OFFICE OF CHIEF ACCOUNTABILITY OFFICER
Summary of the State Board of Education Agenda Items
Consent Agenda
February 20, 2025

OFFICE OF SAFE AND ORDERLY SCHOOLS

G. Approval to revise Miss. Admin. Code Title 7: Part 240: Minimum Bus Specifications by amending certain existing criteria and establishing new criteria for minimum bus specifications for the sale of new buses effective July 1, 2025
(Has cleared the Administrative Procedures Act Process without public comments)

Background Information:
Miss. Code Ann. § 37-41-1 authorizes, empowers, and directs the State Board of Education to promulgate rules and regulations relating to the transportation of students enrolled in the public-school districts, including rules and regulations for setting standards for public school district buses. The *Mississippi Minimum School Bus Standards and Specifications* provide state and federal regulations governing school bus body and chassis specifications, specially equipped school bus specifications, pupil transportation service vehicle specifications, multi-function school activity bus specifications, alternative power specifications, and equipment for the transportation of Pre-K children.

The major revisions to the *Mississippi Minimum School Bus Standards and Specifications* include: adding 10-14 passenger capacity Type "A" school buses/multifunction school activity buses that do not require a commercial driver's license (CDL) to operate, adding the Colorado Racking Load Test and the Kentucky Pole Test that vendors must certify that they meet regarding the construction of the bus, and removing the exterior structural, fiberglass roof or side panels.

The temporary rule and final action are necessary to implement the revisions immediately upon its filing with the Secretary of State in accordance with Miss. Code Ann. § 25-43-3.113(2)(b)(ii). Specifically, to allow for the procurement of competitive bus bids from various vendors for prices to be effective July 1, 2025, based on the revisions to the *Mississippi Minimum School Bus Standards and Specifications.* On December 19, 2024, the State Board of Education approved the temporary rule and granted approval to begin the APA process for obtaining public comments regarding these revisions.

The public comment period was open from December 20, 2024, through 5:00 p.m. January 21, 2025. No public comments were received.

Recommendation: Approval

Back-up material attached

MISSISSIPPI DEPARTMENT OF EDUCATION
Ensuring a bright future for every child

SCHOOL BUS SPECIFICATIONS 2025-2026

Standards effective with all new school buses purchased after July 1, 2025

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GENERAL PROVISIONS

The school bus specifications and minimum standards contained herein apply to all school transportation vehicles purchased by any public-school districts of Mississippi effective the date of this document. No school district has authority under state laws and Mississippi Board of Education regulations to purchase or use any equipment except the type approved by the Mississippi Board of Education. All public-school buses owned, operated, rented, leased, and contracted for any public-school board used to transport children to and from school or school related-events must meet or exceed the minimum requirements of these specifications, meet all applicable Federal Motor Vehicle Safety Standards (FMVSS), and meet or exceed the 2015 National School Bus Transportation Specifications and Procedures, except when in conflict with the requirements herein. In such cases, the requirements specified in this document shall prevail.

Federal regulations require that all vehicles manufactured and sold for the purpose of transporting school children meet applicable Federal Motor Vehicle Safety Standards. It is the responsibility of the manufacturer and seller to ensure all school buses are certified according to the standards. Each vehicle shall be properly serviced prior to being delivered to the school district.

Any reference to "or equal" means that manufacturers of the chassis or body (or complete bus) for which a bid is submitted shall have the authority to determine equal quality of parts and components to be considered.

A representative of the Division of Pupil Transportation, Mississippi Department of Education, Jackson, Mississippi, shall have the privilege of visiting school bus manufacturing plants of successful bidders for the purpose of inspecting school bus chassis, school bus bodies, or combinations thereof, both during construction and after completion for delivery to Mississippi school districts. Under unusual circumstances and with adequate justification, exceptions to these specifications may be granted by the Division of Pupil Transportation. In the event of a conflict between the requirements of an applicable Federal Motor Vehicle Safety Standard, as referred to in this section, and the Mississippi minimum specifications, the requirements of the FMVSS shall control. School buses not meeting Mississippi School Bus minimum specifications will not be certified by the Mississippi Department of Education.

References to Standards in the School Bus Manufacturers Technical Committee (SBMTC) and Standards in the Society of Automotive Engineers (SAE) will be throughout the document.

ABOUT THIS DOCUMENT

Mississippi School Bus Regulations and Specifications consists of the following distinct sections: *School Bus Body and Chassis Specifications, Specially Equipped School Bus Specifications, Pupil Transportation Service Vehicles, Used School Buses, Multifunctional School Activity Bus, Alternative Power Specifications and Equipment for the Transportation of Pre-School Children.*

This document is designed to provide timely, clear instructions to school districts, school bus owner/operators, private contractors, manufacturers and vendors, and service personnel regarding Mississippi's school bus adopted specifications for school buses and related equipment and for standards and procedures to be incorporated in vehicle and related equipment inspections, replacements, and repairs.

With respect to specifications for school buses and related equipment, after each National Congress on School Transportation publishes its adopted changes in the National School Transportation Specifications and Procedures (available at https://www.nasdpts.org/NSTSP-Documents) or distributes interim addenda to that document, the Mississippi Department of Education may review the recommendations and revise the Mississippi School Bus Specifications accordingly.

Revisions in Mississippi statutes and/or the Mississippi Department of Education regulations will be published as amendments to this document. Compliance shall become effective as stated at the time of publication, or as otherwise specified by statute or other official document.

GUIDING PRINCIPLES

A. Information published in this document is intended to keep interested parties apprised of statutory requirements and other regulations that apply to various conditions of purchase, ownership, maintenance, inspection and disposal of school buses and related equipment.

B. The overriding principle for Mississippi's adoption of the National Congress on School Transportation's revised National School Transportation Specifications and Procedures is to provide the safest modes of transportation to and from school and school-related activities for the school children of Mississippi.

C. Specifications for school buses and related equipment are adopted so as to promote competition among manufacturers to design and construct equipment that is both reliable and affordable to school districts and independent transportation contractors.

D. Mississippi's specifications for school buses and related equipment are designed to allow for approval of the use of new inventions and improvements that are consistent with Federal Motor Vehicle Safety Standards (FMVSS), Mississippi statutes and goals of safety, security, and efficiency and that have been approved by the Mississippi Department of Education, Office of Safe and Orderly Schools, Division of Pupil Transportation.

INTENDED USE

Mississippi Code Ann. § 37-41-57 gives the State Board of Education the authority to adopt and enforce regulations of the design and operation of all school buses used for the transportation of school children when owned and operated by any school board or privately owned and operated under contract with any school board in this state. The specifications, regulations, and procedures described in this document, therefore, are intended for use by school district and other entities that have been placed under the jurisdiction of the Mississippi Department of Education, including private companies that contract with local education agencies (LEA) to provide school transportation services, and for use for manufacturers, vendors, and technicians that have specific interests in school transportation services. The document is made available, also, as a guide for charter schools and non-public schools to consider when establishing their respective regulations, specifications, and inspections.

The following terms are used throughout this document to define the applicability of Mississippi's specifications and inspection procedures for public school districts and private contractors:

A. *SHALL:* a mandatory condition. Where certain school bus designs, equipment or operations are described with the *"shall"* stipulation, it is *mandatory* that all school buses and all school bus operations meet those requirements, as written.

   Note: The word *"shall"* is also used when referring to items that are already adopted into federal laws, standards or regulations.

B. *SHOULD:* an advisory condition. Where certain school bus designs, equipment or operations are described with the word *"should,"* such items are considered to be advisable usage. In other words, the item is *recommended,* but not mandatory, for all school buses or all school bus operations.

C. *MAY:* a permissive condition. Where certain school bus designs, equipment or operations are described with the word *"may,"* such items are considered for *possible* usage. However, there is no intent that the item be required for all school buses or all school bus operations.

The vehicle specifications contained herein are intended to apply primarily to **new** vehicles, including all types of school buses, as defined under the various types of "school buses." It should be noted that vehicles with a capacity of ten (10) or fewer persons, including the driver, cannot be certified as *school buses* under federal regulations.

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DEFINITIONS OF SCHOOL BUSES

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 designed for carrying more than 10 persons. 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. All Type A buses shall have dual rear wheels. Operators of 10-14 passenger Type A buses are **not** required to obtain a Commercial Driver's License (CDL). MDE has created a specific Training Curriculum for these drivers. This is a mode of pupil transportation that may offer flexibility and efficiencies to local school districts and serve to increase the pool of available drivers and meet the unique needs of their student body. Drivers of these vehicles will need to obtain a Class-D Non-CDL to operate these vehicles. Detailed licensing information can be found on the Mississippi Department of Public Safety, Driver Service Bureau website.

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, designed for carrying more than ten 10 persons.

TYPE D

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

Front Engine Style

Rear Engine Style

MULTIFUNCTION SCHOOL ACTIVITY BUS (MFSAB)

A Multifunction School Activity Bus (MFSAB) shall mean a school bus whose purposes do not include transporting students to and from home or school bus stops, "as defined in 49 CFR 571.3." This subcategory of school bus meets all FMVSS for school buses except the traffic control requirements. MFSAB may be any Type A, C, or D.

SPECIAL NEEDS BUS

A Special Needs School bus shall mean any Type A, C, or D school bus as defined in this section, which has been modified to transport students requiring the use of a Wheelchair/Mobility Aid Position or Lift.

TABLE OF TYPE AND CAPACITY

TYPE(S)	CAPACITY
Type A-I Cutaway Van (Dual Wheels)	10-14, 16 - 20
Type A-II Cutaway Van (Dual Wheels)	16 – 23, 24-30
Type C - Conventional Flat Face Cowl	29-41, 42-59, 60-71, 72-83
Type D - Transit Type Front & Rear Mounted Engine	41-53, 54-65, 66-75, 76-90

SCHOOL BUS BODY AND CHASSIS SPECIFICATIONS

AIR CLEANER

A. 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.

AISLE

All emergency doors shall be accessible by a twelve inch (12") minimum aisle. Aisle shall be unobstructed at all times by any type of barrier, seat, wheelchair or tiedown, unless a flip seat is installed and occupied. A flip seat in the unoccupied (up) position shall not obstruct the twelve inch (12") minimum aisle to any side emergency door.

AXLE

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

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.

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. All buses shall have either a parking pawl in the transmission or a park brake interlock that requires the service brake to be applied to allow release of the parking brake.

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 a seated 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 hydraulic-assist brakes shall meet requirements of FMVSS 105.

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

E. 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.*

F. All Type D buses 71 and over passenger capacity shall be equipped with air brakes.

BUMPER (FRONT)

A. School buses shall be equipped with a front bumper.

B. The front bumper on buses of Type A-2 (with GVWR greater than 14,500 pounds), 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 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. 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.

BUMPER (REAR)

A. The bumper on Type A-1 buses shall be a minimum of 8 inches wide (high). Bumpers on Types A-2, C and D buses shall be a minimum of 9 ½ 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 one 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.

CAMERA SYSTEM - not brand specific (optional)

School bus camera systems shall be constructed to provide reliability to withstand extreme hot and cold temperatures, road vibrations, high humidity, and airborne dust/dirt caused by unpaved roads.

A. Interior

1. Interior camera system shall permit a minimum connection for four cameras.

2. Camera systems shall provide audio and video day/night recording.

3. May be either a hard or solid-state drive recorder system.

4. A dash camera may be installed for exterior traffic monitoring.

5. Cameras may be mounted in the front, side, back, and/or mid-ship of the bus. If mid-ship, they must be mounted off center and over a seat back. Corners and sharp edges shall be rounded or covered with a protective material.

6. Recording equipment shall be mounted as not to produce any tripping hazard if floor mounted.

7. The exterior camera system monitor may be incorporated as part of the interior rear-view mirror as long as when the monitor is inactive, it does not interfere with the normal use of the mirror.

8. The camera system hard drive/DVR shall be mounted outside the federal head impact zone, FMVSS 222 (School Bus Passenger Seating and Crash Protection).

9. Navigational devices, video event recording devices, and crash avoidance cameras mounted on the interior of the windshield shall be mounted not more than four inches below the upper edge of the area swept by the windshield wipers or not more than seven inches above the lower edge of the area swept by the windshield wipers. The devices shall be mounted outside the school bus driver's sightlines to the road, highway signs, highway signals, and students crossing in front of the bus.

B. Exterior

1. Cameras shall be a color not contrasting to its background and it shall not interfere with any safety system lettering. Back up cameras are exempt from the contrasting color requirement. These camera housings shall be black or school bus yellow.

2. Exterior cameras shall not extend over six inches from the surface of the bus.

3. Exterior cameras shall be mounted as high as possible.

4. Stop arm: Exterior camera may be mounted at or near the stop arm (see letter C).

5. Backup camera shall be used on Type D buses with a rear-engine.

6. Exterior camera system monitors shall not be mounted if it blocks the driver view in any direction.

7. Exterior camera system monitors shall only activate when the bus is in reverse for a rear camera or in park for side cameras. For buses without a park position in the transmission, the monitor shall only activate when the parking brake is applied. A forward-facing system monitor shall only activate with the red 8-way light warning system.

8. Exterior camera system monitors shall be automatically controlled without requiring driver action.

C. Stop Arm Video Monitoring Systems

If a stop arm video monitoring system is installed on a school bus, the following minimum system requirements shall apply.

1. The system shall produce live digital and recorded video of vehicles being operated in violation of Nathan's Law.

2. The system shall produce a recorded image of the license plate.

3. The system shall record the activation status of at least one warning device (activation of either and/or the red traffic warning lights and the side stop sign) mounted on the school bus and the time, date, and location of the vehicle when the image is recorded.

4. The system shall not obscure the lettering of the side of the bus.

5. The system shall not impede or block any emergency exits.

6. Wiring shall not be mounted on the outside of the school bus and shall not be mounted inside the driver/passenger area.

7. All roof and side mounting locations shall be sealed to ensure no leaks.

8. They system shall have separate wiring from any emergency lights, alarms, etc.

9. All exterior cameras housings shall be painted NSBY.

10. The system shall operate automatically and not require driver activation.

11. Vendor/Manufacturer shall provide documentation to the locality that the system is properly mounted, and camera(s) are capturing clear video identifying a moving vehicle.

12. Vendor/Manufacturer shall warranty the complete system for at least 12 months after the school district accepts documentation of mounting.

13. Exterior camera(s) shall be designed to eliminate movement due to vandalism and rough roads.

CAPACITY PLATE

A label indicating the maximum design capacity of the bus shall be located near or incorporated in the bus body identification label.

CERTIFICATION

The chassis and body manufacturer(s) shall certify, upon request to the Mississippi Department of Education, that (their) product(s) meets Mississippi's minimum standards on items which are not covered by certification requirements of 49 CFR, Part 567: *Certification.*

CHILD CHECK SYSTEM - (not brand specific)

All school buses shall be equipped with a child check system. A child check system shall be provided meeting the following specifications:

The child check system shall activate when the eight-way warning lights have been activated and fully cycled.

Once the child check system has been activated, the following procedures should take place before the driver can exit the bus (open the entrance door) without the horns sounding until the system is deactivated.

A. The door must be closed before the ignition is turned off or the key is turned to the accessory position, the driver must walk to the rear of the bus and manually operate a deactivation switch, which shall be located above the rear door or in the rear bulkhead area and clearly labeled.

B. Immediately upon deactivating, the interior dome light or such indicators shall activate to identify the system has disarmed.

C. The interior dome light shall illuminate and remain on for a minimum of 60 seconds after deactivating.

Any attempt to exit the bus by opening the entrance door will sound the horn until the system has been de-activated.

COLLISION MITIGATION SYSTEM (OPTIONAL)

There may be an option for passive and/or active electronic collision mitigation system(s).

COLOR

A. The school bus body shall be painted national school bus yellow.

B. The body exterior paint trim, rub rails, bumper, lamp hoods, emergency door arrow, and lettering shall be black. Electric buses may have blue bumpers. (Exceptions to school system name can be found under "Identification.")

C. The roof of the bus shall be painted white not to extend below the drip rails on the sides of the body.

D. The chassis and front and rear bumpers shall be black. Body, cowl, hood and fenders shall be in National School Bus Yellow **(NSBY).**

E. Wheels may be black, chrome, or national school bus yellow. Electric school buses may have factory installed aluminum wheels or blue wheels.

F. The hood grill may be national school bus yellow, chrome, or black. Grill insert may be black. The original grill color shall not be changed by painting.

G. Multifunctional School Activity Buses shall be exempt from this requirement. (See MFSAB specifications)

COMMUNICATION SYSTEMS

Each bus shall be equipped with a two-way, voice communication system capable of providing communication with the operation's base, or at least local 911 operators where technologically feasible. All school buses that transport individuals with disabilities shall be equipped with a two-way electronic voice communication system that can be used at any point on the vehicle's route.

A. The end user shall be responsible for the purchase, installation, and maintenance of the two-way communication system.

B. CB radio systems and cell phones that are not equipped with two-way capabilities will not meet this requirement.

C. It is the responsibility of the local school system to comply with this specification.

CONSTRUCTION

Colorado Racking Load Test: All bus manufacturers shall certify that the bus body construction meets or exceeds all testing standards of the Colorado Racking Load Test. This certification is to assure adequate shear stiffness and construction strength of the bus body (See Appendix A).

Kentucky Pole Test: All bus manufacturers shall certify that the bus body construction meets or exceeds all testing standards of the Kentucky Pole Test (See Appendix B).

Construction of school bus body shall meet all requirements of FMVSS 220 (School Bus Rollover Protection), 49 CFR § 571.220, and all other applicable federal standards.

