

---

**Tennessee School Bus Specifications**

---

**The Background:**

The Advisory Council on School Transportation was appointed by the State Board of Education during its regular meeting on October 25, 2002 and reauthorized by the Executive Director of the State Board in December of 2006. The committee's charge is to advise the Board on all aspects of pupil transportation and to make recommendations aimed to secure the continued safety of students who use school transportation in the State of Tennessee.

The recommendation is to adopt the enclosed document, as Tennessee's Minimum School Bus Standards for all buses with a body tag "build date" later than July 1, 2008, including all changes proposed by the Tennessee Association of Pupil Transportation and the Tennessee State Board of Education Advisory Council on School Transportation.

In addition to a number of technical updates related to school bus specifications, the committee recommends that the crossing control arm be required for new buses (see pages 14-15, enclosed standards). This will add an estimated cost of \$200 per new bus purchased with a body build date later than July 1, 2008. The proposed changes will not significantly increase the cost of a school bus in a competitive bid environment.

The committee believes these changes will increase safety for Tennessee school bus drivers and the students they transport.

Enclosed is a copy of the newly proposed Tennessee Minimum School Bus Standards as reviewed and recommended by the committee, in accordance with Rule 0520-1-5.02. These standards meet all national minimum school bus standards, and all applicable federal motor vehicle safety standards (TCA 49-6-2115). The committee members unanimously approved this final document, including all newly proposed recommendations.

**Cost Summary for Tennessee's Minimum School Bus Standards**

*Vehicles with a body tag "build date" later than July 1, 2008*

**Crossing Control Arm**

Estimated cost of \$200.00 per bus

**The Master Plan Connection:**

This agenda item supports the sufficient resources component of the State Board of Education's Master Plan, and ensures necessary school bus guidelines are in place to support the safe transportation of students.

**The Recommendation:**

SBE staff recommends adoption of the school transportation recommendations on final reading.

# Tennessee School Bus Specifications

July 1, 2008 Revision



**Tennessee State Board Of Education**  
710 James Robertson Parkway, 9<sup>th</sup> Floor  
Nashville, TN 37243-1050  
615-741-2966

# FOREWORD

---

The School Bus Specifications and Procedures adopted by the 2005 National Conference on School Transportation and the Federal Motor Vehicle Safety Standards (FMVSS) were used as guides by the Tennessee State Board of Education Pupil Transportation Advisory Committee in developing the revised minimum specifications for school bus chassis and school bus bodies.

The 2005 National Conference on School Transportation was the latest in a series beginning in 1939 and continuing in 1945, 1948, 1951, 1954, 1959, 1964, 1970, 1980, 1990, 1995, 2000 and 2005. All conferences have been made up of official representatives of State Department of Education, Public Safety, Motor Vehicles and Police or other state agencies having statewide responsibilities for the administration of pupil transportation, local school district personnel, contract operators, and advisors from the industry, and representatives from other interested professional organizations and groups. Each conference has resulted in one or more publications that contain the recommendations of that particular conference.

This document is divided into four sections:

- |           |   |
|-----------|---|
| Section 1 | School Bus Types                                    |
| Section 2 | School Bus Chassis Specifications                   |
| Section 3 | School Bus Body Specifications                      |
| Section 4 | Specifications for Specially Equipped School Buses. |

## EFFECTIVE DATE

These specifications and procedures apply respectively to school buses with a body tag "**build date**" later than **July 1, 2008**.

## SCOPE

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

## USED SCHOOL BUSES

A used school bus purchased or leased for use in Tennessee by or for a public school district shall meet all of the Tennessee Minimum School Bus Specifications and Procedures for School Buses that were in effect on the date that the vehicle was manufactured.

# School Bus Types

Type A: A Type A school bus is a conversion bus constructed utilizing a cutaway front section vehicle with a left side driver's door. This definition includes two classifications: Type A-1, with a Gross Vehicle Weight Rating (GVWR) of 14,500 pounds or less; and Type A-2, with a GVWR greater than 14,500 pounds and less than or equal to 21,500 pounds.



Type A-1



Type A-2

Type B: A Type B school bus is constructed utilizing a stripped chassis. The entrance door is behind the front wheels. This definition includes two classifications: Type B-1, with a GVWR of 10,000 pounds or less, and Type B-2, with a GVWR greater than 10,000 pounds.



Type B

Type C: A Type C school bus is constructed utilizing a chassis with a hood and front fender assembly. The entrance door is behind the front wheels—also known as a conventional style school bus. This type also includes the cutaway truck chassis or truck chassis with cab with or without a left side door and with a GVWR greater than 21,500 pounds.



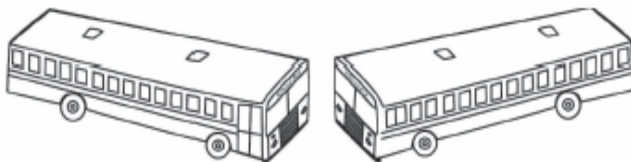
Type C  
Conventional



Type C  
Cutaway



Type D: A Type D school bus is constructed utilizing a stripped chassis. The entrance door is ahead of the front wheels—also known as a rear engine or front engine transit style school bus.



Type D

# **BUS CHASSIS SPECIFICATIONS**

## ***AIR CLEANER***

A dry element air cleaner shall be provided.

B. 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.

## ***AXLES***

The front and rear axle and suspension systems shall have a gross axle weight rating (GAWR) at ground commensurate with the respective front and rear weight loads of the bus loaded to the rated passenger capacity.

## ***BRAKES: GENERAL***

A. The chassis brake system shall conform to the provisions of FMVSS Nos. 105, Hydraulic and Electric Brake Systems, 106, Brake Hoses, and 121, Air Brake Systems, as applicable.

B. The anti-lock brake system (ABS), provided in accordance with FMVSS No. 105, Hydraulic and Electric Brake Systems or No. 121, Air Brake Systems, 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).

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

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

E. 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 device located on the instrument panel within reach of seated 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.

F. 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.

## ***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 indicating a loss of fluid flow from the primary source or a failure of the back-up pump system. Type A buses may be exempt.

## ***BRAKES: AIR***

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

B. 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 to prevent loss of air pressure in the service brake reservoir.

C. For air brake systems, an air pressure gauge shall be provided in the instrument panel capable of complying with Commercial Driver's License (CDL) pre-trip inspection requirements.

D. Air brake-equipped buses may be equipped with a service brake interlock. If equipped with a service brake interlock, the parking brake cannot be released until the brake pedal is depressed.

E. Air brake systems shall include a system for anti-compounding of the service brakes and parking brakes.

F. 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 No. 121, Air Brake Systems.

G. All Type C buses with a design seating capacity of 55 or greater shall be equipped with a full air brake system including an air dryer.

H. All Type D buses shall be equipped with a full air brake system including an air dryer.

## ***BUMPER: FRONT***

A. School buses shall be equipped with a front bumper. The front bumper shall be furnished by the chassis manufacturer for all school bus types unless there is a specific alternate agreement between the chassis manufacturer and body manufacturer.

B. The front bumper on buses of Type A-2 (with GVWR greater than 14,500 pounds), Type B, Type C, and Type D shall be equivalent in strength and durability to pressed steel channel at least 3/16 inches thick and not less than 8 inches wide (high). It shall extend beyond the forward-most part of the body, grille, hood and fenders and shall extend to the outer edges of the fenders at the bumper's top line. Type A buses having a GVWR of 14,500 pounds or less may be equipped with an OEM-supplied front bumper. The front bumper shall be of sufficient strength to permit being pushed by another vehicle on a smooth surface with a 5 degree, (8.7 percent) grade, without permanent distortion. The contact point on the front bumper is intended to be between the frame rails, with as wide a contact area as possible. If the front bumper is used for lifting, the contact points shall be under the bumper attachments to the frame rail brackets unless the manufacturer specifies being applied simultaneously at both lifting points.

Type A buses having a GVWR of 14,500 pounds or less may be equipped with an OEM-supplied front bumper. The front bumper shall be of sufficient strength to permit being pushed by another vehicle on a smooth surface with a 5 degree, (8.7 percent) grade, without permanent distortion. The contact point on the front bumper is intended to be between the frame rails, with as wide a contact area as possible. If the front bumper is used for lifting, the contact points shall be under the bumper attachments to the frame rail brackets unless the manufacturer specifies different lifting points in the owner's manual. Contact and lifting pressures should be applied simultaneously at both lifting points.

C. The front bumper, except breakaway bumper ends, shall be of sufficient strength to permit pushing a vehicle of equal gross vehicle weight, per Section B, without permanent distortion to the bumper, chassis or body.

D. 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 chassis frame shall be furnished by the chassis manufacturer. This installation shall be in accordance with the chassis manufacturer's specifications. Tow hooks or eyes shall have an individual strength rating of 13,500 pounds each, for a combined rating of 27,000 pounds. For pulling and lifting purposes, tow hooks are meant to be used simultaneously. For pulling, angularity applied to the tow hooks will decrease the capacities of the tow hooks.

Note: Type A buses are exempt from this requirement for front tow hooks or eyes due to built-in crush zones. Rear tow eyes or hooks are addressed in BUS BODY SPECIFICATIONS under Towing Attachment Points.

E. 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 hooks/eyes. For the purpose of meeting this specification, the bus shall be empty and positioned on a level, hard surface and both tow hooks/eyes shall share the load equally.

