

**NORTH CAROLINA  
SCHOOL BUS AND  
ACTIVITY BUS  
SPECIFICATIONS**

**Type C – Conventional Bus**

**November 10, 2011**

**North Carolina Department of Public Instruction  
School Support Division  
Transportation Services**

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## SPECIFICATION PAGE 1

### SPECIFICATION COMMITTEE MEMBERS

This committee is comprised of NCDPI, NCDOA, NCDMV, and school district representatives charged with the task of revising and issuing the annual specifications for school buses and service vehicles. Goals of the committee are as follows:

1. To specify a school bus which is best suited to ensure the safety of North Carolina public school students and that is durable in construction in order to protect the investment of the taxpayer.
2. To gather feedback from local school transportation staff members from across the state regarding the vehicle specifications.
3. To research and increase familiarity with new technologies pertaining to school bus bodies and chassis among committee members.
4. To modify and revise specifications for school transportation service vehicles.

This document details terms of service for committee representatives. The committee shall consist of members as shown below.

#### **A. Permanent Members (voting)**

1. DPI central field transportation consultant - Charles Ball, Chairman
2. DPI western field transportation consultant - Randy Henson
3. DPI eastern field transportation consultant - Keith Whitley
4. Division of Motor Vehicles – School Bus & Traffic Safety - Dwight Black and Art Collier

#### **B. LEA Representatives (voting, 3 year terms)**

##### 1. Western Area Representatives -

Term expiring December 2014: Kenny Renfro, Yancey County  
Term expiring December 2013: Kem Givens, Mecklenburg County  
Term expiring December 2012: Danny Cassavaugh Caldwell County

##### 2. Central Area Representatives -

Term expiring December 2014: Gregg Foushee, Person County  
Term expiring December 2013: Adam Johnson, Union County  
Term expiring December 2012: Wayne Stevens, Richmond County

##### 3. Eastern Area Representatives -

Term expiring December 2014: Shannon Ennis, Johnston County  
Term expiring December 2013: Herb Sanderson, Sampson County  
Term expiring December 2012: Steve Harrell, Onslow County

#### **C. Ex-Officio Members (nonvoting)**

Chief Standards Engineer, DOA Division of Purchase & Contract – Ralph Edelberg  
State Procurement Specialist, DOA Division of Purchase & Contract – Cathy Griner  
Section Chief, DPI Transportation Services – Derek Graham  
Consultant, DPI Transportation Services – Craig Warren, Executive Secretary

## SPECIFICATION PAGE 2

### **NORTH CAROLINA TYPE – C SCHOOL BUS SPECIFICATIONS**

#### SPECIAL INSTRUCTIONS

**CONSTRUCTION** - It is the intent of these specifications to describe a Type – C school bus that shall be basically of all steel construction or of some other material which has at least equivalent strength of all steel construction as certified by the bidder. All parts not specifically mentioned, which are necessary in order to provide a complete bus shall be furnished by the successful bidder and shall conform in strength, quality of material and workmanship to which is usually provided by the engineering practice indicated in these specifications. The completed school bus shall meet all Federal Motor Vehicle Safety Standards (FMVSS), requirements of the State of North Carolina and, if not in conflict, requirements of the 2005 National School Transportation Specifications and Procedures” in effect on date of manufacture except as noted. Dealer modification may be required and must be of OEM quality where OEM equipment will not meet specifications.

All parts not specifically mentioned, but necessary to provide a complete school bus, shall be furnished by the contractor and shall conform in strength, quality of materials and workmanship to those provided by engineering practices indicated in these specifications.

**DOCUMENTS AND PUBLICATIONS** - Successful bidders shall furnish the following items for each chassis/body that is purchased:

1. Application for certificate of title.
2. Operator's manual.
3. On-line access, available for current year model, within 30 days of first bus delivery, and shall include repair/service/parts manuals. Access for 100 school districts plus 4 DPI staff; on-line format to be kept current for the life of the bus. Note: Online access must be reviewed and approved prior to awarding of bid. Hard copy/CD may be required.
4. Manufacturer's Statement of Origin.
5. One build sheet (line-setting ticket) including all parts information relating to the chassis/body, to include all engine information (S/N), transmission information (S/N).

NOTE: Service policies, line setting tickets, parts and service/repair manuals and warranty cards shall be delivered directly the LEA's (School Bus Garages). The service policy, warranty cards, and the line setting ticket shall NOT be left in or with the chassis during shipment, to include school and activity buses. One application for Certificate of Title for each unit purchased shall be filled out for vehicle identification section only.

**WARRANTY** - Bidder shall warrant the bus for five (5) years/120,000 miles bumper-to-bumper. Warranty must include ALL items on the bus with the exception of the following “wear” items: tires, brakes, fluids, filters, wiper blades, head lights, belts, and hoses.

Warranty will begin on day of delivery. All parts (including related cleaners, fluids, filters etc.), labor, and environmental fees, shall be the responsibility of the bidder. Correction of latent defects, undiscovered during the initial acceptance inspection by the State but appearing before the applicable warranty period has elapsed, will be the full responsibility of the bidder, at no cost to the State or the user and will require new OEM parts. Upon award, bidder will provide the State with original copies of warranties offered on the above wear items. By execution of bid, bidder agrees to the 5-years/120,000 miles bumper to bumper warranty requirement in its entirety as specified above. By execution of bid, bidder also agrees that sample or specimen warranties which may be included with the bid are provided for informational purposes only and are NOT intended to take exception to any requirement in the warranty section.

**COMPONENTS** - Bidders shall guarantee that chassis offered are current models, that assembly parts are in production for use in new chassis/body and that their manufacture and sale through dealer source will not be discontinued within ten years. All chassis components shall be the same as those accepted on the pilot model unless prior written approval is obtained from the contract administrator.

**WEATHER PROTECTION** - All dash instruments, horn button, ignition switch, etc., of the chassis shall be adequately protected against weather while chassis are in storage or in transit.



## SPECIFICATION PAGE 3

**SERVICE** - The complete bus shall be inspected and completely serviced before being delivered to the LEA.

This service shall include:

1. Complete lubrication of chassis.
2. Filling of steering, engine, cooling system, transmission, and rear axle to proper fluid capacities.
3. Adjustment of engine and all other mechanical features to assure perfect operation.
4. Inspect, adjust, correct, and replace any parts not in proper operating condition or are not in compliance with specifications.
5. Fill fuel tank to capacity with diesel fuel.

**TECHNICAL TRAINING** - Successful bidder or capital outlay provider will be required to furnish an average of six (6) classroom man-hours of technical training per bus purchased for North Carolina transportation personnel. The exact distribution of classroom hours will be made by NCDPI working with the vendor. This training shall be provided at no additional cost and shall be completed 90 days after the last replacement bus has been delivered. Training and schedule to be approved by NCDPI and held at locations to cover the nine established NCPTA regions (see [www.ncptaonline.org](http://www.ncptaonline.org)). Class size will be limited to 25 technicians. Duration of any class session shall not exceed 8 hours per day. (See example below.) NCPTA (summer conference) training sessions will not count toward the required training hours unless training agenda approved in advance by NCDPI.

The required training shall cover the following topics: (hours for each topic to be determined by NCDPI).

Online access training for parts and service manuals

- Engine maintenance/diagnostics
- Transmission maintenance/diagnostics
- Antilock brake maintenance/diagnostics
- Body electrical/ multi-plex wiring maintenance/diagnostics
- Air Conditioning maintenance/diagnostics
- Wheel chair lift maintenance/diagnostics

NCDPI may request training for other topics relating to school bus maintenance as needed. The training instructor provided by the successful bidder is required to be exceptionally knowledgeable in the area of training that will be offered to NC School Bus technicians. NCDPI reserves the right to verify such instruction and to require a replacement instructor if deemed necessary.

**Example:** 300 buses are sold to Contractor A. The requirement for six (6) classroom man-hours per bus results in  $6 \times 300 = 1,800$  classroom man-hours total. If the size of each class during the entire training was 20 technicians, a requirement for  $1,800 / 20 = 90$  hours actual classroom teaching time must be fulfilled by Contractor A. If each teaching day included 6 hours of actual classroom teaching time (start time to end time, excluding time taken for lunch), then there would be  $90 / 6 = 15$  such 6-hour teaching days provided by Contractor A. The computation of the training provided during the contract would account for the actual number of technicians per individual class, and for each class the resulting classroom man-hours (for that class) would be credited to Contractor A against the total above requirement based on the number of buses sold.

