

## **INTRODUCTION:**

As a result of the Coronavirus pandemic the 17<sup>th</sup> National Congress on School Transportation has been postponed until May 2025.

**HOWEVER**, by the time the 17<sup>th</sup> NCST Steering Committee made the decision to postpone the 17<sup>th</sup> National Congress on School Transportation the NCST Writing Committees had completed their review, analysis, and final recommendations on all proposed changes to the 17<sup>th</sup> National School Transportation Specifications and Procedures (NSTSP) publication.

At the request of a writing committee chair, the NCST Steering Committee directed the Editing Committee to update ten NSTSP sections. These updates are only (EDITORIAL in nature) legal references, grammatic, spelling, etc. In other words, only non-debatable proposals were reviewed, edited and updated. Below are the titles of the ten updated sections that have been reviewed and approved by the 17<sup>th</sup> NCST Steering Committee.

### **Sections amended include:**

BUS BODY AND CHASSIS SPECIFICATIONS

APPENDIX B: School Bus Body and Chassis Specifications

SCHOOL BUS INSPECTION

OPERATIONS

ACTIVITY BUS OPERATIONS: TRANSPORTATION OTHER THAN TO AND FROM SCHOOL OR HEAD START

TRANSPORTATION FOR INFANTS, TODDLERS AND PRE-SCHOOL CHILDREN

TRANSPORTATION FOR STUDENTS WITH DISABILITIES AND SPECIAL HEALTH CARE NEEDS

SCHOOL TRANSPORTATION SECURITY AND EMERGENCY PREPAREDNESS

APPENDIX H: School Transportation Security and Emergency Preparedness

SPECIALLY EQUIPPED SCHOOL BUS SPECIFICATIONS

ALL 17<sup>TH</sup> NCST WRITING COMMITTEE EDITS TO THE DOCUMENTS ARE SHOWN IN **RED TEXT**

**Note:** Page number may slip as a result of the editing process.

# **BUS BODY AND CHASSIS SPECIFICATIONS**

**WRITING COMMITTEE EDITS IN RED INK BY SECTION LOCATION:**

**TOWING ATTACHMENT POINTS**

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

### **AXLES**

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

### **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*.

## **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), Types B, C and D shall be equivalent in strength and durability to pressed steel channel at least  $\frac{3}{16}$  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 (above), 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, B, 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.

## **CERTIFICATION**

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

## **COLOR**

- A. The school bus body shall be painted National School Bus Yellow (NSBY). (See APPENDIX B.)
- B. The body exterior trim, as defined by individual states, shall be black or NSBY.
- C. Except for the vertical portion of the front and rear roof caps, the roof of the bus may be painted white. (See illustration in APPENDIX B, Placement of Retroreflective Markings.)
- D. The chassis and front bumper shall be black. Body, cowl, hood and fenders shall be in National School Bus Yellow (NSBY). The flat top surface of the hood may be non-reflective black or NSBY. (See APPENDIX B.)
- E. Wheels may be silver, gray, white, yellow or black.
- F. Multifunction school activity buses (MFSABs) shall be exempt from these requirements.

## **COMMUNICATIONS SYSTEMS**

(See OPERATIONS section.)

## **CONSTRUCTION**

- A. Side Intrusion Test: The bus body shall be constructed to withstand an intrusion force equal to the curb weight of the vehicle or 20,000 pounds, whichever is less. Each vehicle shall be capable of meeting this requirement when tested in accordance with the procedures set forth below. The complete body structure, or a representative seven-body section mock-up with seats installed, shall be load-tested at a location  $24 \pm 2$  inches above the floor line, with a maximum 10-inch diameter cylinder, 48 inches long, mounted in a horizontal plane.

The cylinder shall be placed as close as practical to the mid-point of the tested structure, spanning two internal vertical structural members. The cylinder shall be statically loaded to the required force of curb weight or 20,000 pounds, whichever is less, in a horizontal plane with the load applied from the exterior toward the interior of the test structure. When the minimum load has been applied, the penetration of the loading cylinder into the passenger compartment shall not exceed 10 inches from its original point of contact. There can be no separation of lapped panels or construction joints. Punctures, tears or breaks in the external panels are acceptable but are not permitted on any adjacent interior panel. Body companies shall certify compliance with this intrusion requirement, and include test results, as requested.