Construction shall be of prime commercial quality steel or other material with strength at least equivalent to all-steel as certified by the bus body manufacturer. All such construction materials shall be fire resistant. If roof caps are constructed of fiberglass, the fiberglass must be backed with a steel inner liner to protect the passenger compartment.

Construction shall provide reasonably dustproof and watertight unit.

Bus Body: The roof bows, body posts, strainers, stringers, floor, inner and outer linings, rub rails and other reinforcements shall be of sufficient strength to support entire weight of fully loaded vehicle on its top or side if overturned. Bus body as unit shall be designed and built to provide impact and penetration resistance.

Side Posts and Roof Bows: There shall be a body side post and roof bow fore and aft of each window opening. This may be a continuous bow or two separate pieces effectively joined.

Floor: Shall be of prime commercial quality steel of at least 14-gauge or other metal or

other material at least equal in strength to 14-gauge steel. Floor shall be level from front to back and from side to side except in wheel housing, toe board, and driver's seat platform areas. When plywood is used, it shall be of one-half inch exterior B.B. Grade or equivalent and securely fastened to the existing steel floor.

Roof Strainers: Two or more roof strainers or longitudinal members shall be provided to connect roof bows, to reinforce flattest portion of roof skin, and to space roof bows. These strainers may be installed between roof bows or applied externally. They shall extend from windshield header and, when combined with rear emergency doorpost, are to function as longitudinal members extending from windshield header to rear floor body cross member. At all points of contact between strainers or longitudinal members and other structural material, attachment shall be made by means of welding, riveting or bolting.

Floor Sills: There shall be one main body sill at each side post and two intermediate body sills on approximately ten-inch centers. All sills shall be of equal height, not to exceed three inches. All sills shall extend width of body floor except where structural members or features restrict area. Main body sill shall be equivalent to or heavier than 10-gauge and each intermediate body sill shall be equivalent to or heavier than 16-gauge, or each of all sills shall be equivalent to or greater than 14-gauge. All sills shall be permanently attached to floor. Connections between sides and floor system shall be capable of distributing loads from vertical posts to all floor sills.

All openings between chassis and passenger-carrying compartment made due to alterations by body manufacturers shall be sealed.

A cover shall be provided for the opening to the fuel supply container fill pipe or charging port for battery electric powered school buses.

A moisture and rustproof removable panel shall be provided in the floor for access to the fuel supply container sender gauge. It shall be designed for prolonged use and adequate fastening to the floor.

All Type C and D shall meet the requirements of Section A below.

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 mockup with seats installed, shall be load-tested at a location 24 ± 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, so that the bus does not leak under normal operating conditions.

C. Body joints present in that portion of a Type A school bus body furnished exclusively by the body manufacturer shall conform to the performance requirements of FMVSS 221, "School Bus Body Joint Strength." This does not include the body joints created when body components are attached to components furnished by the chassis manufacturer.

D. Type A school bus bodies shall be equipped with restraining barriers conforming to FMVSS 222, "School Bus Passenger Seating--Crash Protection," Sections 5.2 and 5.3.

CROSSING CONTROL ARM

A. All 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 shall be treated in accordance with the body sheet metal specification.

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.

Note: 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 stepwell 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 primary 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 when viewed from the interior shall be not more than 3 inches below the interior door control cover or header pad.

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

G. All door openings shall be equipped with padding at the top edge of the opening. Padding shall be at least three inches wide and one 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. The emergency release valve, switch or device shall work in the absence of power.

I. If air or electric doors are used, the amber warning lights shall be activated from a momentary switch. A three-position switch or bezel of contrasting color to the dash, located on the panel to the right side shall activate the sequence as follows:

1. Position One - door closed; lights off.

2. Position Two - activate red lights, stop arm, and crossing control arm.

3. Position Three - red lights activated, door open, stop arm activated, and crossing control are activated.

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. Alternator

1. All Type A buses with a GVWR of 15,000 pounds or less shall have a minimum 130-amp alternator. Buses equipped with an electrically powered wheelchair lift and/or air conditioning shall be equipped with the highest rated capacity available from the chassis OEM.

2. All buses over 15,000 pounds GVWR shall be equipped with a heavy-duty truck or bus-type alternator having a minimum output rating of 200 amps or higher and should produce a minimum current output of 50 percent of the rating at engine idle speed.

3. All other buses than those described in B1 equipped with an electrically powered wheelchair lift and/or air conditioning shall have a minimum alternator output of 240 amps and may be equipped with a device that 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.nasdpts.org.)

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

B. 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. The manufacturer shall securely attach the battery on a slide-out or swing-out tray in a closed, vented compartment in the body skirt or chassis frame so that the battery is accessible for convenient servicing from the outside. When in the stored position, the tray shall be retained by a securing mechanism capable of holding the tray [with battery(ies)] in position when subjected to a 5g load from any direction. The battery compartment door or cover, if separate from the tray, shall be hinged at the front or top. It shall be secured by a positive operated latching system or other type fastener. The door may be an integral part of the battery slide tray. The door or cover must fit tightly to the body, and not present sharp edges or snagging points. Battery cables shall meet the Society of Automotive Engineers (SAE) requirements. Battery cables shall be of sufficient length to allow the battery tray to fully extend. Any chassis frame-mounted batteries shall be relocated to a battery compartment on Type A buses.

3. All batteries are to be secured in a sliding tray except that on van conversion or cutaway front-section chassis, batteries 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 shall be of sufficient gauge to carry the required amperage.

4. 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.

5. Electric buses may have mounted twelve (12) volt batteries in an easily accessible location under the hood.

C. Electrical Components

Materials in all electrical components shall contain no mercury.

D. Wiring, Chassis

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 (controlled by dimmer switch).

3. 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.

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

E. Wiring, Body

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

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.

7. 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 interconnecting 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.*

8. Wiring shall be arranged in at least six regular circuits, as follows:

   a. Head, tail, stop (brake), clearance and instrument panel lamps

b. Step well lamps 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

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

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

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

12. 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.

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

G. 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.

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

ELECTRONIC STABILITY CONTROL (ESC) (optional)

Buses should be equipped with Electronic Stability Control (ESC).

EMERGENCY EQUIPMENT

A. Fire Extinguisher

1. The bus shall be equipped with at least one (1) pressurized, dry, chemical fire extinguisher, complete with hose, to meet Underwriters Laboratories, Inc., approval. The extinguisher shall be mounted in a bracket, located in the driver's compartment and readily accessible to the driver and passengers. A pressure gauge shall be mounted on the extinguisher so as to be easily read without

moving the extinguisher from its mounted position. The fire extinguisher shall not be located in the entrance door area.

2. The fire extinguisher shall be of a type approved by Underwriter Laboratories, Inc., with a total rating of 2A:10B:C or greater and at least 5 lbs. The operating mechanism shall be sealed with a type of seal which will not interfere with the use of the fire extinguisher.

3. Fire extinguishers must comply with State Fire Codes

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 properly mounted and identified as a first aid kit. The location for the first aid kit shall be marked.

2. Each kit shall include:

2 - 1" x 2 1/2 yards adhesive tape rolls 24 - sterile gauze pads 3" x 3"
100 - 3/4" x 3" adhesive bandages 8 - 2" bandage compress
10 - 3" bandage compress
2 - 2" x 6' sterile gauze roller bandages
2 - non-sterile triangular bandages approximately 40" x 36" x 54" with 2 safety pins
3 - sterile gauze pads 36" x 36"
3 - sterile eye pads
1 - round end scissors 1 - pair latex gloves
1 - mouth-to-mouth airway

C. Body Fluid Clean-up Kit

1. Each bus shall have a removable and moisture proof body fluid clean-up kit accessible to the driver. It shall be properly mounted and identified as a body fluid clean-up kit.

2. Each kit shall include:

1 - 2 oz. package infectious liquid spill control powder
1 - odor reducing mask
2 - latex gloves
2 - antiseptic wipes
2 - paper crepe towels 1 - scraper
1 - plastic disposal bag with scoop and tie

D. Warning Devices

Each school bus shall contain at least three (3) reflectorized, 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 one-inch letters, identifying each piece of equipment contained therein.

EMERGENCY EXITS

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.

A. 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.

B. Emergency Door Requirements

1. The exposed area of the upper panel of emergency doors shall be a minimum of 400 square inches of approved safety glazing.

2. If installed, all glass panels on emergency doors shall be approved glazing.

3. There shall be no steps leading to an emergency door.

4. There shall be no obstruction higher than ¼ inch across the bottom of any emergency door opening. Fasteners used within the emergency exit opening shall be free of sharp edges or burrs.

C. Emergency Exit Requirements

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

1. Each emergency exit shall comply with FMVSS 217. These emergency exits are in addition to the rear emergency door or exit.

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

3. Simple release mechanism shall be provided on roof exits, permitting operation as emergency exits(s), assessable inside and outside the vehicle. Roof exits shall be installed, hinged toward the front.

4. Roof exits shall provide a "partially open" position along with the full width of the hatch, adequate to allow air and thereby ventilate the bus.

5. All metallic hardware shall be manufactured from corrosion-resistant materials such as aluminum, brass or stainless steel, etc. as to prevent corrosion and possible failure of the opening mechanism.

6. Use **Table 1** if the bus contains a rear emergency door or 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.

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	
1-42	1-42	I	1	1	
43-78	43-78	2	2	2	
79-90	79-90	2	3	3	

TABLE2
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	
1-42	1-42	1	1	1	
43-78	43-78	2	2	2	
79-90	79-90	2	3	3	

EXHAUST SYSTEM

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

B. The tailpipe and after-treatment system 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. The tailpipe may be flush with, or shall not extend more than two inches beyond, the perimeter of the body for side-exit pipe or the bumper for rear-exit pipe. The exhaust system shall be designed such that exhaust gas will not be trapped under the body of the bus.

D. The tailpipe shall exit to the left or right 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 or the tailpipe may extend through the bumper. The tailpipe exit location on all Types A-1 buses may be in accordance with the manufacturer's standards. The tailpipe shall not exit beneath any fuel filler location, emergency door or lift door.

E. The exhaust system shall be insulated in a manner to prevent any damage to any fuel system component.

F. The design of the after-treatment systems shall not allow active (non-manual) regeneration of the particulate filter during the loading and unloading of passengers. Manual regeneration systems will be designed such that unintentional operation will not occur.

G. For after treatment systems that require Diesel Exhaust Fluid (DEF) to meet federally mandated emissions:

1. The composition of Diesel Exhaust Fluid (DEF) must comply with International Standard ISO 22241-1. Refer to engine manufacturer for any additional DEF requirements.

2. The DEF supply tank shall be sized to meet a minimum ratio of 3 diesel fills to 1 DEF fill.

FENDERS:FRONT

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.

FIRE SUPPRESSION (OPTIONAL)

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

B. 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.

FLOOR AND FLOOR COVERINGS

A. The floor in the under-seat area, including the tops of the wheel housing, driver's

compartment, and toe board, shall be covered with rubber floor covering or the equivalent, having a minimum overall thickness of point one eight of an inch (1/8") and calculated burn rate of 0.1 or less using the test measures, procedure and formulas in FMVSS 302 Flammability of Interior Materials. The driver's area on all Type A buses may be manufacturer's standard flooring and floor covering.

B. The floor covering in the aisle shall be of an aisle-type rubber or equivalent, wear-resistant and ribbed. The minimum overall thickness shall be 3/16 inch measured from the tops of the 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 of a type recommended by the manufacturer of the floor-covering material. All seams must be sealed with a waterproof sealer.

D. On Types C and D buses, the manufacturer shall provide a screw-down plate to access the fuel tank sending unit that is secured and insulated. The plate shall be mounted so that access is readily available to repair personnel and so that the floor covering is not disturbed during the repair process.

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 wheelbase.

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.

E. Monocoque bus chassis are not allowed.

FUEL SYSTEM

A. Fuel tank(s) having a minimum 25-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. All types of school buses with a design capacity of 53 and larger shall have a fuel capacity of not less than 60 gallons. Type C and D buses with a design capacity of 65 and larger may have a 100-gallon tank.

D. 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.

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

F. 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.

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

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

I. 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.

HANDRAILS

At least one handrail shall be installed. The handrail shall be a minimum of 1" diameter and be constructed from corrosion resistant material(s). 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 SYSTEM, PROVISION FOR

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 one 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.)*

HEATING AND AIR CONDITIONING SYSTEMS

A. Heating system

1. The heater shall be hot water combustion type, electric heating element or heat pump.
2. The front heater shall be of fresh air, or combination fresh air and re- circulating type.

3. Heater hoses and clamps shall be adequately supported and shielded to protect hoses against excessive wear due to vibration. Heater lines, cores, and elements on the interior of the bus shall be shielded to prevent scalding or burning for the driver or passengers. Heater hoses conform to SAE J20r3, June 2006 E

4. Buses shall have a minimum of two heaters: one front and one rear.

5. Additional heaters may be re-circulating air type.

6. The heating system shall be capable of maintaining bus interior temperatures, as specified in test procedure SAE J2233.

B. Auxiliary fuel-fired (Optional)

1. Auxiliary fuel-fired heating systems are permitted, provided they comply with the following:

   a. The auxiliary heating system shall utilize the same type of 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.

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

2. All forced-air heaters installed by body manufacturers shall bear a name plate that indicates the heater rating in accordance with Standards is the School Bus Manufacturers Technical Committee (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.

3. 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, cores, and elements on the interior of the bus shall be shielded to prevent scalding or burning of the driver or passengers.

4. Each hot water system installed by a body manufacturer shall include one shutoff 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.

5. All heaters of hot water type in the passenger compartment shall be equipped with a device, installed in the hot water pressure line, which regulates the water flow to all passenger heaters. The device shall be conveniently operated by the driver while seated. The driver and passenger heaters may operate independently of each other for maximum comfort.

6. On hot water type systems, 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.

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

C. Passenger Compartment Air Conditioning

The following specifications are applicable to all types of school buses that shall be equipped with air conditioning. This section is divided into three parts. Part 1 covers performance specifications; Part 2 covers test conditions and Part 3 covers other requirements applicable to all buses.

1. Performance Specifications

a. Standard Performance

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) three feet above the center point of the horizontal driver seat surface, (2) at the longitudinal midpoint of the body, and (3) three feet forward of the rear emergency door or, for Type D rear-engine buses, three feet forward of the end of the aisle. Note for the Type A vehicles placement of the rear thermocouple should be centered in the bus over the rear axle. The independent temperature reading of each temperature probe inside the bus shall be within a range of ± 3 degrees Fahrenheit of the average temperature at the conclusion of the test.

b. High Performance

The installed air conditioning system should cool the interior of the bus from 100 degrees to 70 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:

- three feet above the center point of the horizontal driver seat surface,
- at the longitudinal midpoint of the body, and (3) three feet forward of the rear emergency door or, for Type D rear-engine buses, three feet forward of the end of the aisle. Note for the Type A vehicles placement of the rear thermocouple should be centered in the bus over the rear axle. The independent temperature reading of each temperature probe inside the bus shall be within a range of ± 3 degrees Fahrenheit of the average temperature at the conclusion of the test.

2. Test Conditions

The test conditions under which the above performance standards 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 at a point measured two feet horizontally from the top of the windows on both sides of the bus, with windows open for two hours; and (3) closing windows, turning on the air conditioner with the engine running at 1250 ± 50 RPM, and cooling the interior of the bus to 80 degrees Fahrenheit, (standard performance) or 70 degrees Fahrenheit (high performance), within 30 minutes while maintaining 100 degrees Fahrenheit outside temperature.

The manufacturer shall provide test results that show compliance with standard systems. If the bid specifies, 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.

3. 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 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 (except at evaporator locations) of the passenger area on both sides of the bus interior;

   d. The body shall 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) shall 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 percent light transmission;

   f. Electrical generating capacity shall be provided to accommodate the additional electrical demands imposed by the air conditioning system;

   g. Roofs shall be painted white to aid in heat dissipation; and

   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.

   i. For all buses (except Type D rear engine transit) equipped with a rear evaporator assembly, evaporator shall not encroach upon head impact zone but may occupy an area of less than 26.5 inches from the rear wall and 14 inches from the ceiling.

   j. j. For Type D rear engine transit buses equipped with a rear evaporator over the davenport, the evaporator assembly may not interfere with rear exit window and may not extend above the rear seating row.

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.

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, *Hom-Forward Warming- Electric-Performance, Test, and Application.*

IDENTIFICATION

A. The body shall bear the words "SCHOOL BUS" in black letters at least eight (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, contractor name or cooperative shall be displayed at the beltline in letters that are a minimum of 5 inches in height.

   2. The bus identification number displayed on the sides, on the rear and on the front shall be black or contrasting unshaded numbers not less than 5 inches high.

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

   1. Bus identification number 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 two-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. Electronic warning sign related to school bus flashing signal.

7. Lettering relating to railroad stop procedures; and

8. Identification of fuel type in 1-inch lettering adjacent to the fuel filler opening.

9. Manufacturer's identification of the Diesel Exhaust Fluid (DEF) compartment, if applicable.

D. Only signs and lettering approved by state law, regulation, or authority shall appear on the bus.

INSIDE HEIGHT

The inside body height shall be seventy-two inches (72") or more, measured metal to metal, at any point on longitudinal centerline from the front vertical bow to the rear vertical bow. The inside body height of Type A-1 buses shall be sixty-two inches (62") or more. Inside height measurement does not apply to air conditioning equipment.

INSTRUMENTS AND INSTRUMENT PANEL

A. The chassis shall be equipped with the instruments and gauges listed below:

Note: Telltale warning lamps in lieu of gauges are not acceptable, except as noted.

1. Speedometer

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

3. Tachometer

Note: For Type 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. DEF gauge (if quipped).

9. High beam headlamp indicator.

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

11. Turn signal indicator; and

12. 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.