**SPECIFICATION PAGE 4**

**MINIMUM REQUIREMENTS OF A TYPE-C SCHOOL BUS CHASSIS**

**APPROVED ELECTRONIC DIESEL ENGINES  
Must meet 2010 EPA Emissions Level Standards**

<b>MAKE</b>	<b>MODEL</b>	<b>HORSEPOWER</b>	<b>TORQUE</b>
Cummins	ISB	220	520
International	Maxx Force DT	215	560
<b><u>OPTIONAL ITEM ONLY</u></b>			
International	Maxx Force 7	220	560

**Approved Chassis Requirements**

Basic Pupil Load	<u>41-42</u>	<u>53-54</u>	<u>65-66</u>	<u>71-72</u>
Wheel base (approximate inches)	165-193	198-236	238-259	258-279
Front Axle Capacity (lbs.)*	10,000	10,000	10,000	10,000
Rear Axle Capacity (lbs.)*	17,500	19,000	19,000	19,000
Transmission Speeds Forward	5	5	5	5

\*Requirement is for the suspension/axle/tire assembly (system), not just the axle component alone.

**Approved Brake Sizes**

All chassis required shall be equipped with air brakes. No dust shields required.

	<u>41-42</u>	<u>53-54</u>	<u>65-66</u>	<u>71-72</u>
Air - Front Outboard Drum	15 x 4	15 x 4	15 x 4	15 x 4
Air - Rear Outboard Drum	16 ½ x 7	16 ½ x 7	16 ½ x 7	16 ½ x 7

## SPECIFICATION PAGE 5

### DETAIL REQUIREMENTS – TYPE C

#### CONVENTIONAL SCHOOL BUS CHASSIS

**AIR CLEANER** - Chassis is to be equipped with a dry, element-type air cleaner, mounted in a location that prevents rainwater from entering and prevents moisture from being trapped in air cleaner assembly with hood closed. Assembly is to include a moisture vacuator device. The air cleaner and the element shall meet all appropriate SAE J726 tests, per engine application. All air cleaner assemblies shall be single-stage or dual-stage and equipped with a locking restriction gauge.

#### **AXLES**

**FRONT AXLE** - The front axle shall have gross weight capacity at the ground according to the chassis manufacturer's rating, equal to or exceeding that portion of the total load which is supported by the front axle. (See table for axle capacities). Include cast iron hub assemblies with unitized oil bath seals and 75W-90 (Emgard, Mobil, or equivalent) synthetic lube.

**NOTE:** Wheel alignment is to be checked and corrected AFTER body installation and before delivery, and to include caster, camber, toe-in, and rear axle tracking.

**REAR AXLE** - The rear axle shall be of full-floating type and have a gross weight capacity at ground according to the chassis manufacturer's rating equal to or exceeding that portion of the total load which is supported by the rear axle, except minimum as specified in table "Minimum Requirements of a Type-C School Bus Chassis." Axle shall be equipped with a magnetic fill plug, magnetic drain plug and filled to recommended level with 75W-90 synthetic lubricant (Emgard, Mobil, or equivalent). The required rear axle ratio for school buses with tire size 11R22.5 and equipped with the above listed engines is between 6:43 – 6:50 inclusive. The required rear axle ratio for school buses with Flat Floors and tire size 255/70R22.5 is between 6:43 - 6:50 inclusive. The required rear axle ratio for activity buses with tire size 11R22.5 and equipped with the above listed engines is between 6:43 – 6:50 inclusive. All buses to be equipped with these axle ratios. Rear axle housing to include tag or stamp indicating ratio and fluid requirement.

NOTE: AT ANY TIME DURING THE YEAR WARRANTY PERIOD THAT A REAR AXLE IS DETERMINED TO BE THE CAUSE OF NOISE (SOUND PRESSURE RADIATED TO THE INTERIOR OF A SCHOOL BUS) THE CHASSIS MANUFACTURER SHALL BE RESPONSIBLE FOR MAKING REPAIRS. THIS IS TO BE MEASURED AT A REFERENCE POINT OF ONE-INCH (1") FROM THE EAR OF ANY SEATED PERSON. IF THAT LEVEL EXCEEDS 85 DECIBELS, THE CHASSIS MANUFACTURER SHALL MAKE REPAIRS TO REDUCE THE NOISE LEVEL OF THE REAR AXLE TO ACCEPTABLE LIMITS.

**BATTERY** - Battery case is to be sealed maintenance free. Chassis must be equipped with two or three (2-3) BCI Group 31 batteries with a total of no less than 1900 CCA. Battery cables shall be long enough to allow full extension of battery tray. Battery cables to be one gauge or heavier, color-coded red-positive / black-ground and easily identified positive and negative. Battery ground cable shall be of the round covered type. Battery must be grounded to the rear of the engine or frame. If grounded to frame, frame must be grounded to engine with same size cable.

All battery cables to be routed to the left frame rail without crossing over the top of any frame member. Routing and clamping of conductors shall be pre-engineered to point of termination outside left frame rail. Both battery cables shall attach to the battery post or battery terminals with a bolted connector. Buses shall be equipped with an all-weather battery disconnect switch to isolate batteries, located in battery box or approved location.

NOTE: ANY WIRES PASSING THROUGH THE FRAME RAILS SHALL BE PROTECTED BY WIRE LOOM OR BRACKETED CLAMP, OR GROMMETED TO PREVENT CHAFING.

## SPECIFICATION PAGE 6

**BRAKES** - The chassis shall be equipped with four wheel brakes. Approved brake shoe dimensions are specified by capacity size under Minimum Requirements. All brake drums to be outboard mounted to facilitate brake maintenance without disturbing wheel bearings and seals. All brake lining is to be premium grade asbestos free material of FF friction rating.

**AIR BRAKES** - Air brakes shall have S-cam type actuation and meet FMVSS 121. Brakes to have cast iron spider. Air reservoirs shall be mounted with the top of tanks not to exceed 4 inches below top of frame rail. Air compressor may be either belt-driven or gear-driven, and is to be at least 13.2 CFM with five-ring piston (2 oil and 3 compression); air compressor and air intake is to be routed through engine air cleaner. Approved compressors – Bendix TF550, Cummins-Wabco 15.2 CFM, and Wabco 18.7. Chassis to be equipped with an air dryer, Bendix AD-9. Automatic slack adjusters (Haldex only) to be supplied on all air brake chassis. Front air chambers to be no less than type 20 Long Stroke (MGM Model CS20L or Haldex SC20L). Rear chamber to be no less than type 30/30 Long Stroke (MGM Model TR 30/30 LP3 or Haldex GC3030LHDHO) and must be mounted on forward side of axle. Schrader valve required to be located in an accessible location in the engine compartment or on wet tank in order to recharge air brake system for towing. (Location to be approved at pilot model.)

**AIR TANK DRAIN CONTROL** - Electronic drain valve system controlled from driver's compartment, one electronic drain valve for each of the three air tanks. The number of switches is at the discretion of the vendor.

**ANTI-LOCK BRAKING SYSTEM (ABS)** - Bendix or Meritor four channel ABS or equivalent. Front and rear wheel speeds are to be sensed separately. Application of front brakes is to be controlled by application pressure modulator and governed by the wheel approaching lock-up to minimize steering input. Rear brake application pressure modulation is governed by individual wheel speeds to minimize braking effort. System must be activated by the ignition switch and actuated by brake application. System shall include blink code diagnostic capability.

**PARKING BRAKES** - Parking brake system shall be designed and constructed to meet the following requirements:

- (1) Parking brake shall hold vehicle stationary or limit traction of braked wheels on 20 percent grade under any condition of legal loading when on surface free from snow, ice and loose material.
- (2) When applied, the actuation of the parking brake shall be immediate, and parking brake shall remain in applied position with capability set forth in above, despite exhaustion of source of energy used for application or despite leakage of any kind.
- (3) Buses with air brakes shall have parking brakes of the spring applied and air release type. Control shall be of the pull to apply and push to release type and mounted in manufacturer's standard location. This control shall be clearly marked yellow. All air brake buses shall be equipped with service brake interlock.

**BUMPER (FRONT)** The front bumper shall be of heavy duty, straight or wrap around/curved design and constructed of 3/16 or one-fourth (1/4) inch thick C - channel approximately 11 inches wide. Bumper must extend to outer edges of fenders at bumper top line. Bumper shall be reinforced, if necessary, to allow jacking and minimal end deflection. Demonstration required at pilot model inspection. Deflections which in the State's judgment are found to be excessive will result in rejection of the bumper.

**DRIVELINE** - The torque capacity of the driveline assembly shall be equal to the maximum engine torque as developed through the first transmission gear. All bearings shall have an inner race so that failure of bearing shall not damage drive shaft. Each propeller shaft shall be equipped with a protective metal guard to prevent whipping through floor or dropping to ground if broken. Driveline guard is to be 7/16-inch round u-bolt or minimum 1" x 1/4 inch flat bar.