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

## CROSSING CONTROL ARM

- A. School buses may 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. (See BUS BODY AND CHASSIS SPECIFICATIONS, Metal Treatment.)
- E. There shall be no sharp edges or projections that could cause injury or be a hazard to students. The end of the arm shall be rounded.
- F. The crossing control arm shall extend a minimum of 70 inches (measured from the bumper at the arm assembly attachment point) when in the extended position. The crossing control arm shall not extend past the end of the bumper when in the stowed position.
- G. The crossing control arm shall extend simultaneously with the stop signal arm(s), activated by stop signal arm controls.
- H. An automatic recycling interrupt switch may be installed for temporarily disabling the crossing control arm.
- I. The assembly shall include a device attached to the bumper near the end of the arm to automatically retain the arm while in the stowed position. That device shall not interfere with normal operations of the crossing control arm.

## DEFROSTERS

- A. Defrosting and defogging equipment shall direct a sufficient flow of heated air onto the windshield, the window to the left of the driver and the glass in the viewing area directly to the right of the driver to eliminate frost, fog and snow.

**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.
  - 1. In addition, buses may be equipped with a left side entrance door located immediately behind the driver to be used exclusively for curb side loading/unloading on one-way streets.
  - 2. Buses equipped with a left side entrance door shall have a mirror mounted in the upper right corner of the interior of the bus so as to provide a clear view of the left side entrance door and stepwell.
- 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 material.
- 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.

## **DRIVE SHAFT**

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

## **ELECTRICAL SYSTEM**

### **A. Battery**

1. The storage batteries shall have minimum cold cranking capacity rating (cold cranking amps) equal to the cranking current required for 30 seconds at 0 degrees Fahrenheit and a minimum reserve capacity rating of 120 minutes at 25 amps. Higher capacities may be required, depending upon optional equipment and local environmental conditions.
2. 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 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.

### **B. Alternator**

1. All Type A and Type B 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.

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 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:

<u>FUNCTION</u>	<u>COLOR</u>
Left Rear Directional Lamp	Yellow
Right Rear Directional Lamp	Dark Green

Stop Lamps	Red
Back-up Lamps	Blue
Tail Lamps	Brown
Ground	White
Ignition Feed, Primary Feed	Black

The color of 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.

## EMERGENCY EQUIPMENT

### A. Fire Extinguisher

1. The bus shall be equipped with at least one UL-approved pressurized, dry chemical fire extinguisher. The extinguisher shall be secured in a mounted bracket, located in the driver's compartment and readily accessible to the driver and passengers. A pressure gauge shall be mounted on the extinguisher and shall be easily read without moving the extinguisher from its mounted position.
2. The fire extinguisher shall have a rating of 2-A:10-B:C or greater. The operating mechanism shall be secured with a type of seal that will not interfere with the use of the fire extinguisher.

### B. First Aid Kit

1. The bus shall have a removable, moisture-proof and dust-proof first aid kit in an accessible place in the driver's compartment. It shall be mounted and identified as a first aid kit. The location for the first aid kit shall be marked. Contents of the first aid kit shall be in compliance with state standards.
2. Suggested contents include:
  - 2 – 1-inch x 2 ½ yards of adhesive tape rolls
  - 24 – Sterile gauze pads 3x3 inches
  - 100 – ¾ x 3 inches adhesive bandages
  - 8 – 2-inch bandage compress
  - 10 – 3-inch bandage compress
  - 2 – 2-inch x 6 foot sterile gauze roller bandages
  - 2 – Non-sterile triangular bandages, minimum 39x35x54 inches with two safety pins
  - 3 – Sterile gauze pads 36x36 inches
  - 3 – Sterile eye pads
  - 1 – Rounded-end scissors
  - 1 – Pair medical examination gloves
  - 1 – Mouth-to-mouth airway

C. Body Fluid Clean-Up Kit

Each bus shall have a removable and moisture-proof body fluid clean-up kit accessible to the driver. It shall be mounted and identified as a body fluid cleanup kit. Contents of the body fluid clean-up kit shall be in compliance with state standards.