INSULATION

A. Thermal insulation shall be fire-resistant, UL approved, with minimum R-value of

5.5. Insulation shall be installed to prevent sagging.

B. Floor insulation shall be five-ply softwood plywood, nominal ¾-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 ½-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 AND 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 one 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 ¼ 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 the National School Transportation Specifications and Procedures.

LAMPS AND SIGNALS

A. Interior lamps which illuminate the aisle and the stepwell shall be provided. The stepwell 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 dimmer switch or may be controlled by the dimmer that operates the gauge lighting.

C. School bus alternately flashing signal lamps shall be provided, as described by MS Code 63-7-23. MFSABs are exempt from this requirement.

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

2. In addition to the four red lamps described above, four amber lamps shall be installed so that one amber lamp is located near each red signal lamp, at 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 and the crossing control arm are extended or when the bus entrance door is opened. The above-mentioned activation sequence can be accomplished with either a "sequential operation" or a "non-sequential operation" warning lamp system. While each of the systems can be configured to include components such as a master switch, amber activation switch, interrupt switch, etc., the presence (or absence) of these components does not affect the classification of the system as either sequential or non-sequential. Both sequential and nonsequential systems can be configured with a multitude of switch combinations to provide a unique system meeting specific user requirements. 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. If air or electric doors are used, the amber lights shall be activated from a momentary switch. A three-position switch shall activate the sequence as follows:

    a. Position one-Door closed; lights off.
    b. Position two-Activate red lights, stop arm and crossing control arm.
    c. Position three-Red lights activated, door open, stop arm activated and crossing control arm activated.

4. Background color may be SBY or glossy black.

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

6. 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 seven 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.

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 four combination red stop/tail lamps.

   a. Two combination lamps with a minimum diameter of seven 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 four 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 one lower tail lamp. Stop lamps shall be activated by the service brakes and shall emit a steady light when illuminated.

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. A white flashing strobe lamp shall be installed on the roof of a school bus at a location not closer than 12 inches or more than 6 feet from the rear of the roof edge. However, if the bus is equipped with a roof hatch or other roof mounted equipment falling within the above-mentioned measurements, the strobe lamp may be located directly behind that equipment. The lamp shall have a single clear lens emitting light 360 degrees around its vertical axis, meeting the requirements

of SAE J845. 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 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 two white rear backup lamps that are at least four 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.

    1. Optional Additional Backup Lights shall be an additional lighting system behind the rear axle. The system shall be white, LED wired to the backup light circuit. The system shall be skirt mounted and illuminate a rectangular area on both sides of the vehicle beginning 29 inches aft of center point of the rear axle. This area shall extend outward from the vehicle sides 24 inches and rearward 30 inches with no point within this area having illumination of less than 3-foot candles as tested on a bare concrete surface. Must be OEM installed by the manufacturer.

H. A daytime-running-lamps (DRL) system shall be provided.

I. LED lighting shall be used in all exterior body lamps and signals. Eight-way loading/unloading lights and stop arm shall be strobe- type LED. Any light not integrated with the manufacturer's headlamp shall be LED. However, Generation II type (80 mA) shall be the minimum brightness when used in stop arm and alternating strobing signal lamp applications.

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. This includes, but is not limited to, such items as crossing control arm and stop arm.

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, unvented or undrained

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 be subjected to a cyclic corrosion testing as outlined in SAE J1563.

MIRRORS

A. The interior glass mirror shall be either laminated or tempered and shall have rounded corners and protected edges. Mirrors shall be 6 x 16 inches minimum for Type A buses and be 6 x 30 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 unwiped 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 control external rear view mirrors may be used.

E. LED flashing lights integral to the cross 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, 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.

MUD GUARDS (MUD FLAPS)

Mud guards shall be rubber and meet requirements of Mississippi Code Ann.§ 63-7-73. Mud guards shall be at least the width of the vehicle's tires.

NOISE SUPRESSION SWITCH (Optional)

A manual noise suppression switch may be installed in the control panel. This switch or switch background shall be red or yellow and labeled. This switch shall be an on/off-type (not momentary) that deactivates all 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, lighting or warning systems.

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.

OVERALL LENGTH

The overall length of the bus shall not exceed forty-five feet (45'), excluding accessories.

OVERALL WIDTH

The overall width of the bus shall not exceed one hundred two inches (102"), excluding accessories.

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).

PUBLIC ADDRESS SYSTEM (Optional)

A. Buses may be equipped with an AM/FM/audio and/or public address system having interior and exterior speakers. Interior speakers shall be flush mounted with the bulkhead.

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

RETARDER SYSTEM (OPTIONAL)

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

RETROREFLECTIVE MATERIAL

A. The front and rear bumper shall be marked diagonally 45 degrees down to the centerline of the pavement with 2" x ¼" wide strips of non-contrasting retro reflective material.

B. The rear of the bus body shall be marked with strips of retro reflective National School Bus Yellow (NSBY) material to outline the perimeter of the back of the bus using material which conforms to the requirements of FMVSS 571.131 (Table I). The perimeter marking of rear emergency exits per FMVSS 217 and/or the use of retro reflective SCHOOL BUS signs partially accomplish the objective of this requirement. To complete the perimeter marking of the back of the bus, strips of at least one-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 rear corners of the bus. Vertical strips shall be applied at the corners connecting these horizontal strips. Multifunctional school activity buses (MFSABs) shall be exempt from these color requirements.

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

D. The sides of the bus body shall be marked with retro reflective NSBY material at least 1 ¾ in width, extending the length of the bus body and located vertically between the floor line and the belt line.

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

ROAD SPEED CONTROL

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

RUB RAILS

A. There shall be one (1) rub rail located on each side of the bus approximately at the seat level which shall extend from the rear side of the entrance door completely around the bus body (except for the emergency door or any maintenance access door) to a point of curvature near the outside cowl on the left side.

B. There shall be one (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 wheel housing, and shall extend only to the longitudinal tangent of right and left rear corners.

C. Rub rails shall be attached at each body post and all other up-right structural members.

D. Each rub rails shall be four inches (4") or more in width in finished form, shall be constructed of 16-gauge steel or suitable material of equivalent strength suitable to help protect body side panes from damage. Rub rails shall be constructed in corrugated or ribbed fashion.

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

F. The bottom edge of the body side skirts shall be stiffened by application of a rub rail, or the edge may be stiffened by providing a flange or other stiffeners.

SEAT AND RESTRAINING BARRIERS

A. Passenger Seating (Capacity and Design)

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.

3. All restraining barriers and passenger seats shall 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 bolts, washers and nuts in order to meet the performance requirements of FMVSS No. 222. Flange-head nuts may be used in lieu of nuts and washers. All seat frames attached to the seat rail shall be fastened with two or more bolts, washers and nuts, or with flange-head nuts. Seats may be track-mounted in conformance with FMVSS No. 222.

5. 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.

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. Passenger seat belts may be installed on large school buses over 10,000 pounds GVWR. If seat belt assembles are installed on large school buses over 10,000 lbs, they shall be of the lap/shoulder belt configuration. Seat belt assemblies shall be installed by the manufacturer or authorized dealer and must conform to FMVSS 209. All buses equipped with lap/shoulder seat belts or Child Safety Restraint Systems (which includes integrated seats, for student seating, shall contain at least 2 seat belt cutters. One belt cutter must be properly secured in a location within reach of the driver while belted into the driver's seat. The additional belt cutter shall be properly secured in a location determined by the purchaser. Belt cutters shall be durable, designed to eliminate the possibility of the operator or others being cut during the use, and must have a full handgrip.

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 the National Highway Traffic Safety Administration's (NHTSA) "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 5th percentile female to a 95th 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

1. 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.

2. 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 5th percentile adult female to 95th percentile adult male. The belt shall be of a high visibility contrasting color.

3. 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 webbing cutter shall be mounted in a location accessible to the seated driver in an easily detachable manner.

SHOCK ABSORBERS

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

SIDE SKIRTS

School bus body side skirts between the front and rear axles shall extend down to within two inches plus or minus, of the horizontal line from the center of the front spindle to the center of the rear axle. The manufacturer may offer optional side skirt lengths that extend lower than this requirement. This measurement shall apply to a new unloaded school bus located on a flat, level surface.

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 two 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.

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.

Note: 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 .0187 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 ½-inch nosing that contrasts in color by at least 70 percent 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 (seven days at 50 pphm at 40 degrees C) and Weatherometer exposure (ASTM D-750, *Standard Test Method for Rubber Deterioration in Carbon-Arc Weathering Apparatus,* seven days).

3. Flame resistance: Step treads shall have a calculated burn rate of .01 mm per minute or less using the test methods, procedures and formulas listed in FMVSS No. 302, *Flammability of Interior Materials.*

   Note: A spray on application type material may be used in lieu of item A. that meets the requirements of items B. through D. The material shall be applied not only to the interior surfaces of the service doorstep treads but also to the exterior, if not covered by undercoating.

STIRRUP STEPS

If the windshield and lamps are not easily accessible from the ground, there may be at least one 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 ARM SIGNAL

A. 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.

B. Buses shall be equipped with one stop arm, air or electrically driven, meeting SAE J1133 and the following requirements:

   1. An additional stop signal arm may be added to all Type C and D school buses. It shall be installed on the left side of the bus near the rear section of the bus and shall have one (1) "STOP" emblem facing the rear of the bus when the stop sign is in the open position (optional).

   2. A light lit illuminated "Stop" sign may be installed on the rear emergency door between the upper and lower glass panels to alert a motorist directly behind the school bus (optional).

STORAGE COMPARTMENT (OPTIONAL)

A. 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.

B. If luggage and/or equipment is to be carried on the bus, a compartment of adequate strength and capacity may be provided. The compartment shall be side mount under body type with flush mount door and recess handle and may range from ten (10) to thirty (30) cubic feet in size.

SUN SHIELD

A. Each Type C and D school bus shall have an interior adjustable sun visor with minimum measurements of 6 inches by 30 inches. It shall be installed in a position convenient for use by the driver, anchored on both ends, and shall be tinted transparent plastic or plexiglass.

B. On all Type A buses, the sun shield shall be manufacturer's standard.

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.

TIRE 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, 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.

TOWING ATTACHMENT POINTS

Front and/or 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 towing device shall have a strength rating of 13,500 pounds each, for a combined rating of 27,000 pounds with the force applied in the rearward direction, parallel to the ground, and parallel to the longitudinal axis of the chassis frame rail. 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.

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

Note: Type A buses are exempt from the requirement for front tow hooks or eyes due to built-in crush zones.

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 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.

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. Automatic transmissions shall be standard for all type school buses.

B. Automatic transmissions shall have a transmission shifter interlock controlled by the application of the service brake to prohibit accidental engagement of the transmission.

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.

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 ½ 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 ½ feet, curb-to-curb measurement.

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

B. certification to the bus body manufacturer that materials meet or exceed all performance requirements of SAE J1959, Sept. 2003 Edition of the Standard.

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

D. The undercoating material shall not cover any exhaust components of the chassis.

VENTILATION

A. Auxiliary Fan(s) shall meet the following requirements:

B. Fan(s) shall be placed in a location where they can be adjusted for maximum effectiveness and where they do not obstruct the driver's vision to the mirrors or interfere with the safe operation of the vehicle.

1. Fans shall have six-inch (nominal) diameter.

2. Fan blades shall be enclosed in a protective cage. Each fan shall be controlled by a separate switch.

C. 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.

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

E. 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 nine 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 windshield wiping system, two speed or variable speed, with an intermittent feature shall be provided. The wipers shall meet the requirements of FMVSS 104.

B. The wipers shall be operated by one or more air or electric motors of sufficient power to operate the wipers. Type A-I and A-II buses utilizing the chassis manufacturer's one-piece windshield may be equipped with two wipers driven by either one or two electric motors.

SPECIALLY EQUIPPED SCHOOL BUS SPECIFICATIONS 0INTRODUCTION

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 and Procedures and with the Federal Motor Vehicle Safety Standards (FMVSSs) applicable to their respective model year and with gross vehicle weight rating (GVWR) category.

B. Specially equipped school buses shall comply with Mississippi specifications as enumerated in the Bus Body and Chassis Specifications section of this document.

C. 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.

AIR CONDITIONING

Special needs buses shall be equipped with air conditioning. Refer to School Bus Body and Chassis Specifications, for minimum heating and air conditioning standards.

AISLES

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

COMMUNICATION SYSTEM

A. All school buses that transport individuals with disabilities shall be equipped with a two-way electronic voice communication system that can be used at any point on the vehicle's route.

B. Each bus should have a public address system capable of driver communication with passengers inside and outside the bus.

CRASH BARRIERS

A. A crash barrier with an aluminized courtesy panel extending to the floor and walls shall be placed between the lift and any seat position on a front-mounted lift (bench seat or wheelchair position). Stanchions are not acceptable.

B. There shall be a padded crash barrier approximately 8 inches in front of the forward edge of the seat cushion of all passenger seats that do not have another seat approximately 27 inches in front of them. There shall be a padded crash barrier or seat in front of any wheelchair position unless it is contiguous with and behind another wheelchair position. The forward-most barrier on both sides of the bus shall have a fullwidth, aluminized courtesy panel extending to the floor.

EVACUATION BLANKET (OPTIONAL)

A minimum of two fire-retardant, evacuation blankets, Tie Tech Evacuation Transporter Part# 1013, or equal, and a minimum of two storage pouches may be provided on buses equipped with a lift. The location to secure the evacuation blanket shall be easily accessible and determined by the purchaser at the time of the bid.

FIRE SUPPRESSION SYSTEM (OPTIONAL)

A. A fire suppression system is recommended for installation in the engine compartment.

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

C. 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.

GLAZING

Tinted glazing shall 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 retroreflective 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

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.

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 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. Handrails: (See 49 CFR 571.403, S6.4.9, *Handrails.)*

14. Circuit breaker: A resettable 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.

15. Excessive pressure: (See 49 CFR 571. 403, S6.8, *Jacking prevention.)*

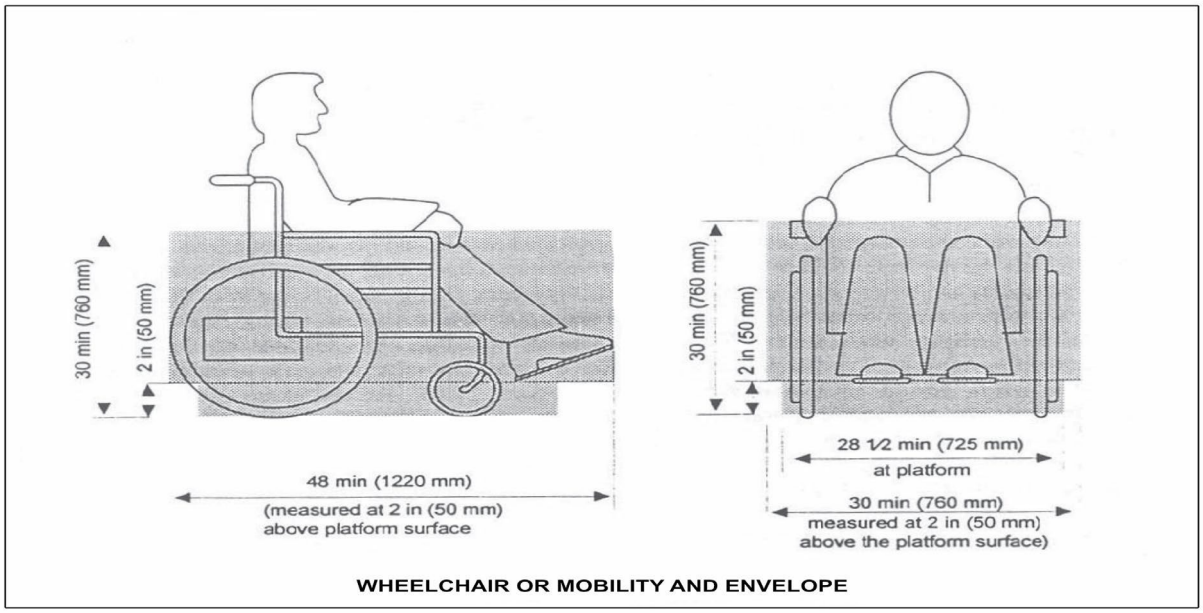
16. Documentation: The following information shall be provided with each vehicle equipped with a lift.

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

    b. Detailed instructions regarding use of the lift 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.

17. 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

18. 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.



WHEELCHAIR OR MOBILITY AND ENVELOPE

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 tiedown* and the phrases *securement system* or *tiedown 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 tiedown 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. The wheelchair tiedown 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 Tiedown and Occupant Restraint Systems for Use in Motor Vehicles.* [1]

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 manufactures 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.The WTORS, including the storage device, shall meet the flammability standards established in FMVSS No. 302, *Flammability of Interior Materials.*

5. The following information shall be provided with each vehicle equipped with a securement and restraint system:

   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.

6. 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/Tiedown: (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.) If the upper torso belt anchorage is higher than 44 inches measured from the vehicle floor, an adjustment device, as part of the occupant restraint system, shall be supplied.

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. This lighting shall be LED.

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 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 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 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. In addition to the webbing cutter required in the BUS BODY AND CHASSIS section, each specially equipped school bus that is set up to accommodate wheelchairs or other assistive or restraint devices with webbing attached shall contain an additional webbing cutter properly secured in a location to be determined by the purchaser. The webbing cutter shall meet the requirements listed in the BUS BODY AND CHASSIS section, seats and restraining barriers, paragraph E.

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 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. Each specially equipped school bus that is set up to accommodate wheelchairs or other assistive restraint devices should be equipped with an emergency evacuation device that is certified and tested to withstand at least a 300-pound load when used as an emergency stretcher or drag. This evacuation device shall be properly secured to the bus in a location to be determined by the purchaser.