## SPECIFICATION PAGE 7

**ENGINE SPECIFICATION** - Diesel engines will be used in all size chassis. All engines are to have cold cranking ability to zero degrees Fahrenheit (ether assisted system not allowed). Acceptable engines are listed on Minimum Requirements page. Electrical system shall be of the single voltage type. All engines, fuel lines, fittings, hoses, and tank components to be B20 compatible. Bio Fuel Standards per State Contract shall be as follows. Product shall consist of a blend of 20 percent (plus or minus one percent) mono-alkyl esters of long chain fatty acids, derived from virgin vegetable oil blend-stock and/or yellow grease blend stock conforming to the requirements of ASTM D 6751 and 80 percent minimum ULSD fuel oil conforming to ASTM D 975. B20 engine certification from engine manufacturer is required with bid package.

**ELECTRONIC CONTROL MODULE PROGRAM PARAMETERS AND PASSWORD** – All ECM program parameters and password consisting of 0000 shall be discussed and established at the Post Award Meeting. Idle shutdown shall be programmable by the LEA through access to the ECM.

**EXHAUST SYSTEM** - A total exhaust system, exhaust pipe, muffler and tail pipe through bumper shall be furnished by the chassis manufacturer, pre-engineered to terminate no less than 1 inch past a school bus body rear bumper (must meet FMVSS). Tail pipe shall be minimum 16-gauge aluminized coated 409 stainless steel or aluminized coated carbon steel aft of DPF and shall not be reduced in size after it leaves muffler. Manufacturer drawings shall be provided the North Carolina Department of Public Instruction and the respective body companies, showing exhaust system routing and support bracket locations (upon request). The chassis manufacturer shall provide sufficient tail pipe length to allow body mounting without extension.

At any point the exhaust system is 12 inches or less from the fuel tank, the fuel tank shall be properly insulated with metal shield. No adhesive shields allowed. Exhaust system components located within 4 inches of any non-metallic part shall be properly shielded to prevent heat transfer. All connections shall be slip joint connections (no butt connections) using offset band clamps compression clamp, or Marmon compression joint.

Muffler shall be constructed of stainless steel or aluminized materials that meet federal emission guidelines. Exhaust pipe, muffler and tail pipe shall be of the heavy-duty type and of sufficient size to minimize backpressure.

**FENDERS AND HOOD** - The total spread of outer edges of front fenders, measured at fender line, shall exceed total spread of front tires when front wheels are in straight-ahead position. The fenders shall be properly braced and free from any body attachment. Hood and fenders to be assembled as one unit and of the forward tilt type. The hood stop cable shall be equipped with a spring or damping device to prevent hood damage while being opened.

Under the tilt hood, there shall be installed in a convenient accessible location, a waterproof electrical disconnect plug(s) (quick disconnect of all electrical wiring to tilt hood) for all electric lines running to electric accessories mounted on the hood.

**FRAME** - Each frame side member shall be of one-piece construction (minimum 50,000 psi). Cross members and components attached to frame shall be installed with grade 8 fasteners. Frame shall be doubled from a point forward of front spring hanger, on rear axle, to a point equal to leading edge of rear air bag on side where torsion bar meets frame rail.

Routing of all brake lines and/or electrical wiring shall be located within the frame rail flanges.

NOTE: ANY WIRES OR BRAKE LINES PASSING THROUGH THE FRAME RAILS SHALL BE PROTECTED BY WIRE LOOM OR BRACKETED CLAMP, OR GROMMETED TO PREVENT CHAFING.

## SPECIFICATION PAGE 8

**FUEL TANK** - The fuel tank shall conform to FMVSS 301 in construction and mounting. Fuel system to have a fuel filter and water separator (Racor Model 490 or approved equal) that shall be capable of running the Racor 490 fuel filter element which includes clear fuel bowl, water sensor and primer pump. Fuel filter/water separator is to be located between fuel tank and engine and mounted on the firewall, frame rail or engine, prior to any fuel pump. A separate engine mounted secondary fuel filter is also required. Tank to be equipped with a minimum of one internal baffles. Tank capacity on 41, 54, and 66 capacity buses must be at least 60 gallons with aluminized interior. A 100 gallon capacity tank of same specifications will be required on all 72 capacity buses. Tank shall be equipped for at least a 93-95% draw. Note: One (1) tank with a 60 or 100 gallon capacity is to be provided on all chassis. Multiple tanks are not acceptable. Tank to be located immediately behind the entrance door such that fueling takes place just to the rear of the entrance door in order to maximize fueling flow and convenience of remote fueling.

Fuel tank may also be mounted between the chassis frame rails. However, fuel tank, regardless of installation location, must allow a fueling rate of minimum 25 gallons per minute, without activation of the automatic fuel dispenser shut-off feature before the tank is filled to minimum 80% of its full rated capacity, when the bus is elevated 5" from level as measured on the side of the bus AWAY from the fueling port (that is, for buses fueled from the right side, the left side of the bus must be elevated 5" from level for this test). There shall be no fuel splash-back at any time during the fueling operation, such that there is no risk of damage to asphalt in fueling areas by fuel exiting from the filler neck. Unless otherwise notified by the State, the contractor must demonstrate to the State's satisfaction during the pilot model, by means of an actual fuel fill operation, the ability of the installed fuel tank to accept fuel at the simultaneous conditions specified above. If the installed fuel tank and filling system fails to meet the above requirements in full (including splash-back restriction) during the pilot model demonstration, or in any demonstration thereafter, the bus will be considered unacceptable, and the contractor is expected to make immediate, permanent, and appropriate modifications to the tank location and/or filler tube configuration, or to other factors as may be necessary, in all affected buses.

**ALTERNATOR** - Current shall be generated by use of an alternator of the heavy-duty 12-volt type with a built-in rectifier. Minimum output rating shall be at least 270 amperes. Voltage shall be controlled by a transistorized regulator of adequate capacity and matched to operate properly with alternator furnished. Alternator to be equipped with a SAEJ180 two legged mount or acceptable easily accessible high position equivalent mount. All chassis on order are to be equipped with the same brand name alternator (Leece-Neville 4944PA w/ internal regulator, 4949PA w/internal regulator, 4975PAA w/remote mounted regulator or Leece-Neville 320 AMP 4962PAH).

Serpentine belts shall be furnished to drive alternator and fan. Chassis/body grounding of electrical system shall be provided by the use of suitable grounding straps grounding the body to the frame, the engine to the frame and the batteries to the frame.

Chassis manufacturer shall install a readily accessible terminal so that body and chassis electrical load can be recorded through the chassis ammeter and/or voltmeter. Chassis terminal shall have a minimum of 270-ampere capacity. Ammeter and/or voltmeter must give a true reading to show how the charging system is operating.

**ALTERNATOR WIRING HARNESS** - All conductors from the alternator to the battery shall be continuous in length and capable of carrying 270 amps. The conductors shall be sized to provide at least a 25 percent greater current carrying capacity than the design output of the alternator. The conductor between the alternator and the battery shall be routed in a manner that will provide the least distance between points of termination. A separate ground conductor from alternator to engine or frame shall be provided. A separate ground wire from the bus body to the frame shall be provided. All wiring shall be required to meet Society of Automotive Engineering (SAE) Codes.

**WIRING (CHASIS)**: All wiring in the bus shall be in accordance with ALL applicable SAE standards, and must be of a gauge which is rated to handle on a continuous duty basis a load (amperage) which is 25% greater than the maximum rated load of the connected component, or which is 25% greater than the maximum rated combined load of all connected components if several components are served by a single conductor (whether positive or grounding side of the circuit). Any wiring serving to provide a duplication for the grounding a load must be of a gauge rated to handle on a continuous duty basis a load (amperage) which is 25% greater than the maximum rated load of the connected component. The conductors which run specifically from the alternator to the battery are addressed elsewhere herein.

## SPECIFICATION PAGE 9

**GROUNDING**: All grounding on the bus shall be in accordance with ALL applicable SAE standards and shall furthermore be consistent with best industry practice. For each grounding terminal, there shall be a SINGLE particular grounding terminal type specified in the manufacturer's authorized production drawings for the vehicle, and all units delivered to the State shall be furnished with the particular terminal type so specified, for each and every grounding connection throughout the vehicle. There shall be no case on the vehicle where a particular grounding terminal type is not specified in the production drawings, or where two vehicles of same model number use different grounding terminal types for the same connection. Grounding fastener means which are permitted include bolts, welded lugs, and self-tapping screws, but each type shall be fully and permanently suitable for use in the location installed and for the number and gauges of wires served. In instances where welding is used to secure the fastener means to the vehicle frame or body component, the weld must be such that it will not fail in any expected service condition for the useful life of the vehicle. The voltage difference between any two grounding points shall be in accordance with SAE standards. For high current grounds which exceed 30 Amp loads, a cable or ground strap terminal must be bolted directly to the frame rail in pre-drilled mounting holes. During the pilot model inspection, the contractor shall make accessible any and all grounding connections which the State wishes to inspect and/or test.

**WIRING DIAGRAM**: A complete schematic diagram covering all wiring in the bus is required to be furnished and delivered to each LEA school bus garage statewide which orders buses from this contract. The diagram may be provided in either hard copy or digital form (including online). The same diagram may be requested by the State and will be required to be delivered (at no charge) within 3 days of the initial request to the requestor.

