The chassis manufacturer, upon request of the Delaware Department of Education, shall certify that its product meets the state's minimum standards on items not covered by the FMVSS certification requirements of 49 CFR, Part 567.
- 1.8 Clutch
 - 1.8.1 Clutch torque capacity shall be equal to or greater than the engine torque output.
 - 1.8.2 A starter interlock shall be installed to prevent actuation of the starter if the clutch pedal is not depressed.
- 1.9 Color
 - 1.9.1 The chassis, including wheels and front bumper, shall be black. Body cowl, hood, and fenders shall be in National School Bus Yellow (NSBY). The flat top surface of the hood may be painted with non reflective NSBY. (See appendix B, 2000 National School Transportation Specifications and Procedures).
 - 1.9.2 Demountable rims, if used, may be, silver, gray or black as received from the wheel manufacturer.
 - 1.9.3 Wheel covers shall not be permitted.
 - 1.9.4 Mud flaps if used shall be completely black.
 - 1.9.4.1 For bus chassis and bodies produced after January 1, 2004, the buses shall be equipped with mud flaps. They shall be black except they may have manufacturer's logo or name in white or yellow.
- 1.10 Daytime Running Lamps: Head lamps shall be provided with a switch to automatically operate the lamps when the vehicle is placed in gear or the parking brake is released. If this switch is designed to provide reduced illumination under normal operating conditions, a means whereby the head lamps can be engaged at full power shall be provided.
- 1.11 Drive Shaft: The 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.
- 1.12 Electrical System
 - 1.12.1 Battery
 - 1.12.1.1 The storage batteries shall have minimum cold cranking capacity rating (cold cranking amps) equal to the cranking current required for 30 seconds at 0 degrees Fahrenheit 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.
 - 1.12.1.2 Since all batteries are to be secured in a sliding tray in the body, chassis manufacturers shall mount the battery temporarily on the chassis frame, except that van conversion or cutaway front section chassis may be secured in accordance with manufacturer's standard configuration. In these cases, the final location of the battery and the appropriate cable lengths shall be agreed upon mutually by the chassis and body manufacturer. However, in all cases the battery cable provided with the chassis shall have sufficient length to allow some slack.
 - 1.12.2 Alternator
 - 1.12.2.1 All Type A-2 buses and Type B buses with a GVWR of 15,000 lbs. or less shall have a minimum 60 ampere alternator
 - 1.12.2.2 Types A-2 and Type B buses over 15,000 lbs. GVWR and all Type C and Type 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 or higher which produce a minimum current output of 50 percent of the rating at engine idle speed.

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- 1.12.2.3 Buses equipped with an electrically powered wheelchair lift shall have a minimum 130 ampere alternator
- 1.12.2.4 A belt alternator drive shall be capable of handling the rated capacity of the alternator with no detrimental effect on any other driven components. (See School Bus Manufacturers Technical Council (SBMTC), "School Bus Technical Reference," for estimating required alternator capacity.)
- 1.12.2.5 A direct drive alternator is permissible in lieu of a belt driven alternator.
- 1.12.3 Wiring
 - 1.12.3.1 All wiring shall conform to current applicable recommended practices of the Society of Automotive Engineers (SAE).
 - 1.12.3.1.1 All wiring shall use color and at least one other method of identification. The other method shall be either a number code or name code, and each chassis shall be delivered with a wiring diagram that illustrates the wiring of the chassis.
 - 1.12.3.1.2 Body accessories shall be wired through the ignition switch and the clearance lights through a separate switch wired through the body controlled electronic control module.
 - 1.12.3.2 The 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. The strip or plug shall contain the following terminals for the body connections:
 - 1.12.3.2.1 Main 100 amp body circuit;
 - 1.12.3.2.2 Tail lamps;
 - 1.12.3.2.3 Right turn signal;
 - 1.12.3.2.4 Left turn signal;
 - 1.12.3.2.5 Stop lamps;
 - 1.12.3.2.6 Back up lamps; and
 - 1.12.3.2.7 Instrument panel lights (rheostat controlled by headlamp switch)
- 1.12.4 Circuits
 - 1.12.4.1 An appropriate identifying diagram (color plus a name or number code) for all chassis electrical circuits shall be provided to the body manufacturer for distribution to the end user.
 - 1.12.4.1.1 The headlight system must be wired separately from the body controlled electronic control module.
- 1.13 Engine: All engines shall have an engine block heater.
- 1.14 Engine Fire Extinguisher: The chassis manufacturer may provide an automatic fire extinguisher system in the engine compartment.
- 1.15 Exhaust System
 - 1.15.1 The 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.
 - 1.15.2 The tailpipe shall be constructed of a corrosion resistant tubing material at least equal in strength and durability to 16 gauge steel tubing of equal diameter.
 - 1.15.3 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" 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.
 - 1.15.3.1 On Types C and D vehicles, the tailpipe shall not exit beneath a fuel fill or emergency door exit.
 - 1.15.3.2 Types A and B chassis may be furnished with the manufacturer's standard tailpipe configuration.
 - 1.15.3.3 Chassis manufacturers may furnish a tailpipe that exits through the rear bumper.
 - 1.15.4 The exhaust system on a chassis shall be adequately insulated from the fuel system.
 - 1.15.5 The muffler shall be constructed of corrosion resistant material.
 - 1.15.6 The exhaust system on the chassis 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.
 - 1.15.7 The tailpipe may be flush with, but shall not extend out more than two inches beyond, the perimeter of the body for side exit pipe or the bumper for rear exit pipe.

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- 1.15.8 The tailpipe shall exit to the left of the emergency exit door in the rear of the vehicle or to the left side of the bus in front or behind the rear drive axle. The tailpipe exit location on all Types A-1 or B-1 buses may be according to the manufacturer's standard. The tailpipe shall not exit beneath any fuel filler location or beneath any emergency door.
 - 1.15.8.1 For bus chassis and bodies produced after January 1, 2004, the tailpipe shall exit to the left or right of the emergency exit door in the rear of the vehicle. The tailpipe exit location on all Types A-1 or B01 buses may be according to the manufacturers standard. The tailpipe shall not exit beneath any fuel filler location or beneath any emergency door.
- 1.16 Fenders, Front Type C Vehicles
 - 1.16.1 Total spread of outer edges of front fenders, measured at fender line, shall exceed total spread of front tires when front wheels are in a straight ahead position.
 - 1.16.2 Front fenders shall be properly braced and shall not require attachment to any part of the body.
- 1.17 Frame
 - 1.17.1 The frame (or equivalent) shall be of such design and strength characteristics as to correspond at least to standard practices for trucks of the same general load characteristics, which are used for highway service.
 - 1.17.2 Any secondary manufacturer that modifies the original chassis frame shall guarantee the performance of workmanship and materials resulting from such modification.
 - 1.17.3 Frames shall not be modified for the purpose of extending the wheel base.
 - 1.17.4 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.
 - 1.17.5 Frame lengths shall be established in accordance with the design criteria for the complete vehicle.
- 1.18 Fuel Tank
 - 1.18.1 The fuel tank (or tanks) provided by the chassis manufacturer shall have a minimum 60 gallon capacity for school buses with a capacity of 36 passengers and above. School buses less than a capacity of 36 shall have a manufacturer's standard fuel tank. The tank shall be filled and vented to the outside of the body and the fuel filler shall be placed in a location where accidental fuel spillage will not drip or drain on any part of the exhaust system.
 - 1.18.2 Fuel lines shall be mounted to the chassis frame in such a manner that the frame provides the maximum possible protections from damage.
 - 1.18.3 The fuel system shall comply with FMVSS 301.
 - 1.18.4 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.
 - 1.18.5 The actual draw capacity of each fuel tank shall be a minimum of 83% of the tank capacity.
 - 1.18.6 Installation of alternative fuel systems, including fuel tanks and piping from tank to the engine, shall comply with all applicable fire codes in effect on the date of manufacture of the bus.
 - 1.18.7 Installation of LPG tanks shall comply with National Fire Protection Association (NFPA) 58.
 - 1.18.8 Fuel gauges must be calibrated for size of tank used. If more than one tank is used, there must be a gauge for each tank.
- 1.19 Governor: When the engine is remotely located from the driver, the governor shall be set to limit engine speed to maximum revolutions per minute as recommended by the engine manufacturer, and a tachometer shall be installed so the engine speed may be known to the driver while seated in a normal driving position.
- 1.20 Heating System, Provision For: 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 connectors. The engine shall be capable of supplying coolant at a temperature of at least 170 degrees Fahrenheit at the engine cooling thermostat opening temperature. The coolant flow rate shall be 50 pounds per minute at the return end of 30 feet of one inch inside diameter automotive hot water heater hose. (See SBMTC-001.)
- 1.21 Horn: The bus shall be equipped with dual electrical horns capable of producing a complex sounds in bands of audio frequencies between 250 and 2,000 cycles per second and tested in accordance with SAE J-377.
 - 1.21.1 For bus chassis and bodies produced after January 1, 2004, the bus shall be equipped with a horn(s) 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. Type A buses may be equipped according to the manufacturer's standard.