## **CERTIFICATION**

Upon request of the state agency having student transportation jurisdiction, the chassis manufacturer 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.

## **CLUTCH**

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

## **COLOR**

- A. 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 non-reflective black or NSBY.
- B. If used, demountable rims may be silver, gray, white, yellow or black, (as received from the wheel manufacturer).
- C. Multi-Function School Activity Buses (MFSABs) shall be exempt from these requirements.

## **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.

## **ELECTRICAL SYSTEM**

### **A. Battery**

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.
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 the 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 manufacturers. However, in all cases the battery cable provided with the chassis shall have sufficient length to allow some slack, and be of sufficient gauge to carry the required amperage.

### **B. Alternator**

1. All Type A-2 and Type B buses with a GVWR of 15,000 pounds or less shall have a minimum 130-amp alternator.
2. Type A-2 and Type B buses over 15,000 pounds GVWR and all Type C and Type D buses shall be equipped with a heavy-duty truck or bus-type alternator meeting SAE J180, Electrical Charging Systems for Construction and Industrial Machinery, having a minimum output rating of 130 amps or higher, and should produce a minimum current output of 50 percent of the rating at engine idle speed.



3. Buses equipped with an electrically powered wheelchair lift, air conditioning or other accessories may be equipped with a device that monitors the electrical system voltage and advances the engine idle speed when the voltage drops to, or below, a pre-set level.

4. A belt driven alternator shall be capable of handling the rated capacity of the alternator with no detrimental effect on any other driven components. (For estimating required alternator capacity, see School Bus Manufacturers Technical Council's publication, "School Bus Technical Reference," available at <http://www.nasdppts.org>.)

5. A direct-drive alternator is permissible in lieu of a belt-driven alternator.

#### C. Electrical Components

1. Materials in all electrical components shall contain no mercury.

#### D. Wiring

1. All wiring shall conform to current applicable recommended practices of the Society of Automotive Engineers (SAE). All wiring shall use color and at least one other method for 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.

2. The chassis manufacturer of an incomplete vehicle shall install a readily accessible terminal strip or connector 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 connector shall contain the following terminals for the body connections:

- a. Main 100-amp body circuit;
- b. Tail lamps;
- c. Right turn signal;
- d. Left turn signal;
- e. Stop lamps;
- f. Back-up lamps; and
- g. Instrument panel lamps (rheostat controlled by headlamp switch).

#### E. Circuits

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.

2. Wiring for the headlamp system must be separate from the electronic controlled body solenoid/module.

F. Daytime Running Lamps (DRL) A daytime running lamps system shall be provided.

### ***ENGINE FIRE EXTINGUISHER***

The chassis manufacturer may provide an automatic fire extinguisher system in the engine compartment.

### ***EXHAUST SYSTEM***

A. The exhaust pipe, muffler and tailpipe shall be outside the bus body compartment and shall be attached to the chassis so any other chassis component is not damaged.

B. 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.

C. Chassis manufacturers shall furnish an exhaust system with a tailpipe of sufficient length to exit at the rear of the bus or at the left side of the bus body no more than 18 inches forward of the front edge of the rear wheel house opening. If designed to exit at the rear of the bus, the tailpipe shall extend at least five inches beyond the end of the chassis frame. If designed to exit at 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. On Types C and D vehicles, the tailpipe shall not exit beneath a fuel fill or emergency door exit.

2. Types A and B chassis may be furnished with the manufacturer's standard tailpipe configuration. (See also BUS BODY SPECIFICATIONS: Tailpipe.)

D. The exhaust system on a chassis shall be adequately insulated from the fuel system.

E. The muffler shall be constructed of corrosion-resistant material.

### ***FENDERS: FRONT TYPE C VEHICLES***

A. When measured at the fender line, the total spread of the outer edges of front fenders shall exceed the total spread of front tires when front wheels are in a straight-ahead position.

B. Front fenders shall be properly braced and shall not require attachment to any part of the body.

### ***FRAME***

A. Frame lengths shall be established in accordance with the design criteria for the complete vehicle.

B. Making 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 the chassis manufacturer.

C. Frames shall not be modified for the purpose of extending the wheel base.

D. Any secondary manufacturer that modifies the original chassis frame shall provide a warranty at least equal to the warranty offered by the original equipment manufacturer (OEM), and shall certify that the modification and other parts or equipment affected by the modification shall be free from defects in material and workmanship under normal use and service intended by the OEM.

### ***FUEL SYSTEM***

A. Fuel tank(s) having a minimum 30-gallon capacity shall be provided by the chassis manufacturer. Each tank shall be filled from and vented to the outside of the passenger compartment, and each fuel filler should be placed in a location where accidental fuel spillage will not drip or drain on any part of the exhaust system.

B. The fuel system shall comply with FMVSS No. 301, Fuel System Integrity.

C. 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.

D. The actual draw capacity of each fuel tank shall be a minimum of 83 percent of the tank capacity.

E. Installation of alternative fuel systems, including fuel tanks and piping from the tank to the engine, shall comply with all applicable fire codes in effect on the date of manufacture of the bus.

F. Installation of Liquefied Petroleum Gas (LPG) tanks shall comply with National Fire Protection Association (NFPA) 58, Liquefied Petroleum Gas Code.

G. Installation of Compressed Natural Gas (CNG) containers shall comply with FMVSS No. 304, Compressed Natural Gas Fuel Container Integrity.

H. The CNG Fuel System shall comply with FMVSS No. 303, Fuel System Integrity of Compressed Natural Gas Vehicles.

## **GOVERNOR**

An electronic engine speed limiter shall be provided and set to limit engine speed, not to exceed the maximum revolutions per minute, as recommended by the engine manufacturer.

## **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 coolant thermostat opening. The coolant flow rate shall be 50 pounds per minute at the return end of 30 feet of 1 inch inside diameter automotive hot water heater hose. (See SBMTC-001, Standard Code for Testing and Rating Automotive Bus Hot Water Heating and Ventilating Equipment.)

## **HORN**

The bus shall be equipped with a horn(s) of standard make with the 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 J377, Horn-Forward Warning-Electric-Performance, Test, and Application.

## **INSTRUMENTS AND INSTRUMENT PANEL**

A. 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. Speedometer;

2. Odometer which will give accrued mileage (to seven digits), including tenths of miles, unless tenths of miles are registered on a trip odometer. Odometer is to be able to be read without using a key;

3. Tachometer;

(Note: For types B, C and D buses, a tachometer shall be installed so as to be visible to the driver while seated in a normal driving position.);

4. Voltmeter

(Note: 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.); 5. Oil pressure gauge;

6. Water temperature gauge;

7. Fuel gauge;

8. Upper beam headlamp indicator;

9. Brake air pressure gauge (air brakes), brake indicator lamp (vacuum/hydraulic brakes), or brake indicator lamp (hydraulic/hydraulic);

10. Turn signal indicator; and

11. Glow-plug indicator lamp, where appropriate.

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

C. 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.

D. Instruments and controls must be illuminated as required by FMVSS No. 101, Controls and Displays.

E. Multi-function gauge (MFG)

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

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. If 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.

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

## ***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 in accordance with the engine manufacturer's recommendation.

## ***OPENINGS***

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

## ***PASSENGER LOAD***

A. Actual gross vehicle weight (GVW) is the sum of the chassis weight plus the body weight, plus the driver's weight, plus total seated student weight. For purposes of calculation, the driver's weight is 150 pounds and the student weight is 120 pounds per student.

B. 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).

C. The manufacturer's GVWR for a particular school bus shall be furnished by manufacturers in duplicate (unless more copies are requested) to the state agency having student transportation jurisdiction. The state agency shall, in turn, transmit such ratings to other state agencies responsible for development or enforcement of state standards for school buses.

## ***RETARDER SYSTEM (OPTIONAL EQUIPMENT)***

A retarder system, if used, shall limit the speed of a fully loaded school bus to 19.0 mph on a 7 percent grade for 3.6 miles.

## ***ROAD SPEED CONTROL***

When it is desired to accurately control vehicle maximum speed, a vehicle speed limiter may be utilized.

## **SHOCK ABSORBERS**

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

## **STEERING GEAR**

- A. 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.
- B. If external adjustments are required, the steering mechanism shall be accessible to make adjustments.
- C. Changes shall not be made to the steering apparatus which are not approved by the chassis manufacturer.
- D. There shall be a clearance of at least 2 inches between the steering wheel and cowl, instrument panel, windshield or any other surface.
- E. Power steering is required and shall be of the integral type with integral valves.
- F. The steering system shall be designed to provide a means for lubrication of all wear-points that are not permanently lubricated.

## **SUSPENSION SYSTEMS**

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

## **THROTTLE**

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

## **TIRES AND RIMS**

- A. Rims and tires of the proper size and load rating commensurate with the chassis manufacturer's GVWR shall be provided. The use of multi-piece rims and/or tube-type tires shall not be permitted on any school bus ordered after December 31, 1995.
- B. Dual rear tires shall be provided on Type A-2, Type B, Type C and Type D school buses.
- C. All tires on a vehicle shall be of the same size, and the load range of the tires shall meet or exceed the GVWR, as required by FMVSS No. 120, Tire Selection and Rims for Vehicles other than Passenger Car.
- D. If the vehicle is equipped with a spare tire and rim assembly, it shall be the same size as those mounted on the vehicle.
- E. If a tire carrier is required, it shall be suitably mounted in an accessible location outside of the passenger compartment.