D. If transporting oxygen, refer to AMO Standard 003.

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 are acceptable for use in specially equipped vehicles if:

A. Items do 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. Items do not diminish the safety of the bus interior.

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

D. Items do not require undue additional activity and/or responsibility for the driver.

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

F. Approved options allowed for specifications may include the following:
   1. Electronic Stability Control
   2. Collision Mitigation System
   3. Humprey Valve or equivalent air dump valve
   4. An exterior camera system that aides the driver by projecting an image inside the rearview mirror of the driver. Any aftermarket screens are not allowed.
   5. Predictive Stop Arm
   6. Student Tracking Systems
   7. Illuminated Safety Stop Arm (Must be Retroreflective)
   8. Illuminated School Bus Sign
   9. Clean Spray Technologies Bus Sanitation System
   10. OEM Pedestrian Detection
   11. Electronic Parking Brake

12. Auto Reverse Passenger Doors

13. MDT (Mobile Data Terminal)
    - As an option for school buses, the usage of navigation software is allowed during operation of the bus. The necessary, accompanying electronic devices are also allowed for navigation. The screen may be visible during navigation on said electronic device(s) during the operation of the bus. All use of this technology requires MDE approval prior to installation.

14. Clean Surface/CASPR

    - Prior to use of this product MDE approval for mounting location and/or padding is required.

15. Additional Back Up Lights

PUPIL TRANSPORTATION SERVICE VEHICLES

Pupil transportation service vehicles shall be standard production models and shall be equipped with adequate springs, axles, tires, and other load carrying components to meet GVWR requirements. Optional equipment may be purchased for service vehicles provided they appear as part of the specifications used by the respective school districts in soliciting bids on service vehicles.

USED SCHOOL BUSES

All used school buses purchased or operated by a local education agency or private contractor shall meet the Mississippi Minium Standards for School Buses for the year in which the bus was manufactured.

MULTIFUNCTIONAL SCHOOL ACTIVITY BUS SPECIFICATIONS

DEFINITION:

A Multifunctional School Activity Bus (MFSAB) is a school bus constructed to Federal Motor Vehicle Safety Standards (FMVSS) and Mississippi Minimum School Bus Specifications. It must be purchased or leased as a new bus and shall only be used for extracurricular activities. THESE BUSES SHALL NOT BE USED TO TRANSPORT STUDENTS TO AND FROM HOME, SCHOOL BUS STOPS, OR BETWEEN SCHOOLS FOR THE PURPOSE OF ATTENDANCE.

The following exceptions to the Mississippi Minimum Specifications for School Buses for regular route buses shall be allowed for Multifunction School Activity Buses.

CHILD CHECK SYSTEM

Child check systems are required on all MFSAB.

COLOR:

The local education agency (LEA) with school board approval may determine the color of the activity bus. The color scheme may utilize any combination of up to THREE colors. This combination may be in addition to the white roof. The color National School Bus Yellow (SBMTC-008 Publication) shall not be used as a part of the color scheme.

The local education agency and/or vendors shall submit preliminary color and graphic schemes to the Mississippi Department of Education, Pupil Transportation Division for approval prior to the purchase or manufacture of a Multifunctional School Activity Bus (MFSAB).

IDENTIFICATION:

A. The bus body shall bear the words "ACTIVITY BUS" in a contrasting color at least 8 inches high in the area where "school bus" is normally positioned. Lettering and numbering shall conform to FMVSS and Mississippi Minimum Specifications and shall meet reflectivity standards. Bus numbering on this bus may be of a contrasting color.

B. The name of the school district, or school shall be displayed in at least five-inch letters on both sides of the bus in the beltline area. If a school system elects to put the name of the school in the beltline, the school system shall be displayed on both sides of the bus in the rear skirt area with a minimum of 3" letters. NO SIGNS shall be applied to any area of the bus including the bumpers. Mascot logos may be placed on the bus with approval from the Mississippi Department of Education, Pupil Transportation Division.

C. No signs, logos, or other items that obstruct visibility shall be displayed on the windows of the bus. No full wraps are allowed, and no decals shall cover reflective safety material.

D. Full or modified wrapping of existing regular route school buses purchased to transport students between home and school as a Multifunction School Activity Buses are not allowed.

INSPECTIONS:

Inspections by qualified technicians at the LEA shall be performed on all Multifunctional School Activity Buses (MFSAB) as required by state law and the rules and regulations of the Mississippi State Board of Education.

LIGHTING AND WARNING DEVICES:

All Multifunctional School Activity Buses (MFSAB) shall meet state and federal standards for normal school bus lighting and warning device requirements with the following exceptions:

A. Multifunctional School Activity Buses (MFSAB) shall not be equipped with alternately flashing amber or red signal lamps used for loading and unloading students.

B. Multifunctional School Activity Buses (MFSAB) shall not be equipped with stop arm signals or crossing control arms.

REGULATIONS:

These buses shall be owned by the LEA or leased from private school bus transportation contractors. All Mississippi laws, rules of the State Board of Education, and other applicable regulations pertaining to the operation of school buses and certification of school bus drivers shall apply to Multifunctional School Activity Buses.

SEATING:

Activity seats, which meet FMVSS 222 and 210, may be used in lieu of regular school bus seats. If activity seats are used, passenger seat belts are optional on Type C and Type D MFSAB. These seat belt assemblies shall be of the lap/shoulder configuration and shall be installed by the manufacturer, or authorized dealer, and must conform to FMVSS 209, 210, 222 and 225.

ALTERNATIVE POWER SPECIFICATIONS

INTRODUCTION

This section is designed to be used as an overview of the alternative fuels being utilized for school transportation. It is not designed to replace current applicable federal, state, manufacturing or safety specifications that may exceed requirements within this section. There may be advancements in engineering and improvements in equipment fabrication methods and operating practices that differ from those specifically called for in this section. Such deviations or improvements may provide safety and may meet the intent of, and be compatible with, this section. Entities wishing to purchase alternative fuel school buses should use this section only as a starting point. More detailed specifications, including specific design and performance criteria and safety specifications, should be researched by prospective purchasers of alternative fuel school buses.

GENERAL REQUIREMENTS

Alternative power school buses shall meet all the specifications in this manual and the specific requirements for the type of alternate power systems listed below:

1. Chassis shall meet all specifications previously mentioned in BUS CHASSIS SPECIFICATIONS.

2. Chassis shall meet all applicable Federal Motor Vehicle Safety Standards (FMVSS).

3. The fuel system integrity shall meet the specified leakage performance standards when impacted by a moving contoured barrier in accordance with test conditions specified in FMVSS No. 301, *Fuel System Integrity,* or FMVSS No. 303, *Fuel System Integrity of Compressed Natural Gas Vehicles,* as applicable.

4. Original equipment manufacturers (OEMs) and conversion systems using compressed natural gas (CNG) shall comply with National Fire Protection Association (NFPA) Specification 52 2013, *Compressed Natural Gas Vehicular Fuel Systems.* Fuel systems using liquefied petroleum gas (LPG) shall comply with NFPA Specification 58 2014, *Liquefied Petroleum Gases Engine Fuel Systems.*

5. Fuel tank(s) for vehicles of less than 54 passenger capacity powered by LPG or CNG shall have a minimum 40-gallon capacity. Fuel tank(s) for vehicles of 54 or more passenger capacity powered by LPG or CNG shall have a minimum 60- gallon capacity.

6. Natural gas-powered buses may be equipped with an interior/exterior gas detection system. All natural gas-powered buses may be equipped with an automatic or manual fire detection and suppression system.

7. All materials and assemblies used to transfer or store alternative fuels shall be installed outside the passenger/driver compartment.

8. All Types C and D buses using alternative fuels shall meet the same base requirements of BUS CHASSIS SPECIFICATIONS for passenger load.

9. The total weight shall not exceed the vehicle's GVWR when loaded to rated capacity.

10. The manufacturer supplying the alternative fuel equipment must provide the owner and operator with adequate training and certification in fueling procedures, scheduled maintenance, troubleshooting and repair of alternative fuel equipment.

11. All fueling equipment shall be designed specifically for fueling motor vehicles and shall be certified by the manufacturer as meeting all applicable federal, state and industry standards.

12. All on-board fuel supply containers shall meet all appropriate requirements of the American Society for Mechanical Engineering (ASME) code, U.S. Department of Transportation (DOT) regulations or applicable FMVSSs and NFPA standards.

13. All fuel supply containers shall be securely mounted to withstand a static force of eight times their weight in any direction.

14. All safety devices that discharge to the atmosphere shall be vented to the outside of the vehicle. The discharge line from the safety relief valve on all school buses shall be located in a manner appropriate to the characteristics of the alternative fuel. Discharge lines shall not pass through the passenger compartment.

15. CNG buses shall have a positive, quick-acting (¼ turn) shut-off control valve shall be installed in each gaseous fuel supply line, as close as possible to the fuel supply containers. The valve controls shall be placed in a location easily operable from the exterior of the vehicle. The location of the valve controls shall be clearly marked on the exterior surface of the bus.

16. An electrical grounding system shall be required for grounding of the fuel system during maintenance-related venting.

17. Fuel systems identified as compatible with biodiesel must be provided with components compatible with biodiesel conforming to the specifications of ASTM 6751, *Biodiesel Standard.*

18. High Voltage-Powered Vehicles: Buses utilizing a high voltage propulsion system (more than 48 nominal volts) shall meet the requirements of FMVSS 305, *Electric Powered Vehicles: Electrolyte Spillage and Electrical Shock Protection,* except for the following:

    a. The propulsion power source (batteries, fuel cells, etc.) shall be located outside the passenger compartment.

    b. The propulsion power source enclosure shall be constructed to conform to the power source manufacturer's requirements and recommendations.

    c. Due to the much larger size and quantities of the propulsion power sources on larger vehicles, buses over 10,000 lbs. are permitted to exceed the 5.0-liter spillage constraint of Section S5.1, Electrolyte damage from propulsion batteries and the requirements to statically rotate the vehicle on its longitudinal axis post-test.

HIGH VOLTAGE-POWERED VEHICLES

The Mississippi School Bus Minimum Specification is the primary specification for all public-school buses in Mississippi pursuant to Mississippi Code Annotated Section 37-41-1: All applicable provisions of the Mississippi School Bus Minimum Specifications of school bus body and chassis shall be adhered to unless specifically mentioned in this section. This section and specifications listed in this section are for new electric school buses only and does not allow for the modification of any existing school bus.

Training For State Personnel, Local School District Personnel, and First Responders

The vendor shall be required to provide training for state personnel, transportation directors/supervisors, bus shop foreman, school bus mechanics/technicians, bus driver instructors, bus operators, and first responders in the safe and efficient operation, inspection, repair, maintenance, and emergency response of the bus. This training may be provided at multiple locations around the state in response to local demands.

Compliance With FMVSS and SAE

A high voltage-powered vehicle shall meet all Federal Motor Vehicle Safety Standards and all Society of Automotive Engineers standards that are applicable at time of manufacture.

Alternator

The alternator shall meet the applicable state specifications in the School Bus Body and Chassis section. Alternately, the alternator functions may be performed by the Hybrid Drive System Batteries.

Battery(ies)

Low Voltage Battery

The Low Voltage Battery shall meet the applicable state specifications in the School Bus Body and Chassis. Alternately, the Low Voltage Battery functions may be performed by the Hybrid Drive System Batteries.

Hybrid Drive System Batteries

A. Energy storage for the Hybrid Drive System shall be protected from crash impacts and shall be encased in a non-conductive, acid-resistant compartment. This compartment must be well ventilated to preclude the possibility of hydrogen gas buildup. Energy storage shall be located in an area and in such a way as to provide ease of service.

B. Batteries shall require automatic electrical isolation in the case of a vehicle crash.

C. The Hybrid Drive System Batteries shall allow for a minimum storage of 28 kWh for charge depletion.

D. The high voltage battery system integrity shall meet the specified spillage performance standards in accordance with test conditions specified in FMVSS No. 305 as applicable.

Battery Management System

A. The Hybrid Drive System Batteries may be equipped with a system that allows the batteries to be charged via connection to the local electric utility, otherwise known as a Plug-in Hybrid Electric system. The plug connector shall make a conductive electrical connection and shall be an Apollo 200 AMP connector by BIW Connector Systems or approved equal.

B. The Hybrid School Bus shall have equipment for monitoring the status of the batteries while the batteries remain on the vehicle. This equipment shall include the capability to balance the state of charge and monitor temperature of individual battery modules (if appropriate).

Brakes, Service

The Hybrid School Bus shall include a regenerative braking system that uses the motor and/or generator to slow the vehicle in conjunction with the service brakes while returning electrical energy to the Hybrid Drive System Batteries.

Differential Ratio

The Differential shall be compatible with the Transmission/Hybrid Drive System and provide for a minimum of 65 mph in highest gear.

Engine Equipment

A. The hybrid system shall include a system that deactivates the engine when not in use, such as, at red lights, and reactivates the engine when needed for acceleration.

B. The engine shall be equipped with system that electrically heats the engine to maintain minimum starting temperature. This system should be integrated with the Plug-in Battery Management System, if so equipped, and not require a separate electrical grid connection. The engine heater shall also heat the fuel filtration system. The engine heater shall be switched to allow this heating to be optional.

Fuel System Capability

The diesel fuel system shall be capable of operating with a 20 percent biodiesel blend (B20).

High Voltage System

A. High Voltage-Powered Vehicles: Buses utilizing a high voltage propulsion system (more than 48 normal volts) shall meet the requirements of FMVSS No. 305, *Electric Powered Vehicles: Electrolyte Spillage and Electrical Shock Protection,* except for the following:

   1. The propulsion power source (batteries, fuel cells, etc.) shall be located outside the passenger compartment.

   2. The propulsion power source enclosure shall be constructed to conform to the power source manufacturer's requirements and recommendations.

   3. Due to the much larger size and quantities of the propulsion power sources on larger vehicles, buses over 10,000 lbs. are permitted to exceed the 5.0-liter spillage constraint of Section S5.1, *Electrolyte damage from propulsion batteries* and the requirements to statically rotate the vehicle on its longitudinal axis posttest.

B. Wire, cable, and conductor insulation in the High Voltage System shall provide adequate insulation for the voltage used and for ambient temperatures ranging from - 15°F to 120°F. All high voltage circuits shall be bright orange in color or otherwise labeled as HIGH

C. VOLTAGE. All high voltage circuits shall provide adequate and automatic protection against electrical overloads caused by short circuits or other excessive current conditions through the use of fuses, circuit breakers, and ground fault interruption.

D. Each door, cover, or other panel that affords immediate access to any high voltage area shall be plainly marked with a hazard warning label which shall read WARNING-HIGH VOLTAGE or DANGER-HIGH VOLTAGE. This label shall be located in a highly conspicuous place. All high voltage access areas shall be equipped with a lock or otherwise secured to prevent unauthorized access.

E. The High Voltage System should be designed so that when the ignition switch is off, the propulsion motor is positively disconnected. All other accessories powered by the main propulsion battery circuit shall remain operable when the ignition switch is off.

F. All buses shall be equipped with an additional manual or automatic switch or device independent of the propulsion motor disconnect controls that permits the positive disconnection of all circuits from the Hybrid Drive System Batteries. This switch shall be operable from outside the vehicle. Each door or panel providing access to this switch shall be plainly marked to indicate that it is a main-power-disconnect switch or device.

Ignition System

The ignition switch circuit shall be linked to the Battery Management System and will prevent driving the vehicle while it is connected to an external battery charging source.

Transmission/Hybrid Drive System

A. The Hybrid Drive System shall work in conjunction with the chassis engine to provide motive power to the bus. This system shall be automatically controlled requiring no intervention by the driver after it has been put in forward or reverse gear. Systems that require the use of a manual clutch or require the driver to shift through a progression of gears will not be accepted.

B. The Hybrid drive controller/converter system shall incorporate a Ground Fault Interrupt (GFI) system that protects passengers and others from electrical shock if a shorted circuit or water intrusion situation occurs.

C. The bus dash shall have an indicator light that indicates whether the bus is operating in Charge Depleting or Charge Sustaining mode. Charge Depleting is an operating mode in which the state of charge of the Hybrid Drive System Battery decreases as the bus operates. At a certain minimum state of charge, the bus becomes Charge Sustaining. Charge Sustaining is an operating mode in which the Battery Management System seeks to maintain or increase the state of charge of the Hybrid Drive System Battery. The Hybrid School Bus shall have the capability to operate in both modes.

D. The Hybrid Drive System shall have a system for protecting system components from thermal damage due to electrical overload. This system should include temperature sensors at critical points and be capable of reducing Hybrid Drive System electrical power when necessary. The bus dash shall have a warning light that indicates when a Hybrid Drive System component exceeds a safe temperature.

E. The warning light should illuminate prior to critical temperature to allow sufficient time to safely stop the bus.

BATTERY ELECTRIC VEHICLES (BEV)

BACK-UP ALARM

BEVs shall be equipped with a back-up alarm to warn other vehicles and pedestrians when the school bus drive is placed in Reverse.

BATTERY(IES)

Low Voltage Battery(ies)

A. The low voltage battery shall meet the applicable state specifications.

B. At lec:1st one (1) low voltage battery will be installed to provide power to 12VDC circuits.

C. A low voltage battery shutoff switch shall be installed in the vicinity of the low voltage battery compartment in an area not easily accessible to the driver or passengers. If behind an access door or panel, the location of the low voltage battery shutoff switch must be clearly labeled on the exterior of the door or access panel.