1.22 Instruments and Instrument Panel

1.22.1 The chassis shall be equipped with the instruments and gauges listed below. (Telltale warning lamps in lieu of gauges are not acceptable, except as noted):

1.22.1.1 Speedometer;

1.22.1.2 Odometer, which will give, accrued mileage (to seven digits), including tenths of miles;

1.22.1.3 Voltmeter: An ammeter with graduated charge and discharge indications is permitted in lieu of a voltmeter; however, when used, the ammeter wiring must be compatible with the current flow of the system;

1.22.1.4 Oil pressure gauge;

1.22.1.5 Water temperature gauge;

1.22.1.6 Fuel gauge;

1.22.1.7 Upper beam headlight indicator;

1.22.1.8 Turn signal indicator; and

1.22.1.9 Glow plug indicator light where appropriate

1.22.2 All instruments shall be easily accessible for maintenance and repair.

1.22.3 The 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.

1.22.4 The instrument panel shall have lamps of sufficient candlepower to illuminate all instruments, gauges and shift selector indicator for the automatic transmission.

1.22.5 Multi function gauge (MFG)

1.22.5.1 The driver must be able to manually select any displayable function of the gauge on a MFG whenever desired.

1.22.5.2 Whenever an out of limits condition that would be displayed on one or more functions of a MFG occurs, the MFG controller should automatically display this condition on the instrument cluster. This should be in the form of an illuminated telltale warning lamp as well as having the MFG automatically display the out of limits indications. Should two or more functions displayed on the MFG go out of limits simultaneously, then the MFG should sequence automatically between those functions continuously until the condition(s) are corrected.

1.22.5.3 The use of a MFG does not relieve the need for audible warning devices, where required.

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

1.24 Openings: All openings in the floorboard or firewall between chassis and passenger compartment (e.g. for gearshift selector and parking brake lever) shall be sealed.

1.25 Passenger Load

1.25.1 The 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. (For purposes of calculation, the driver's weight is 150 pounds and the pupil weight is 120 pounds per pupil.)

1.25.2 Actual 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 Gross Axle Weight Rating (GAWR).

1.25.3 The manufacturer's GVWR for a particular school bus shall be furnished by manufacturers in duplicate (unless more copies are requested) to the Delaware Department of Education. The Department of Education shall, in turn, transmit such ratings to the Department of Public Safety, Division of Motor Vehicles.

1.26 Power and Grade Ability:

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

1.26.2 For school buses with less than 36 passenger capacity, the minimum power plant shall be 160 hp engine or equal.

1.26.3 For school buses with a capacity of 36 passengers or greater, the engine will produce at least 170 hp measured at an RPM not to exceed 2,600 and generate at least 420 foot pounds of torque.

1.26.3.1 For bus chassis and bodies produced after March 1, 2003, all buses with a capacity of 36 passengers or greater, shall have an engine that produces at least 190 hp.

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- 1.27 Retarder System: A retarder system, if used, shall maintain the speed of a fully loaded school bus at 19.0 mph on a 7% grade for 3.6 miles.
- 1.28 Road Speed Control: The bus shall be equipped with a vehicle speed limiter to accurately control vehicle maximum speed to 65 miles per hour.
- 1.29 Shock Absorbers: The bus shall be equipped with double action shock absorbers compatible with manufacturer's rated axle capacity at each wheel location.
- 1.30 Steering Gear
 - 1.30.1 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.
 - 1.30.2 If external adjustments are required, steering mechanism shall be accessible to make adjustments.
 - 1.30.3 No changes shall be made in the steering apparatus, which are not approved by the chassis manufacturer.
 - 1.30.4 There shall be a clearance of at least 2 inches between the steering wheel and cowl, instrument panel, windshield, or any other surface.
 - 1.30.5 Power steering is required and shall be of the integral type with integral valves.
 - 1.30.6 The steering system shall be designed to provide a means for lubrication of all wear points, which are not permanently lubricated.
- 1.31 Suspension Systems
 - 1.31.1 The capacity of springs or suspension assemblies shall be commensurate with the chassis manufacturer's GVWR.
 - 1.31.2 Rear leaf springs shall be of a progressive rate or multistage 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.
- 1.32 Throttle: The force required to operate the throttle shall not exceed 16 pounds throughout the full range of accelerator pedal travel.
- 1.33 Tires and Rims
 - 1.33.1 Rims of the proper size and tires of the proper size and load rating commensurate with chassis manufacturer's gross vehicle weight rating shall be provided. All wheel rims shall be the same size to allow for interchangeability. The use of multipiece rims and tube type tires shall not be permitted.
 - 1.33.2 Dual rear tires shall be provided on Type A-2, Type B, Type C, and Type D school buses.
 - 1.33.3 All tires on a vehicle shall be tubeless radials and be of the same size, and the load range of the tires shall meet or exceed the GVWR, as required by FMVSS 120.
 - 1.33.4 If the vehicle is equipped with a spare tire and rim assembly, it shall be the same size as those mounted on the vehicle.
 - 1.33.5 If a tire carrier is required, it shall be suitably mounted in an accessible location outside the passenger compartment.
- 1.34 Tow Eyes or Hooks: Tow eyes or hooks shall be furnished and attached so they do not 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 specifications. (Note: Type A buses are exempt from this requirement.)
- 1.35 Transmission
 - 1.35.1 Automatic transmissions (AT-545 or approved equal) shall have no fewer than three forward speeds and one reverse speed. Mechanical shift selectors shall provide a detent between each gear position when the gear selector quadrant and shift selector are not steering column mounted.
 - 1.35.2 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.
 - 1.35.3 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 seated in the driver's seat.
- 1.36 Turning Radius
 - 1.36.1 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.
 - 1.36.2 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.

- 1.37 Undercoating: The chassis manufacturers, or their agents, shall coat the undersides of steel or metallic constructed front fenders with a rust proofing compound, for which the compound manufacturer has 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.

6 DE Reg. 1351 (4/1/03)

7 DE Reg. 933 (1/1/04)

2.0 Bus Body Standards

2.1 Aisle

- 2.1.1 All emergency doors shall be accessible by a 12" minimum aisle. The aisle shall be unobstructed at all times by any type of barrier, seat, wheelchair or tiedown.
- 2.1.2 A 2" white line shall separate the driver compartment from the passenger compartment.
- 2.1.3 The seat backs shall be slanted sufficiently to give aisle clearance of 15" at tops of seat backs.

2.2 Back Up Warning Alarm: An automatic audible alarm shall be installed behind the rear axle and shall comply with the published Backup Alarm Standards (SAE J994B), providing a minimum of 112 dBA.

2.3 Battery

- 2.3.1 The battery is to be furnished by the chassis manufacturer.
- 2.3.2 When the battery is mounted as described in the "Bus Chassis Standards", 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. The battery compartment door or cover shall be hinged at the front or top, and secured by an adequate and conveniently operated latch or other type fastener. The battery compartment is not required on Type A-1 buses.
- 2.3.3 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.

2.4 Bumper (Front)

- 2.4.1 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 described in the "Bus Chassis Standards".