D. Warning Devices

Each school bus shall contain at least three retroreflective 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

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

B. Emergency Window Requirements

1. The rear emergency window shall have a lifting assistance device that will aid in lifting and holding the rear emergency window open.
2. Side emergency exit windows, when installed, may be vertically hinged on the forward side of the window. No side emergency exit window will be located above a stop arm.

C. Emergency Door Requirements

1. The 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 other glass panels on emergency doors shall be approved safety glazing.
3. There shall be no steps leading to an emergency door.
4. There shall be no obstruction higher than  $\frac{1}{4}$  inch across the bottom of any emergency door opening. Fasteners used within the emergency exit opening shall be free of sharp edges or burrs.

- D. Emergency Exit Requirements: The use of the following tables is to determine the required number and types of emergency exits to comply with this specification, based on the bus manufacturer’s equipped seating capacity.
1. Use **Table 1** if the bus contains a rear emergency door, or
  2. Use **Table 2** if the bus contains a rear pushout emergency window AND a left side emergency door, as required by FMVSS No. 217 for school buses without a rear emergency door.
  3. When using either Table 1 or Table 2:
    - a. Enter the Table number at the appropriate “CAPACITY” and select the desired row from the options for that capacity.
    - b. A school bus will meet the requirements of this specification and the requirements of FMVSS 217 if it contains the types and quantities of emergency exits listed on the row selected.

<b>TABLE 1</b> BUSES WITH REAR EMERGENCY DOOR (All Front Engine Buses)						<b>TABLE 2</b> 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			Available Combinations By Capacity	Manufacturers Equipped Capacity	Shall Have	And Shall Also Have		
		Roof Hatch	L. Side Emerg. Exit Windows	R. Side Emerg. Exit Windows	L. Side Emerg. Exit Door			Roof Hatch	L. Side Emerg. Exit Windows	R. Side Emerg. Exit Windows	R. Side Emerg. Exit Door
1-45	1-45	1	0	0	0	1-45	1-45	1	0	0	0
46-77	46-77	2	1	1	0	46-89	46-89	2	1	1	0
	46-77	2	0	0	1		46-89	2	0	0	1
78-93	78-93	2	2	2	0	90-105	90-105	2	2	2	0
	78-93	2	1	1	1		90-105	2	1	1	1

## 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 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 or B-1 buses may be in accordance to 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 SYSTEMS (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.

## FLOORS

- A. The floor in the under-seat area, including tops of wheel housings, driver's compartment and toeboard, shall be covered with an elastomer floor covering, having a minimum overall thickness of .125 inch and a calculated burn rate of 0.1 mm per minute or less, using the test methods, procedures and formulas listed in FMVSS No. 302, *Flammability of Interior Materials*. The driver's area and toeboard area in all Type-A buses may be manufacturer's standard flooring and floor covering.
- B. The floor covering in the aisles shall be ribbed or other raised pattern elastomer and have a calculated burn rate of 0.1 mm per minute or less using the test methods, procedures and formulas listed in FMVSS No. 302. Minimum overall thickness shall be .187 inch measured from tops of ribs.
- C. The floor covering must be permanently bonded to the floor and must not crack when subjected to sudden changes in temperature. Bonding or adhesive material shall be waterproof and shall be a type recommended by the manufacturer of floor-covering material. All seams shall be sealed with waterproof sealer.
- D. On Types B, C and D buses, a flush-mounted, screw-down plate that is secured and sealed shall be provided to access the diesel or gasoline fuel tank sending unit and/or fuel pump. This plate shall not be installed under flooring material.

## FRAME

- A. Frame lengths shall be established in accordance with the design criteria for the complete vehicle.
- B. Making holes in top or bottom flanges or side units of the frame and welding to the frame shall not be permitted except as provided or accepted by the chassis manufacturer.
- C. Frames shall not be modified for the purpose of extending the wheel base.
- D. Any secondary manufacturer that modifies the original chassis frame shall provide a warranty at least equal to the warranty offered by the original equipment manufacturer (OEM), and the secondary manufacturer shall certify that the modification and other parts or equipment affected by the modification shall be free from defects in material and workmanship under normal use and service intended by the OEM.