## **TRANSMISSION**

- A. Automatic transmissions 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.

B. 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.

C. A transmission interlock, controlled by application of the service brake, shall be installed to prohibit accidental engagement of the automatic transmission.

### ***TURNING RADIUS***

A. 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.

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

### ***UNDERCOATING***

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, Coating Compound, Bituminous, Solvent Type, Underbody, using modified tests.

# **BUS BODY SPECIFICATIONS**

## ***AISLE***

A. All emergency exit doors shall be accessible by a 12 inch minimum aisle. The aisle shall be unobstructed at all times by any type of barrier, seat, wheelchair or tie-down, unless a flip seat is installed and occupied. The track of a track seating system is exempt from this requirement. A flip seat in the unoccupied (up) position shall not obstruct the 12 inch minimum aisle to any side emergency exit door.

B. The seat backs shall be slanted sufficiently to give aisle clearance of 15 inches at tops of seat backs.

## ***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, or shall have a variable volume feature that allows the alarm to vary from 87 dBA to 112 dBA sound level, staying at least 5 dBA above the ambient noise level.

## ***BATTERY***

A. The battery is to be furnished by the chassis manufacturer.

B. When the battery is mounted as described in BUS CHASSIS SPECIFICATIONS, 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 shall be secured by an adequate and conveniently operated latch or other type fastener. Battery cables installed by the body manufacturer shall meet chassis manufacturer and SAE requirements. Battery cables shall be of sufficient length to allow the battery tray to fully extend. The battery compartment is required on Type A-1 diesel buses.

C. Buses may be equipped with a battery shut-off switch. The switch is to be placed in a location not readily accessible to the driver or passengers.

## ***BUMPER: FRONT***

If the chassis manufacturer does not provide a bumper on a Type D school bus, the bumper shall be provided by the body manufacturer. The bumper shall conform to the specifications described in BUS CHASSIS SPECIFICATIONS.

## ***BUMPER: REAR***

A. The bumper on Type A-1 buses shall be a minimum of 8 inches wide (high). Bumpers on Types A-2, B, C and D buses shall be a minimum of 9 1/2 inches wide (high). The bumper shall be of sufficient strength to permit being pushed by another vehicle of similar size and being lifted by the bumper without permanent distortion.

B. The bumper shall wrap around the back corners of the bus. It shall extend forward at least 12 inches, measured from the rear-most point of the body at the floor line, and shall be mounted flush with the sides of the body or protected with an end panel.

C. The bumper shall be attached to the chassis frame in such a manner that it may be removed. It shall be braced to resist deformation of the bumper resulting from impact from the rear or the side. It shall be designed to discourage hitching of rides by an individual.

D. The bumper shall extend at least 1 inch beyond the rear-most part of the body surface, measured at the floor line.

E. The bottom of the rear bumper shall not be more than 30 inches above ground level.

## **CEILING**

(See BUS BODY SPECIFICATIONS, Insulation and Interior.)

## **CERTIFICATION**

Upon request of the state agency having student transportation jurisdiction, the body manufacturer shall certify that its product meets the state's minimum standards on items which are not covered by FMVSS certification requirements of 49 CFR, Part 567, Certification.

## **CHAINS (TIRE)**

(See BUS BODY SPECIFICATIONS, Wheelhousing.)

## **COLOR**

A. The school bus body shall be painted National School Bus Yellow (NSBY). (See APPENDIX B.)

B. The body exterior paint trim shall be black.

C. Except for the vertical portion of the front and rear roof caps, the roof of the bus may be painted white. (See illustration in APPENDIX B, Placement of Retro-reflective Markings.)

D. MFSABs shall be exempt from these color requirements.

## **COMMUNICATIONS SYSTEMS**

(See OPERATIONS.)

## **CONSTRUCTION**

A. Side Intrusion Test: The bus body shall be constructed to withstand an intrusion force equal to the curb weight of the vehicle or 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. The complete body structure, or a representative seven-body section mock up with seats installed, shall be load-tested at a location  $24 \pm 2$  inches above the floor line, with a maximum 10 inch diameter cylinder, 48 inches long, mounted in a horizontal plane. 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 the load applied from the exterior toward the interior of the test structure. When the minimum load has been applied, the penetration of the loading cylinder into the passenger compartment shall not exceed 10 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. Body companies shall certify compliance with this intrusion requirement, and include test results, as requested.

B. Construction shall be reasonably dust-proof and watertight.

## **CROSSING CONTROL ARM (Mandatory)**

A. School buses shall be equipped with a crossing control arm mounted on the right side of the front bumper. When opened, this arm shall extend in a line parallel to the body side and aligned with the right front wheel.

B. All components of the crossing control arm and all connections shall be weatherproofed.

C. 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.



D. The crossing control arm shall be constructed of non-corrodible or nonferrous material, or treated in accordance with the body sheet metal specification. (See BUS BODY SPECIFICATIONS, Metal Treatment.)

E. There shall be no sharp edges or projections that could cause injury or be a hazard to students. The end of the arm shall be rounded.

F. The crossing control arm shall extend a minimum of 70 inches (measured from the bumper at the arm assembly attachment point) when in the extended position. The crossing control arm shall not extend past the end of the bumper when in the stowed position.

G. The crossing control arm shall extend simultaneously with the stop signal arm(s), activated by stop signal arm controls.

H. An automatic recycling interrupt switch may be installed for temporarily disabling the crossing control arm.

I. The assembly shall include a device attached to the bumper near the end of the arm to automatically retain the arm while in the stowed position. That device shall not interfere with normal operations of the crossing control arm.

## **DEFROSTERS**

A. 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. (Exception: The requirements of this standard do not apply to the exterior surfaces of double pane storm windows.)

B. The defrosting system shall conform to SAE J381, Windshield Defrosting Systems Test Procedure and Performance Requirements-Trucks, Buses, and Multipurpose Vehicles.

C. 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 step-well may be the re-circulating air type.

D. Auxiliary fans are not considered defrosting or defogging systems.

E. Portable heaters shall not be used.

## **DOORS**

A. The entrance door shall be under 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% grade, both uphill and downhill.

B. The entrance door shall be located on the right side of the bus, opposite and within direct view of the driver.

C. The entrance door shall have a minimum horizontal opening of 24 inches and a minimum vertical opening of 68 inches.

D. The entrance door shall be a split-type door and shall open outward.

E. All entrance door glass shall be approved safety glass. The bottom of each lower glass panel shall be not more than 10 inches from the top surface of the bottom step. The top of each upper glass panel shall be not more than 3 inches from the top of the door.

F. Vertical closing edges on entrance doors shall be equipped with flexible material.

G. All door openings shall be equipped with padding at the top edge of the opening. Padding shall be at least 3 inches wide and 1 inch thick and extend the full width of the door opening.

H. On power-operated entrance doors, the emergency release valve, switch or device to release the entrance door must be placed above or to the immediate left or immediate right of the entrance door and must be clearly labeled.

## **EMERGENCY EXITS**

A. Any installed emergency exit shall comply with the design and performance requirements of FMVSS No. 217, Bus Emergency Exits and Window Retention and Release, applicable to that type of exit, regardless of whether or not that exit is required by FMVSS No. 217.

### **B. Emergency window requirements**

1. The rear emergency window shall have a lifting assistance device that will aid in lifting and holding the rear emergency window open.

2. 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.

### **C. Emergency door requirements**

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 door on Types A-2, B, C and D vehicles shall be equipped with a minimum of 350 square inches of approved safety glazing.

2. There shall be no steps leading to an emergency door except on Types C and D all-wheel drive buses.

3. Padding shall be affixed to the top edge of each emergency door opening. Padding shall be at least 3 inches wide and 1 inch thick and shall extend the full width of the door opening.

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

D. Emergency exit requirements: The use of the following tables is to determine the required number and types of emergency exits to comply with this specification, based on the bus manufacturer's equipped seating capacity.

1. Use Table 1 if the bus contains a Rear Emergency Door, or

2. Use Table 2 if the bus contains a Rear Push-out Emergency Window AND a Left Side Emergency Door, as required by FMVSS No. 217 for school buses without a Rear Emergency Door.

3. When using either Table 1 or Table 2:

a. Enter the Table at the appropriate "CAPACITY" and select the desired row from the options for that capacity.

b. A school bus will meet the requirements of this specification and the requirements of FMVSS 217 if it contains the types and quantities of emergency exits listed on the row selected.

**TABLE 1**  
**BUSES WITH REAR EMERGENCY DOOR**  
**(All Front Engine Buses)**

Available Combinations By Capacity	Manufacturers Equipped Capacity	Shall Have	And Shall Also Have		
		Roof Hatch	L. Side Emerg. Exit Windows	R. Side Emerg. Exit Windows	L. Side Emerg. Exit Door
1-45	1-45	1	0	0	0
46-70	46-70	2	1	1	0
	46-70	2	0	0	1
71-85	71-85	2	2	2	0
	71-85	2	0	0	1
86-93	86-93	2	2	2	0
	86-93	2	1	1	1

**Table 2**  
**BUSES WITH REAR PUSHOUT WINDOW**  
**AND LEFT SIDE EMERGENCY DOOR**  
**(All Rear Engine Buses)**

Available Combinations By Capacity	Manufacturers Equipped Capacity	Shall Have	And Shall Also Have		
		Roof Hatch	L. Side Emerg. Exit Windows	R. Side Emerg. Exit Windows	L. Side Emerg. Exit Door
1-45	1-45	1	0	0	0
46-82	46-82	2	1	1	0
	46-82	2	0	0	1
83-89	83-89	2	1	1	0
	83-89	2	0	0	1
90-105	90-105	2	2	2	0
	90-105	2	1	1	1

## **EMERGENCY EQUIPMENT**

### Fire extinguisher

1. The bus shall be equipped with at least one UL-approved pressurized, dry chemical fire extinguisher. The extinguisher shall be secured in a mounted 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. The fire extinguisher shall have a rating of 2-A:10-BC, or greater. The operating mechanism shall be secured with a type of seal that will not interfere with the use of the fire extinguisher.