2.5 Bumper (Rear)

- 2.5.1 The bumper shall be pressed steel channel at least 3/16" thick or equivalent strength material (except for Type A buses). Type A-1 buses bumper shall be a minimum of 8" wide (high) and Type A-2, B, C, and D buses bumper shall be a minimum of 9 1/2" wide (high). The bumper shall be of sufficient strength to permit being pushed by another vehicle without permanent distortion.
- 2.5.2 The bumper shall be wrapped around the 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 sides or protected with an end panel.
- 2.5.3 The 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 the rear or the side. It shall be so attached as to discourage hitching of rides by an individual.
- 2.5.4 The bumper shall extend at least 1" beyond the rear most part of the body surface measured at the floor line.

2.6 Ceiling: See Insulation and Interior, this section.

2.7 Certification: The body manufacturer shall, upon request, certify to the Delaware Department of Education, that its product meets state standards on items not covered by FMVSS certification requirements of 49 CFR, Part 567.

2.8 Chains (Tire): See Wheelhousing, this section.

2.9 Color

- 2.9.1 The school bus body shall be painted National School Bus Yellow (NSBY).
- 2.9.2 The body exterior paint trim, bumper, lamp hoods, emergency door arrow, and lettering shall be black. (See illustration in NSTSP, Appendix B)
- 2.9.3 Optionally, the roof of the bus may be painted white down to no lower than the top window lines except that the front and rear roof caps shall remain NSBY.

2.10 Communications: Buses shall be equipped with a radio (non CB) or telephonic communication device. It will be added by the school district, school, or contractor.

2.11 Construction**2.11.1 Side Intrusion Test:**

- 2.11.1.1 The bus body shall be constructed to withstand an intrusion force equal to the curb weight of the vehicle; but shall not exceed 20,000 pounds, whichever is less. Each vehicle shall be capable of meeting this requirement when tested in accordance with the procedures set forth below.
- 2.11.1.2 The complete body structure, or a representative seven body section mock up with seats installed, shall be load tested at a location 24 inches plus or minus two inches above the floor line, with a maximum 10 inch diameter cylinder, 48 inches long, mounted in a horizontal plane.
- 2.11.1.3 The cylinder shall be placed as close as practical to the mid point of the tested structure, spanning two internal vertical structural members. The cylinder shall be statically loaded to the required force of curb weight or 20,000 pounds, whichever is less, in a horizontal plane with a load applied from the exterior toward the interior of the test structure. Once the minimum load has been applied, the penetration of the loading cylinder into the passenger compartment shall not exceed a maximum of ten inches from its original point of contact. There can be no separation of lapped panels or construction joints. Punctures, tears or breaks in the external panels are acceptable but are not permitted on any adjacent interior panel.
- 2.11.1.4 Body companies shall certify compliance with this intrusion requirement, including test results, if requested.

2.11.2 Construction shall be reasonably dust proof and watertight.**2.12 Crossing Control Arm**

- 2.12.1 Buses shall be equipped with a crossing control arm mounted on the right side of the front bumper. The arm when opened shall extend in a line parallel with the body side and positioned on a line with the right side wheels.
- 2.12.2 All components of the crossing control arm and all connections shall be weatherproofed.
- 2.12.3 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.
- 2.12.4 The crossing control arm shall meet or exceed SAE Standard J1133.
- 2.12.5 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").
- 2.12.6 There shall be no sharp edges or projections that could cause hazard or injury to students.
- 2.12.7 The crossing control arm shall extend minimum 70" (measured from the bumper at the arm assembly attachment point) when in the extended position.
- 2.12.8 The crossing control arms shall extend simultaneously with the stop arm(s) by means of the stop arm controls.

2.13 Defrosters

- 2.13.1 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.
- 2.13.2 The defrosting system shall conform to SAE J381 and J382.
- 2.13.3 The defroster and defogging system shall be capable of furnishing heated, outside ambient air, except that the part of the system furnishing additional air to the windshield, entrance door and stepwell may be of the recirculating air type.
- 2.13.4 Auxiliary fans are not considered defrosting or defogging systems and are described under "Ventilation."
- 2.13.5 Portable heaters shall not be used.

2.14 Doors

- 2.14.1 The service door shall be in the driver's control, designed to afford easy release and to 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, as tested on a 10 percent grade both uphill and downhill.
- 2.14.2 The service door shall be located on the right side of the bus, opposite and within direct view of driver.
- 2.14.3 The service door shall have a minimum horizontal opening of 24" and a minimum vertical opening of 68". Type A-1 vehicles shall have a minimum opening area of 1,200 square inches.

- 2.14.4 Service door shall be a split type, sedan type, or jackknife type. (Split type door includes any sectioned door that 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. School buses with a capacity of 36 passengers or greater shall be equipped with an outward opening service door.
- 2.14.5 Lower, as well as upper, door panels shall be of approved safety glass. The bottom of each lower glass panel shall not be more than 10" from the top surface of bottom step. The 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.
- 2.14.6 Vertical closing edges on split type or folding type entrance doors shall be equipped with flexible material to protect children's fingers. Type A-1 vehicles may be equipped with chassis manufacturer's standard entrance door.
- 2.14.7 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 left side door.
- 2.14.8 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.
- 2.14.9 If a power assisted service door is used, the actuation switch shall be to the right of the steering wheel within reach of drivers in the 95th percentile of the male and female adult population).
- 2.14.10 On power operated service doors, the emergency release valve, switch or device to release the service door must be placed above or to the immediate left or right of the service door and clearly labeled.
- 2.14.11 For bus chassis and bodies produced after January 1, 2004, the power entrance door shall be capable of being operated by a single three (3) position sequential switch, located convenient and accessible to the right of the driver. The first position shall activate the red flashing lights and the stop arm with the door closed. The second position shall open the door. Returning the switch to the off position shall close the door and cancel the stop arm and lights. The amber lights shall be controlled by a manual button located on the control panel to the right or left of the driver. Controls shall be a sequential operation system.
- 2.15 Driver Compartment
 - 2.15.1 The driver's seat supplied by the body company shall be a high back seat with a minimum seat back adjustable to 15 degrees, without requiring the use of tools, and 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 head nuts.
 - 2.15.2 Driver seat positioning and range of adjustments shall be designed to accommodate comfortable actuation of the foot control pedals by 95% of the male and female adult population.
 - 2.15.3 Type A buses may utilize the standard driver's seat provided by the chassis manufacturer.
 - 2.15.4 Driver Restraint System: A Type 2 lap and shoulder belt shall be provided for the driver. The assembly shall be equipped with an emergency locking retractor for the continuous belt system. On all buses except Type A equipped with a standard chassis manufacturer's driver seat, the lap portion of the belt system shall be guided or anchored to prevent the driver from sliding sideways under it. The lap and shoulder belt shall be designed to allow for easy adjustment in order to fit properly and to effectively protect drivers varying in size from 5th percentile adult female to 95th percentile adult male.
- 2.16 Emergency Exits
 - 2.16.1 All installed emergency exits shall comply with the requirements of FMVSS 217.
 - 2.16.2 Emergency door requirements
 - 2.16.2.1 The upper portion of the emergency door shall be equipped with approved safety glazing, the exposed area of which shall be at least 400 square inches. The lower portion of the rear emergency doors on Types A-2, B, C, and D vehicles shall be equipped with a minimum of 350 square inches of approved safety glazing.
 - 2.16.2.2 There shall be no steps leading to an emergency door.
 - 2.16.2.3 The emergency door(s) shall be equipped with padding at the top edge of each door opening. Padding shall be at least 3" wide and 1" thick, and shall extend the full width of the door opening.
 - 2.16.2.4 The side emergency door, if required, must meet the requirements as set forth in FMVSS 217, regardless of its use with any other combination of emergency exits. There shall be a clear aisle leading to it i.e., flip seats shall not be used.

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2.16.2.5 There shall be no obstruction higher than 1/4 inch across the bottom of any emergency door opening.

2.16.2.6 The rear emergency window shall have an assisted lifting device that will aid in lifting and holding the rear emergency window open.

2.16.3 Emergency exit requirements: Types A, B, C, and D vehicles shall be equipped with a total number of emergency exits as follows for the equipped capacities of vehicles. Exits required by FMVSS 217 may be included to comprise the total number of exits specified.