**ROAD SPEED CONTROL** - The electronically controlled engine is to be programmed to establish the maximum road speed stated on order. Note: 45 mph on all school bus chassis and 55 mph on activity bus chassis.

**HORNS** - The chassis shall be equipped with dual horns of manufacturer's standard make and mounted so as not to collect water inside the horn.

**IGNITION** - All chassis shall be equipped with an ignition switch lock, which is set up on the master key system. One key will operate all chassis furnished by any one manufacturer regardless of year model.

**LIGHTS** - Each chassis shall be equipped with a minimum of two extended life headlights and two turn signal lights. An appropriate size fuse/breaker shall protect turn signal lights. Turn signal shall be wired to operate as hazard warning lights and shall be connected to a variable load flasher. If two flashers are used, both shall be of the heavy-duty variable load type. All lights shall be of the proper intensity and adjustment to meet the standards of the National Bureau of Standards. The headlight switch shall be of ample capacity to handle the load added by the addition of the clearance, marker lights, and strobe lights required on the body. There shall be provided on the inside firewall or electrical panel left of driver chassis terminals for the connection of the body tail lights, stop lights, backup light and license well light. Turn signal lights shall not operate unless the ignition switch is in the ACC or ON position.

NOTE: Multiplexing/Electronic System Control Technology shall be acceptable in lieu of fuses/circuit breakers or other electronic controls.

**DAYTIME RUNNING LIGHTS** - Low beam headlights, tail lights, parking lights, and marker lights operate at full voltage with the ignition switch on and the headlight switch off. The lights shall not engage while the starter is engaged.

**INSTRUMENT PANEL** - The instrument panel shall be equipped with an ammeter or voltmeter, oil pressure gauge, water temperature gauge, one million mile odometer, vacuum or air pressure gauges, fuel gauge and a high water temperature and low oil pressure light and buzzer. Light indicators will not meet these requirements. All instruments and gauges should be located within 12 inches to the right or left of steering column. The instrument panel shall have lights of sufficient candlepower to illuminate all instruments.

**LUBRICATION SYSTEM** - Chassis lubricating system shall be of the high-pressure type, with hydraulic type fittings located in accordance with best commercial practice. The fittings are to be of a design that will permit quick attachment of the grease gun.

**OIL FILTER** - The oil filter shall be of the manufacturer's standard full flow type with a dry capacity of at least one (1) quart. It shall be of the spin on, throwaway type or replaceable element type filter.

## SPECIFICATION PAGE 10

**OPENINGS** - All openings in floorboard or firewall between chassis and passenger carrying compartment, such as engine area and/or gearshift selector, shall be sealed. Any insulating or access panels on firewall or in floor shall be adequately fastened at both top and bottom and easily removable on completed bus. Maximum decibel level at driver seat to be no more than 83 d.b.a. when tested in accordance with procedures found in Appendix B of the 2005 National School Transportation Specifications and Procedures. It is the responsibility of the manufacturer to reduce the interior noise to acceptable levels.

**RADIATOR** - The radiator shall be of heavy-duty construction with welded headers. The radiator core shall be a welded tube to header joint for increased life. Radiator core shall not be soldered. Radiators of heavy-duty aluminum construction are considered to be an acceptable alternative. Vehicle shall be equipped with an expansion and de-aeration tank with overflow vent hose to route coolant away from the engine. The radiator shall be of sufficient size to adequately cool the engine and transmission under all operating conditions and shall have a valve for drainage. The cooling fan, mechanically belt driven, shall be equipped with an ambient-air-temperature-controlled fan clutch or an engine-water-temperature-controlled fan clutch to facilitate ease of operation and maintenance and meet or exceed OEM requirements. Coolant shall be Organic Acid Technology (OAT) Extended Life Coolant and shall meet all requirements of the respective engine manufacturer and radiator suppliers. Coolant/water mix shall be determined by engine manufacturer. Antifreeze/coolant provided shall be a type only requiring additive at midpoint of coolant life. This additive is an extender only, not containing SCA's. Coolant shall protect the cooling system to -30 degrees Fahrenheit. Engine coolant shall not cause any damage or other adverse effect on any component of the cooling system.

**HOSE AND HOSE CLAMPS** - All hoses shall be silicone or Ethylene Propylene Diene Monomer (EPDM) and all engine coolant hoses that require clamp connections of one inch diameter and larger on the engine or associated components shall be equipped with constant torque clamps, spring-equipped (Breeze or equivalent).

**SHOCK ABSORBERS** - Chassis shall be equipped with heavy-duty, double-action hydraulic shock absorbers front and rear.

**SPRINGS** - Chassis spring assemblies shall be of ample resiliency under all load conditions, except minimum as specified in table "Minimum Requirements of a Type-C School Bus Chassis." Center spring through bolt shall be of proper size for holes punched in spring leaves.

1. Front springs are to be anchored at the front end and stationary eye to be protected by a wrapper leaf in addition to the main leaf.
2. Spring saddles shall be of suitable cast iron construction.
3. Rear Suspension (Air Ride) - All configurations of buses shall be equipped with rear air-ride suspension.

**STEERING** - The steering gear shall be designed to assure safe and accurate performance of the vehicle under any and all conditions. Steering shall have full time power assist with an integral type steering gear (external hydraulic assist cylinder not acceptable). The mechanism must provide for easy adjustment for lost motion. The upper and lower kingpin shall have roller bearings or bronze bushings. The steering column shall be equipped with tilt feature. Tie rod ends, drag links and kingpins shall be equipped with Zerk type grease fittings unless permanently sealed.

**TIRES** - The chassis shall be equipped with six (6) machine-balanced tires, two on the front and four on the rear. Tires shall be of the tubeless type with full steel belted radial construction (sidewall and tread area). Tires furnished shall be tire manufacturer's top line tires and listed in the tire manufacturer's current published catalog and price list. All tires shall be 11R22.5 in size and at least sixteen- (16) ply rating and load range H.-Tires shall be Michelin XZE2, Bridgestone Model R260F, Goodyear G661 HSA.

NOTE: Power lift buses designed to provide a solid platform for the flat floor body configurations must be equipped with Michelin XZE Bridgestone Model R250 ED Goodyear G661 HSA P255/70R22.5 radial tires. All wheel rims shall be 22.5-inch ten-stud hub-piloted.

**WHEELS** - The chassis shall be equipped with six (6) wheels and rims of the ten-stud hub piloted disc wheel design. All rims are to have a width of 8.25 inches. All rims to be painted black.



**TRANSMISSION** - Chassis shall be equipped with an Allison 2500 PTS series automatic transmission filled with TES-295 approved fluid. Automatic transmission shall have an integral torque converter. The transmission shifter shall be manufacturer's standard. Within the range selected, ratio changes shall be effected automatically at full engine power if desired and without use of an engine disconnect clutch. It shall have an illuminated range indicator embossed or made of metal and properly fastened. Control shall be located to the right of the steering column (dash mounting preferred).

**LOAD BASE SHIFT SCHEDULING** - Load-based shift scheduling is required.

**SERIAL NUMBER LABEL** - A metal label shall be furnished showing the Vehicle Identification Number, and permanently affixed on the firewall or dash panel visible from left front corner of bus in a position for maximum visibility and legibility (exact location to be approved). Letters and numerals shall be of the cut or embossed type. The serial letters and numerals should be a minimum of 4MM in height

**TOW HOOKS** - Two heavy-duty tow hooks shall be furnished and factory installed one on each frame rail at front in an approved manner. Two located just forward of rear bumper and are to be attached to the chassis rails independent of the rear bumper and capable of towing the fully loaded vehicle.

**MINIMUM REQUIREMENTS FOR NC TYPE-C SCHOOL BUS BODIES**

**COLORADO RACKING TEST:** Colorado Racking Test shall be required on or before the acceptance date of the first bus of the respective configuration.

**Specifications:**

In addition to complying with the test procedures described in FMVSS 220, the body manufacturers shall record and report the downward vertical movement of the force at 0, 25, 50, 75, and 100% 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) 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.