### B. First aid kit

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 mounted and identified as a first aid kit. The location for the first aid kit shall be marked. Contents of the first aid kit shall be in compliance with state standards.

#### 2. Suggested contents include:

- 2 - 1 inch x 2 1/2 yards of adhesive tape rolls
- 24 - Sterile gauze pads 3x3 inches
- 100 - 3/4 x 3 inches adhesive bandages
- 8 - 2 inch bandage compress
- 10 - 3 inch bandage compress
- 2 - 2 inch x 6 feet sterile gauze roller bandages
- 2 - Non-sterile triangular bandages, minimum 39x35x54 inches with 2 safety pins
- 3 - Sterile gauze pads 36x36 inches
- 3 - Sterile eye pads
- 1 - Rounded-end scissors
- 1 - Pair medical examination gloves
- 1 - Mouth-to-mouth airway

### C. 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 mounted and identified as a body fluid clean-up kit. Contents of the body fluid clean-up kit shall be in compliance with state standards.

### D. Warning devices

Each school bus shall contain at least 3 retro-reflective triangle road warning devices that meet the requirements of FMVSS No. 125, Warning Devices. They shall be mounted in an accessible place.

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

F. Each bus shall be equipped with a child alert/reminder system that will activate if the driver attempts to exit the school bus without walking to the rear of the bus to check for sleeping children.

## ***FIRE SUPPRESSION SYSTEMS (OPTIONAL)***

Fire suppression system nozzles shall be located in the engine compartment, under the bus, in the electrical panel or under the dash, but they shall not be located in the passenger compartment. The system must include a lamp or buzzer to alert the driver that the system has been activated.

## ***FLOORS***

A. The floor in the under-seat area, including tops of wheel-housings, driver's compartment and toeboard, shall be covered with an elastomer floor covering, having a minimum overall thickness of 1/8 inch and a calculated burn rate of 0.1 or less, using the test methods, procedures and formulas listed in FMVSS No. 302, Flammability of Interior Materials. The driver's area and toeboard area in all Type-A buses may be manufacturer's standard flooring and floor covering.

B. The floor covering in the aisles shall be ribbed or other raised pattern elastomer and shall have a calculated burn rate of 0.1 or less using the test methods, procedures and formulas listed in FMVSS No. 302. Minimum overall thickness shall be 3/16 inch measured from tops of ribs.

C. 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 shall be sealed with waterproof sealer.

D. 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 and/or fuel pump. This plate shall not be installed under flooring material.

## ***HANDRAILS***

At least 1 handrail shall be installed. The handrail(s) shall assist passengers during entry or exit, and shall be designed to prevent entanglement, as evidenced by the passing of the NHTSA string and nut test.

## ***HEATING AND AIR CONDITIONING SYSTEMS***

### **A. Heating System**

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

f. The auxiliary heating system shall require low voltage; and

g. Auxiliary heating systems shall comply with FMVSS No. 301, Fuel System Integrity, and all other applicable FMVSSs, as well as with SAE test procedures.

6. All forced-air heaters installed by body manufacturers shall bear a name plate that indicates the heater rating in accordance with SBMTC-001, Standard Code for Testing and Rating Automotive Bus Hot Water Heating and Ventilating Equipment. The plate shall be affixed by the heater manufacturer and shall constitute certification that the heater performance is as shown on the plate.

7. Heater hoses shall be adequately supported to guard against excessive wear due to vibration. The hoses shall not dangle or rub against the chassis or any sharp edges and shall not interfere with or restrict the operation of any engine function. Heater hoses shall conform to SAE J20c, Coolant System Hoses. Heater lines on the interior of the bus shall be shielded to prevent scalding of the driver or passengers.

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 Types A and B buses the valves may be installed in another accessible location.

9. Each hot water heating system shall be equipped with a device installed in the hot water pressure line that regulates the water flow to all heaters. The device shall be located for convenient operation by the driver while seated.

10. Accessible bleeder valves for removing air from the heater shall be installed in an appropriate place in the return lines of body company-installed heater.

11. Access panels shall be provided to make heater motors, cores and fans readily accessible for service. An exterior access panel to the driver's heater may be provided.

## B. Air Conditioning (Optional)

The following specifications are applicable to all types of school buses that may be equipped with air conditioning. This section is divided into two parts. Part 1 covers performance specifications and Part 2 covers other requirements applicable to all buses.

### 1. Performance Specifications

The installed air conditioning system should cool the interior of the bus from 100 degrees to 80 degrees Fahrenheit, measured at three points (minimum) located four feet above the floor on the longitudinal centerline of the bus. The three required points shall be: (1) near the driver's location, (2) at the longitudinal midpoint of the body, and (3) two feet forward of the emergency door or, for Type D rear-engine buses, 2 feet forward of the end of the aisle. 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 one hour; and (3) closing windows, turning on the air conditioner with the engine running at the chassis manufacturer's recommended low idle speed, and cooling the interior of the bus to 80 degrees Fahrenheit, or lower, within 30 minutes while maintaining 100 degrees Fahrenheit outside temperature. Alternately, and at the user's discretion, this test may be performed under actual summer conditions, which consist of temperatures above 85 degrees Fahrenheit, humidity above 50% with normal sun loading of the bus and the engine running at the engine manufacturer's recommended low idle speed.

After a minimum of one hour of heat-soaking, the system shall be turned on and must provide a minimum of a 20 degree temperature drop in the 30 minute time limit. The manufacturer shall provide facilities for the user or user's representative to confirm that a pilot model of each bus design meets the above performance requirements.

## 2. Other Requirements

- a. 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 the bus;
- b. Evaporators and ducting systems shall be designed and installed to be free of projections or sharp edges. Ductwork shall be installed so that exposed edges face the front of the bus and do not present sharp edges;
- c. On school buses equipped with Type-2 seatbelts having anchorages above the windows, the evaporator and ducting (if used) shall be placed at a height sufficient to not obstruct occupant securement anchorages. This clearance shall be provided along the entire length of the passenger area on both sides of the bus interior;
- d. The body may be equipped with insulation, including sidewalls, roof, firewall, rear, inside body bows and plywood or composite floor insulation to reduce thermal transfer;
- e. All glass (windshield, service and emergency doors, side and rear windows) may be equipped with maximum integral tinting allowed by federal, state or ANSI standards for the respective locations, except that windows rear of the driver's compartment, if tinted, shall have approximately 28% light transmission;
- f. Electrical generating capacity shall be provided to accommodate the additional electrical demands imposed by the air conditioning system;
- g. Roofs may be painted white to aid in heat dissipation.
- h. Air intake for any evaporator assembly(ies), except for front evaporator of Type A-1, shall be equipped with replaceable air filter(s) accessible without disassembly of evaporator case.

## **HINGES**

All exterior metal door hinges shall be designed to allow lubrication to be channeled to the center 75% of each hinge loop without disassembly, unless they are constructed of stainless steel, brass or non-metallic hinge pins or other designs that prevent corrosion.

## **IDENTIFICATION**

A. The body shall bear the words "SCHOOL BUS" in black letters at least 8 inches high on both front and rear of the body or on signs attached thereto. Lettering shall be placed as high as possible without impairment of its visibility. Letters shall conform to "Series B" of Standard Alphabets for Highway Signs. "SCHOOL BUS" lettering shall have a reflective background, or as an option, may be illuminated by backlighting. MFSABs are exempt from these requirements.

B. Required lettering and numbering shall include:

1. District, company name or owner of the bus displayed at the beltline.
2. The bus identification number displayed on the sides, on the rear and on the front.

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

1. Bus identification number, minimum 12 inch high characters, on top of the bus, in addition to required numbering on the sides, rear and front;
2. The location of the battery(ies) identified by the word "BATTERY" or "BATTERIES" on the battery compartment door in 2 inch lettering;

3. Symbols or letters not to exceed 64 square inches of total display near the entrance door, displaying information for identification by the students of the bus or route served;
4. Manufacturer, dealer or school identification or logos;
5. Symbols identifying the bus as equipped for or transporting students with special needs as noted in SPECIALLY EQUIPPED SCHOOL BUS SPECIFICATIONS;
6. Lettering on the rear of the bus relating to school bus flashing signal lamps or railroad stop procedures; and
7. Identification of fuel type in 2 inch lettering adjacent to the fuel filler opening.

### ***INSIDE HEIGHT***

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

### ***INSULATION (OPTIONAL)***

A. 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.

B. If floor insulation is required, it shall be 5-ply softwood plywood, nominal 5/8 inch thickness and shall be equal to or exceed properties of the exterior-type, C-D Grade, as specified in the 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 inch-thick plywood or equivalent material meeting the above requirements. Equivalent material may be used to replace plywood, provided it has equal or greater insulation R-value, sound abatement, deterioration-resistant and moisture-resistant properties.