0 to 42 Passenger = 1 emergency exit per side and 1 roof hatch.

43 to 78 Passenger = 2 emergency exits per side and 2 roof hatches.

79 to 90 Passenger = 3 emergency exits per side and 2 roof hatches.

2.16.4 Side emergency exit windows when installed may be vertically hinged on the forward side of the window. No side emergency exit window will be located above a stop arm.

2.16.5 In addition to the audible warning required on emergency doors by FMVSS 217, additional emergency exits shall also be equipped with an audible warning device.

2.17 Emergency Equipment

2.17.1 Fire Extinguisher

2.17.1.1 The bus shall be equipped with at least one UL approved pressurized, dry chemical fire extinguisher. The extinguisher shall be mounted (and secured) 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 shall be easily read without moving the extinguisher from its mounted position.

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

2.17.2 First aid kit

2.17.2.1 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 secured) and identified as a first aid kit. The location for the first aid kit shall be marked.

2.17.2.2 Minimum contents include:

<u>Units</u>	<u>Quantity per unit</u>
2	12- 1" x 3" adhesive bandages
1	2 - 2" bandage compress
1	1 - 4" bandage compress
1	1 - non sterile triangular bandages approximately 40" x 36" x 54" with 2 safety pins
1	eye kit with 2 sterile eye pads and 1 oz. wash
1	3- burn ointment, 1/8 oz.
1	5- ammonia inhalants
1	5- PVP antiseptic swabs
1	5- insect sting swabs

2.17.3 Body fluid clean up kit: Each bus shall have a removable and moisture proof body fluid clean up kit accessible to the driver. It shall be properly mounted and identified as a body fluid clean up kit in the driver's compartment. Minimum contents of the body fluid clean up kit shall include the following:

2.17.3.1 1- 16 oz. bottle of 70% rubbing alcohol or 10% solution of bleach

2.17.3.2 1- plastic trash bag with tie, minimum of 12" x 12"

2.17.3.3 2- pairs of medical examination gloves (non latex)

2.17.3.4 10- paper towels, approximately 10 1/2" x 12 1/2"

2.17.4 Warning devices: Each school bus shall contain at least three (3) reflectorized triangle road warning devices mounted in an accessible place that meet requirements in FMVSS 125.

2.17.5 Any of the emergency equipment may be mounted in an enclosed compartment provided the compartment is labeled in not less than 1" letters, identifying each piece of equipment contained therein.

2.18 Floor

- 2.18.1 The floor in the under seat area, including tops of wheel housings, driver's compartment and toe board, 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.
- 2.18.2 The floor covering in the aisles shall be of aisle type rubber or equivalent, wear resistant and ribbed. Minimum overall thickness shall be .187" measured from tops of ribs.
- 2.18.3 The floor covering must be permanently bonded to the 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.
- 2.18.4 On Types B, C and D buses, a flush mounted, screw down plate that is secured and sealed shall be provided to access the fuel tank sending unit.
- 2.19 Handrails: At least one handrail shall be installed. The handrail(s) shall assist passengers during entry or exit, and be designed to prevent entanglement, as evidenced by the passage of the National Highway Transportation Safety Administration (NHTSA) string and nut test as defined in the NSTSP.
- 2.20 Heater and Air Conditioning Systems
 - 2.20.1 Heating System
 - 2.20.1.1 The heater shall be a hot water type.
 - 2.20.1.2 Every bus with a capacity of 36 or more shall have 2 heaters at the front: 1 to the left of the driver, and 1 to the right of the driver near the entrance door, and 1 heater in the rear portion of the bus.
 - 2.20.1.3 If only one heater is used, it shall be fresh air or combination fresh air and recirculation type.
 - 2.20.1.4 If more than one heater is used, additional heaters may be temperatures as specified recirculating air type.
 - 2.20.1.5 The heating system shall be capable of maintaining bus interior in SAE test procedure J2233.
 - 2.20.1.6 All forced air heaters installed by body manufacturers shall bear a name plate that indicates the heater rating in accordance with SBMTC-001. The plate shall be affixed by the heater manufacturer and shall constitute certification that the heater performance is as shown on the plate.
 - 2.20.1.7 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 SAE J20c. Heater lines on the interior of bus shall be shielded to prevent scalding of the driver or passengers.
 - 2.20.1.8 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.
 - 2.20.1.9 There shall be a water flow regulating valve installed in the pressure line for convenient operation by the driver while seated.
 - 2.20.1.10 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.
 - 2.20.1.11 Access panels shall be provided to make heater motors, cores and fans readily accessible for service. An outside access panel may be provided for the driver's heater.
 - 2.20.2 Air Conditioning
 - 2.20.2.1 Performance Specifications
 - 2.20.2.1.1 The installed air conditioning system shall cool the interior of the bus down to at least 80 degrees Fahrenheit, measured at a minimum of three points, located 4' above the floor at the longitudinal centerline of the bus. The three points shall be: (1) near the driver's location, (2) at the midpoint of the body, and (3) 2' forward of the emergency door, or, for type D rear engine buses, 2' forward of the end of the aisle.
 - 2.20.2.1.2 The test conditions under which the above performance must be achieved shall consist of: (1) placing the bus in a room (such as a paint booth) where ambient temperature can be maintained at 100 degrees Fahrenheit (2) heat soaking the bus at 100 degrees Fahrenheit with windows open for at least 1 hour and (3) closing windows, turning on the air conditioner with the engine running at the chassis manufacturer's recommended low idle speed, and

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cooling the interior of the bus to 80 degrees Fahrenheit or lower within a maximum of 30 minutes while maintaining 100 degrees Fahrenheit outside temperature.

- 2.20.2.1.3 Alternately, this test may be performed under actual summer conditions, which consist of temperatures above 85 degrees Fahrenheit, humidity above 50 percent with normal sun loading of the bus and the engine running at the engine manufacturer's recommended low idle speed. After a minimum of 1 hour of heat soaking, the system shall be turned on and must provide a minimum 20 degree temperature drop in the 30 minute time limit.

2.20.2.2 Other Requirements

- 2.20.2.2.1 Evaporator cases, lines and ducting (as equipped) shall be designed in such a manner that all condensation is effectively drained to the exterior of the bus below the floor level under all conditions of vehicle movement and without leakage on any interior portion of bus.
- 2.20.2.2.2 Any evaporator or ducting system shall be designed and installed so as to be free of injury prone projections or sharp edges. Any ductwork shall be installed so that exposed edges face the front of the bus and do not present sharp edges.
- 2.20.2.2.3 Evaporator cases and ducting systems shall be equipped with diffusers that are adjustable.
- 2.20.2.2.4 On specially equipped school buses, the evaporator and ducting (if used) shall be placed high enough that they will not obstruct occupant securement shoulder strap upper attachment points. This clearance shall be provided along entire length of the passenger area on both sides of the bus interior to allow for potential retrofitting of new wheelchair positions and occupant securement devices throughout the bus.
- 2.20.2.2.5 The condensers shall be equipped with a sight glass (or at least one for each part of a split system) that is accessible and directly visible for checking the level of the refrigerant.
- 2.20.2.2.6 The compressor system shall be equipped with both a high pressure and a low pressure switch to prevent compressor operation when system temperatures are above or below recommended safe levels. Lubrication of moving compressor parts shall be accomplished automatically. An automatic (electric) clutch shall be provided on each compressor.
- 2.20.2.2.7 All system operating controls, including on off switch(es), blower switch(es) and thermostat controls shall be accessible to the driver in a seated position.
- 2.20.2.2.8 Blowers shall be a minimum of two speeds.
- 2.20.2.2.9 Wiring shall be copper with color coded insulation. The air conditioning system shall be equipped with at least one manually resettable circuit breaker per side to provide overload protection for the main power circuit feeding the evaporator blowers and condenser fans. System control circuits shall also have overload protection, but may be fused.
- 2.20.2.2.10 Refrigerant shall be R 134A.
- 2.20.2.2.11 All wiring, hoses, and lines shall be grommited, routed, and supported so as to reduce wear. All flexible refrigerant hoses shall be double braided.
- 2.20.2.2.12 The body shall be equipped with insulation, including sidewalls, roof, firewall, rear, inside body bows and plywood (see "Insulation") or composite floor insulation to aid in heat dissipation and reflection.
- 2.20.2.2.13 All glass (windshield, service and emergency doors, side and rear windows) shall be equipped with maximum integral tinting allowed by federal or ANSI standards for the respective locations, except that windows rear of the driver's compartment shall have approximately 28 percent light transmission.
- 2.20.2.2.14 Type A buses equipped with air conditioning shall be furnished with an alternator with a minimum output rating of 120 amperes. Type B, C, and D buses equipped with air conditioning shall be furnished with an alternator with a minimum output rating of 160 amperes.
- 2.20.2.2.15 Roofs shall be painted white (see "Color").