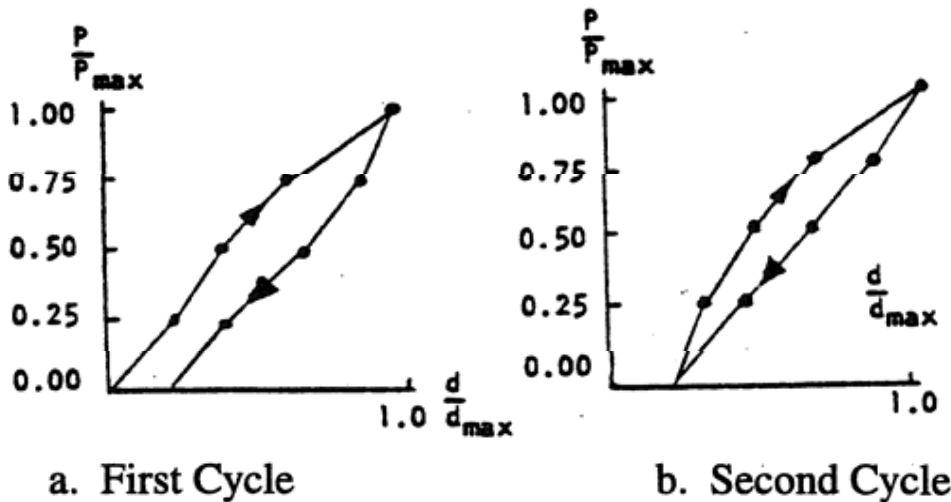


Figure 1. Static Load Test Load-Deflection Curves

## SPECIFICATION PAGE 12

A diagonal (racking) load test shall be performed on Type C, 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 procedure described.

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

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

(a)(2) Each emergency exit of the vehicle provided in accordance with FMVSS 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.

(b)(1) 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)(2) 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 than the length of the vehicle's roof measured along its longitudinal centerline.

(b)(3) 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.

(b)(4) 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.

(b)(5) 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.

(b)(6) Measure the diagonal movement of any point on the force application plate which occurred during the application of force in accordance with (5) and open the emergency exits as specified in (a) (2).

(b)(7) 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).

(c)(1) Temperature: The ambient temperature is any level between 32 degrees F and 90 degrees F.

(c)(2) Windows and Doors: Vehicle windows, doors, and emergency exits are in the fully-closed position, and latched but not locked.

(d) 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 which employs a hydraulic jack to load a two-frame test assembly is illustrated in figure 2.

## SPECIFICATION PAGE 13

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 = DVW divided by N

DVW - dynamic vehicle weight

N - total number of bus body frames

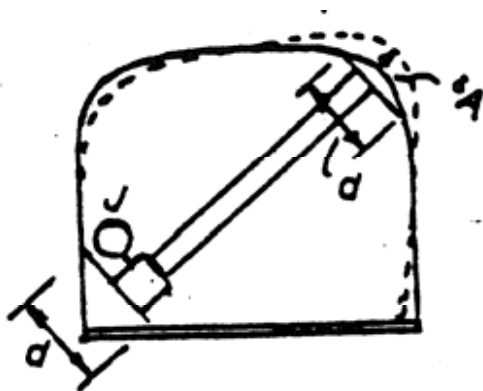
and DVW = DF x GVW

DF - dynamic factor, not less than 1.5

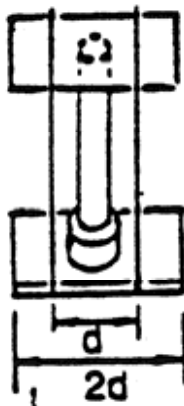
GVW - gross vehicle weight

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 the sum of all jack readings 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.

**SPECIFICATION PAGE 14**

**KENTUCKY POLE TEST:** Kentucky Pole Test shall be required on or before the acceptance date of the first bus of the respective configuration.

**Specifications**

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

Manufacturer shall submit appropriate certification information.

**DIMENSIONS**

**BODY SIZES** - The following standards shall govern the sizes of school bus and activity bus Type-C bodies. The maximum overall outside width of the body shall be 96 inches. The height of the body from the top of the finished floor to the underside of the ceiling, at the center of the body, shall be approximately 77-78 inches.

Note: All wheel chair positions except flat floor configurations shall be aft of the rear wheel wells.

The following table shall govern the body lengths:

<u>Maximum Seating Capacity</u>	<u>Approximate Body Length</u>
41-42	244-275"
53-54	302-329"
65-66	358-376"
71-72	387-402"

**VEHICLE DATA PLATE** - On the inside of the bus, there shall be installed (1) on metal component of header, above the driver and to the left of the visor mounting bracket or (2) on ceiling, directly above the driver's head, a single manufacturer's name plate which can be easily read, on which shall be shown the name of the body manufacturer, the name of the chassis manufacturer, the serial number of body, the serial number of the chassis, seating capacity, GVWR, date body built, date chassis built, actual bus height, length, and weight, and actual tire size installed on bus. Actual weight does not refer to G.V.W.R., but instead shall mean the actual weight of the completed bus full of fuel (60 or 100 gallons, in accordance with tank size furnished) and fluids.

Plate to be metal with all information embossed (for fireproofing). Additional vehicle manufacturer's data plate(s) are not acceptable; all vehicle data shall be on the above single data plate.

**BODY CONSTRUCTION**

**DESIGN SPECIFICATIONS** - Welds, rivets, or high strength bolts or a combination of these items in combination with adhesives may be used in connecting parts of the structural body. Bolts shall have a provision (self-locking nuts/lock-washers) to prevent loosening under vibratory loads. All bolts, nuts, washers and screws used throughout the body shall be cadmium or zinc plated, or thoroughly treated in a manner for prevention of rust (ECO 2000 coating or equivalent). Lock washer or locking devices shall be placed on all bolts used for structural purposes.

**GAUGE OF MATERIALS** - All gauge numbers used in these specifications refer to the U.S. Standard Gauge Number as published by the American Iron and Steel Institute. The following table lists the Manufacturer's Standard Gauge for Steel Sheets in thickness and equivalents:

<u>Gauge Number</u>	<u>Non-coated Steel</u>	<u>Coated Steel</u>
10	.1345	.1382
12	.1046	.1084
14	.0747	.0785
16	.0598	.0635
18	.0478	.0516
20	.0359	.0396
22	.0299	.0336
24	.0239	.0276

The above listed thickness, with the tolerances allowed by the American Iron and Steel Institute, are the minimum thickness acceptable for each given gauge number.

**BODY FLOOR**

**BODY FLOOR DESCRIPTION** - The body floor shall consist of floor panels or floor sections which are no greater in width than the spacing of posts or roof bow frames. The panels shall consist of a steel floor plate(s) stiffened with sills running the full width of the floor. Sills may consist of cold-formed sections of steel or of suitable hot rolled sections. All panels or sections shall be joined so as to form a leak proof and dust proof floor and connected with longitudinal members running the length of the body which are capable of distributing the roof loads from the posts or bow frame to all supporting members.

**FLOOR LOADS** - The floor shall be designed to support all fixed and changeable loads. Fixed loads shall consist of all parts of the body supported by the floor system. Changeable loads are live loads determined on the basis of 125 pounds per passenger with three passengers per seat. The weights of the passengers and seats may be estimated at 70 pounds per square foot of floor area. To allow for vibration and shock, all loads shall be doubled.

**FLOOR PLATE** - The floor of the body shall be 14-gauge Galvalume and/or zinc coated steel floor plate or equivalent and shall be covered with a minimum of 5/8-inch, Marine Grade, Grade B, 5-ply plywood. Plates shall run the full width of the floor and be supported at all edges. Openings should be made only when required such as wheel housing. All openings to be reinforced so as to maintain the full strength of non-punctured floor and not interfere with floor tracking on raised floor models. The floor plates shall be connected to supporting members so as to function as a part of the sills in carrying loads. Access shall be provided through removable cover that provides access to fuel sending unit.

## SPECIFICATION PAGE 16

**FLOOR SILLS** - All cold formed floor sills are to be 14-gauge or heavier, or the main sill shall be equal to or heavier than a gauge of 10 and each intermediate sill shall be equal to or heavier than a gauge of 16. All sills shall extend the full effective width of the floor without splicing so the floor will support the roof load imposed by the side posts. Sills are not required to extend the full width of the body in the wheelhouse area, the gas filler area, or where other structural members interfere. However, if sills do not run the full width of the body, they shall be connected to the adjacent sill for continuity of strength or by other approved methods. If two hot rolled sections or plates are used to form a sill, the two sections shall be connected so as to function as a unit with the rest of the floor system without spread or slip.

There shall be a main sill at each post or bow-frame, except in the wheelhouse area, and two intermediate sills. The intermediate sills shall be equal in depth to main sills. The maximum spacing of the sills shall be 10 inches. The ends of all main sills shall be securely connected, top and bottom, to a longitudinal side rail running the length of the body or other equivalent floor assembly method providing the same level of floor structural integrity. The connections and side rail shall be capable of distributing loads from the posts or bow-frames to all sills. The bus body's transverse and longitudinal frame members should allow stress to flow evenly throughout the bus body. The manufacturer should substantiate the strength integrity of any joint or gusset connection of these members to prove they are of equal or greater than a continuous constructed member is. If requested, this information shall be furnished to the State for review.

**STEPWELL** - A stepwell, having three steps, shall be built into the front assembly and completely enclosed with doors extending to bottom step. Each step shall be 14-gauge steel construction and covered with ribbed rubber or elastomer material as per the 2010 National Standards. The top step riser is to include approximate 2 inch contrasting letters at top edge of step riser stating "USE HANDRAIL". The top edge of riser for next lower step is to include in same sized letters "NO TRESPASSING".