## FUEL SYSTEM

- A. Fuel tank(s) having a minimum 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. Fuel tank(s) may be mounted between the chassis frame rails or outboard of the frame rails on either the left or right side of the vehicle.
- D. The actual draw capacity of each fuel tank shall be a minimum of 83 percent of the tank capacity.
- E. Installation of alternative fuel systems, including fuel tanks and piping from the tank to the engine, shall comply with all applicable fire codes in effect on the date of manufacture of the bus.
- F. Installation of Liquefied Petroleum Gas (LPG) tanks shall comply with National Fire Protection Association (NFPA) 58, *Liquefied Petroleum Gas Code*.
- G. Installation of Compressed Natural Gas (CNG) containers shall comply with FMVSS No. 304, *Compressed Natural Gas Fuel Container Integrity*.
- H. The CNG Fuel System shall comply with FMVSS No. 303, *Fuel System Integrity of Compressed Natural Gas Vehicles*.

## **GOVERNOR**

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

## **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 nut and string 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. If only one heater is used, it shall be fresh-air or combination fresh-air and recirculation type.
3. If more than one heater is used, additional heaters may be re-circulating air type.
4. The heating system shall be capable of maintaining bus interior temperatures, as specified in test procedure SAE J2233.
5. Auxiliary fuel-fired heating systems are permitted, provided they comply with the following:
  - a. The auxiliary heating system shall utilize the same type fuel as specified for the vehicle engine;
  - b. The heater(s) may be direct, hot air-type or may be connected to the engine coolant system;
  - c. An auxiliary heating system, when connected to the engine coolant system, may be used to preheat the engine coolant or preheat and add supplementary heat to the heating system;
  - d. Auxiliary heating systems must be installed pursuant to the manufacturer's recommendations and shall not direct exhaust in such a manner that will endanger bus passengers;
  - e. All combustion heaters shall be in compliance with current Federal Motor Carrier Safety Regulations;
  - f. The auxiliary heating system shall require low voltage.
  - 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.
6. All forced-air heaters installed by body manufacturers shall bear a name plate that indicates the heater rating in accordance with SBMTC-001, *Standard Code for Testing and Rating Automotive Bus Hot Water Heating and Ventilating Equipment*. The plate shall be affixed by the heater manufacturer and shall constitute certification that the heater performance is as shown on the plate.
7. Heater hoses shall be adequately supported to guard against excessive wear due to vibration. The hoses shall not dangle or rub against the chassis or any sharp edges

and shall not interfere with or restrict the operation of any engine function. Heater hoses shall conform to SAE J20c, *Coolant System Hoses*. Heater lines, cores, and elements on the interior of the bus shall be shielded to prevent scalding or burning of the driver or passengers.

8. 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.
9. 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.
10. 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.
11. 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.

B. Passenger Compartment Air Conditioning (Optional)

The following specifications are applicable to all types of school buses that may be equipped with air conditioning. This section is divided into 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  $\pm 3$  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: (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  $\pm 3$  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  $1250 \pm 50$  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 may be equipped with insulation, including sidewalls, roof, firewall, rear, inside body bows and plywood or composite floor insulation to reduce thermal transfer;
- e. All glass (windshield, service and emergency doors, side and rear windows) may be equipped with maximum integral tinting allowed by federal, state or ANSI standards for the respective locations, except that windows rear of the driver's compartment, if tinted, shall have approximately 28 percent light transmission;
- f. Electrical generating capacity shall be provided to accommodate the additional electrical demands imposed by the air conditioning system;
- g. Roofs may be painted white to aid in heat dissipation (See APPENDIX B); 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. 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, *Horn—Forward Warning— Electric—Performance, Test, and Application*.

## IDENTIFICATION

- A. The body shall bear the words “SCHOOL BUS” in black letters at least eight inches high on both front and rear of the body or on signs attached thereto. Lettering shall be placed as high as possible without impairment of its visibility. Letters shall conform to “Series B” of Standard Alphabets for Highway Signs. “SCHOOL BUS” lettering shall have a reflective background, or as an option, may be illuminated by backlighting. MFSABs are exempt from these requirements.
- B. Required lettering and numbering shall include:
  - 1. District, company name or owner of the bus displayed at the beltline.
  - 2. The bus identification number displayed on the sides, on the rear and on the front.
- C. Other lettering, numbering or symbols which may be displayed on the exterior of the bus shall be limited to:
  - 1. Bus identification number, minimum 12-inch high characters, on top of the bus, in addition to required numbering on the sides, rear and front;
  - 2. The location of the battery(ies) identified by the word “BATTERY” or “BATTERIES” on the battery compartment door in 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. Lettering on the rear of the bus relating to school bus flashing signal lamps or electronic warning sign;
  - 7. Lettering relating to railroad stop procedures; and
  - 8. Identification of fuel type in 1-inch lettering adjacent to the fuel filler opening.