- 2.21 Hinges: All exterior metal door hinges which do not have stainless steel, brass, or nonmetallic hinge pins or other designs that prevent corrosion shall be designed to allow lubrication to be channeled to the center 75 percent of each hinge loop without disassembly.

2.22 Identification

- 2.22.1 The 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. All lettering on NSBY surfaces shall be black, and lettering on black surfaces shall be NSBY or white.

2.22.2 Bus identification number shall be displayed on the sides, on the rear, and on the front.

2.22.3 District or company name or owner of the bus shall be displayed;

2.22.4 Other lettering, numbering, or symbols which may be displayed on the exterior of the bus, shall be limited to:

2.22.4.1 The location of the battery(ies) identified by the word "Battery" or "Batteries" on the battery compartment door in 2" lettering;

2.22.4.2 Symbols or letters not to exceed 64 square inches of total display near the service door, displaying information for identification by the students of the bus or route served;

2.22.4.3 Symbols identifying the bus as equipped for or transporting students with special needs (see Specially Equipped School Bus section);

2.22.4.4 Lettering of fuel type in 2" lettering adjacent to the fuel filler opening; and

2.22.4.5 Manufacturer, company name, dealer, school logo, or U.S. Flag (with no other wording or artwork) decal or plate not to exceed 6 inches x 12 inches may be displayed in the right side plate location on the rear of the bus.

2.23 Inside Height: 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-1 buses shall be 62" or more.

2.24 Insulation

2.24.1 If thermal insulation is specified, it shall be fire resistant, UL approved, with minimum R value of 5.5. Insulation shall be installed so as to prevent sagging.

2.24.2 If floor insulation is required, it shall be 5 ply nominal 5/8" thick plywood, 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-1 buses may be equipped with nominal 1/2" thick plywood meeting the above requirements. Equivalent material may be used to replace plywood, provided it has an equal or greater insulation R value, deterioration, sound abatement and moisture resistance properties.

2.25 Interior

2.25.1 The 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 the ceiling is constructed to contain lap joints, the 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 tow chains. (See "Storage Compartment")

2.25.2 The driver's area forward of the foremost padded barriers will permit the mounting of required safety equipment and vehicle operation equipment.

2.25.3 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 tested according to the procedure found in the NSTSP, Appendix B. School buses with a capacity of 36 passengers or greater shall be equipped with a sound proof body package that includes firewall and engine cover. The headliner over the driver's compartment to the front barriers shall be perforated to absorb sound.

2.25.4 Interior overhead storage compartments may be provided if they meet the following criteria:

2.25.4.1 Meet head protection requirements of FMVSS 222 where applicable;

2.25.4.2 Have a minimum rated capacity displayed for each compartment;

2.25.4.3 Be completely enclosed and equipped with latching doors which must be sufficient to withstand a force five times the maximum rated capacity of the compartment;

2.25.4.4 Have all corners and edges rounded with a minimum radius of 1" or padded equivalent to door header padding;

2.25.4.5 Be attached to the bus sufficiently to withstand a force equal to 20 times the maximum rated capacity of the compartment; and

2.25.4.6 Have no protrusions greater than 1/4 inch.

2.25.5 For bus chassis and bodies produced after March 1, 2003, the interiors shall have mar proof side walls.

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2.26 Lamps and Signals

2.26.1 Interior lamps shall be provided which adequately illuminate the aisle and the stepwell. The stepwell light shall be illuminated by a service door operated switch, to illuminate only when headlights and clearance lights are on and the service door is open.

2.26.2 Body instrument panel lights shall be controlled by an independent rheostat switch.

2.26.3 School bus alternately flashing signal lamps:

2.26.3.1 The bus shall be equipped with two red lamps at the rear of vehicle and two red lamps at the front of the vehicle. Lamps may be the sealed beam or halogen type.

2.26.3.3.1 For bus chassis and bodies produced after January 1, 2004, the visors or hoods, black in color, are only required on non flush mounted lights and shall have a minimum depth of 4".

2.26.3.2 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 the 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 deenergized) 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.

2.26.3.3 The area around lens of alternately flashing signal lamps extending outward from the edge of the lamps 3" (+/- ¼") to the sides and top and minimum 1" to the bottom, shall be black in color on the body or roof area against which the signal lamp is seen (from distance of 500 feet along axis of vehicle). Visors or hoods, black in color, are required and shall have a minimum depth of 4". (See NSTSP, Appendix B)

2.26.3.4 Red lamps shall flash at any time the stop signal arm is extended.

2.26.3.5 All flashers for alternately flashing red and amber signal lamps shall be enclosed in the body in a readily accessible location.

2.26.4 Turn signal and stop or tail lamps:

2.26.4.1 Bus body shall be equipped with amber rear turn signal lamps that are at least 7" in diameter. 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 a maximum of 12" below the rear window. Type A-1 conversion vehicle lamps must be at least 21 square inches in lens area and must be in the manufacturer's standard color.

2.26.4.1.1 For bus chassis and bodies produced after January 1, 2004, the bus body shall be equipped with amber rear turn signal lamps that are at least 7" in diameter, or if the shape is other than round, a minimum 38 square inches. 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 a maximum of 12" below the rear window. Type A-1 conversion vehicle lamps must be at least 21 square inches in lens area and must be in the manufacturer's standard color.

2.26.4.2 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. An additional side turn signal lamp may be mounted over the rear wheel opening on both sides.

2.26.4.2.1 For bus chassis and bodies produced after January 1, 2004, an additional amber side turn lamp shall be mounted between the rear wheel opening and the rear of the bus on both sides.

2.26.4.3 In addition to manufacturer's standard turn signals, Type C school buses shall also be equipped with front, Class A fender or hood mounted turn signals.

2.26.4.4 Buses shall be equipped with four combination red stop or tail lamps:

2.26.4.4.1 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.

2.26.4.4.2 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. The 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-1 buses with bodies supplied by chassis manufacturer may have manufacturer's standard stop and tail lamps.

2.26.4.5 All buses shall be equipped with a 16 light monitor. 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, circuit breaker, or field effect transistor to protect against any short circuit or intermittent shorts.

2.26.4.6 Body markers shall be the armored type.

2.26.4.7 Backup lamps: The 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 FMVSS 108. If backup lamps are placed on the same horizontal line as the brake lamps and turn signal lamps, they shall be to the inside.

2.26.5 School buses may be equipped with fog lamps.

2.27 Metal Treatment

2.27.1 All metal used in construction of bus body shall be zinc coated or aluminum coated or treated by equivalent process before the 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.

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

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

2.27.4 As evidence that above requirements have been met, samples of materials and sections used in the construction of the bus body shall not lose more than 10 percent of material by weight when subjected to a 1000 hour salt spray test as provided for in latest revision of ASTM Standard B-117.

2.28 Mirrors

2.28.1 The 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. The 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.

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

2.28.3 Buses may be equipped with heated or remote control external mirrors.

2.28.3.1 For bus chassis and bodies produced after March 1, 2003, buses for 36 passengers or greater shall be equipped with heated and remote control exterior rear view mirrors.

2.28.3.2 For bus chassis and bodies produced after January 1, 2004, the buses, 36 passengers or greater, shall be equipped with heated cross over mirrors.

2.29 Mounting

2.29.1 The chassis frame shall support rear body cross member. The 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.