High Voltage Battery(ies)

A. High voltage battery assemblies shall be located in between or under chassis frame rails protected by a steel cradle.

B. High voltage batteries shall have a main service disconnect that isolates the batteries and does not allow high voltage outside the battery pack.

BATTERY MANAGEMENT SYSTEM

A. The high voltage batteries shall be equipped with a system that allows the batteries to be charged via a connection to the local electric utility grid. This connection shall be a Combined Charging System (CCS) or SAE J1772, compatible with the charging equipment.

B. The charging receptacle/port shall be mounted/located in accordance with manufacturer standards. The receptacle shall accommodate the minimum requirements for Level II AC charging DC fast charging.

C. If the charging port is behind a door or an access panel, the door or access panel will be clearly labeled with the location of the charging port.

D. Vehicles shall have on-board equipment to monitor and display battery health. This displayed information shall include but is not limited to:
   1. High voltage battery state of charge
   2. Motor temp

3. Battery available range in miles
4. Battery discharge and regeneration rates
5. Battery health (temperature, battery cell balancing, as applicable, etc.)

BRAKES, SERVICE

In addition to service brake specifications for combustion engine buses, BEVs will be equipped with a regenerative braking that utilizes the electric drive system in concert with the service brakes to slow the vehicle and return electrical energy to the battery system.

DC-DC CONVERTER

A. A DC-DC converter shall be provided and deliver a minimum of 200 amps at 12VDC.

B. The converter system shall incorporate a Ground Fault Interrupt (GFI) that disconnects/isolates the high voltage batteries in the event of a shorted circuit or water intrusion.

C. Charging connection point shall be outside the passenger compartment

EXTERIOR MARKING

In addition to the marking/labeling specified this manual, BEVs will have clear markings/labeling, with the word "Electric" indicating that the school bus is electric powered.

A. Image graphics may be used in combination with words.

B. Lettering will be a minimum of two inches high, blue in color.

C. Lettering to include imagery shall be located on both sides of the school bus along the roof cap starting above the service door and ending no further than the forward edge of the second passenger window. Additional marking/labeling shall be added to the rear of the bus but shall not be placed in any windows or crowd/encroach on any required emergency/standard markings.

D. The bus numbering of electric school buses shall include the letters EV to identify the bus as an electric vehicle (EX: 25-04EV).

HEATING AND COOLING

Heaters and air conditioning shall be capable of heating and cooling the passenger and driver's compartments.

HIGH VOLTAGE SYSTEM

A. High Voltage-Powered Vehicles: Buses utilizing a high voltage propulsion system (60 VDC or 30 VAC) shall comply with the following:

   1. The propulsion power source (batteries, fuel cells, etc.) shall be located outside the passenger compartment.
   2. The propulsion power source enclosure shall be constructed to conform to the power source manufacturer's requirements and recommendations.

B. Wire, cable, and conductor insulation in the High Voltage System shall provide adequate insulation for the voltage used and for ambient temperatures ranging from - 15°F to 120°F. All high voltage wiring/cabling shall be covered with bright orange loom or otherwise labeled as HIGH VOLTAGE. All high voltage circuits shall provide adequate and automatic protection against electrical overloads caused by short circuits or other excessive current conditions through the use of fuses, circuit breakers, and ground fault interruption.

C. Each door, cover, or other panel that affords immediate access to any high voltage area shall be plainly marked with a hazard warning label which shall read WARNING-HIGH VOLTAGE or DANGER-HIGH VOLTAGE. This label shall be located in a highly conspicuous place. All high voltage access areas shall be equipped with a lock or otherwise secured to prevent unauthorized access.

IGNITION SYSTEM

A. The ignition switch circuit shall be linked to the Battery Management System and will prevent the driving of the vehicle while it is connected to an external battery charging source.

B. The high voltage system shall be designed so that when the ignition switch is off, the high voltage is positively disconnected.

LOW SPEED SOUND GENERATOR

A. BEVs shall be equipped with a low-speed sound generator to warn other vehicles and pedestrians of the school bus's approach i.e., when approaching an intersections and crosswalks. The sound generator will remain on when the school bus is in any drive gear except reverse.

B. The low-speed sound generator shall not emit sound while the bus is completely stopped, with the transmission in neutral or park, and with the parking brake set e.g., while loading and unloading.

PROPULSION SYSTEM/DRIVETRAIN

A. Shall be of sufficient power and torque to propel the vehicle fully loaded up to at least 60 mph and no more than 65 mph.

B. The propulsion system may be mounted utilizing a drivetrain or positioned in a way to provide power to the wheels.

C. All propulsion systems must be contained below the floor line and cannot come into contact with the road surface.

D. Propulsion system warranties shall be a minimum 5 years/100,000 miles.

SEATING

All seats shall be mounted to minimize contact with batteries and underside of the bus if seat replacement is necessary.

SYSTEM PROTECTION

A. As part of the Battery Management System, the BEV will be equipped with an automatic shutdown to protect system components from damage caused by malfunctions such as charging/discharging faults, battery overheating, electrical overheating, degraded battery health, etc.

B. Prior to automatic shutdown, a warning or maintenance indicator shall display in the driver console to notify the driver of impending shutdown or the need for immediate maintenance and allow enough time to safely reposition and stop the bus. Gradual derating of propulsion prior to complete automatic shutdown.

EQUIPMENT FOR TRANSPORTATION OF PRE-SCHOOL AGE CHILDREN

The school bus is important in the educational development of young children who have special needs because it is the mechanism for transporting them to and from support and development programs. Infants, toddlers, and pre-school children with or without special needs present a particular challenge for transportation personnel because school buses were not designed to transport very young children as passengers. Therefore, these children present multiple challenges to providers of school bus transportation services. Nevertheless, great strides have been made in the types of equipment used to assist pre-school children with or without special needs to safely adapt to school bus transportation.

Challenges relating to proper installation, maintenance and use of Child Safety Restraint Systems (CSRSs), including car seats, arise. Many of these challenges are addressed in NHTSA's "Guideline for the Safe Transportation of Pre-school Age Children in School Buses" (February 1999).

Each pre-school age school bus passenger should use a child safety restraint system appropriate for the child's age, weight, height and specialized needs, as determined by the IEP. Thus, a team effort is required to ensure that appropriate and proper specifications are developed for the procurement of equipment that meet the specific needs of each individual school bus passenger.

The following Federal Motor Vehicle Safety Standards are applicable in this section:

FMVSS No. 208 Occupant Protection
FMVSS No. 209 Seat Belt Assemblies
FMVSS No. 210 Seat Belt Assembly Anchorages
FMVSS No. 213 Child Restraint Systems
FMVSS No. 217 Bus Emergency Exits and Window Retention Release
FMVSS No. 222 School Bus Passenger Seating and Crash Protection
FMVSS No. 225 Uniform Child Restraint Anchorages

A. All CSRSs used in the school bus must

1. Meet requirements of FMVSS No. 213.

2. Be installed, cleaned, maintained and used according to the manufacturer's instructions.

3. Not be under a recall that recommends non-use of the CSRS.

4. Have all parts intact and in working order.

5. Must not have exceeded the manufacturer's assigned expiration date.

6. Be secured to a vehicle seat with a safety belt that meets FMVSS No. 209 or anchorages to meet FMVSS No. 225 or FMVSS No. 210; and

7. Use safety belts or latch systems that are installed only on bus seats that meet FMVSS No. 210.

8. Be replaced when occupied during a school bus crash as specified by the manufacturer of the CSRS.

B. Child Safety Restraint Systems (CSRSs)

CSRSs used in school buses must be appropriate for the individual child and must be used correctly. All of the restraint systems used for transportation must be secured to the bus seat in the manner prescribed and approved by both the school bus and CSRS manufacturer.

1. Elements of Correct Installation of CSRSs

   It is recognized that compartmentalization, the passive safety restraint system required in school buses under FMVSS No. 222, provides a higher level of safety to children over 40 pounds. Children diagnosed with medical complexities or fragility might require special securement or positioning systems.

   a. Direction

      Position (rear- or forward-facing) and adjust recline angle accordingly. Some rear-facing seats are designed for rear-facing only and may not be used in a forward-facing position. (Check manufacturer's instructions.)

   b. Belt Paths and Harness Strap Location

      Use the correct belt path and harness strap slots on the CSRS as directed by the manufacturer's instructions.

      Note: Heavy coats should be removed to ensure a tighter fit.

   c. Installation

      To achieve tight installation, place hand on and push down in the CSRS to compress the bus seat cushion. With the buckle(s) engaged, pull the loose end of the seat belt(s) to tighten and lock the safety belt. The CSRS should not move more than one inch forward or side-to-side when tested by grasping the seat at the belt path.

2. Types of Restraints
3.

a. *Rear-facing CSRS (infant-only)*

These seats are designed for infants from birth to twenty or twenty-two pounds (manufacturer's instructions) and who usually are less than 26 inches in length. These seats are used in rear-facing position at a 45 degree recline, which provides support to the infant's head, neck and back.

b. Convertible CSRS (Rear-Facing)

Rear-facing infant position is designed for children from birth to twenty pounds, one year of age (manufacturer's instructions), weighing up to twenty pounds and usually less than 26 inches in length. Many CSRSs are now available to accommodate larger children (30 to 35 lbs.) in the rear- facing position. Note: See manufacturer's guidelines for weight and height restrictions. It is recommended that children ride rear facing as long as recommended or allowed by the CSRS manufacturer.

c. Convertible CSRSs (Forward-Facing)

Forward-facing CSRSs with five-point harness, T-Shield or tray-shield are designed for children above twenty to sixty pounds. (Rear-facing position should be maintained for as long as recommended or advised by the manufacturer.) Some forward-facing-only seats are available to accommodate larger children. Note: Some CSRSs cannot be installed properly in a twenty-inch bus seat (i.e., tray-shield and some convertible seats).

d. *CarBeds*

A car bed for infants up to 20 pounds allows the infant to lie flat. The use of a car bed should be predicated on the advice of a physician or an appropriate medical support professional (e.g., physical/occupational therapist) and approved by qualified personnel at an IEP team meeting.

e. *Specialized Positioning*

Specialized positioning seats are used only when a child does not fit in a standard CSRS or has a particular condition warranting more support. As per NHTSA's, "Child Passenger Safety Training Instructor Guide for School Buses," tether straps are not required in school buses; however, some special needs CSRSs require a tether strap. (See manufacturer's instructions and all NHTSA curricula to determine the specifics.)

f. Safety Vests

The decision to use a vest should be made by an IEP team that includes qualified personnel and the parent, and the use of safety vests should be noted on the IEP. Vest selection should be appropriate for the size and needs of the child. Proper fit must account for seasonal changes in clothing. Pre-school children, due to their age, weight, physical development and their overall mental ability, should be securely fitted with a crotch strap supplied by the manufacturer. (Only vests required under FMVSS 213 will have a crotch strap supplied by the manufacturer. It is not optional.) Safety vests must be used only on school bus seats. The entire seat directly behind the child in the seat-mounted vest must be unoccupied or have restrained occupants. Vests shall be anchored, as specified by the manufacturer.

g. Wheelchairs

All decisions regarding the use of wheelchairs in the school bus must be made by an IEP team that includes qualified personnel and the parent and should be noted on the IEP. School buses must be properly equipped to accommodate wheelchairs or other mobility devices before transporting passengers who require such devices. (See the Specially Equipped School Bus Specifications section, this document.)

C. Bus Seat Designated for a Child Safety Restraint System

The transportation provider should ensure installation and use in accordance with the following NHTSA guidelines:

1. Locations of school bus seats designated for CSRSs should start at the front of the vehicle to provide drivers with quick access to the CSRS occupants.

2. CSRS anchorages on school bus seats should meet all applicable FMVSSs.

3. The non-adjustable end of the lap belt should be positioned at the center for a CSRS placed next to the window; or, at the aisle for a CSRS placed next to the aisle.

4. The non-adjustable end of the lap belt must not extend more than one to two inches from the seat.

5. When ordering new school buses, the maximum spacing specified under FMVSS No. 222, School Bus Passenger Seating and Crash Protection, (within 24 inches space from the seating reference point) is recommended for seats designated for CSRSs to provide adequate space for the CSRSs.

6. The combined width of CSRSs and/or other passengers on a single seat does not exceed the width of the seat.

7. If other students share seat positions with CSRSs, the CSRSs are placed in the window-seating position, excluding emergency exit windows.

D. Medical Equipment

All decisions regarding medical equipment in the school bus should be made in accordance with state laws and regulations. Decisions regarding medical equipment should be the joint decision of trained personnel who are knowledgeable about the type of medical assistance and support a pre-school child may need while in a school bus. Decisions should be made by qualified team members in attendance at IEP meetings, including the parent. The IEP document should include all the appropriate information. Safe transportation specifications should be documented on the IEP. Some special considerations and recommendations are as follows:

1. All medical support equipment shall be secured at the mounting location to withstand a pulling force of five times the weight of the item.

2. Latched compartments are the preferred methods of transport.

3. All medical equipment should be secured below the window.

4. Oxygen equipment (liquid or gas) shall be approved by the manufacturer for transport and should be securely mounted to the bus and fastened to prevent damage and exposure to intense heat levels.

Note: Refer to the SPECIALLY EQUIPPED SCHOOL BUS SPECIFICATIONS section.

E. Special Considerations

Because of the dependency of young children and the need to make decisions on a case-by-case basis, the following section on special considerations is provided for guidance on a variety of issues related to the transportation of pre-school children.

1. Equipment Maintenance: Procedures should be established for scheduled maintenance, cleaning and inspection of all equipment, including CSRSs. Procedures should be in place to assure that all equipment is checked regularly for recalls and for product expiration dates. Procedures must be in place for cleaning CSRSs according to manufacturers' instructions. Proper disposal of outdated equipment is important.

Note: A recall list may be found at www.nhtsa.dot.gov.

2. Radios/Two Way Communication and Cell Phones

   Refer to the SPECIALLY EQUIPPED SCHOOL BUS SPECIFICATIONS
   section.

SALE AND DISPOSAL OF USED PUPIL TRANSPORTATION EQUIPMENT

Mississippi Code Sections Ann. §37-7-451 through 37-7-457 provide authority for the Disposition of Property Not Needed for School Purposes. This has been considered a legal means of selling school buses that are no longer needed in the transportation program. Advertisement for competitive bids on the sale of this equipment is required under the above sections. In the event that one school district sells transportation equipment to another school district, it is necessary to comply with the provisions of Section 37-41-101(5), MS Code of 1972, amended. It is not necessary to obtain approval from the Mississippi Department of Education to dispose of said equipment.

The procedures outlined in this section should be used in order to assure the proper disposal of school buses that are sold or otherwise removed from the local education agency's school bus fleet.

If the bus is sold to another local education agency, private school, or other educational agency that will continue to use the vehicle as a school bus, only the name of the school system and the tag should be removed. If the bus is sold or traded to a dealer, only the tag should be removed. The school bus dealer will remove the name of the school district.

Federal and state law requires that school buses be equipped with signal lamps and other visual signals and markings that clearly identify the vehicle as a school bus. School buses are also equipped with specialized equipment that are designed to protect students, school bus drivers, and motorists. These visual markings, signals, and other specialized equipment, which include amber and red flashing lights, stop signs, warning signs on the rear of the bus, school bus lettering, and crossing control arms, are peculiar to school buses and may not be used on other vehicles, except as provided under Mississippi law. Accordingly, the disposal of school buses requires measures above and beyond those necessary for the disposal of other school district vehicles.

To avoid possible liability, improve security, and also ensure compliance with the law, the following procedures should be followed when disposing of buses that will no longer be used as school buses:

A. Disable the overhead amber and red flashing lamps, stop arm(s), and crossing arm used for loading and unloading students.

B. Remove all references to the entire name of the school district on the sides of the bus, not just the name of the county or city.

C. Remove the words "SCHOOL BUS" on the front and rear of the bus.

D. Remove the tag from the vehicle before the sale.

Mississippi Code Ann. §63-7-79

1. Any person who owns or operates a used school bus for the purpose of transportation or use of any kind on the public roads and highways of the State of Mississippi, other than for school purposes, shall change the color of such bus from the regular school bus color of yellow or national school bus chrome to a color in contrast to this color before such bus can be used or operated on the highways or public roads in Mississippi.

2. The vendor or owner of any school bus shall inform the purchaser in writing at or prior to the time of the sale of any bus not to be used for school purposes as to the requirements of this section.

3. Any person who shall violate the provisions of this section shall, upon conviction thereof, be fined not less than twenty-five dollars (425.00) nor more than one hundred dollars ($100.00).

APPENDIX A - COLORADO RACKING LOAD TEST

The Colorado Racking Test shall be required on or before the acceptance date of the first bus of the respective configuration.

TEST PROCEDURE:

In addition to complying with the test procedures described in FMVSS No. 220, the body manufacturers shall record and report the downward vertical movement of the force at 0, 25, 50, 75 and 100 percent of the maximum force (both loading and unloading). The expected force deflection curve is illustrated schematically in Figure 1a. Low load nonlinearities may indicate joint deformation; high load nonlinearities may indicate yielding in structural members.

A second load cycle shall be performed following the procedure given in the first paragraph. The expected force-deflection curve is illustrated schematically in Figure 1b. Any hysteresis following the initial shakedown will be revealed by this second cycle.