## INSIDE HEIGHT

Inside body height shall be 72 inches or more, measured metal to metal, at any point on the longitudinal centerline from the front vertical bow to the rear vertical bow. Inside body height of Type A-1 buses shall be 62 inches or more. 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 types B, C and D buses, a tachometer shall be installed so as to be visible to the driver while seated in a normal driving position.*

4. Voltmeter;

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

5. Oil pressure gauge;
6. Water temperature gauge;
7. Fuel gauge;
8. High beam headlamp indicator;
9. Brake air pressure gauge (air brakes), brake indicator lamp (vacuum/hydraulic brakes), or brake indicator lamp (hydraulic/hydraulic);
10. Turn signal indicator; and
11. Glow-plug indicator lamp, where appropriate.

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

- C. The instruments and gauges shall be mounted on the instrument panel so that each is clearly visible to the driver while seated in a normal driving position.
- D. Instruments and controls must be illuminated as required by FMVSS No. 101, *Controls and Displays*.
- E. Multi-Function Gauge (MFG)
  - 1. The driver must be able to manually select any displayable function of the gauge on a MFG, whenever desired.
  - 2. Whenever an out-of-limits condition that would be displayed on one or more functions of a MFG occurs, the MFG controller should automatically display this condition on the instrument cluster. This should be in the form of an illuminated telltale warning lamp, as well as having the MFG automatically display the out-of-limits indications. If two or more functions displayed on the MFG go out of limits simultaneously, then the MFG should sequence automatically between those functions continuously until the condition(s) are corrected.
  - 3. The use of a MFG does not relieve the need for audible warning devices, where required.

## **INSULATION (OPTIONAL)**

- A. If thermal insulation is specified, it shall be fire-resistant, UL approved, with minimum R-value of 5.5. Insulation shall be installed so as to prevent sagging.
- B. If floor insulation is required, it shall be five-ply softwood plywood, nominal 5/8-inch thickness and shall be equal to or exceed properties of the exterior-type, C-D Grade, as specified in the standard issued by U.S. Department of Commerce. When plywood is used, all exposed edges shall be sealed. Type A-1 buses may be equipped with nominal 1/2-inch-thick plywood or equivalent material meeting the above requirements.

Equivalent material may be used to replace plywood, provided it has equal or greater insulation R-value, sound abatement, deterioration-resistant and moisture-resistant properties.

## **INTERIOR**

- A. The interior of the bus shall be free of all unnecessary projections, which include luggage racks and attendant handrails, to minimize the potential for injury. This specification requires inner lining on ceilings and walls. If the ceiling is constructed with lap joints, the forward panel shall be lapped by rear panel and exposed edges shall be beaded, hemmed, flanged or otherwise treated to minimize sharp edges. Buses may be equipped with a storage

compartment for tools, tire chains and/or tow chains. (See BUS BODY 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 APPENDIX B.

## 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 law. 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 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 *non-sequential* 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. For background color requirements, refer to appropriate state specification requirements.
4. Red lamps shall flash at any time the stop signal arm is extended.
5. All flashers for alternately flashing red and amber signal lamps shall be enclosed in the body in a readily accessible location.

D. Turn signal and stop/tail lamps

1. The bus body shall be equipped with amber rear turn signal lamps that are at least 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. An optional white flashing strobe lamp may 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.
- H. A daytime running lamps (DRL) system shall be provided.

## **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 6x16 inches minimum for Type A buses and be 6x30 inches minimum for Types C and D buses.
- B. Each school bus shall be equipped with exterior mirrors meeting the requirements of FMVSS No. 111, *Rearview Mirrors*. The right-side rear view mirror shall not be obscured by the 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 controlled external rear view mirrors may be used.