2.29.2 Insulators shall be installed at all contact points between the body and the chassis frame on Types A-2, B, C, and D buses, and shall be secured by a positive means to the chassis frame or body to prevent shifting, separation, or displacement of the isolators under severe operating conditions.

2.30 Overall Length: Overall length of bus shall not exceed 40 feet, excluding accessories.

2.31 Overall Width: Overall width of bus shall not exceed 96", excluding accessories.

2.32 Public Address System:

2.32.1 There shall be installed a public address amplifier specifically designed for vehicular applications with a minimum power output of not less than 5 watts sine wave power. Such system shall consist of an on off switch, volume control, and an inside outside speaker selector switch. Additionally, it shall have an outside

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speaker completely weather-proofed a minimum 7 watt power capability and two interior dynamic speakers with a minimum diameter of 4 inches. These speakers shall be located above the window line, to the rear of the driver, and shall not project more than 1/2 inch from the interlining of the bus. There shall be no sharp edges or corners that could cause injury to a passenger. The outside speaker shall be located on the front of the cowl under the hood or other suitable location under the hood.

2.32.2 Buses may be equipped with an AM or FM audio system.

2.32.3 No internal speakers, other than the driver's communication systems, may be installed within 4' of the driver's seat back in its rearmost upright position.

2.33 Reflective Material (see NSTSP, Appendix B)

2.33.1 The front and rear bumper may be marked diagonally 45 degrees down to centerline of pavement with 2" +/- 1/4" wide strips of non contrasting reflective material.

2.33.2 The 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 that conforms with the requirements of FMVSS 131, Table 1. The perimeter marking of rear emergency exits per FMVSS 217 or the use of reflective "SCHOOL BUS" signs partially accomplishes 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. Vertical strips shall be applied at the corners connecting these horizontal strips.

2.33.3 "School Bus" signs shall be marked with reflective NSBY material comprising background for lettering of the front or rear "School Bus" signs.

2.33.4 Sides of bus body shall be marked with at least 1 3/4" reflective NSBY material, extending the length of the bus body and located (vertically) between the floor line and the beltline.

2.34 Rub Rails

2.34.1 There shall be one rub rail located on each side of the bus at seat cushion level which extends from the rear side of the entrance door completely around the bus body (except the emergency door or any maintenance access door) to the point of curvature near the outside cowl on the left side.

2.34.2 There shall be one additional rub rail located on each side at, or no more than 10" above, the floor line. The rub rail shall cover the same longitudinal area as the upper rub rail, except at the wheel housings, and it shall extend only to the radii of the right and left rear corners.

2.34.3 Both rub rails shall be attached at each body post and all other upright structural members.

2.34.4 Each rub rail 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.

2.34.5 Both rub rails shall be applied outside the body or outside the body posts. (Pressed in or snap on rub rails do not satisfy this requirement.) For Type A-1 vehicles using the body provided by the chassis manufacturer, or for Types A-2, B, C and D buses using the rear luggage or the rear engine compartment, rub rails need not extend around the rear corners.

2.34.6 There shall be a rub rail (snow rail) or equivalent bracing located horizontally at the bottom edge of the body side skirts.

2.35 Seat and Restraining Barriers

2.35.1 Passenger Seating

2.35.1.1 All seats shall have a minimum cushion depth of 15" and must comply with all requirements of FMVSS 222. School bus design capacities shall be in accordance with 49 CFR, Part 571.3 and FMVSS 222.

2.35.1.2 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 NSTSP, Appendix B)

2.35.1.3 School buses equipped with front barriers shall have modesty panels (full width) installed under the barriers the full length to the floor.

2.35.1.4 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.

2.35.1.5 All seat frames attached to the seat rail shall be fastened with two (2) bolts, washers and nuts or flange head nuts.

2.35.1.6 All school buses (including Type A) shall be equipped with restraining barriers which conform to FMVSS 222.

2.35.1.7 There shall be a minimum of 8" clearance between the last seat and the rear interior of the bus.

2.35.2 Pre school Age Seating: When installed, all passenger seats designed to accommodate a child or infant carrier seat shall comply with FMVSS 225. These seats shall be in compliance with NHTSA's "Guideline for Safe Transportation of Pre school Age Children in School Buses."

2.36 Steps

2.36.1 All school buses with a capacity of 36 passengers and above shall have a three step stepwell.

2.36.2 The first step at service door shall be not less than 10" and not more than 14" from the ground when measured from the 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.

2.36.3 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.

2.36.4 Steps shall be enclosed to prevent accumulation of ice and snow.

2.36.5 Steps shall not protrude beyond the side body line.

2.37 Step Treads

2.37.1 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.

2.37.2 The metal back of the tread shall be permanently bonded to the step tread material.

2.37.3 Steps, including the floor line platform area, shall have a 1 1/2" white nosing as an integral piece without any joint.

2.37.4 Step treads shall have the following characteristics:

2.37.4.1 Special compounding for good abrasion resistance and coefficient of friction of at least 0.6 for the step surface, and 0.8 for the step nosing;

2.37.4.2 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;

2.37.4.3 A durometer hardness 85 to 95.

2.38 Stirrup Steps: Unless the windshield and lamps are not easily accessible from the ground, there shall 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.

2.39 Stop Signal Arm: The stop signal arm shall be reflectorized material and comply with the requirements of FMVSS 131.

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

2.41 Strobe Light

2.41.1 A white flashing strobe light shall be installed on the roof. It shall be located from 4 to 6 feet from the rear of the roof edge (except air conditioned buses with rooftop evaporators), within 1 foot of centerline, and behind all other roof equipment. The strobe shall extend above the roof between 4 1/2 to 6 3/4 inches, and the light shall be 12 to 16 joules with a clear lens emitting light 360 degrees around its vertical axis.

2.41.2 The light shall be wired to activate when the amber alternately flashing signal lamps are activated, continuing through the full loading or unloading cycle, with an override switch to allow activation of the strobe light during inclement weather.

2.41.3 A pilot light shall be included to indicate when the light is in operation

2.42 Sun Shield

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2.42.1 An interior adjustable transparent sun shield with a finished edge not less than 6" X 30" for Types B, C, and D vehicles, shall be installed in a position convenient for use by driver.

2.42.2 On all Type A buses the sun shield (visor) shall be installed according to the manufacturer's standard.

2.43 Traction Assisting Devices

2.43.1 Where required or used, sanders shall:

2.43.1.1 Be of hopper cartridge valve type;

2.43.1.2 Have a metal hopper with all interior surfaces treated to prevent condensation of moisture;

2.43.1.3 Be of at least 100 pound (grit) capacity;

2.43.1.4 Have cover on the filler opening of hopper, which screws into place, thereby sealing the unit airtight;

2.43.1.5 Have discharge tubes extending to the front of each rear wheel under the fender;

2.43.1.6 Have no clogging discharge tubes with slush proof, non freezing rubber nozzles;

2.43.1.7 Be operated by an electric switch with telltale pilot light mounted on the instrument panel;

2.43.1.8 Be exclusively driver controlled; and

2.43.1.9 Have a gauge to indicate that the hopper needs refilling when it reaches one quarter full.

2.43.2 Automatic traction chains may be installed.

2.44 Undercoating

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

2.44.1.1 Salt spray resistance, pass test modified to 5% salt and 1000 hours;

2.44.1.2 Abrasion resistance, pass; and

2.44.1.3 Fire resistance, pass.

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

2.44.2 The undercoating material shall be applied with suitable airless or conventional spray equipment to the recommended film thickness and shall show no evidence of voids in cured film.

2.45 Ventilation

2.45.1 Auxiliary fans (2) shall meet the following requirements.

2.45.1.1 Fans for left and right sides shall be placed in a location where they can be adjusted for maximum effectiveness and where they do not obstruct vision to any mirror, the roadway, or students outside the bus. Note: Type A buses may be equipped with one fan.

2.45.1.2 fans shall be of 6" diameter

2.45.1.3 fan blades shall be covered with a protective cage. Each fan shall be controlled by a separate switch.

2.45.2 The bus 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.

2.45.3 Static type, non closeable exhaust ventilation shall be installed toward the front of the bus.

2.45.4 Roof hatches designed to provide ventilation in all types of exterior conditions may be provided. They may be equipped with additional ventilating fans.