This location is alternative to previous slides showing separated decal location higher, out of the kick zone

Entrance step shall extend below skirt line to such depth as necessary to make the distance to the ground from the bottom of the step no less than 10 inches and no more than 14 inches.

**FLOOR COVERING** - The floor under seat area and drivers compartment shall be covered with black, smooth finish rubber covering or elastomer covering, at least 1/8" thick. The aisle and entrance area shall be covered with black, ribbed pattern rubber or elastomer covering at least 3/16" thick. The frontal area around the driver compartment is to be covered with black sound abatement. The adhesive for laminating the cover to the floor shall be water – resistant type of trowel or spray consistency. A rust proof metal molding strip shall be applied over the edges and joints of the covering. If the chassis is equipped with transmission cover, the cover shall be placed on top of floor board and securely fastened and sealed.

**BODY FRAME**

**BODY FRAMING** - Where posts or bow frames are not loaded in a plane of symmetry, they shall be braced so as to deflect without twisting. The minimum depth of member shall be at least 1 and 1/2 inches and shall be 16-gauge or equivalent. The maximum spacing shall be 30 inches on centers on all sections except one or two, each of which shall be no greater than 40 inches on center. If oversize section is used, there shall be installed additional roof reinforcement in this section.

The section modulus of the cross section shall be not less than 0.22 (in<sup>3</sup>).

Note: All bidders shall submit with their proposal complete detailed engineering drawings detailing the size and shape of a cross section of the post or bow frame along with detailed calculations verifying that the section meets requirements.

**ROOF BOW** - A roof bow shall be located at each post to form a bow frame or bow frames may be formed in one piece. If side post members and bow frames are not one continuous piece, when framing members are joined the connections shall be such as to develop the full strength of the cross section of the two or more members joined. Roof bows shall not be buckled or distorted out of cross section during the process of bending to the curved shape. Each post shall be connected to a main floor sill, either directly through gussets or indirectly through the side rails. These connections shall consist of fasteners at a minimum of two elevations to effectively anchor the bow frame to the floor systems.

Note: All bidders are to submit with their proposal complete detailed engineering drawings of the joint connection.

**ROOF STRINGERS** - Two or more roof stringers or longitudinal members shall be provided to space the roof bows and reinforce the flattest portion of the roof skin. These stringers may be installed between the roof bows or applied externally. They shall extend from the windshield header and when combined with the rear emergency doorposts, are to function as longitudinal members extending from the windshield header to the rear floor body cross member. At all points of contact between stringers or longitudinal members and other structural material, attachment shall be made by manufacturer's method of attachment. If stringers are applied internally, they shall be fastened to each roof bow. If stringers are applied externally, all joints must be lapped the full width of the roof bow and attached to each roof bow with four rivets or securely welded.

**SIDE STRINGER(S)** - There shall be one or more side stringers or longitudinal members to connect the vertical structural members and to provide impact and penetration resistance in the event of contact with other vehicles or objects.

The side stringer shall be installed in the area between the bottom of the window and the bottom of the seat frame and shall extend completely around the bus body, except for the door openings and body cowl panel.

The formed side stringer to be 16-gauge or equivalent metal, 3 inches wide before forming.

The side stringers or are to be fastened to each vertical structural member, in any one or a combination of the following methods as long as stress continuity of the member is maintained:

1. Installed between the vertical members.
2. Behind the panels but attached to the vertical members.
3. Outside of the external panels.

The fastening method employed shall be such that the strength of the stringer is fully utilized.

The side stringer or longitudinal member may be combined with a rub rail, or be in the form of an additional rub rail, so long as the separate conditions and physical requirements for the longitudinal rub rails are met.

## SPECIFICATION PAGE 18

**FRONT FRAMING** -The design shall recognize the weakness at the windshield by provision of frame action to carry lateral loads. The front assembly shall be sufficiently heavy to withstand vibrations transmitted to it through chassis cowl.

Cowl posts shall be 12-gauge and attaching members shall be 14-gauge or two-section, pre-stressed, "Clam shell" pillar assemblies may be utilized in lieu of cowl posts. There shall be a roof bow or reinforced header installed over these posts. Windshield or cowl posts must be of sturdy construction and so designed that the posts will not be so wide as to unnecessarily obstruct the driver's view. If cowl posts are made in two sections, the sections should be joined together by overlapping and welding in an approved manner or the sections should have an insert and be welded. The body shall be fastened to the chassis cowl in a waterproof manner.

**REAR FRAMING** - The emergency doorposts shall extend from the floor sill to the window header and shall be 14-gauge. There shall be installed on each side of the emergency doorposts an additional post equal in strength to the side posts, which shall extend from the floor sill to the windowsill.

**SKIRT REINFORCEMENT** - There shall be installed at the bottom of the outer paneling a continuous skirt stiffener, equal in strength to a 1-inch by 1/8-inch angle. If body construction is of such a design that this type stiffener cannot be used, an additional 4<sup>th</sup> guardrail shall be applied externally. Guardrail to be equal in strength and construction to the guardrails required in the Guardrail Section. This stiffener shall be supported by extending posts or bow-frames or by 16-gauge gussets.

**WINDOW FRAMING** - Window framing shall be constructed of a 14 to 16 gauge formed header or stringer (not a flat strip) with a minimum depth of 1 ½ inches perpendicular to the side of the body. This stringer shall extend completely around the bus body. There shall be installed at the windowsill a stringer which extends completely around the body except for the door opening. A continuous internal and external header constructed of a minimum 18 gauge material, extending the full length of the body and attached to each rafter is acceptable. All construction must meet FMVSS.

### EXTERIOR PANELING

**PANEL DESIGN** - Joints in roof panels should occur only at roof bows, roof stringers and window headers.

**SHEET METAL SKIN** - All paneling above the top of the floor except the cowl panel, wheel housing, and body hoods shall be 20-gauge or heavier. The cowl panel, if provided, shall be of 12-gauge or heavier metal, or cowl panel may be 14-gauge metal with 12-gauge framing.

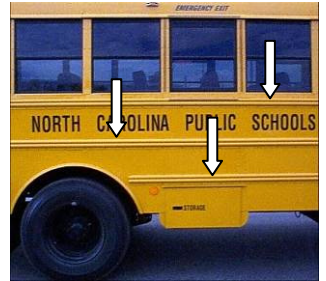
Side lower skirt edge shall be at a horizontal line from the center of the front spindle to the center of the rear axle plus or minus 2 inches.

**WHEEL HOUSING** - The wheel housing shall be rigidly reinforced and shall be attached to the floor in such a manner as to prevent any water or dust from entering the body. They shall be designed for easy removal of tires. External wheel housing opening shall be equipped with a steel or rubber fenderette that extends past outermost portion of tire.



**GUARD RAILS**

In addition to the side stringer or rub rail required in the above wheel housing section, there shall be applied to the outside of the body, three guard rails. These members to be corrugated so as to provide maximum stiffness and shall be 16-gauge or heavier. Pressed-in guardrails will not meet these requirements. Guardrails shall be located at the following approximate locations: floor level, seat level, and windowsill level. The seat level and window level rails shall begin at the entrance door posts on the right side of the body and, except for the rear emergency door, extend around the rear of the body to left windshield post. Where design problems cause difficulty in installing one of the above guard rails, the floor level rail may be extended in its place or an additional stringer installed. Floor level guardrails are to begin at the entrance doorposts on the right side of the body and, except for the wheel house and gas filler and lift door area, extend to the right rear body post, and to the left windshield post. Except for the wheelhouse, they are to extend to the left rear body post, except where design does not permit installation. The guardrails are to be vented and attached at least twice to each post within their lengths. Splices, if any, are to be located at posts by lapping the full width of the supporting part of the posts. All guardrails to be cleaned primed and rust proofed underneath before being installed on body. Guardrails shall be installed utilizing Pan Head Carbon Steel Screws/stainless steel sheet metal screws/ or Drive rivets in all attaching positions



Note: In the event that continuous guard rails are not possible as stated above, reinforcement shall be installed inside the bus body to compensate for the absence of rails.

**WATER TEST**

**GENERAL** - Throughout the construction of the body, there shall be evidence of good workmanship and engineering ability.

All buses shall be water tested for leaks in a high pressure multi-angle test chamber.

Note: Body shall meet all applicable FMVSS requirements. If requested, this test information shall be furnished to the State for review.

**INTERIOR PANELS**

**SHEET METAL LINING** - The roof section of the body is to be lined entirely with 20-gauge perforated sheet steel. Lining panels to have a minimum of at least 2 inches of un-perforated steel for attaching to roof bows. Panels must be designed and fastened to minimize vibration and to be installed for easy removal. Panels from the windowsill to seat rail or to floor shall be 22 to 24 gauge metal textured and embossed stainless, aluminized, or clear-coated galvanized steel sheet.