## **MOUNTING**

- A. The rear body cross member shall be supported by the chassis frame. Except where chassis components interfere, the bus body shall be attached to the chassis frame at each main floor sill in such a manner as to prevent shifting or separation of the body from the chassis under severe operating conditions.
- B. Isolators shall be installed at all contact points between the body and the chassis frame on Types A-2, B, C and D buses, and shall be secured by a positive means to the chassis frame or body to prevent shifting, separation, or displacement of the isolators under severe operating conditions.

## **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**

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

## **OVERALL WIDTH**

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

## **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**

- A. Buses may be equipped with an am/fm/audio and/or public address system having interior and exterior speakers.
- B. No internal speakers, other than the driver's communication systems, may be installed within four feet of the driver's seat back in its rearmost upright position.

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

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

## **RETROREFLECTIVE MATERIAL**

(See also APPENDICES A and B, Retroreflective Sheeting.)

- A. The front and/or rear bumper may be marked diagonally 45 degrees down toward the centerline of the pavement with two  $\pm \frac{1}{4}$  inch-wide strips of non-contrasting retroreflective material.
- B. The rear of the bus body shall be marked with strips of retroreflective NSBY material to outline the perimeter of the back of the bus using material which conforms with the

requirements of FMVSS No. 131, *School Bus Pedestrian Safety Devices*, Table 1. The perimeter marking of rear emergency exits per FMVSS No. 217, *Bus Emergency Exits and Window Retention and Release*, and/or the use of retroreflective "SCHOOL BUS" signs partially accomplish the objective of this requirement. To complete the perimeter marking of the back of the bus, strips of retroreflective NSBY material, a minimum of 1 inch and a maximum of 2 inches in width shall be applied horizontally above the rear windows and above the rear bumper, extending from the rear emergency exit perimeter, marking outward to the left and right rear corners of the bus. Vertical strips shall be applied at the corners connecting these horizontal strips. Multifunction school activity buses (MFSABs) shall be exempt from these color requirements.

- C. "SCHOOL BUS" signs, if not a lighted design, shall be marked with retroreflective NSBY material comprising background for lettering of the front and/or rear "SCHOOL BUS" signs.
- D. Sides of the bus body shall be marked with at least 1 ¾ inch retroreflective NSBY material, extending the length of the bus body and located (vertically) between the floor line and the beltline.
- E. If used, signs placed on the rear of the bus relating to school bus flashing signal lamps or railroad stop procedures may be 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 rub rail on each side of the bus located at, or no more than eight inches above, the seat cushion level. The rub rail shall extend from the rear side of the entrance door completely around the bus body (except at the emergency door or any maintenance access door) to the point of curvature near the outside cowl on the left side.
- B. There shall be one additional rub rail on each side located 10 inches or less above the floor line. The rub rail shall cover the same longitudinal span as the upper rub rail, except at the wheel housing, and it shall extend only to the longitudinal tangent of the right and left rear corners.
- C. Rub rails above the floor line shall be attached at each body post and at all other upright structural members.
- D. Each rub rail shall be four inches or more in width in its finished form and shall be constructed of 16-gauge metal or other material of equivalent strength that is suitable to help protect body side panels from damage. Rub rails shall be constructed in corrugated or ribbed fashion.

- E. Rub rails shall be applied outside the body or outside the body posts. (Pressed-in or snap-on rub rails do not satisfy this requirement.) For Type A-1 vehicles using the body provided by the chassis manufacturer or for Types A-2, B, C and D buses containing the rear luggage or the rear engine compartment, rub rails need not extend around the rear corners.
- F. The bottom edge of the body side skirts shall be stiffened by application of a rub rail, or the edge may be stiffened by providing a flange or other stiffeners.

## **SEATS AND RESTRAINING BARRIERS**

- A. Passenger Seating
  - 1. School bus design capacities shall be in accordance with 49 CFR, Part 571.3, *Definitions*, and FMVSS No. 222, *School Bus Passenger Seating and Crash Protection*.
  - 2. All seats shall have a minimum cushion depth of 15 inches, a seat back height of 24 inches above the seating reference point and must comply with all other requirements of FMVSS No. 222.
  - 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. Lap belts shall not be installed on passenger seats in large school buses (over 10,000 pounds GVWR) except in conjunction with child safety restraint systems that comply with the requirements of FMVSS No. 213, *Child Restraint Systems*.