### ***INTERIOR***

A. The interior of the bus shall be free of all unnecessary projections, which include luggage racks and attendant handrails, to minimize the potential for injury. This specification requires inner lining on ceilings and walls. If the ceiling is constructed with 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/or tow chains. (See BUS BODY SPECIFICATIONS, Storage Compartment.)

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

1. Head protection requirements of FMVSS No. 222, School Bus Passenger Seating and Crash Protection, where applicable;
2. Be completely enclosed and equipped with latching door (both door and latch sufficient to withstand a pushing force of 50 pounds applied at the inside center of the door);
3. Have all corners and edges rounded with a minimum radius of 1 inch or be padded equivalent to door header padding;
4. Be attached to the bus sufficiently to withstand a force equal to 20 times the maximum rated capacity of the compartment; and
5. Have no protrusions greater than 1/4 inch.

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



D. Every school bus shall be constructed so that the noise level at the ear of the occupant nearest to the primary vehicle noise source shall not exceed 85 dBA when tested according to the procedure described in Appendix B.

#### E. Vehicle Registration Document Holder

All Type C and Type D buses shall have a document holder attached in the front overhead area. The holder shall be metal or hard plastic. The holder shall have a clear plastic window that will allow the registration information to be seen. The holder will be designed in such a manner that easy insertion and removal of the registration document can take place without removing the holder from its mounting. The document holder shall be approximately 9 1/2 inches by 13 inches.

## **LAMPS AND SIGNALS**

A. Interior lamps which illuminate the aisle and the stepwell shall be provided. The step-well lamp shall be illuminated by an entrance door-operated switch, to illuminate only when headlamps and clearance lamps are on and the entrance door is open.

B. Body instrument panel lamps may be controlled by an independent rheostat switch or may be controlled by the rheostat that operates the gauge lighting.

C. School bus alternately flashing signal lamps shall be provided, as described by law. MFSAB's are exempt from this requirement.

1. The bus shall be equipped with 2 red lamps at the rear of the vehicle and 2 red lamps at the front of the vehicle.

2. In addition to the 4 red lamps described above, 4 amber lamps shall be installed so that 1 amber lamp is located near each red signal lamp, at the same level, but closer to the vertical centerline of the bus. The system of red and amber signal lamps shall be wired so that amber lamps are energized manually. The red lamps are automatically energized and amber lamps are automatically de-energized when stop signal arms are extended or when the bus entrance door is opened. An amber pilot lamp and a red pilot lamp shall be installed adjacent to the driver controls for the flashing signal lamp to indicate to the driver which lamp system is activated.

3. The background color shall be black.

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

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

#### D. Turn signal and stop/tail lamps

1. The bus body shall be equipped with amber rear turn signal lamps that are at least 7 inches in diameter or, if a shape other than round, a minimum 38 square inches of illuminated area and shall meet FMVSS No. 108, Lamps, Reflective Devices, and Associated Equipment. These signal lamps must be connected to the chassis hazard warning switch to cause simultaneous flashing of turn signal lamps when needed as a vehicular traffic hazard warning. Turn signal lamps are to be placed as wide apart as practical and their horizontal centerline shall be a maximum of 12 inches 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. Buses shall be equipped with amber side-mounted turn signal lamps. 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 entrance door.

3. Buses shall be equipped with 4 combination red stop/tail lamps.

a. Two combination lamps with a minimum diameter of 7 inches, 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.

b. Two combination lamps with a minimum diameter of 4 inches, or if a shape other than round, a minimum of 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 1 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 be equipped with the manufacturer's standard stop and tail lamps.

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

F. An optional white flashing strobe lamp may be installed on the roof of a school bus, at a location not to exceed 1/3 the body length forward from the rear of the roof edge. The lamp shall have a single clear lens emitting light 360 degrees around its vertical axis and it may not extend above the roof more than the maximum legal height. A manual switch and a pilot lamp shall be included to indicate when the lamp is in operation.

Optionally, the strobe lamp may be mounted on the roof in the area directly over the restraining barrier on the driver's side; may be wired to activate with the amber alternately flashing signal lamps, continuing through the full loading or unloading cycle; and may be equipped with an override switch to allow activation of the strobe at any time for use in inclement weather.

G. The bus body shall be equipped with 2 white rear backup lamps that are at least 4 inches in diameter or, if a shape other than round, a minimum of 12 square inches of illuminated area and shall meet FMVSS No. 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.

## ***METAL TREATMENT***

A. All metal except high grade stainless steel or aluminum used in construction of the bus body shall be zinc-coated or aluminum-coated or treated to prevent corrosion. This includes but is not limited to 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.

B. 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 to improve paint adhesion.

C. 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, un-vented or un-drained areas and surfaces subjected to abrasion during vehicle operation.

D. As evidence that the 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 1,000-hour salt spray test, as provided for in the latest revision of ASTM Standard B-117

## ***MIRRORS***

A. The interior glass mirror shall be either laminated or tempered and shall have rounded corners and protected edges. Mirrors shall be 6x16 inches minimum for Type A buses and be 6x30 inches minimum for Types C and D buses.

B. Each school bus shall be equipped with exterior mirrors meeting the requirements of FMVSS No. 111, Rearview Mirrors. The right side rear view mirror shall not be obscured by the un-wiped portion of the windshield. Mirrors shall be easily adjustable, but shall be rigidly braced, so as to reduce vibration.

C. Heated external mirrors may be used.

D. Remote controlled external rear view mirrors may be used.

## ***MOUNTING***

A. The rear body cross member shall be supported by the chassis frame. Except where chassis components interfere, the bus body shall be attached to the chassis frame at each main floor sill in such a manner as to prevent shifting or separation of the body from the chassis under severe operating conditions.

B. Isolators 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.

## ***OVERALL LENGTH***

Overall length of the bus shall not exceed 45 feet, excluding accessories.

## ***OVERALL WIDTH***

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

## ***PUBLIC ADDRESS SYSTEM***

A. Buses may be equipped with an AM/FM/audio and/or public address system having interior and exterior speakers.

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

## ***RETRO-REFLECTIVE MATERIAL***

(See also APPENDICES A and B, Retro-reflective Sheeting.)

A. The front and/or rear bumper may be marked diagonally 45 degrees down toward the centerline of the pavement with  $2\pm 1/4$  inch wide strips of non-contrasting retro-reflective material.

B. The rear of the bus body shall be marked with strips of retro-reflective NSBY material to outline the perimeter of the back of the bus using material which conforms with the requirements of FMVSS No. 131, School Bus Pedestrian Safety Devices, Table 1. The perimeter marking of rear emergency exits per FMVSS No. 217, Bus Emergency Exits and Window Retention and Release, and/or the use of retro-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  $13/4$  inch retro-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.

C. "SCHOOL BUS" signs, if not a lighted design, shall be marked with retro-reflective NSBY material comprising background for lettering of the front and/or rear "SCHOOL BUS" signs.

D. Sides of the bus body shall be marked with at least  $13/4$  inch retro-reflective NSBY material, extending the length of the bus body and located (vertically) between the floor line and the beltline.

E. If used, signs placed on the rear of the bus relating to school bus flashing signal lamps or railroad stop procedures may be retro-reflective material, as specified by each state.

## **RUB RAILS**

A. There shall be 1 rub rail on each side of the bus located at, or no more than 8 inches above, the seat cushion level. They shall extend from the rear side of the entrance door completely around the bus body (except at the emergency door or any maintenance access door) to the point of curvature near the outside cowl on the left side.

B. There shall be 1 additional rub rail on each side located 10 inches or less above the floor line. The rub rail shall cover the same longitudinal span as the upper rub rail, except at the wheel housing, and it shall extend only to the longitudinal tangent of the right and left rear corners.

C. Rub rails above the floor line shall be attached at each body post and at all other upright structural members.

D. Each rub rail shall be 4 inches or more in width in its finished form and shall be constructed of 16-gauge metal or other material of equivalent strength suitable to help protect body side panels from damage. Rub rails shall be constructed in corrugated or ribbed fashion.

E. 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 containing the rear luggage or the rear engine compartment, rub rails need not extend around the rear corners.

F. The bottom edge of the body side skirts shall be stiffened by application of a rub rail.

## **SEATS AND RESTRAINING BARRIERS**

### **A. Passenger Seating**

1. School bus design capacities shall be in accordance with 49 CFR, Part 571.3, Definitions, and FMVSS No. 222, School Bus Passenger Seating and Crash Protection.

2. All seats shall have a minimum cushion depth of 15 inches, a seat back height of 24 inches above the seating reference point, and must comply with all other requirements of FMVSS No. 222. In addition to the fastener that forms the pivot for each seat retaining clip, a secondary fastener may be used in each clip to prevent the clip from rotating and releasing the seat cushion unintentionally.

3. As an option, all restraining barriers and passenger seats may be constructed with materials that enable them to meet the criteria of the School Bus Seat Upholstery Fire Block Test.

4. Each seat leg shall be secured to the floor by a minimum of 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 No. 222. If track seating is installed, the manufacturer shall supply minimum and maximum seat spacing dimensions (applicable to the bus) which comply with FMVSS No. 222. This information shall be on a label permanently affixed to the bus.