**MOLDINGS** - At the junction of the interior paneling and the floor, there shall be installed a galvanized, aluminum or other corrosion resistant molding.

All interior lining shall be secured to meet FMVSS 221.

**SEATING**

**SEATING DESCRIPTION**- Seats shall be forward facing and be spaced with the maximum knee room available within standard body lengths. All seats should be 39" or 30" wide, 15 inches deep, and 28" seat back height. The seat width shall be 39" unless otherwise required by the need for minimum aisle clearance depending on interior configuration. Seats are to be arranged in rows of two or staggered with a minimum 12-inch center aisle. All material used in the seat cushions and backs shall meet the requirements of FMVSS 302. All seat upholstery material to be of the type known as fire-block. All seats shall meet the requirements of FMVSS 222.

**CHILD SAFETY RESTRAINT SYSTEMS (CSRS)** - All North Carolina school buses shall be equipped with Integrated Child Restraint Seats that meet FMVSS 210, 213, 222, 225 and 302 (Fire Block Test). All CSRS attachment hardware and anchorage systems must meet FMVSS 210, Seat Belt Anchorage or FMVSS 225, Tether Anchorage and Child Restraint Anchorage Systems. (CE White Model #CR11-39 or IMMI Safeguard Model #ICS-39) Seat upholstery material shall meet FMVSS 302 and shall match seat upholstery material used on all other passenger seats.



CSRS compliant seats shall be installed in the following standard locations;

All bus configurations require -1<sup>st</sup> Two Rows (total of 8 seating positions)

Except on 41-42 (Non Flat Floor lift equipped bus), 1<sup>st</sup> row on one side and 2 rows on other side (total 6 seating positions.)

Some units may be ordered with additional CSRS seats up to 14, 18, 22, or 24 depending on the capacity of bus. However, some units may be ordered with NO CSRS seats which will require a deduct in price.

**SEAT CUSHION PAD** - The top of the seat crown should be approximately 16 inches above the floor. The cushion material should be a minimum thickness of 3 ½-inches front 2 inches rear, excluding plywood base. The cushion shall have a ½-inch thick mounting board and shall be secured to the seat frame to meet the cushion retention requirements of FMVSS 222. Seat cushion is to be covered with an approved (fire block type) upholstery fabric to include underside of seat cushion. The cushion pad is to be secured by a positive locking mechanism (see picture for approved locking mechanism) that requires the removal of a securing device before latch mechanism will unseat from frame.

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**SEAT BACK PAD** – All seat backs shall have reinforcing material equivalent to 24-gauge metal between the front and rear padding and it shall be properly fastened to the seat frame. The back pad and cover shall meet requirements FMVSS 302 and 222. The seat back is to be covered with (fire block type) upholstery fabric.

**DRIVER'S SEAT** – The driver's seat shall be of a high-back air suspension type with a minimum seat back adjustment of fifteen (15) degrees and a head restraint accommodating sizes through ninety-five (95) percentile adult male (as defined in FMVSS 208). The driver's seat shall be covered with black fire-block material. The driver's seat shall have minimum distance between the steering wheel and the seat back not less than eleven inches (11"), with a minimum aft adjustment of six inches (6"). The driver's seat shall provide for fore-and-aft and up and down adjustment and shall be contoured with adequate support on the sides. The seat shall be designed to provide lumbar support and positioned on the centerline of the steering wheel. Driver seat shall be C. E. White ISH-2002, The Seats Inc., or National Model 2000 school bus driver seat with integrated 3-point lap and shoulder harness

Seat shall be identified by permanently attached / approved vinyl tag containing seat manufacturer, model number, serial number and build date.

**DRIVERS SEAT BELT** - The amount of usable belt, as measured from the top point of the seat back, through the sliding buckle, to the point on the left side of the seat cushion where it joins the seat back (that is, near the drivers left hip) shall be at least 103". The ability to quick-release driver seat latch with weight applied is required.

Note: Seat belt webbing shall be bright orange.

**FIRE BLOCK UPHOLSTERY FABRIC** - The upholstery material used to cover all seat cushions and backs shall conform to requirements of the following product specifications and testing:

The base fabrics shall be fire block, , un-dyed, and the minimum finished weight per square yard shall be 25 oz., lock stitch knit backing. The breakdown of the material shall be as follows:

Mfg: Prevail, Kevlar Mfg., or Spradling

Weight of Film: 38-oz linear yd.

Finish Weight of Material: 25-oz/sq. yd.

Product Specifications/Testing:

Grab tensile (lbs.) ASTM-D751

Tongue tear (lbs.) Fed 191A-51334

Tack tear (lbs.) ASTM D751-79 mod.

Trapezoid tear (lbs.) ASTM D1117

Adhesion (lbs./in.) ASTM D751

Seam breakage - AMC method

Flex testing (1 hr.) CFFA-10

Blocking-Fed Standard 191-5872

Low temperature (-20) #5 roller Fed STD 191A-5872

Abrasion (Wyzenbeek) Fed standard 191A-5304 240 grit-1000

Puncture Test 28 lbs.

Minimum 6 Stitches Per Inch using Tex 105 30/6 Spun Kevlar or Higher Thread

Flammability Testing:

FMVSS - 302

FAR 25.853

Boston bag

National School Bus Standards fire block material

All sewing on cushions and backs to be securely stitched with all seams lock stitched or double stitched with Tex 105 30/6 Spun Kevlar or higher thread or equal fire block thread. Seam ends should be backstitched to prevent unraveling. The same grade of material and construction shall be used in all activity buses. Seat color is to be blue.

**ASSIST RAIL AND CRASH BARRIER**

**ASSIST RAIL** - Two safety assist handles or rails shall be provided at the front entrance, located on the right and left, securely mounted inside of body and should extend to bottom step to be within approximately 28 inches of ground. The right side assist handle shall be braced to dash firewall or approved floor location. Assist handles shall be made from 1 ¼" inch OD round stainless architectural tubing or 1 ¼" inch OD anodized aluminum meeting ADA minimum requirements.

**CRASH BARRIER** - Crash barrier shall meet FMVSS 222 & 302 and shall be constructed and covered as per seat backs with blue seat material. Crash barrier material shall be fire block type. Crash barrier on right and left side of bus shall have a modesty panel between the stanchion bars of crash barrier from floor level to bottom of crash barrier.

**BROOM HOLDER** - A non-metallic broom securement device shall be mounted in front of or on the front side of the crash barrier, behind the driver seat. Exact location to be approved upon inspection of pilot model.

**ELECTRICAL SYSTEM**

NOTE: Multiplexing/Electronic System Control Technology shall be acceptable in lieu of fuses/circuit breakers or other electronic controls.

**WIRING (BODY)** - All wiring shall conform to the standards of the Society of Automotive Engineers. It shall be color and number coded, insulated and protected by covering with fire suppressant cover. All fuse/circuit breaker blocks shall have circuit identification decals.

Wiring should be in circuits as follows: dome and stepwell lights, flasher lights and stop arm lights, emergency door buzzer, windshield wipers, heaters and defroster, and turn signal system. The body wiring shall be enclosed with a removable cover extending from front to rear of body. All electrical connections between body and chassis should be made at the connection furnished on the chassis. Wires will not be spliced into existing chassis wiring.

Located in panel left of driver or in adjacent outside electrical panel shall be two accessory studs: one (1) each fused, functioning in "run" or "accessory" positions only, and one (1) each battery voltage fused 50 amp minimum, each such stud labeled as specified. Alternatively, six (6) each, fused 20-amp minimum accessory drop wires, with four (4) functioning as accessory and two (2) functioning as continuous hot, and so labeled. Access from driver area is required if outside electrical panel is used.

**CONTROL PANEL** - To the left of the driver, there shall be installed an enclosed electrical accessory panel that can be easily removed for servicing. Inside the panel shall be located all relays, switches (including heater and defroster), junction block, circuit breakers, flasher units, and door buzzer. The accessory panel should be grounded to cowl of chassis by use of 10-gauge wire. All electrical connections inside panel to be constructed so as to eliminate heat buildup in wires. Control panel shall have heavy duty, rocker type or equivalent switches that are identified using international symbols.

(See pictures for approved switch locations)

**RELAYS** - There shall be provided two constant service, heavy-duty master relays (Essex or Tyco) or an integrated power distribution board that provides the same function as the heavy-duty master relays. These are to be actuated by the ignition switch and through which all electrical accessories except the turn signal units are to be wired. Wiring from the chassis to the relays and from the relays to the fuse block shall be number 10-gauge wire. One master relay or integrated power distribution board to supply current for the dome lights, stepwell light, windshield wipers, and emergency door buzzer. There shall also be a manual noise abatement switch installed in the control panel, labeled and alternately colored, and wired into the activation circuit for the master body circuit relay. This shall be an on/off type switch that deactivates all body equipment that produces noise, including, at least the heaters, air conditioners, fans, and defrosters. This switch shall not deactivate safety systems such as windshield wipers or lighting systems.