B. Pre-School Age Seating

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

**Note:** See A.8, above.

C. Driver Seat

1. The driver's seat supplied by the body manufacturer shall be a high back seat. The seat back shall be adjustable to 15 degrees minimum, without requiring the use of tools. The seat shall be equipped with a head restraint to accommodate a 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

A Type 2 lap/shoulder belt shall be provided for the driver. On buses where the driver's seat and upper anchorage for the shoulder belt are both attached to the body structure, a driver's seat with an integrated Type 2 lap/shoulder belt may be substituted. On buses where the driver's seat and upper anchorage for the shoulder belt are separately attached to both body and chassis structures (i.e., one attached to the chassis and the other attached to the body), a driver's seat with an integrated Type 2 lap/shoulder belt should be used.

The assembly shall be equipped with an emergency locking retractor for the continuous belt system. On all buses except Type A that are equipped with a standard chassis manufacturer's driver's seat, the lap portion of the belt system shall be guided or anchored to prevent the driver from sliding sideways under the belt system. The lap/shoulder belt shall be designed to allow for easy adjustment in order to fit properly and to effectively protect drivers varying in size from 5th percentile adult female to 95th percentile adult male. The belt may be of a high visibility contrasting color.

- E. Each bus shall be equipped with a durable webbing cutter having a full width handgrip and a

protected, replaceable or non-corrodible blade. The required 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 for adjustments to be made.
- 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 0.187 inch.
- B. The step covering shall be permanently bonded to a durable backing material that is resistant to corrosion.
- C. Steps, including the floor line platform area, shall have a 1½-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 door step 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 SIGNAL ARM**

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

## **STORAGE COMPARTMENT (OPTIONAL)**

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

## **SUN SHIELD**

- A. On Types B, C and D vehicles, an interior adjustable transparent sun shield, with a finished edge and dimensions not less than 6x30 inches, shall be installed in a position convenient for use by the driver.
- B. On Type A buses, the sun shield (visor) shall be installed by the chassis manufacturer.

## **SUSPENSION SYSTEMS**

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

## **THROTTLE**

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

## **TIRES AND RIMS**

- A. Rims and tires of the proper size and load rating commensurate with the chassis manufacturer's GVWR shall be provided. The use of multi-piece rims and/or tube-type tires shall not be permitted on any school bus ordered after December 31, 1995.
- B. Dual rear tires shall be provided on Type A-2, Type B, Type C and Type D school buses.
- C. All tires on a vehicle shall be of the same size, and the load range of the tires shall meet or exceed the GVWR, as required by FMVSS No. 120, *Tire Selection and Rims for Vehicles other*

*than Passenger Car.*

- D. If the vehicle is equipped with a spare tire and rim assembly, it shall be the same size as those mounted on the vehicle.
- E. If a tire carrier is required, it shall be suitably mounted in an accessible location outside of the passenger compartment.

## **TOWING ATTACHMENT POINTS**

Front **and** 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. 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 wheelhousing to the front of each rear wheel;

6. Have non-clogging discharge tubes with slush-proof, non-freezing rubber nozzles;
  7. Be operated by an electric switch with a pilot lamp mounted on the instrument panel located so as to be exclusively controlled by the driver;
  8. Be equipped with a gauge to indicate that the hopper has reached the one-quarter level (and needs to be refilled); and
  9. Be designed to prevent freezing of all activation components and moving parts.
- B. Automatic traction chains may be installed.

## **TRANSMISSION**

- A. Automatic transmissions shall have no fewer than three forward speeds and one reverse speed. Mechanical shift selectors shall provide a detent between each gear position when the gear selector quadrant and shift selector are not steering-column mounted.
- B. 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 certification to the bus body manufacturer that materials meet or exceed all performance requirements of SAE J1959, Sept. 2003 Edition of the Standard.
- B. 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.

- C. 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.

## **WHEEL HOUSING**

- 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 two-speed or variable speed windshield wiping system, with an intermittent feature, shall be provided and shall be operated by a single switch.
- B. The wipers shall meet the requirements of FMVSS No. 104, *Windshield Wiping and Washing Systems*.