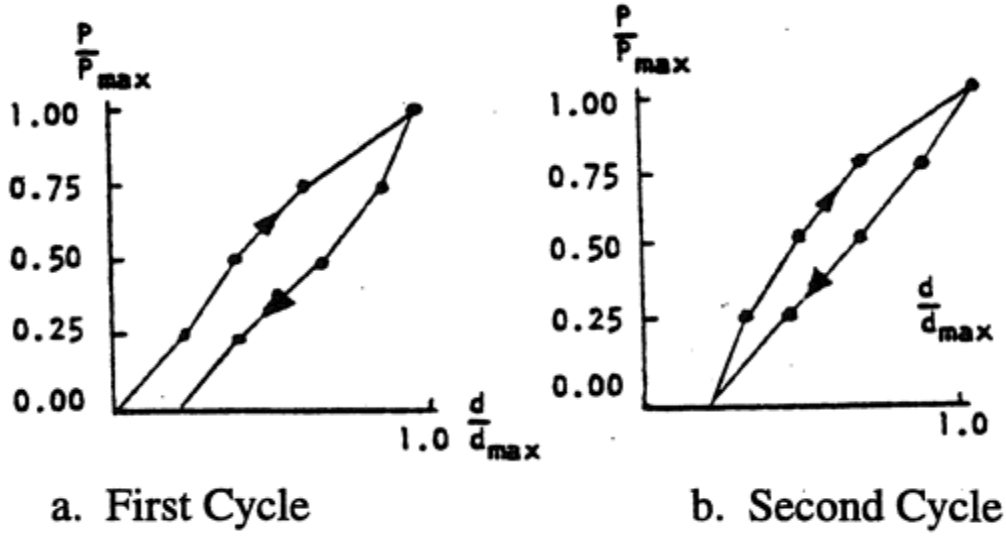


Figure 1. Static Load Test Load-Deflection Curves

A diagonal (racking) load test must be performed on types A, B, C and D school buses to assure adequate shear stiffness and strength of the bus body. Details of the test are provided below:

A two-cycle loading sequence shall be conducted following the described procedure.

A. **Requirements:** When a force equal to 1 1/2 times the gross vehicle weight (GVW) is applied to the edge of the roof of the vehicle's body structure through a force application plate, as specified in Test Procedures (b):

   1. The diagonal movement of the force at any point on the application plate shall not exceed 5 1/8 inches; and

2. Each emergency exit of the vehicle provided in accordance with FMVSS No. 217 shall be capable of operation as specified in that standard during the full application of the force and after release of the force.

B. **Test Procedures:** Each vehicle shall be capable of meeting the requirements of (1) and (2) when tested in accordance with the procedures set forth below.

a. The vehicle shall be supported on a rigid surface along the lower edge of the frame or along the body sills in the absence of a frame.

b. The load shall be applied through a force application plate that is flat and rigid. The dimensions of the plate shall be chosen to assure that the plate edges never make contact with the vehicle skin during testing. A typical width is 18 inches, and a typical length is 20 inches less that the length of the vehicle's roof measured along its longitudinal centerline.

c. Place the force application plate in contact with the edge of the vehicle roof. Orient the plate so that its flat, rigid surface is perpendicular to a diagonal line connecting the most distant points on an interior cross-section of the vehicle. The rear edge of the plate shall be positioned approximately 20 inches from the rear edge of the vehicle roof. A temporary stand may be used to support the plate until a force is applied.

d. Apply an evenly distributed force in a diagonally downward direction through the force application plate at any rate not more than 0.5 inch per second, until a force of 500 pounds has been applied.

e. Apply additional force in a diagonally downward direction through the force application plate at a rate of not more than 0.5 inch per second until the force specified in (a) has been applied, and maintain this application of force.

f. Measure the diagonal movement of any point on the force application plate that occurred during the application of force in accordance with (b)(5), and open the emergency exits as specified in (a)(2).

g. Release all diagonal force applied through the force application plate, and operate the emergency exits as specified in (a)(2).

C. **Test Conditions:** The following conditions apply to the requirements specified in (3).

a. Temperature: The ambient temperature is between 32 degrees F and 90 degrees F.

b. Windows and Doors: Vehicle windows, doors, and emergency exits are in the fully-closed position, and latched but not locked.

D. **<u>An alternative method</u>** of testing for the racking load test shall be as follows:

The racking load shall be applied along a line connecting the most distant points on a transverse cross- section of the bus interior. It produces a shear distortion of the cross-section, as shown in figure 2.

A representative method of loading that employs a hydraulic jack to load a two-frame test assembly is illustrated in figure 2.

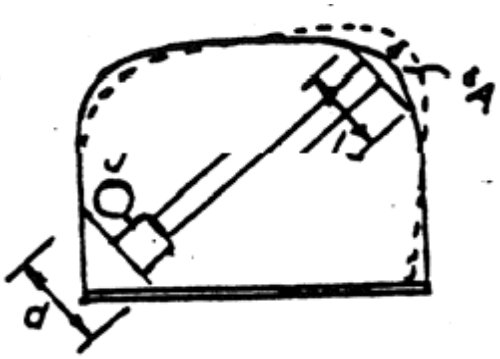
The maximum jack load for the two-frame assembly is determined by the following formula:

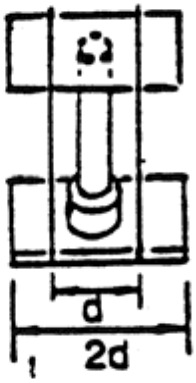
J = 2P J - maximum jack load for two-frame test assembly P = load/frame

where P = Dynamic Vehicle Weight (DVW) divided by N DVW - dynamic vehicle weight
N - total number of bus body frames and DVW = DF x GVW
DF - dynamic factor, not less than 1.5 GVW - gross vehicle weight

Thus, for a DF = 1.5, a GVW = 22,000 pounds-force (lbf) and N= 11, the dynamic vehicle weight is DVW = 33,000 lbf, the load/frame is P = 3000 lbf and the maximum jack load is J = 6000 lbf.

When a complete bus body is rack-loaded, the total load DVW must be distributed uniformly along the bus body. This may be accomplished by mounting a series of hydraulic jacks along the length of the bus interior. Seats may be removed to facilitate jack mounting. The rack load will be considered to be uniformly distributed when the variation in the hydraulic jack readings is less than 10 percent. A maximum load is the sum of all jack readings and shall equal DVW.





Transverse Cross Section **Side View**

Figure 2. Arrangement of Hydraulic Jack for Rack-Loading of Two-Frame Assembly

The test may be performed on a complete bus body or on a representative section composed of at least two complete frames (body posts plus roof bows) and floor. Standard seats may be installed in the test section in a manner identical to that of

the full bus body. Fabrication procedures for the test assembly shall be identical to those used in normal bus body production.

A two-cycle loading sequence shall be conducted, with intermediate and final load and deflection readings recorded, according to the procedure described.

The maximum deflection in line with the jack (A, maximum) shall not exceed 4 inches.

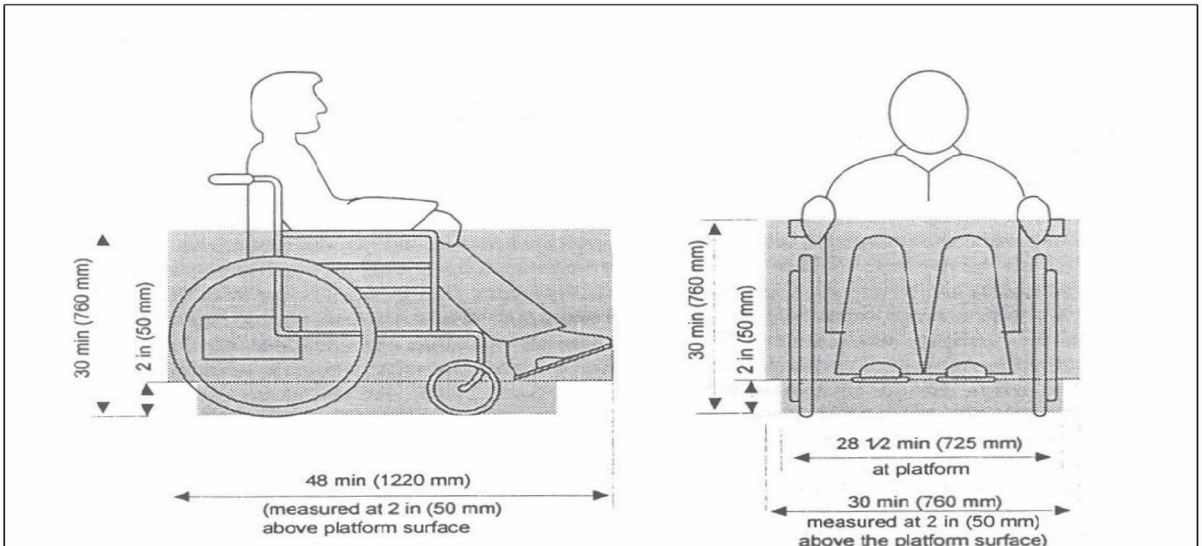
Manufacturer shall specify which testing method was used and submit appropriate certification information.

APPENDIX B - KENTUCKY POLE TEST

The Kentucky Pole Test shall be required on or before the acceptance date of the first bus of the respective configuration.

TEST PROCEDURE:
The body shall be impacted at any point along the roof line on the outside surface, using an 8-inch diameter cylinder, 48 inches long, at a 30-to-45-degree angle, 1 to 3 inches above the top window line. The cylinder shall impact the roofline with the 48 inches dimension in a vertical plane with a force not to exceed 10 inches maximum to 8 inches minimum penetration of the body panels into the passenger compartment after impact.

The manufacturer shall submit appropriate certification information.



WHEELCHAIR OR MOBILITY AND ENVELOPE

RESTRAINING DEVICES

E. 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*.

F. Alternatively, a child restraint anchorage system that complies with FMVSS No. 225, *Child Restraint Anchorage Systems,* may be installed.

G. Seat belt assemblies, if installed, shall conform to FMVSS No. 209, *Seat Belt Assemblies*.

H. 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 tiedown* and the phrases *securement system* or *tiedown 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 tiedown and occupant restraint system (WTORS)* is used to refer to the total system that secures the wheelchair and restrains the wheelchair occupant.

D. WTORS-general requirements:

1. The wheelchair tiedown 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 Tiedown and Occupant Restraint Systems for Use in Motor Vehicles*. [1]

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 manufactures 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.The WTORS, including the storage device, shall meet the flammability standards established in FMVSS No. 302, *Flammability of Interior Materials*.

5. The following information shall be provided with each vehicle equipped with a securement and restraint system:

    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.

6. 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.

E. Wheelchair Securement/Tiedown: (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.

F. Occupant restraint system: (See 49 CFR 571.403, S5.4.3, S5.4.4.) If the upper torso belt anchorage is higher than 44 inches measured from the vehicle floor, an adjustment device, as part of the occupant restraint system, shall be supplied.

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. This lighting shall be LED.

SPECIAL SERVICE ENTRANCE

F. 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.

G. 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.

H. 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.

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

J. 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 special service entrance.

SPECIAL SERVICE ENTRANCE DOORS

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

L. 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.

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

N. All doors shall be weather sealed.

O. 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.

P. 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.

Q. 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.

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

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

T. 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

E. In addition to the webbing cutter required in the BUS BODY AND CHASSIS section, each specially equipped school bus that is set up to accommodate wheelchairs or other assistive or restraint devices with webbing attached shall contain an additional webbing cutter properly secured in a location to be determined by the purchaser. The webbing cutter shall meet the requirements listed in the BUS BODY AND CHASSIS section, seats and restraining barriers, paragraph E.

F. 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 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.

G. Each specially equipped school bus that is set up to accommodate wheelchairs or other assistive restraint devices should be equipped with an emergency evacuation device that is certified and tested to withstand at least a 300-pound load when used as an emergency stretcher or drag. This evacuation device shall be properly secured to the bus in a location to be determined by the purchaser.

H. If transporting oxygen, refer to AMO Standard 003.

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 are acceptable for use in specially equipped vehicles if:

G. Items do 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.)

H. Items do not diminish the safety of the bus interior.

I. Items do not create additional risk to students who are boarding or exiting the bus or are in or near the school bus loading zone.

J. Items do not require undue additional activity and/or responsibility for the driver.

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

L. Approved options allowed for specifications may include the following:
   1. Electronic Stability Control
   2. Collision Mitigation System
   3. Humprey Valve or equivalent air dump valve
   4. An exterior camera system that aides the driver by projecting an image inside

the rearview mirror of the driver. Any aftermarket screens are not allowed.

5. Predictive Stop Arm

6. Student Tracking Systems

7. Illuminated Safety Stop Arm (Must be Retroreflective)

8. Illuminated School Bus Sign

9. Clean Spray Technologies Bus Sanitation System

10. OEM Pedestrian Detection

11. Electronic Parking Brake

12. Auto Reverse Passenger Doors

13. MDT (Mobile Data Terminal)
    - As an option for school buses, the usage of navigation software is allowed during operation of the bus. The necessary, accompanying electronic devices are also allowed for navigation. The screen may be visible during navigation on said electronic device(s) during the operation of the bus. All use of this technology requires MDE approval prior to installation.

14. Clean Surface/CASPR

    - Prior to use of this product MDE approval for mounting location and/or padding is required.

15. Additional Back Up Lights

PUPIL TRANSPORTATION SERVICE VEHICLES

Pupil transportation service vehicles shall be standard production models and shall be equipped with adequate springs, axles, tires, and other load carrying components to meet GVWR requirements. Optional equipment may be purchased for service vehicles provided they appear as part of the specifications used by the respective school districts in soliciting bids on service vehicles.

USED SCHOOL BUSES

All used school buses purchased or operated by a local education agency or private contractor shall meet the Mississippi Minium Standards for School Buses for the year in which the bus was manufactured.

MULTIFUNCTIONAL SCHOOL ACTIVITY BUS SPECIFICATIONS

DEFINITION:

A Multifunctional School Activity Bus (MFSAB) is a school bus constructed to Federal Motor Vehicle Safety Standards (FMVSS) and Mississippi Minimum School Bus Specifications. It must be purchased or leased as a new bus and shall only be used for extracurricular activities. THESE BUSES SHALL NOT BE USED TO TRANSPORT STUDENTS TO AND FROM HOME, SCHOOL BUS STOPS, OR BETWEEN SCHOOLS FOR THE PURPOSE OF ATTENDANCE.

The following exceptions to the Mississippi Minimum Specifications for School Buses for regular route buses shall be allowed for Multifunction School Activity Buses.

CHILD CHECK SYSTEM

Child check systems are required on all MFSAB.

COLOR:

The local education agency (LEA) with school board approval may determine the color of the activity bus. The color scheme may utilize any combination of up to THREE colors. This combination may be in addition to the white roof. The color National School Bus Yellow (SBMTC-008 Publication) shall not be used as a part of the color scheme.

The local education agency and/or vendors shall submit preliminary color and graphic schemes to the Mississippi Department of Education, Pupil Transportation Division for approval prior to the purchase or manufacture of a Multifunctional School Activity Bus (MFSAB).

IDENTIFICATION:

E. The bus body shall bear the words "ACTIVITY BUS" in a contrasting color at least 8 inches high in the area where "school bus" is normally positioned. Lettering and numbering shall conform to FMVSS and Mississippi Minimum Specifications and shall meet reflectivity standards. Bus numbering on this bus may be of a contrasting color.

F. The name of the school district, or school shall be displayed in at least five-inch letters on both sides of the bus in the beltline area. If a school system elects to put

the name of the school in the beltline, the school system shall be displayed on both sides of the bus in the rear skirt area with a minimum of 3" letters. NO SIGNS shall be applied to any area of the bus including the bumpers. Mascot logos may be placed on the bus with approval from the Mississippi Department of Education, Pupil Transportation Division.

G. No signs, logos, or other items that obstruct visibility shall be displayed on the windows of the bus. No full wraps are allowed, and no decals shall cover reflective safety material.

H. Full or modified wrapping of existing regular route school buses purchased to transport students between home and school as a Multifunction School Activity Buses are not allowed.

INSPECTIONS:

Inspections by qualified technicians at the LEA shall be performed on all Multifunctional School Activity Buses (MFSAB) as required by state law and the rules and regulations of the Mississippi State Board of Education.

LIGHTING AND WARNING DEVICES:

All Multifunctional School Activity Buses (MFSAB) shall meet state and federal standards for normal school bus lighting and warning device requirements with the following exceptions:

A. Multifunctional School Activity Buses (MFSAB) shall not be equipped with alternately flashing amber or red signal lamps used for loading and unloading students.

B. Multifunctional School Activity Buses (MFSAB) shall not be equipped with stop arm signals or crossing control arms.

REGULATIONS:

These buses shall be owned by the LEA or leased from private school bus transportation contractors. All Mississippi laws, rules of the State Board of Education, and other applicable regulations pertaining to the operation of school buses and certification of school bus drivers shall apply to Multifunctional School Activity Buses.

SEATING:

Activity seats, which meet FMVSS 222 and 210, may be used in lieu of regular school bus

seats. If activity seats are used, passenger seat belts are optional on Type C and Type D MFSAB. These seat belt assemblies shall be of the lap/shoulder configuration and shall be installed by the manufacturer, or authorized dealer, and must conform to FMVSS 209, 210, 222 and 225.

ALTERNATIVE POWER SPECIFICATIONS

INTRODUCTION

This section is designed to be used as an overview of the alternative fuels being utilized for school transportation. It is not designed to replace current applicable federal, state, manufacturing or safety specifications that may exceed requirements within this section. There may be advancements in engineering and improvements in equipment fabrication methods and operating practices that differ from those specifically called for in this section. Such deviations or improvements may provide safety and may meet the intent of, and be compatible with, this section. Entities wishing to purchase alternative fuel school buses should use this section only as a starting point. More detailed specifications, including specific design and performance criteria and safety specifications, should be researched by prospective purchasers of alternative fuel school buses.