2.46 Wheelhousing

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

2.46.2 Wheel housings shall be attached to the floor sheets in such a manner so as to prevent any dust, water or fumes from entering the body. Wheel housings shall be constructed of at least 16 gauge steel.

2.46.3 The inside height of the wheel housings above the floor line shall not exceed 12".

2.46.4 The wheel housings shall provide clearance for installation and use of tire chains on single and dual (if so equipped) power driving wheels.

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

2.47 Windows

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

2.47.2 Optional tinted and frost free glazing may be installed in all doors, windows, and windshields consistent with federal, state, and local regulations. Windshields shall be tinted with maximum integral tinting allowed by federal or ANSI standards with a shaded band across the top.

2.48 Windshield Washers: A windshield washer system shall be provided.

2.49 Windshield Wipers

2.49.1 A two speed or variable speed windshield wiping system shall be provided. An intermittent feature may be provided.

2.49.1.1 For bus chassis and bodies produced after March 1, 2003, a two speed or variable speed windshield wiping system shall be provided and an intermittent feature shall be provided.

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

2.50 Wiring

2.50.1 All wiring shall conform to current SAE standards.

2.50.2 Circuits:

2.50.2.1 Wiring shall be arranged in circuits, as required, with each circuit protected by a fuse, circuit breaker or field effect transistor. 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 shall 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:

<u>FUNCTION</u>	<u>COLOR</u>
Left Rear Directional Lamp	Yellow
Right Rear Directional Lamp	Dark Green
Stop Lamps	Red
Back up Lamps	Blue
Tail Lamps	Brown
Ground	White
Ignition Feed, Primary Feed	Black

The color of cables shall correspond to SAE J 1128.

2.50.2.2 Wiring shall be arranged in at least six regular circuits as follows:

2.50.2.2.1 Head, tail, stop (brake) and instrument panel lamps;

2.50.2.2.2 Clearance lamps and stepwell lamps that shall be actuated when service door is open;

2.50.2.2.3 Dome lamps;

2.50.2.2.4 Ignition and emergency door signal;

2.50.2.2.5 Turn signal lamps; and

2.50.2.2.6 Alternately flashing signal lamps.

2.50.2.3 Any of the above combination circuits may be subdivided into additional independent circuits.

2.50.2.4 Heaters and defrosters shall be wired on an independent circuit.

2.50.2.5 Whenever possible, all other electrical functions (such as sanders and electric type windshield wipers) shall be provided with independent and properly protected circuits.

2.50.2.6 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.

2.50.3 The entire electrical system of the body shall be designed for the same voltage as the chassis on which the body is mounted.

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- 2.50.4 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 the wiring diagram.
- 2.50.5 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.
- 2.50.6 The body power wire shall be attached to a special terminal on the chassis.
- 2.50.7 All wires passing through metal openings shall be protected by a grommet.
- 2.50.8 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.

6 DE Reg. 1351 (4/1/03)

7 DE Reg. 933 (1/1/04)

11 DE Reg. 1231 (03/01/08)

3.0 Standards for Specially Equipped School Buses

3.1 General Requirements

- 3.1.1 School buses designed for transporting students with special transportation needs shall comply with these standards and with FMVSSs applicable to their GVWR category.
- 3.1.2 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 that 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.
- 3.1.3 All lift buses shall have flat floors.
- 3.1.4 Padded barriers shall be installed to protect wheelchair positions where seating does not interface as barrier.
- 3.1.5 Seats shall have the minimum spacing specified under FMVSS No. 222 *School Bus Passenger Seating and Crash Protection* (within 24 inches from the safety reference point) per NHTSA February 1999 *Guideline for the Safe Transportation of Pre School Age Children in School Buses*.
- 3.1.6 All seats shall have seat belts installed (39" seats shall have 3 seatbelts and 30" seats shall have 2 seatbelts).

3.2 Aisles: All school buses equipped with a power lift shall provide a minimum 30" aisle leading from any wheelchair or mobility aid position to at least one emergency exit. A wheelchair securement position shall never be located directly in front of a power lift door location. It is understood that, when provided, the lift service door is considered an emergency exit.

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

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

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

3.6 Power Lifts and Ramps

3.6.1 The power lift (power up and gravity down with a manual backup system) shall be located on the right side of the bus body when not extended.

3.6.1.1 School buses with hydraulic brakes shall be equipped with a hydraulic brake interlock system meeting Americans with Disabilities Act (ADA) standards and ensure the lift can not operate unless the parking brake is set. The interlock shall be wired through the ignition switch.

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

- 3.6.1.3 A ramp device which does not meet the specifications of ADA but does meet the specifications of paragraph 3.6.3 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 be installed for emergency exit use. If stowed in the passenger compartment, the ramp must be properly secured and placed away from general passenger contact. It must not obstruct or restrict any aisle or exit while in its stowed or deployed position.
- 3.6.1.4 All vehicles covered by this specification shall provide a level change mechanism or boarding device (e.g., lift or ramp) complying with paragraphs 3.6.2 or 3.6.3 of this section with sufficient clearances to permit a wheelchair or other mobility aid user to reach a securement location.
- 3.6.2 Vehicle lift
- 3.6.2.1 Design loads. 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 six, based on the ultimate strength of the material. Non working parts, such as platform, frame, and attachment hardware that would not be expected to wear, shall have a safety factor of at least three, based on the ultimate strength of the material.
- 3.6.2.2 Lift capacity: The lifting mechanism and platform shall be capable of lifting at least 800 pounds.
- 3.6.2.3 Controls: Controls shall be provided that enable the operator to activate the lift mechanism from either inside or outside the bus. The controls may be interlocked with the vehicle brakes, transmission or door, or they may 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 (e.g., 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.
- 3.6.2.3.1 Exception: Where the lift is designed to deploy with its long dimension parallel to the vehicle axis 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.
- 3.6.2.4 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.
- 3.6.2.5 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.
- 3.6.2.6 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 that extends beyond the vehicle in its raised position shall have a barrier with a minimum height of 1 ½". 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

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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.

- 3.6.2.7 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 32" at the platform to 30" above it, and a minimum clear length of 48" measured from 2" above the surface of the platform to 30" above the surface of the platform.
- 3.6.2.8 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 inch horizontally and 5/8 inch 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.
- 3.6.2.9 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.
- 3.6.2.10 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.
- 3.6.2.11 Platform movement: No part of the platform shall move at a rate exceeding 6" per second while 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.
- 3.6.2.12 Boarding direction: The lift shall permit both inboard and outboard facing of wheelchair and mobility aid users.
- 3.6.2.13 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.
- 3.6.2.14 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.
- 3.6.2.15 Circuit breaker: A resettable circuit breaker shall be installed between the 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 and driver compartment.
- 3.6.2.16 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.
- 3.6.2.17 Documentation: The following information shall be provided with each vehicle equipped with a lift:
 - 3.6.2.17.1 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.)
 - 3.6.2.17.2 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 or mobility aids on lift.

3.6.2.18 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.

3.6.2.19 Identification and certification: Each lift shall be permanently and legibly marked or shall incorporate a non removable label or tag that states that it conforms to all applicable requirements of the NSTSP. 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 NSTSP.

3.6.3 Vehicle ramp

3.6.3.1 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.

3.6.3.2 Floor of ramp shall be constructed of non skid material.

3.6.3.3 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.

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

3.7 Regular Service Entrance

3.7.1 On power lift equipped vehicles, steps shall be the full width of the step well, excluding the thickness of doors in the open position.

3.7.2 A suitable device shall be provided at the front and rear of the stepwell to assist passengers during ingress or egress. This device shall allow for easy grasping or holding and shall have no openings or pinch points that might entangle clothing, accessories or limbs.

3.8 Restraining Devices

3.8.1 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.

3.8.2 Belt assemblies, if installed, shall conform to FMVSS 209.

3.8.3 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.

3.9 Seating Arrangements: Flexibility in seat spacing to accommodate special devices shall be permitted to meet passenger requirements. All seating shall be forward facing.