5. All seat frames attached to the seat rail shall be fastened with 2 or more bolts, washers and nuts, or with flange-head nuts.

6. All school buses (including Type A) shall be equipped with restraining barriers which conform to FMVSS No. 222.

7. A flip-up seat may be installed at any side emergency door. If provided, the flip-up seat shall conform to FMVSS No. 222 and aisle clearance requirements of FMVSS No. 217, Bus Emergency Exits and Window

Retention and Release. The flip-up seat shall be free of sharp projections on the underside of the seat bottom. The underside of the flip-up seat bottoms shall be padded or contoured to reduce the possibility of clothing being snagged. Flip-up seats shall be constructed to prevent passenger limbs from becoming entrapped between the seat back and the seat cushion when the seat is in the upright position. The seat cushion shall be designed to rise to a vertical position automatically when it is not occupied.

8. Lap belts shall not be installed on passenger seats in large school buses (over 10,000 pounds GVWR) except in conjunction with child safety restraint systems that comply with the requirements of FMVSS No. 213, Child Restraint Systems.

#### B. Pre-School Age Seating

Passenger seats designed to accommodate a child or infant carrier seat shall comply with FMVSS No. 225, Child Restraint Anchorage Systems. These seats shall be in compliance with NHTSA's "Guideline for the Safe Transportation of Pre-school Age Children in School Buses." (Note: See A.8, above.)

#### C. Driver Seat

1. The driver's seat supplied by the body manufacturer shall be a high back seat. The seat back shall be adjustable to 15 degrees minimum, without requiring the use of tools. The seat shall be equipped with a head restraint to accommodate a 5<sup>th</sup> percentile female to a 95<sup>th</sup> percentile adult male, as defined in FMVSS No. 208, Occupant Crash Protection.

2. Type A buses may utilize the standard driver's seat provided by the chassis manufacturer.

#### D. Driver Restraint System

A. Type 2 lap/shoulder belt shall be provided for the driver. On buses where the driver's seat and upper anchorage for the shoulder belt are both attached to the body structure, a driver's seat with an integrated Type 2 lap/shoulder belt may be substituted. On buses where the driver's seat and upper anchorage for the shoulder belt are separately attached to both body and chassis structures (i.e., one attached to the chassis and the other attached to the body), a driver's seat with an integrated Type 2 lap/shoulder belt should be used. The assembly shall be equipped with an emergency locking retractor for the continuous belt system. On all buses except Type A that are equipped with a standard chassis manufacturer's driver's seat, the lap portion of the belt system shall be guided or anchored to prevent the driver from sliding sideways under the belt system. The lap/shoulder belt shall be designed to allow for easy adjustment in order to fit properly and to effectively protect drivers varying in size from 5<sup>th</sup> percentile adult female to 95<sup>th</sup> percentile adult male.

E. Each bus shall be equipped with a durable webbing cutter having a full width handgrip and a protected, replaceable or non-corrodible blade. The required belt cutter shall be mounted in a location accessible to the seated driver in an easily detachable manner.

### ***SIDE SKIRTS (OPTIONAL)***

School bus body side skirts between the front and rear axles may extend down at least to the horizontal line from the center of the front spindle to the center of the rear axle. This measurement shall apply to a new unloaded school bus located on a flat level surface.

### ***STEERING WHEEL***

(See BUS CHASSIS SPECIFICATIONS, Steering Gear.)

### ***STEPS***

A. The first step at the entrance door shall be not less than 10 inches and not more than 14 inches 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 entrance door shall be 12 inches to 16 inches from the

ground. An auxiliary step may be provided to compensate for the increase in ground-to-first-step clearance. The auxiliary step is not required to be enclosed.

B. Step risers shall not exceed a height of 10 inches. Exception: When plywood is used on a steel floor or step, the riser height may be increased by the thickness of the plywood.

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

D. Steps shall not protrude beyond the side body line.

## **STEP TREADS**

A. All steps, including the floor line platform area, shall be covered with an elastomer floor covering having a minimum overall thickness of 0.187 inch.

B. The step covering shall be permanently bonded to a durable backing material that is resistant to corrosion.

C. Steps, including the floor line platform area, shall have a 1 1/2 inch nosing that contrasts in color by at least 70% measured in accordance with the contrasting color specification in 36 CFR, Part 1192, ADA, Accessibility Guidelines for Transportation Vehicles.

D. Step treads shall have the following characteristics:

1. Abrasion resistance: Step tread material weight loss shall not exceed 0.40 percent, as tested under ASTM D-4060, Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser, (CS-17 wheel, 1000 gram, 1000 cycle);

2. Weathering resistance: Step treads shall not break, crack, or check after ozone exposure (7 days at 50 phm at 40 degrees C) and Weatherometer exposure (ASTM D-750, Standard Test Method for Rubber Deterioration in Carbon-Arc Weathering Apparatus, 7 days); and Flame resistance: Step treads shall have a calculated burn rate of .01 or less using the test methods, procedures and formulas listed in FMVSS No. 302, Flammability of Interior Materials.

## **STIRRUP STEPS**

If the windshield and lamps are not easily accessible from the ground, there may be at least 1 folding stirrup step or recessed foothold installed on each side of the front of the body for easy accessibility for cleaning. There also may be a grab handle installed in conjunction with the step. Steps are permitted in or on the front bumper in lieu of the stirrup steps if the windshield and lamps are easily accessible for cleaning from that position.

## **STOP SIGNAL ARM**

The stop signal arm(s) shall comply with the requirements of FMVSS No. 131, School Bus Pedestrian Safety Devices. MFSABs are exempt from these requirements.

## **STORAGE COMPARTMENT (OPTIONAL)**

A storage container for tools, tire chains and/or other equipment may be located either inside or outside the passenger compartment. If inside, it shall be fastened to the floor and have a cover with a positive fastening device.

## **SUN SHIELD**

A. For Types B, C and D vehicles, an interior adjustable transparent sun shield, with a finished edge and dimensions not less than 6x30 inches, shall be installed in a position convenient for use by the driver.

B. On Type A buses, the sun shield (visor) shall be installed by the chassis manufacturer.

## ***TAILPIPE***

A. The tailpipe may be flush with, or shall not extend more than 2 inches beyond, the perimeter of the body for side-exit pipe or the bumper for rear-exit pipe.

B. 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 of or behind the rear drive axle. The tailpipe exit location on all Types A-1 or B-1 buses may be in accordance to the manufacturer's standards. The tailpipe shall not exit beneath any fuel filler location or beneath any emergency door.

## ***TOWING ATTACHMENT POINTS***

Rear towing devices (i.e. tow hooks, tow eyes, or other designated towing attachment points) shall be furnished to assist in the retrieval of buses that are stuck and/or for towing buses when a wrecker with a "wheel lift" or an "axle lift" is not available or cannot be applied to the towed vehicle.

A. Towing devices shall be attached to the chassis frame either by the chassis manufacturer or in accordance with the chassis manufacturer's specifications.

B. Each rear towing device shall have a strength rating of 13,500 pounds with the force applied in the rearward direction, parallel to the ground, and parallel to the longitudinal axis of the chassis frame rail.

C. The towing devices shall be mounted such that they do not project rearward of the rear bumper.

## ***TRACTION ASSISTING DEVICES (OPTIONAL)***

A. Where required or used, sanders shall:

1. Be hopper cartridge-valve type;
2. Have a metal hopper with all interior surfaces treated to prevent condensation of moisture;
3. Have at least 100 pounds (grit) capacity;
4. Have a cover that screws in place on the filler opening of the hopper, thereby sealing the unit airtight;
5. Have discharge tubes extending under the fender wheel-housing to the front of each rear wheel;
6. Have non-clogging discharge tubes with slush-proof, non-freezing rubber nozzles;
7. Be operated by an electric switch with a pilot lamp mounted on the instrument panel located so as to be exclusively controlled by the driver;
8. Be equipped with a gauge to indicate that the hopper has reached the one-quarter level (and needs to be refilled); and
9. Be designed to prevent freezing of all activation components and moving parts.

B. Automatic traction chains may be installed.

## ***TRASH CONTAINER AND HOLDING DEVICE (OPTIONAL)***

When requested or used, the trash container shall be secured by a holding device that is designed to prevent movement and to allow easy removal and replacement. It shall be installed in an accessible location in the driver's compartment, not obstructing passenger access to the entrance door.

## ***UNDERCOATING***

A. The entire underside of the 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 to the bus body manufacturer a notarized certification to the bus body manufacturer that materials meet or exceed all performance and qualitative requirements of paragraph 3.4 of Federal Specification TT-C-520b, Coating

Compound, Bituminous, Solvent Type, Underbody (For Motor Vehicles) , using modified test procedures\* for the following requirements:

1. Salt spray resistance-test modified to 5% salt and 1000 hours;
2. Abrasion resistance; and
3. Fire resistance.

\* (Test panels are 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.)

B. 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 the cured film.

## **VENTILATION**

A. Auxiliary fans shall meet the following requirements:

1. Fans for left and right sides of the windshield shall be placed in a location where they can be adjusted for maximum effectiveness and where they do not obstruct vision to any mirror. Note: Type A buses may be equipped with one fan;
2. Fans shall have 6-inch (nominal) diameter; and
3. Fan blades shall be enclosed in a protective cage. Each fan shall be controlled by a separate switch.