GENERAL REQUIREMENTS

Alternative power school buses shall meet all the specifications in this manual and the specific requirements for the type of alternate power systems listed below:

19. Chassis shall meet all specifications previously mentioned in BUS CHASSIS SPECIFICATIONS.

20. Chassis shall meet all applicable Federal Motor Vehicle Safety Standards (FMVSS).

21. The fuel system integrity shall meet the specified leakage performance standards when impacted by a moving contoured barrier in accordance with test conditions specified in FMVSS No. 301, *Fuel System Integrity,* or FMVSS No. 303, *Fuel System Integrity of Compressed Natural Gas Vehicles,* as applicable.

22. Original equipment manufacturers (OEMs) and conversion systems using compressed natural gas (CNG) shall comply with National Fire Protection Association (NFPA) Specification 52 2013, *Compressed Natural Gas Vehicular Fuel Systems*. Fuel systems using liquefied petroleum gas (LPG) shall comply with NFPA Specification 58 2014, *Liquefied Petroleum Gases Engine Fuel Systems*.

23. Fuel tank(s) for vehicles of less than 54 passenger capacity powered by LPG or CNG shall have a minimum 40-gallon capacity. Fuel tank(s) for vehicles of 54 or more passenger capacity powered by LPG or CNG shall have a minimum 60- gallon capacity.

24. Natural gas-powered buses may be equipped with an interior/exterior gas detection system. All natural gas-powered buses may be equipped with an automatic or manual fire detection and suppression system.

25. All materials and assemblies used to transfer or store alternative fuels shall be installed outside the passenger/driver compartment.

26. All Types C and D buses using alternative fuels shall meet the same base requirements of BUS CHASSIS SPECIFICATIONS for passenger load.

27. The total weight shall not exceed the vehicle's GVWR when loaded to rated capacity.

28. The manufacturer supplying the alternative fuel equipment must provide the owner and operator with adequate training and certification in fueling procedures, scheduled maintenance, troubleshooting and repair of alternative fuel equipment.

29. AII fueling equipment shall be designed specifically for fueling motor vehicles and shall be certified by the manufacturer as meeting all applicable federal, state and industry standards.

30. AII on-board fuel supply containers shall meet all appropriate requirements of the American Society for Mechanical Engineering (ASME) code, U.S. Department of Transportation (DOT) regulations or applicable FMVSSs and NFPA standards.

31. All fuel supply containers shall be securely mounted to withstand a static force of eight times their weight in any direction.

32. AII safety devices that discharge to the atmosphere shall be vented to the outside of the vehicle. The discharge line from the safety relief valve on all school buses shall be located in a manner appropriate to the characteristics of the alternative fuel. Discharge lines shall not pass through the passenger compartment.

33. CNG buses shall have a positive, quick-acting (¼ turn) shut-off control valve shall be installed in each gaseous fuel supply line, as close as possible to the fuel supply containers. The valve controls shall be placed in a location easily operable from the exterior of the vehicle. The location of the valve controls shall be clearly marked on the exterior surface of the bus.

34. An electrical grounding system shall be required for grounding of the fuel system during maintenance-related venting.

35. Fuel systems identified as compatible with biodiesel must be provided with components compatible with biodiesel conforming to the specifications of ASTM 6751, *Biodiesel Standard*.

36. High Voltage-Powered Vehicles: Buses utilizing a high voltage propulsion system (more than 48 nominal volts) shall meet the requirements of FMVSS 305, *Electric Powered Vehicles: Electrolyte Spillage and Electrical Shock Protection,* except for the following:

    a. The propulsion power source (batteries, fuel cells, etc.) shall be located outside the passenger compartment.

    b. The propulsion power source enclosure shall be constructed to conform to the power source manufacturer's requirements and recommendations.

    c. Due to the much larger size and quantities of the propulsion power sources on larger vehicles, buses over 10,000 lbs. are permitted to exceed the 5.0-liter spillage constraint of Section S5.1, Electrolyte damage from propulsion batteries and the requirements to statically rotate the vehicle on its longitudinal axis post-test.

HIGH VOLTAGE-POWERED VEHICLES

The Mississippi School Bus Minimum Specification is the primary specification for all public-school buses in Mississippi pursuant to Mississippi Code Annotated Section 37-41-1: All applicable provisions of the Mississippi School Bus Minimum Specifications of school bus body and chassis shall be adhered to unless specifically mentioned in this section. This section and specifications listed in this section are for new electric school buses only and does not allow for the modification of any existing school bus.

Training For State Personnel, Local School District Personnel, and First Responders

The vendor shall be required to provide training for state personnel, transportation directors/supervisors, bus shop foreman, school bus mechanics/technicians, bus driver instructors, bus operators, and first responders in the safe and efficient operation, inspection, repair, maintenance, and emergency response of the bus. This training may be provided at multiple locations around the state in response to local demands.

Compliance With FMVSS and SAE

A high voltage-powered vehicle shall meet all Federal Motor Vehicle Safety Standards and all Society of Automotive Engineers standards that are applicable at time of manufacture.

Alternator

The alternator shall meet the applicable state specifications in the School Bus Body and Chassis section. Alternately, the alternator functions may be performed by the Hybrid Drive System Batteries.

Battery(ies)

Low Voltage Battery

The Low Voltage Battery shall meet the applicable state specifications in the School Bus Body and Chassis. Alternately, the Low Voltage Battery functions may be performed by the Hybrid Drive System Batteries.

Hybrid Drive System Batteries

E. Energy storage for the Hybrid Drive System shall be protected from crash impacts and shall be encased in a non-conductive, acid-resistant compartment. This compartment must be well ventilated to preclude the possibility of hydrogen gas

buildup. Energy storage shall be located in an area and in such a way as to provide ease of service.

F. Batteries shall require automatic electrical isolation in the case of a vehicle crash.

G. The Hybrid Drive System Batteries shall allow for a minimum storage of 28 kWh for charge depletion.

H. The high voltage battery system integrity shall meet the specified spillage performance standards in accordance with test conditions specified in FMVSS No. 305 as applicable.

Battery Management System

C. The Hybrid Drive System Batteries may be equipped with a system that allows the batteries to be charged via connection to the local electric utility, otherwise known as a Plug-in Hybrid Electric system. The plug connector shall make a conductive electrical connection and shall be an Apollo 200 AMP connector by BIW Connector Systems or approved equal.

D. The Hybrid School Bus shall have equipment for monitoring the status of the batteries while the batteries remain on the vehicle. This equipment shall include the capability to balance the state of charge and monitor temperature of individual battery modules (if appropriate).

Brakes, Service

The Hybrid School Bus shall include a regenerative braking system that uses the motor and/or generator to slow the vehicle in conjunction with the service brakes while returning electrical energy to the Hybrid Drive System Batteries.

Differential Ratio

The Differential shall be compatible with the Transmission/Hybrid Drive System and provide for a minimum of 65 mph in highest gear.

Engine Equipment

C. The hybrid system shall include a system that deactivates the engine when not in use, such as, at red lights, and reactivates the engine when needed for acceleration.

D. The engine shall be equipped with system that electrically heats the engine to maintain minimum starting temperature. This system should be integrated with the Plug-in Battery Management System, if so equipped, and not require a separate electrical grid connection. The engine heater shall also heat the fuel filtration system. The engine heater shall be switched to allow this heating to be optional.

Fuel System Capability

The diesel fuel system shall be capable of operating with a 20 percent biodiesel blend (B20).

High Voltage System

G. High Voltage-Powered Vehicles: Buses utilizing a high voltage propulsion system (more than 48 normal volts) shall meet the requirements of FMVSS No. 305, *Electric Powered Vehicles: Electrolyte Spillage and Electrical Shock Protection,* except for the following:

1. The propulsion power source (batteries, fuel cells, etc.) shall be located outside the passenger compartment.

2. The propulsion power source enclosure shall be constructed to conform to the power source manufacturer's requirements and recommendations.

3. Due to the much larger size and quantities of the propulsion power sources on larger vehicles, buses over 10,000 lbs. are permitted to exceed the 5.0-liter spillage constraint of Section S5.1, *Electrolyte damage from propulsion batteries* and the requirements to statically rotate the vehicle on its longitudinal axis posttest.

H. Wire, cable, and conductor insulation in the High Voltage System shall provide adequate insulation for the voltage used and for ambient temperatures ranging from - 15°F to 120°F. All high voltage circuits shall be bright orange in color or otherwise labeled as HIGH

I. VOLTAGE. All high voltage circuits shall provide adequate and automatic protection against electrical overloads caused by short circuits or other excessive current conditions through the use of fuses, circuit breakers, and ground fault interruption.

J. Each door, cover, or other panel that affords immediate access to any high voltage area shall be plainly marked with a hazard warning label which shall read WARNING-HIGH VOLTAGE or DANGER-HIGH VOLTAGE. This label shall be located in a highly conspicuous place. All high voltage access areas shall be equipped with a lock or otherwise secured to prevent unauthorized access.

K. The High Voltage System should be designed so that when the ignition switch is off, the propulsion motor is positively disconnected. All other accessories powered by the main propulsion battery circuit shall remain operable when the ignition switch is off.

L. All buses shall be equipped with an additional manual or automatic switch or device independent of the propulsion motor disconnect controls that permits the positive disconnection of all circuits from the Hybrid Drive System Batteries. This switch

shall be operable from outside the vehicle. Each door or panel providing access to this switch shall be plainly marked to indicate that it is a main-power- disconnect switch or device.

Ignition System

The ignition switch circuit shall be linked to the Battery Management System and will prevent driving the vehicle while it is connected to an external battery charging source.

Transmission/Hybrid Drive System

F. The Hybrid Drive System shall work in conjunction with the chassis engine to provide motive power to the bus. This system shall be automatically controlled requiring no intervention by the driver after it has been put in forward or reverse gear. Systems that require the use of a manual clutch or require the driver to shift through a progression of gears will not be accepted.

G. The Hybrid drive controller/converter system shall incorporate a Ground Fault lnterrupt (GFI) system that protects passengers and others from electrical shock if a shorted circuit or water intrusion situation occurs.

H. The bus dash shall have an indicator light that indicates whether the bus is operating in Charge Depleting or Charge Sustaining mode. Charge Depleting is an operating mode in which the state of charge of the Hybrid Drive System Battery decreases as the bus operates. At a certain minimum state of charge, the bus becomes Charge Sustaining. Charge Sustaining is an operating mode in which the Battery Management System seeks to maintain or increase the state of charge of the Hybrid Drive System Battery. The Hybrid School Bus shall have the capability to operate in both modes.

I. The Hybrid Drive System shall have a system for protecting system components from thermal damage due to electrical overload. This system should include temperature sensors at critical points and be capable of reducing Hybrid Drive System electrical power when necessary. The bus dash shall have a warning light that indicates when a Hybrid Drive System component exceeds a safe temperature.

J. The warning light should illuminate prior to critical temperature to allow sufficient time to safely stop the bus.

BATTERY ELECTRIC VEHICLES (BEV)

BACK-UP ALARM

BEVs shall be equipped with a back-up alarm to warn other vehicles and pedestrians when the school bus drive is placed in Reverse.

BATTERY(IES)

Low Voltage Battery(ies)

D. The low voltage battery shall meet the applicable state specifications.

E. At lec:1st one (1) low voltage battery will be installed to provide power to 12VDC circuits.

F. A low voltage battery shutoff switch shall be installed in the vicinity of the low voltage battery compartment in an area not easily accessible to the driver or passengers. If behind an access door or panel, the location of the low voltage battery shutoff switch must be clearly labeled on the exterior of the door or access panel.

High Voltage Battery(ies)

C. High voltage battery assemblies shall be located in between or under chassis frame rails protected by a steel cradle.

D. High voltage batteries shall have a main service disconnect that isolates the batteries and does not allow high voltage outside the battery pack.

BATTERY MANAGEMENT SYSTEM

E. The high voltage batteries shall be equipped with a system that allows the batteries to be charged via a connection to the local electric utility grid. This connection shall be a Combined Charging System (CCS) or SAE J1772, compatible with the charging equipment.

F. The charging receptacle/port shall be mounted/located in accordance with manufacturer standards. The receptacle shall accommodate the minimum requirements for Level II AC charging DC fast charging.

G. If the charging port is behind a door or an access panel, the door or access panel will be clearly labeled with the location of the charging port.

H. Vehicles shall have on-board equipment to monitor and display battery health. This displayed information shall include but is not limited to:
   1. High voltage battery state of charge
   2. Motor temp
   3. Battery available range in miles
   4. Battery discharge and regeneration rates
   5. Battery health (temperature, battery cell balancing, as applicable, etc.)

BRAKES, SERVICE

In addition to service brake specifications for combustion engine buses, BEVs will be equipped with a regenerative braking that utilizes the electric drive system in concert with the service brakes to slow the vehicle and return electrical energy to the battery system.

DC-DC CONVERTER

D. A DC-DC converter shall be provided and deliver a minimum of 200 amps at 12VDC.

E. The converter system shall incorporate a Ground Fault Interrupt (GFI) that disconnects/isolates the high voltage batteries in the event of a shorted circuit or water intrusion.

F. Charging connection point shall be outside the passenger compartment

EXTERIOR MARKING

In addition to the marking/labeling specified this manual, BEVs will have clear markings/labeling, with the word "Electric" indicating that the school bus is electric powered.

E. Image graphics may be used in combination with words.

F. Lettering will be a minimum of two inches high, blue in color.

G. Lettering to include imagery shall be located on both sides of the school bus along the roof cap starting above the service door and ending no further than the forward edge of the second passenger window. Additional marking/labeling shall be added to the rear of the bus but shall not be placed in any windows or crowd/encroach on any required emergency/standard markings.

H. The bus numbering of electric school buses shall include the letters EV to identify the

bus as an electric vehicle (EX: 25-04EV).

HEATING AND COOLING

Heaters and air conditioning shall be capable of heating and cooling the passenger and driver's compartments.

HIGH VOLTAGE SYSTEM

D. High Voltage-Powered Vehicles: Buses utilizing a high voltage propulsion system (60 VDC or 30 VAC) shall comply with the following:

   1. The propulsion power source (batteries, fuel cells, etc.) shall be located outside the passenger compartment.
   2. The propulsion power source enclosure shall be constructed to conform to the power source manufacturer's requirements and recommendations.

E. Wire, cable, and conductor insulation in the High Voltage System shall provide adequate insulation for the voltage used and for ambient temperatures ranging from - 15°F to 120°F. All high voltage wiring/cabling shall be covered with bright orange loom or otherwise labeled as HIGH VOLTAGE. All high voltage circuits shall provide adequate and automatic protection against electrical overloads caused by short circuits or other excessive current conditions through the use of fuses, circuit breakers, and ground fault interruption.

F. Each door, cover, or other panel that affords immediate access to any high voltage area shall be plainly marked with a hazard warning label which shall read WARNING-HIGH VOLTAGE or DANGER-HIGH VOLTAGE. This label shall be located in a highly conspicuous place. All high voltage access areas shall be equipped with a lock or otherwise secured to prevent unauthorized access.

IGNITION SYSTEM

C. The ignition switch circuit shall be linked to the Battery Management System and will prevent the driving of the vehicle while it is connected to an external battery charging source.

D. The high voltage system shall be designed so that when the ignition switch is off, the high voltage is positively disconnected.

LOW SPEED SOUND GENERATOR

C. BEVs shall be equipped with a low-speed sound generator to warn other vehicles and pedestrians of the school bus's approach i.e., when approaching an intersections and crosswalks. The sound generator will remain on when the school bus is in any drive gear except reverse.

D. The low-speed sound generator shall not emit sound while the bus is completely stopped, with the transmission in neutral or park, and with the parking brake set e.g., while loading and unloading.

PROPULSION SYSTEM/DRIVETRAIN

E. Shall be of sufficient power and torque to propel the vehicle fully loaded up to at least 60 mph and no more than 65 mph.

F. The propulsion system may be mounted utilizing a drivetrain or positioned in a way to provide power to the wheels.

G. All propulsion systems must be contained below the floor line and cannot come into contact with the road surface.

H. Propulsion system warranties shall be a minimum 5 years/100,000 miles.

SEATING

All seats shall be mounted to minimize contact with batteries and underside of the bus if seat replacement is necessary.

SYSTEM PROTECTION

C. As part of the Battery Management System, the BEV will be equipped with an automatic shutdown to protect system components from damage caused by malfunctions such as charging/discharging faults, battery overheating, electrical overheating, degraded battery health, etc.

D. Prior to automatic shutdown, a warning or maintenance indicator shall display in the driver console to notify the driver of impending shutdown or the need for immediate

maintenance and allow enough time to safely reposition and stop the bus. Gradual derating of propulsion prior to complete automatic shutdown.

EQUIPMENT FOR TRANSPORTATION OF PRE-SCHOOL AGE CHILDREN

The school bus is important in the educational development of young children who have special needs because it is the mechanism for transporting them to and from support and development programs. Infants, toddlers, and pre-school children with or without special needs present a particular challenge for transportation personnel because school buses were not designed to transport very young children as passengers. Therefore, these children present multiple challenges to providers of school bus transportation services. Nevertheless, great strides have been made in the types of equipment used to assist pre-school children with or without special needs to safely adapt to school bus transportation.

Challenges relating to proper installation, maintenance and use of Child Safety Restraint Systems (CSRSs), including car seats, arise. Many of these challenges are addressed in NHTSA's "Guideline for the Safe Transportation of Pre-school Age Children in School Buses" (February 1999).

Each pre-school age school bus passenger should use a child safety restraint system appropriate for the child's age, weight, height and specialized needs, as determined by the IEP. Thus, a team effort is required to ensure that appropriate and proper specifications are developed for the procurement of equipment that meet the specific needs of each individual school bus passenger.