3.10 Securement and Restraint System for Wheelchair or 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 secures the wheelchair or 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 or mobility aid. The phrase *securement and restraint system* is used to refer to the total system which secures and restrains both the wheelchair or mobility aid and the occupant.

3.10.1 Securement and restraint system, general

3.10.1.1 The Wheelchair or 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.

3.10.1.2 The securement and restraint system, including the system track, floor plates, pockets or other anchorages shall be provided by the same manufacturer, or shall be certified to be compatible by manufacturers of all equipment and systems used.

3.10.1.3 When a wheelchair or 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 or 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 3.10.2 and 3.10.3 of this section.)

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- 3.10.1.4 When a wheelchair or mobility aid securement device (webbing or strap assembly) is shared with an occupant restraint, the wheelchair or 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 3.10.2 and 3.10.3 of this section.)
- 3.10.1.5 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.
- 3.10.1.6 The occupant restraint system shall be designed to be attached to the bus body either directly or in combination with the wheelchair or mobility aid securement system, by a method which prohibits the transfer of weight or force from the wheelchair or mobility aid to the occupant in the event of an impact.
- 3.10.1.7 When an occupied wheelchair or mobility aid is secured in accordance with the manufacturer's instructions, the securement and restraint system shall limit the movement of the occupied wheelchair or mobility aid to no more than 2" in any direction under normal driving conditions.
- 3.10.1.8 The securement and restraint system shall incorporate an identification scheme that will allow for the easy identification of the various components and their functions. It shall consist of one of the following, or combination thereof:
 - 3.10.1.8.1 The wheelchair or mobility aid securement (webbing or strap assemblies) and the occupant restraint belt assemblies shall be of contrasting color or color shade.
 - 3.10.1.8.2 The wheelchair or mobility aid securement device (webbing or strap assemblies) and occupant restraint belt assemblies may 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.
- 3.10.1.9 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.
- 3.10.1.10 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.
- 3.10.1.11 The securement and restraint system shall be located and installed such that when an occupied wheelchair or mobility aid is secured, it does not block access to the lift door.
- 3.10.1.12 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.
- 3.10.1.13 The entire securement and restraint system, including the storage device, shall meet the flammability standards established in FMVSS 302.
- 3.10.1.14 Each securement device (webbing or strap assembly) and restraint belt assembly shall be permanently and legibly marked or shall incorporate a non removable label or tag that states that it conforms to all applicable FMVSS requirements, as well as, the NSTSP. 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 or mobility aid securement and occupants' restraint system meets all of the requirements as specified in FMVSS 222 and the NSTSP.
- 3.10.1.15 The following information shall be provided with each vehicle equipped with a securement and restraint system:
 - 3.10.1.15.1 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).
 - 3.10.1.15.2 Detailed instructions regarding use, including a diagram showing the proper placement of the wheelchair or mobility aids and positioning of securement devices and occupant restraints, including correct belt angles.
- 3.10.1.16 The system manufacturer shall make available training materials to ensure the proper use and maintenance of the wheelchair or mobility aid securement and occupant restraint system. These may include instructional videos, classroom curriculum, system test results or other related materials.

3.10.2 Wheelchair or Mobility aid Securement System

- 3.10.2.1 Each location for the securement of a wheelchair or mobility aid shall consist of a minimum of four anchorage points. A minimum of two anchorage points shall be located in front of the wheelchair or 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.
- 3.10.2.2 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.
- 3.10.2.3 The securement system shall secure common wheelchair or mobility aids and shall be able to be attached easily by a person who has average dexterity and who is familiar with the system and wheelchair or mobility aid.
- 3.10.2.4 As installed, each securement anchorage shall be capable of withstanding a minimum force of 3,000 pounds when applied as specified in FMVSS 222. When more than one securement device shares a common anchorage, the anchorage shall be capable of withstanding the force indicated above, multiplied by the number of securement devices sharing that anchorage.
- 3.10.2.5 Each securement device, if incorporating webbing or a strap assembly, shall comply with the requirements for Type 1 lap belt systems, in accordance with §4.2, §4.3, and §4.4(a) of FMVSS 209.
- 3.10.2.6 The securement system shall secure the wheelchair or mobility aid in such a manner that the attachments or coupling hardware will not become detached when any wheelchair or 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).
- 3.10.2.7 Each securement device (webbing or strap assembly) shall be capable of withstanding a minimum force of 2500 pounds when tested in accordance with FMVSS 209.
- 3.10.2.8 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.

3.10.3 Occupant Restraint System

- 3.10.3.1 A Type 2A lap and shoulder restraint system that meets all applicable requirements of FMVSS 209 and 210 shall provide for restraint of the occupant.
- 3.10.3.2 The occupant restraint system shall be made of materials which do not stain, soil or tear an occupant's clothing, and shall be resistant to water damage and fraying.
- 3.10.3.3 Each restraint system location shall have not less than one anchorage of manufacturer's design for the upper end of the upper torso restraint.
 - 3.10.3.3.1 The anchorage for each occupant's upper torso restraint shall be capable of withstanding a minimum force of 1500 pounds when applied as specified in FMVSS 222.
- 3.10.3.4 Each wheelchair or mobility aid location shall have not less than two floor anchorages for the occupant pelvic restraint and the connected upper torso restraint.
 - 3.10.3.4.1 Each floor anchorage shall be capable of withstanding a minimum force of 3,000 pounds when applied as specified in FMVSS 222.
 - 3.10.3.4.2 When more than one occupant restraint shares a common anchorage, the anchorage shall be capable of withstanding a minimum force of 3000 pounds multiplied by the number of occupant restraints sharing the common anchorage in accordance with FMVSS 222.
- 3.10.3.5 Each floor and wall anchorage that secures the occupant restraint to the vehicle which is not permanently attached, shall be of a "positive latch" design and shall not allow for any accidental disconnection.

3.10.4 Dynamic Testing

- 3.10.4.1 The wheelchair or mobility aid securement and occupant restraint system shall be subjected to and successfully pass a dynamic sled test at a minimum impact speed divided by deceleration of 30 mph divided by 20g's.
- 3.10.4.2 The dynamic test shall be performed by experienced personnel using an impact simulator with proven ability to provide reliable, accurate test results that can be replicated.

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- 3.10.4.3 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."
- 3.10.4.4 The wheelchair or 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."
- 3.10.4.5 The dynamic test shall be performed using system assemblies, components and attaching hardware that 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.
- 3.10.4.6 When tested, the wheelchair or 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 NSTSP, Appendix D)
 - 3.10.4.6.1 Retain the test dummy in the test wheelchair and on the test sled with the test wheelchair in an upright position.
 - 3.10.4.6.2 Do not show any fragmentation or complete separation of any load carrying part.
 - 3.10.4.6.3 Do not allow the horizontal excursions of the test dummy and the test wheelchair to exceed specified limits.
 - 3.10.4.6.4 Prevent the test wheelchair from imposing forward loads on the test dummy.
 - 3.10.4.6.5 Allow removal of the test dummy and the test wheelchair, subsequent to the test, without the use of tools.
- 3.11 Special Light: Doorways in which lifts are installed shall have for use during lift operation a special light providing a minimum of 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.
- 3.12 Special Service Entrance
 - 3.12.1 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.
 - 3.12.2 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.
 - 3.12.3 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.
 - 3.12.4 A drip molding shall be installed above the opening to effectively divert water from the entrance.
 - 3.12.5 Door posts and headers at the 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.
- 3.13 Special Service Entrance Doors
 - 3.13.1 A single door shall be used for the special service entrance. They shall have rub rails.
 - 3.13.2 There shall be a 57" door height opening.
 - 3.13.3 A single door shall be hinged to the forward side of the entrance unless doing so would obstruct the regular service entrance. If 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.
 - 3.13.4 All doors shall have positive fastening devices to hold doors in the "open" position.
 - 3.13.5 All doors shall be weather sealed.
 - 3.13.6 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.
 - 3.13.7 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.
 - 3.13.8 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.

3.13.9 A switch shall be installed so that the lifting mechanism will not operate when the lift platform door(s) is closed.

3.13.10 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.

5 DE Reg. 879 (10/1/01)

7 DE Reg. 933 (1/1/04)

16 DE Reg. 416 (10/01/12)