B. The bus body shall be equipped with a suitably controlled ventilating system with capacity sufficient to maintain the proper quantity of air flow under operating conditions without having to open a window except in extremely warm weather.

C. Static-type, non-closeable exhaust ventilation shall be installed in a low-pressure area of the roof.

D. Roof hatches designed to provide ventilation in all types of exterior weather conditions may be provided.

## **WHEELHOUSING**

A. The wheel-housing opening shall allow for easy tire removal and service.

B. Wheel-housings shall be attached to the floor panels in a manner to prevent any dust, water or fumes from entering the body. Wheel-housings shall be constructed of 16-gauge (or thicker) steel.

C. The inside height of the wheel-housings above the floor line shall not exceed 12 inches.

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

E. No part of a raised wheel-housing shall extend into the emergency door opening.

## **WINDOWS**

A. Other than emergency exits designated to comply with FMVSS No. 217, Bus Emergency Exits and Window Retention and Release, each side window shall provide an unobstructed opening of at least 9 inches high (but not more than 13 inches high) and at least 22 inches wide, obtained by lowering the window. One window on each side of the bus may be less than 22 inches wide.

B. Optional tinted and/or frost-free glazing may be installed in all doors or windows.

C. Windshields shall comply with federal, state and local regulations.



## ***WINDSHIELD WASHERS***

A windshield washer system shall be provided.

## ***WINDSHIELD WIPERS***

A. A two-speed or variable speed windshield wiping system, with an intermittent feature, shall be provided and shall be operated by a single switch.

B. The wipers shall meet the requirements of FMVSS No. 104, Windshield Wiping and Washing Systems.

## **WIRING**

### **A. Wiring**

1. All wiring shall conform to current SAE standards.
2. All wiring shall have an amperage capacity exceeding the design load by at least 25%. All wiring splices are to be accessible and noted as splices on the wiring diagram.
3. A body wiring diagram, sized to be easily read, shall be furnished with each bus body or affixed to an area convenient to the electrical accessory control panel.
4. The body power wire shall be attached to a special terminal on the chassis.
5. Each wire passing through metal openings shall be protected by a grommet.
6. Wires not enclosed within the 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.

### **B. Circuits**

1. Wiring shall be arranged in circuits, as required, with each circuit protected by a fuse breaker or electronic protection device. 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 be supplied to the end user. The following body inter-connecting circuits shall be color-coded, as noted:

#### **FUNCTION COLOR**

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 the cables shall correspond to SAE J1128, Low-Tension Primary Cable.

2. Wiring shall be arranged in at least 6 regular circuits, as follows:

- a. Head, tail, stop (brake) and instrument panel lamps;
  - b. Clearance lamps and stepwell lamps that shall be actuated when the entrance door is open;
  - c. Dome lamps;
  - d. Ignition and emergency door signal;
  - e. Turn signal lamps; and
  - f. Alternately flashing signal lamps.
3. Any of the above combination circuits may be subdivided into additional independent circuits.
  4. Heaters and defrosters shall be wired on an independent circuit.
  5. Whenever possible, all other electrical functions (such as sanders and electric-type windshield wipers) shall be provided with independent and properly protected circuits.
  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.

C. Buses may be equipped with a 12-volt power port in the driver's area.

D. There shall be a manual noise suppression switch installed in the control panel. The switch shall be labeled and alternately colored. This switch shall be an on/off type that deactivates body equipment that produces noise, including, at least, the AM/FM radio, heaters, air conditioners, fans and defrosters. This switch shall not deactivate safety systems, such as windshield wipers or lighting systems.

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

# **SPECIALLY EQUIPPED SCHOOL BUS SPECIFICATIONS**

## ***INTRODUCTION***

Equipping buses to accommodate students with disabilities is dependent upon the needs of the passengers. While one bus may be fitted with a lift, another may have belts installed to secure child seats. Buses so equipped are not to be considered a separate class of school bus, but simply a regular school bus that is equipped for special accommodations. The specifications in this section are intended to supplement specifications in the chassis and body sections. In general, specially equipped buses shall meet all the requirements of the preceding sections, plus those listed in this section. It is recognized that the field of special transportation is characterized by varied needs for individual cases and by rapidly emerging technologies for meeting individual student needs. A flexible, "common sense" approach to the adoption and enforcement of specifications for these vehicles, therefore, is prudent. As defined by 49 Code of Federal Regulations (CFR) §571.3, "Bus means a motor vehicle with motive power, except a trailer, designed for carrying more than ten persons" (eleven or more including the driver). This definition also embraces the more specific category, school bus.

Vehicles with ten or fewer occupant positions (including the driver) are not classified as buses. For this reason, the federal vehicle classification, multipurpose passenger vehicle (49 CFR § 571.3), or MPV, must be used by manufacturers for these vehicles in lieu of the classification school bus. The definition of designated seating position in 49 CFR § 571.3 states that, in the case of "vehicles sold or introduced into interstate commerce for purposes that include carrying students to and from school or related events" and which are "intended for securement of an occupied wheelchair during vehicle operations," each wheelchair securement position shall be counted as four designated seating positions when determining the classification (whether school bus or MPV). This classification system does not preclude state or local agencies or these national specifications from requiring compliance of school bus-type MPVs with the more stringent federal standards for school buses. The following specifications address modifications as they pertain to school buses that, with standard seating arrangements prior to modification, would accommodate eleven or more occupants including the driver. If by addition of a power lift, wheelchair positions or other modifications, the capacity is reduced such that vehicles become MPVs, the intent of these specifications is to require these vehicles to meet the same specifications they would have had to meet prior to such modifications, and such MPVs are included in all references to school buses and requirements for school buses which follow.

## ***DEFINITION***

A specially equipped school bus is any school bus that is designed, equipped and/or modified to accommodate students with special transportation needs.

## **GENERAL REQUIREMENTS**

A. Specially equipped school buses shall comply with the National School Transportation Specifications & Procedures and with the Federal Motor Vehicle Safety Standards (FMVSS) applicable to their Gross Vehicle Weight Rating (GVWR) category.

B. Any school bus to be used for the transportation of children who utilize 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.

## **AISLES**

All school buses equipped with a power lift shall provide a minimum 30-inch aisle leading from any wheelchair position to at least one emergency exit door. A wheelchair securement position shall never be located directly in front of (blocking) a power lift door location.

## **GLAZING**

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

## **IDENTIFICATION**

Specially equipped school buses shall display the International Symbol of Accessibility below the window line. Such emblems shall be white on blue or black background, shall not exceed 12 inches square in size and shall be of a high-intensity retro-reflective material meeting the requirements of Federal Highway Administration (FHWA) FP-85, Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects.

## **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/reimbursement models), any location in a school bus intended for securement of a wheelchair during vehicle operation shall be regarded as four designated seating positions, and each lift area shall count as four designated seating positions.

## **POWER LIFTS AND RAMPS**

A. The power lift shall be located on the right side of the bus body. Exception: The lift may be located on the left side of the bus if, and only if, the bus is only used to deliver students to the left side of one-way streets.

1. 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.

2. A ramp device that does not meet the specifications of ADA, but does meet the specifications of paragraph C 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. All specially equipped school buses shall provide a level-change mechanism or boarding device (e.g., lift or ramp), complying with paragraph B or C of this section, with sufficient clearances to permit a wheelchair user to reach a securement location.

B. Vehicle lift and installation

1. General: Vehicle lifts and installations shall comply with the requirements set forth in FMVSS 403, Platform Lift Systems for Motor Vehicles, and FMVSS 404, Platform Lift Installations in Motor Vehicles.

2. Design loads: The design load of the lift shall be at least 800 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. Lift capacity: The lifting mechanism and platform shall be capable of operating effectively with a wheelchair and occupant mass of at least 800 pounds.

4. Controls: (See 49 CFR 571.403, S6.7, Control systems.)

5. Emergency operations: (See 49 CFR 571.403, S6.9, Backup operation.)

6. Power or equipment failures: (See 49 CFR 571.403, S6.2.2, Maximum platform velocity.)

7. Platform barriers: (See 49 CFR 571.403, S6.4.7, Wheelchair retention.)

8. Platform surface: (See 49 CFR 571.403, S6.4.2, S6.4.3, Platform requirements.) (See also "Wheelchair or Mobility Aid Envelope" figure at the end of this subsection.)

9. Platform gaps and entrance ramps: (See 49 CFR 571.403, S6.4.4, Gaps, transitions and openings.)

10. Platform deflection: (See 49 CFR 571.403, S6.4.5, Platform deflection.)

11. Platform movement: (See 49 CFR 571.403, S6.2.3, Maximum platform acceleration.)

12. Boarding direction: The lift shall permit both inboard and outboard facing of wheelchair and mobility aid users.

13. Use by standees: Lifts shall accommodate persons who are using walkers, crutches, canes or braces, or who otherwise have difficulty using steps. The platform may be marked to indicate a preferred standing position. Note: This item refers to equipment specifications. (Also see section,

#### TRANSPORTATION FOR STUDENTS WITH DISABILITIES AND SPECIAL HEALTH CARE NEEDS,

Subsection D, Special Equipment Use and Operation, for applicable operational procedures stating that "During lift operations (including manual) no one shall be allowed to stand on the lift platform.")