The following Federal Motor Vehicle Safety Standards are applicable in this section:

FMVSS No. 208 Occupant Protection

FMVSS No. 209 Seat Belt Assemblies

FMVSS No. 210 Seat Belt Assembly Anchorages

FMVSS No. 213 Child Restraint Systems

FMVSS No. 217 Bus Emergency Exits and Window Retention Release

FMVSS No. 222 School Bus Passenger Seating and Crash Protection

FMVSS No. 225 Uniform Child Restraint Anchorages

F. All CSRSs used in the school bus must

1. Meet requirements of FMVSS No. 213.

2. Be installed, cleaned, maintained and used according to the manufacturer's instructions.

3. Not be under a recall that recommends non-use of the CSRS.
4. Have all parts intact and in working order.
5. Must not have exceeded the manufacturer's assigned expiration date.

6. Be secured to a vehicle seat with a safety belt that meets FMVSS No. 209 or anchorages to meet FMVSS No. 225 or FMVSS No. 210; and

7. Use safety belts or latch systems that are installed only on bus seats that meet FMVSS No. 210.

8. Be replaced when occupied during a school bus crash as specified by the manufacturer of the CSRS.

G. Child Safety Restraint Systems (CSRSs)

CSRSs used in school buses must be appropriate for the individual child and must be used correctly. All of the restraint systems used for transportation must be secured to the bus seat in the manner prescribed and approved by both the school bus and CSRS manufacturer.

1. Elements of Correct Installation of CSRSs

It is recognized that compartmentalization, the passive safety restraint system required in school buses under FMVSS No. 222, provides a higher level of safety to children over 40 pounds. Children diagnosed with medical complexities or fragility might require special securement or positioning systems.

a. Direction

Position (rear- or forward-facing) and adjust recline angle accordingly. Some rear-facing seats are designed for rear-facing only and may not be used in a forward-facing position. (Check manufacturer's instructions.)

b. Belt Paths and Harness Strap Location

Use the correct belt path and harness strap slots on the CSRS as directed by the manufacturer's instructions.

Note: Heavy coats should be removed to ensure a tighter fit.

c. Installation

To achieve tight installation, place hand on and push down in the CSRS to compress the bus seat cushion. With the buckle(s) engaged, pull the loose end of the seat belt(s) to tighten and lock the safety belt. The CSRS should not move more than one inch forward or side-to-side when tested by grasping the seat at the belt path.

2. Types of Restraints
3.

a. *Rear-facing CSRS (infant-only)*

These seats are designed for infants from birth to twenty or twenty-two pounds (manufacturer's instructions) and who usually are less than 26 inches in length. These seats are used in rear-facing position at a 45 degree recline, which provides support to the infant's head, neck and back.

b. Convertible CSRS (Rear-Facing)

Rear-facing infant position is designed for children from birth to twenty pounds, one year of age (manufacturer's instructions), weighing up to twenty pounds and usually less than 26 inches in length. Many CSRSs are now available to accommodate larger children (30 to 35 lbs.) in the rear- facing position. Note: See manufacturer's guidelines for weight and height restrictions. It is recommended that children ride rear facing as long as recommended or allowed by the CSRS manufacturer.

c. Convertible CSRSs (Forward-Facing)

Forward-facing CSRSs with five-point harness, T-Shield or tray-shield are designed for children above twenty to sixty pounds. (Rear-facing position should be maintained for as long as recommended or advised by the manufacturer.) Some forward-facing-only seats are available to accommodate larger children. Note: Some CSRSs cannot be installed properly in a twenty-inch bus seat (i.e., tray-shield and some convertible seats).

d. *CarBeds*

A car bed for infants up to 20 pounds allows the infant to lie flat. The use of a car bed should be predicated on the advice of a physician or an appropriate medical support professional (e.g., physical/occupational therapist) and approved by qualified personnel at an IEP team meeting.

e. *Specialized Positioning*

Specialized positioning seats are used only when a child does not fit in a standard CSRS or has a particular condition warranting more support. As per NHTSA's, "Child Passenger Safety Training Instructor Guide for School Buses," tether straps are not required in school buses; however, some special needs CSRSs require a tether strap. (See manufacturer's instructions and all NHTSA curricula to determine the specifics.)

f. Safety Vests

The decision to use a vest should be made by an IEP team that includes qualified personnel and the parent, and the use of safety vests should be noted on the IEP. Vest selection should be appropriate for the size and needs of the child. Proper fit must account for seasonal changes in clothing. Pre-school children, due to their age, weight, physical development and their overall mental ability, should be securely fitted with a crotch strap supplied by the manufacturer. (Only vests required under FMVSS 213 will have a crotch strap supplied by the manufacturer. It is not optional.) Safety vests must be used only on school bus seats. The entire seat directly behind the child in the seat-mounted vest must be unoccupied or have restrained occupants. Vests shall be anchored, as specified by the manufacturer.

g. Wheelchairs

All decisions regarding the use of wheelchairs in the school bus must be made by an IEP team that includes qualified personnel and the parent and should be noted on the IEP. School buses must be properly equipped to accommodate wheelchairs or other mobility devices before transporting passengers who require such devices. (See the Specially Equipped School Bus Specifications section, this document.)

H. Bus Seat Designated for a Child Safety Restraint System

The transportation provider should ensure installation and use in accordance with the following NHTSA guidelines:

1. Locations of school bus seats designated for CSRSs should start at the front of the vehicle to provide drivers with quick access to the CSRS occupants.

2. CSRS anchorages on school bus seats should meet all applicable FMVSSs.

3. The non-adjustable end of the lap belt should be positioned at the center for a CSRS placed next to the window; or, at the aisle for a CSRS placed next to the aisle.

4. The non-adjustable end of the lap belt must not extend more than one to two inches from the seat.

5. When ordering new school buses, the maximum spacing specified under FMVSS No. 222, School Bus Passenger Seating and Crash Protection, (within 24 inches space from the seating reference point) is recommended for seats designated for CSRSs to provide adequate space for the CSRSs.

6. The combined width of CSRSs and/or other passengers on a single seat does not exceed the width of the seat.

7. If other students share seat positions with CSRSs, the CSRSs are placed in the window-seating position, excluding emergency exit windows.

I. Medical Equipment

All decisions regarding medical equipment in the school bus should be made in accordance with state laws and regulations. Decisions regarding medical equipment should be the joint decision of trained personnel who are knowledgeable about the type of medical assistance and support a pre-school child may need while in a school bus. Decisions should be made by qualified team members in attendance at IEP meetings, including the parent. The IEP document should include all the appropriate information. Safe transportation specifications should be documented on the IEP. Some special considerations and recommendations are as follows:

1. All medical support equipment shall be secured at the mounting location to withstand a pulling force of five times the weight of the item.

2. Latched compartments are the preferred methods of transport.

3. All medical equipment should be secured below the window.

4. Oxygen equipment (liquid or gas) shall be approved by the manufacturer for transport and should be securely mounted to the bus and fastened to prevent damage and exposure to intense heat levels.

Note: Refer to the SPECIALLY EQUIPPED SCHOOL BUS SPECIFICATIONS section.

J. Special Considerations

Because of the dependency of young children and the need to make decisions on a case-by-case basis, the following section on special considerations is provided for guidance on a variety of issues related to the transportation of pre-school children.

1. Equipment Maintenance: Procedures should be established for scheduled maintenance, cleaning and inspection of all equipment, including CSRSs. Procedures should be in place to assure that all equipment is checked regularly for recalls and for product expiration dates. Procedures must be in place for cleaning CSRSs according to manufacturers' instructions. Proper disposal of outdated equipment is important.

Note: A recall list may be found at www.nhtsa.dot.gov.

2. Radios/Two Way Communication and Cell Phones

Refer to the SPECIALLY EQUIPPED SCHOOL BUS SPECIFICATIONS
section.

SALE AND DISPOSAL OF USED PUPIL TRANSPORTATION EQUIPMENT

Mississippi Code Sections Ann. §37-7-451 through 37-7-457 provide authority for the Disposition of Property Not Needed for School Purposes. This has been considered a legal means of selling school buses that are no longer needed in the transportation program. Advertisement for competitive bids on the sale of this equipment is required under the above sections. In the event that one school district sells transportation equipment to another school district, it is necessary to comply with the provisions of Section 37-41-101(5), MS Code of 1972, amended. It is not necessary to obtain approval from the Mississippi Department of Education to dispose of said equipment.

The procedures outlined in this section should be used in order to assure the proper disposal of school buses that are sold or otherwise removed from the local education agency's school bus fleet.

If the bus is sold to another local education agency, private school, or other educational agency that will continue to use the vehicle as a school bus, only the name of the school system and the tag should be removed. If the bus is sold or traded to a dealer, only the tag should be removed. The school bus dealer will remove the name of the school district.

Federal and state law requires that school buses be equipped with signal lamps and other visual signals and markings that clearly identify the vehicle as a school bus. School buses are also equipped with specialized equipment that are designed to protect students, school bus drivers, and motorists. These visual markings, signals, and other specialized equipment, which include amber and red flashing lights, stop signs, warning signs on the rear of the bus, school bus lettering, and crossing control arms, are peculiar to school buses and may not be used on other vehicles, except as provided under Mississippi law. Accordingly, the disposal of school buses requires measures above and beyond those necessary for the disposal of other school district vehicles.

To avoid possible liability, improve security, and also ensure compliance with the law, the following procedures should be followed when disposing of buses that will no longer be used as school buses:

E. Disable the overhead amber and red flashing lamps, stop arm(s), and crossing arm used for loading and unloading students.

F. Remove all references to the entire name of the school district on the sides of the bus, not just the name of the county or city.

G. Remove the words "SCHOOL BUS" on the front and rear of the bus.

H. Remove the tag from the vehicle before the sale.

Mississippi Code Ann. §63-7-79

1. Any person who owns or operates a used school bus for the purpose of transportation or use of any kind on the public roads and highways of the State of Mississippi, other than for school purposes, shall change the color of such bus from the regular school bus color of yellow or national school bus chrome to a color in contrast to this color before such bus can be used or operated on the highways or public roads in Mississippi.

2. The vendor or owner of any school bus shall inform the purchaser in writing at or prior to the time of the sale of any bus not to be used for school purposes as to the requirements of this section.

3. Any person who shall violate the provisions of this section shall, upon conviction thereof, be fined not less than twenty-five dollars (425.00) nor more than one hundred dollars ($100.00).

APPENDIX A - COLORADO RACKING LOAD TEST

The Colorado Racking Test shall be required on or before the acceptance date of the first bus of the respective configuration.

TEST PROCEDURE:

In addition to complying with the test procedures described in FMVSS No. 220, the body manufacturers shall record and report the downward vertical movement of the force at 0, 25, 50, 75 and 100 percent of the maximum force (both loading and unloading). The expected force deflection curve is illustrated schematically in Figure 1a. Low load nonlinearities may indicate joint deformation; high load nonlinearities may indicate yielding in structural members.

A second load cycle shall be performed following the procedure given in the first paragraph. The expected force-deflection curve is illustrated schematically in Figure 1b. Any hysteresis following the initial shakedown will be revealed by this second cycle.

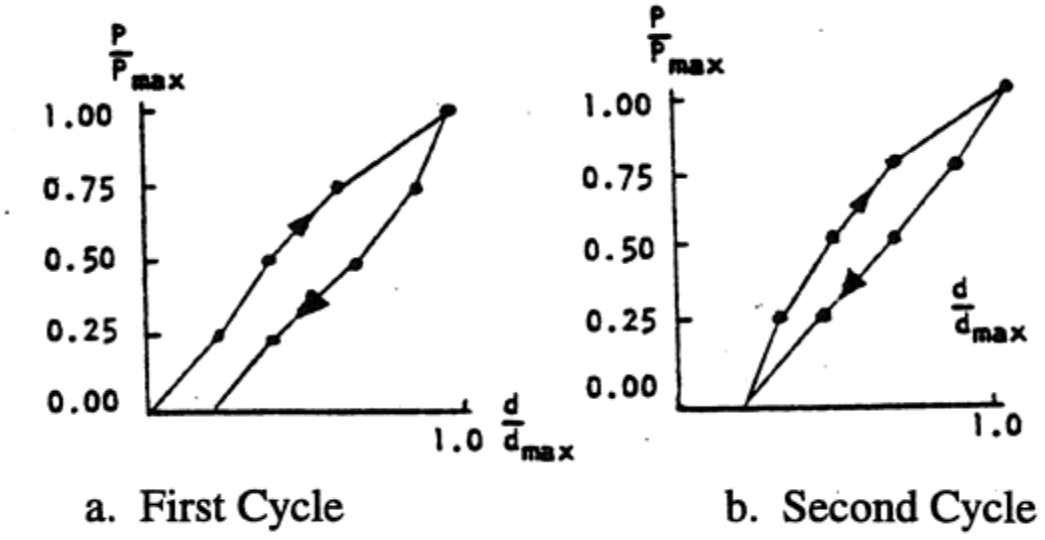


Figure 1. Static Load Test Load-Deflection Curves

A diagonal (racking) load test must be performed on types A, B, C and D school buses to assure adequate shear stiffness and strength of the bus body. Details of the test are provided below:

A two-cycle loading sequence shall be conducted following the described procedure.

E. **Requirements:** When a force equal to 1 1/2 times the gross vehicle weight (GVW) is applied to the edge of the roof of the vehicle's body structure through a force application plate, as specified in Test Procedures (b):

3. The diagonal movement of the force at any point on the application plate shall not exceed 5 1/8 inches; and

4. Each emergency exit of the vehicle provided in accordance with FMVSS No. 217 shall be capable of operation as specified in that standard during the full application of the force and after release of the force.

F. **Test Procedures:** Each vehicle shall be capable of meeting the requirements of (1) and (2) when tested in accordance with the procedures set forth below.

a. The vehicle shall be supported on a rigid surface along the lower edge of the frame or along the body sills in the absence of a frame.

b. The load shall be applied through a force application plate that is flat and rigid. The dimensions of the plate shall be chosen to assure that the plate edges never make contact with the vehicle skin during testing. A typical width is 18 inches, and a typical length is 20 inches less that the length of the vehicle's roof measured along its longitudinal centerline.

c. Place the force application plate in contact with the edge of the vehicle roof. Orient the plate so that its flat, rigid surface is perpendicular to a diagonal line connecting the most distant points on an interior cross-section of the vehicle. The rear edge of the plate shall be positioned approximately 20 inches from the rear edge of the vehicle roof. A temporary stand may be used to support the plate until a force is applied.

d. Apply an evenly distributed force in a diagonally downward direction through the force application plate at any rate not more than 0.5 inch per second, until a force of 500 pounds has been applied.

e. Apply additional force in a diagonally downward direction through the force application plate at a rate of not more than 0.5 inch per second until the force specified in (a) has been applied, and maintain this application of force.

f. Measure the diagonal movement of any point on the force application plate that occurred during the application of force in accordance with (b)(5), and open the emergency exits as specified in (a)(2).

g. Release all diagonal force applied through the force application plate, and operate the emergency exits as specified in (a)(2).

G. **Test Conditions:** The following conditions apply to the requirements specified in (3).

a. Temperature: The ambient temperature is between 32 degrees F and 90 degrees F.

b. Windows and Doors: Vehicle windows, doors, and emergency exits are in the fully-closed position, and latched but not locked.

H. **An alternative method** of testing for the racking load test shall be as follows:

The racking load shall be applied along a line connecting the most distant points on a transverse cross- section of the bus interior. It produces a shear distortion of the cross-section, as shown in figure 2.

A representative method of loading that employs a hydraulic jack to load a two-frame test assembly is illustrated in figure 2.

The maximum jack load for the two-frame assembly is determined by the following formula:

J = 2P J - maximum jack load for two-frame test assembly P = load/frame

where P = Dynamic Vehicle Weight (DVW) divided by N DVW - dynamic vehicle weight

N - total number of bus body frames and DVW = DF x GVW

DF - dynamic factor, not less than 1.5 GVW - gross vehicle weight

Thus, for a DF = 1.5, a GVW = 22,000 pounds-force (lbf) and N= 11, the dynamic vehicle weight is DVW = 33,000 lbf, the load/frame is P = 3000 lbf and the maximum jack load is J = 6000 lbf.

When a complete bus body is rack-loaded, the total load DVW must be distributed uniformly along the bus body. This may be accomplished by mounting a series of hydraulic jacks along the length of the bus interior. Seats may be removed to facilitate jack mounting. The rack load will be considered to be uniformly distributed when the variation in the hydraulic jack readings is less than 10 percent. A maximum load is the sum of all jack readings and shall equal DVW.

Transverse Cross Section **Side View**

Figure 2. Arrangement of Hydraulic Jack for Rack-Loading of Two-Frame Assembly

The test may be performed on a complete bus body or on a representative section composed of at least two complete frames (body posts plus roof bows) and floor. Standard seats may be installed in the test section in a manner identical to that of the full bus body. Fabrication procedures for the test assembly shall be identical to those used in normal bus body production.

A two-cycle loading sequence shall be conducted, with intermediate and final load and deflection readings recorded, according to the procedure described.

The maximum deflection in line with the jack (A, maximum) shall not exceed 4 inches.

Manufacturer shall specify which testing method was used and submit appropriate certification information.

APPENDIX B - KENTUCKY POLE TEST

The Kentucky Pole Test shall be required on or before the acceptance date of the first bus of the respective configuration.

TEST PROCEDURE:

The body shall be impacted at any point along the roof line on the outside surface, using an 8-inch diameter cylinder, 48 inches long, at a 30-to-45-degree angle, 1 to 3 inches above the top window line. The cylinder shall impact the roofline with the 48 inches dimension in a vertical plane with a force not to exceed 10 inches maximum to 8 inches minimum penetration of the body panels into the passenger compartment after impact.

The manufacturer shall submit appropriate certification information.