14. Handrails: (See 49 CFR 571.403, S6.4.9, Hand-rails.)

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

16. Excessive pressure: (See 49 CFR 571.403, S6.8, Jacking prevention.)

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

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

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

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

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

#### C. Vehicle ramp

1. If a ramp is used, it shall be of sufficient strength and rigidity to support the special device, occupant and attendant(s). It shall be equipped with a protective flange on each longitudinal side to keep the special device on the ramp.
2. The surface of the ramp shall be constructed of non-skid material.
3. The ramp shall be equipped with handles and shall be of weight and design to permit one person to put the ramp in place and return it to its storage place.
4. Ramps used for emergency evacuation purposes may be installed in raised floor buses by manufacturers. They shall not be installed as a substitute for a lift when a lift is capable of serving the need.

### ***REGULAR SERVICE ENTRANCE***

- A. On power lift-equipped vehicles, steps shall be the full width of the step well, excluding the thickness of the doors in the open position.
- B. A suitable device shall be provided to assist passengers during ingress and 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.

### ***RESTRAINING DEVICES***

- A. On power lift-equipped school buses with a GVWR of 10,000 pounds or more, seat frames may be equipped with attachment points to which belt assemblies can be attached for use with child safety restraint systems (CSRSs) that comply with FMVSS No. 213, Child Restraint Systems. Any belt assembly anchorage shall comply with FMVSS No. 210, Seat Belt Assembly Anchorages.
- B. Alternatively, a child restraint anchorage system that complies with FMVSS No. 225, Child Restraint Anchorage Systems, may be installed.
- C. Seat belt assemblies, if installed, shall conform to FMVSS No. 209, Seat Belt Assemblies.
- D. Child safety 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 No. 213.

### ***SEATING ARRANGEMENTS***

Flexibility in seat spacing to accommodate special devices shall be permitted to meet passenger requirements. All seating shall meet the requirements of FMVSS No. 222, School Bus Passenger Seating and Crash Protection.

## SECUREMENT AND RESTRAINT SYSTEM FOR WHEELCHAIRS AND WHEELCHAIR-SEATED OCCUPANTS

For purposes of understanding the various aspects and components of this section, the term securement and tie-down and the phrases securement system or tie-down system are used exclusively in reference to the devices that anchor the wheelchair to the vehicle. The term restraint and the phrase restraint system are used exclusively in reference to the equipment that is intended to limit the movement of the wheelchair occupant in a crash or sudden maneuver. The term wheelchair tie-down and occupant restraint system (WTORS) is used to refer to the total system that secures the wheelchair and restrains the wheelchair occupant.

### A. WTORS-general requirements:

1. A wheelchair tie-down and occupant restraint system installed in specially equipped school buses shall be designed, installed, and operated for use with forward-facing wheelchair-seated passengers and shall comply with all applicable requirements of FMVSS 222, School Bus Passenger Seating and Crash Protection, and SAE J2249, Wheelchair Tie-down and Occupant Restraint Systems for Use in Motor Vehicles.
2. The WTORS, including the anchorage 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/systems used.
3. Wheelchair securement positions shall be located such that wheelchairs and their occupants do not block access to the lift door.
4. A device for storage of the WTORS 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.
5. The WTORS, including the storage device, shall meet the flammability standards established in FMVSS No. 302, Flammability of Interior Materials.
6. The following information shall be provided with each vehicle equipped with a securement and restraint system: SAE J2249 is currently being updated and moved to Section 18 of ANSI/RESNA Wheelchair Standards, Volume 4, Wheelchairs and Transportation. The new version is expected to be available by December 2006.
  - a. A phone number where information can be obtained about installation, repair and parts. (Detailed written instructions and a parts list shall be available upon request.)
  - b. Detailed instructions regarding use, including a diagram showing the proper placement of the wheelchair/mobility aids and positioning of securement devices and occupant restraints, including correct belt angles.
7. The WTORS manufacturer shall make training materials available to ensure the proper use and maintenance of the WTORS. These may include instructional videos, classroom curriculum, system test results or other related materials.

B. Wheelchair Securement/Tie-down: (See 49 CFR 571.403, S5.4.1, S5.4.2.) Each wheelchair position in a specially equipped school bus shall have a minimum clear floor area of 30 inches laterally by 48 inches longitudinally. Additional floor area may be required for some wheelchairs. Consultation between the user and the manufacturer is recommended to ensure that adequate area is provided.

C. Occupant restraint system: (See 49 CFR 571.403, S5.4.3, S5.4.4.)

## ***SPECIAL LIGHT***

Doorways in which lifts are installed shall be equipped with a special light that provides a minimum of two foot-candles of illumination measured on the floor of the bus immediately adjacent to the lift during lift operation.

## ***SPECIAL SERVICE ENTRANCE***

A. Power lift-equipped bodies shall have a special service entrance to accommodate the power lift. Exception: A special service entrance shall not be required if the lift is designed to operate within the regular service entrance, is capable of stowing such that the regular service entrance is not blocked in any way and a person entering or exiting the bus is not impeded in any way.

B. The special service entrance and door shall be located on the right side of the bus and shall be designed so as not to obstruct the regular service entrance. Exception: A special service entrance and door may be located on the left side of the bus only if the bus is used only to deliver students to the left side of one-way streets and its use is limited to that function.

C. 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.

D. A drip molding shall be installed above the special service entrance to effectively divert water from the entrance.

E. Door posts and headers at the special service entrance shall be reinforced sufficiently to provide support and strength equivalent to the areas of the side of the bus not used for the special service entrance.

## ***SPECIAL SERVICE ENTRANCE DOORS***

A. A single door or double doors may be used for the special service entrance.

B. A single door shall be hinged to the forward side of the entrance unless this 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 that will prevent the door from swinging open should the primary door latch fail. If double doors are used, the system shall be designed to prevent the door(s) from being blown open by the aerodynamic forces created by the forward motion of the bus, and/or shall incorporate a safety mechanism to provide secondary protection should the primary latching mechanism(s) fail.

C. All doors shall have positive fastening devices to hold doors in the "open" position when the special service entrance is in use.

D. All doors shall be weather sealed.

E. When manually operated dual doors are provided, the rear door shall have at least a one-point fastening device to the header. The forward-mounted door shall have at least three one-point fastening devices. One shall be to the header, one to the floor line of the body, and the other shall be into the rear door. The door and hinge mechanism shall have strength that is greater than, or equivalent to, the strength of the emergency exit door.

F. Door materials, panels and structural components shall have strength equivalent to the conventional service and emergency doors. Color, rub rail extensions, lettering and other exterior features shall match adjacent sections of the body.



G. Each door shall have windows set in a waterproof manner that are visually similar in size and location to adjacent non-door windows. Glazing shall be of the same type and tinting (if applicable) as standard fixed glass in other body locations.

H. Door(s) shall be equipped with a device that will actuate an audible or flashing signal located in the driver's compartment when the door(s) is not securely closed and the ignition is in the "on" position.

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

J. Special service entrance doors shall be equipped with padding at the top edge of the door opening. The padding shall be at least three inches wide and one inch thick and shall extend the full width of the door opening.

## ***SUPPORT EQUIPMENT AND ACCESSORIES***

A. Each specially equipped school bus that is set up to accommodate wheelchairs or other assistive or restraint devices with belts attached shall contain at least one webbing cutter properly secured in a location within reach of the driver while belted into his/her driver's seat. The belt cutter shall be durable and designed to prevent the operator or others from being cut during use.

B. Special equipment or supplies that are used in the bus for mobility assistance, health support or safety purposes shall meet local, federal and engineering standards that may apply, including requirements for proper identification. Equipment that may be used for these purposes includes, but is not limited to:

1. Wheelchairs and other mobile seating devices. (See subsection on Securement and Restraint System for Wheelchairs and Wheelchair-seated Occupants.)

2. Crutches, walkers, canes and other ambulating devices to assist ambulation.

3. Medical support equipment. This may include respiratory devices, such as oxygen bottles (which should be no larger than 22 cubic feet for liquid oxygen and 38 cubic feet for compressed gas) or ventilators. Tanks and valves should be located and positioned to protect them from direct sunlight, bus heater vents or other heat sources. Other equipment may include intravenous and fluid drainage apparatus.

C. All portable equipment and special accessory items, including the equipment listed above, shall be secured at the mounting location to withstand a pulling force of five times the weight of the item or shall be retained in an enclosed, latched compartment. The compartment shall be capable of withstanding forces applied to its interior equal to five times the weight of its contents without failure of the box's integrity and securement to the bus. Exception: If these specifications provide specific requirements for securement of a particular type of equipment (e.g., wheelchairs), the specific specification shall prevail.

## ***TECHNOLOGY AND EQUIPMENT, NEW***

It is the intent of these specifications to accommodate new technologies and equipment that will better facilitate the transportation of students with special needs. New technology and equipment is acceptable for use in specially equipped vehicles if:

A. It does not compromise the effectiveness or integrity of any major safety system. (Examples of safety systems include, but are not limited to, compartmentalization, the eight-lamp warning system, emergency exits and the approved color scheme.)

B. It does not diminish the safety of the bus interior.

C. It does not create additional risk to students who are boarding or exiting the bus or are in or near the school bus loading zone.

D. It does not require undue additional activity and/or responsibility for the driver.

E. It generally increases efficiency and/or safety of the bus, generally provides for a safer or more pleasant experience for the occupants and pedestrians in the vicinity of the bus and/or generally assists the driver and makes his/her many tasks easier to perform.