The other master relay to supply current for the flashing stoplights, stop arm lights, strobe lights and flashers.

**LIGHTING**

All lighting systems shall meet or exceed all applicable FMVSS requirements.

All LEDs must be sealed units with no weep holes.

Lens screws on all exterior lamps shall be stainless steel.

**INTERIOR LIGHTING** - Interior lights shall consist of at least four flush mounted ceiling lights and one adequately protected inside stepwell light. All interior lights, including the stepwell light, shall be activated when door is opened and engine switch is on.

**CLEARANCE/MARKER LIGHTS LED (LIGHT EMITTING DIODE)** – Combination clearance/marker lights shall be installed per specifications. These lights shall be LED (light emitting diode) with sealed electrical plugs and protective aluminum guards with the exception of the center front and rear triple clearance lamps that do not require shields when protected by recessed mounting area. Lamps are required to be LED with sealed electrical plugs. Lamp model to be approved at pilot model inspection for center triple clearance lamps. Front lenses are to be yellow in color and rear lenses are to be red in color. On bodies over 30' in length an amber marker light is to be located midway of the bus body. Lights shall be Truck-Lite 35375Y (yellow), 35375R (red) 5 LED pattern, Weldon 5181 - 4 LED pattern with sealed electrical plugs or equivalent.

**EIGHT LIGHT WARNING SYSTEMS LED (LIGHT EMITTING DIODE)** – Each school bus (not activity bus) shall be equipped with four (4) Weldon LED-flashing stoplights with replaceable LEDs and lens. Lens shall be at least seven inches in diameter, or if in a shape other than round, a minimum of 38 square inches. The light assembly shall be of LED design. Location of lights and direction of beam are to be approved upon inspection of pilot model. The circuit shall be wired so that one front, one rear, and stop arm light shall flash alternately with the other front, rear, and stop arm light. The switch to operate flasher lights is to be located in the control panel in the closest location to the end adjacent to the air door switch and will activate the relay from the ignition switch (location to be approved upon inspection of pilot model). Any light activation switch must have cancellation capability so that the amber lights may be deactivated without opening the door. The flasher light activation switch is to be red in color. The flasher shall be electronic (Weldon 7000 or InPower SBF94) unless the functionality is provided by an electronic system controller. System shall also include an LED Strobe Circuit Flasher.

Note: Deactivation of eight-light system must occur by closing of entrance door.

Note: LED lighting to be provided with vehicle manufacturer warranty of 5 years, and to include labor reimbursement through same period.

For each school bus, (not activity bus), in addition to four red lamps described in the above section, four (4) amber Weldon LED lights with replaceable LEDs and lens shall be installed as follows: one amber lamp shall be located near each red signal lamp at same level, but closer to vertical centerline of bus. Lens shall be at least seven inches in diameter, or if in a shape other than round, a minimum of 38 square inches. A system of red and amber signal lamps shall be wired so that amber lamps are energized manually, and red lamps, and stop arm are automatically energized (with amber lamps being automatically de-energized) when bus service door is opened. Amber lights must be wired with capability to be deactivated without opening the door. Eight light warning lenses shall be covered with black hoods.

**STOP ARM** – Each school bus (not activity bus) shall be equipped with an air operated strobe flashing stop signal. This signal shall be equipped with two (2) flashing strobe lights, at least 4 inches in diameter, red in color, and double faced. The blade for the stop arm shall be metal in construction, octagonal in shape, shall be at least 18 inches in diameter, and shall be covered with 3M Hi-Intensity Prismatic sheeting. The word "STOP" shall be placed on both sides of the blade in letters 6 inches high. Specialty Model 2980 strobing LED. The stop arm air supply is to have an independent solenoid valve and regulator. Air line to be metal or nylon with suitable fittings. Assembly shall be installed as recommended by arm manufacturer.

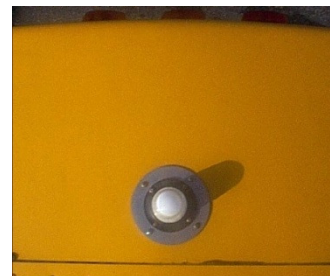
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**TURN SIGNALS LED (LIGHT EMITTING DIODE)** – Each school and activity bus shall be equipped with two- (2) amber LED (light emitting diode), surface mounted, 7-inch round (or, if in a shape other than round, 38 square inch) directional turn signals. If round lights are used, they shall be Truck-Lite Model 91251Y or equivalent. Rear directional turn signals shall be wired to hazard warning switch. In addition to the rear directional turn signals, LED (light emitting diode) side directional lights shall be installed on the body to work in conjunction with the directional turn signals. Lights shall be Truck-Lite 21251Y or Weldon 5170.

**STOP/TAIL LIGHTS LED (LIGHT EMITTING DIODE)** – All buses shall be equipped with four (4) combination stop/tail lights.

1. Each school and activity bus shall be equipped with two (2) red LED (light emitting diode), surface mounted, 7 inch round (or, if in a shape other than round, 38 square inch), combination brake/tail lights. Round lights shall be Truck-Lite 91252R or equivalent.
2. Each school and activity bus shall be equipped with two (2) red LED (light emitting diode), recessed, 4 inch round brake/tail lights (or, if in a shape other than round, 12 square inch). Round lights shall be Truck-Lite 44002R or equivalent, with black rivet-style ring. Truck-Lite Model 44709 or approved vandal resistant installation. Lights shall be placed on the rear of the body between the belt line and the floor. The stop lamps shall be activated by the service brakes and the tail lamps by the parking lamp circuit. Lights shall be secured with rivets.

**STROBE LIGHT** - A strobe light is to be mounted on top of the bus body centered above the rear emergency door 12 – 18 inches from rear edge of roofline. The lens shall be made of clear glass with an aluminum base. The bulb shall be a replaceable double flash (10 Joules minimum) low amp draw/ high light output bulb. A replaceable remote power pack is to be mounted inside the rear 1/3 of the bus body behind an accessible panel (location to be approved at pilot model). The light is to be wired in conjunction with the ignition switch and be activated only when the ignition switch is in the on position. The light shall meet SAE J1318 and J575 standards. Strobe light is to be Specialty Model 205 or equivalent. (See picture for approved light location.) Light shall be grounded to structural support.



**BACK-UP LIGHTS LED (LIGHT EMITTING DIODE)** – Each school and activity bus shall be equipped with two (2) white LED (light emitting diode), recessed, 4 inch back-up lights, Truck-Lite Model 44041C or equivalent, with black rivet-style ring Truck-Lite Model 44709 or approved vandal resistant installation. Weldon 7” LED backup light, model #9186-5586-30 is acceptable when recessed lights are not available. Backup lights shall be secured with rivets and wired to the switch on transmission and be activated in reverse gear only. Lights should be mounted in a location to provide the best illumination for the driver when backing the vehicle. The LED light may be either circular or rectangular, provided the lighted surface area of each light is minimum 12.5 square inches.

**LICENSE PLATE LIGHTS LED (LIGHT EMITTING DIODE)** – Each school and activity bus shall have a LED (light emitting diode) license plate light. The light is required on the right side over the NC State license plate. A light is not required over the safety message plate. (Truck-Lite Model 15205, Weldon 8102-0100-30)

**REFLECTORS** - There shall be installed on the bus body (2) amber and (4) red reflectors that meet FMVSS 108 requirements. The lenses are to be 3 inches in diameter and made from acrylic plastic with six reflecting angles. Frame (if used) is to be polished aluminum or zinc plated steel. Note: Diamond grade vinyl reflectors will be accepted.

**BACKUP WARNING ALARM** - An automatic audible alarm shall be installed behind the rear axle and shall comply with the Society of Automotive Engineering Standard (SAE 994b). The alarm shall be activated when the transmission is placed in reverse gear only.

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**EMERGENCY DOOR BUZZER** - On the rear/side emergency door post at the emergency door lock there shall be installed a switch which is actuated by a maximum of ¼ -inch travel of the lock bolt. The switch shall be covered and wired to an approved buzzer and panel light system, which meets FMVSS 217. The buzzer and panel light shall be activated to warn the driver when the emergency door is not properly fastened.

**ACCESSORY POWER POINT RECEPTACLE** – Panel location to be approved and must be mounted in the driver's area or on a side of the driver's storage compartment on a flat surface.

### HEATING AND VENTILATION

**HEATER** - All body heaters will be supplied with a replaceable filter. On buses equipped with elevated driver seat platform, and if the air intake for the heater faces the rear of the bus, there shall be a steel kick plate barrier to protect the filter from damage. The barrier shall be designed to allow sufficient air intake to the heater and be designed for easy filter removal with quick-release fastener(s) on cover and without deforming filter. A heavy duty, fresh air, heater shall be provided which uses the hot engine water as a heat source. The heat exchanger shall be of the coil type and capable of withstanding an internal pressure of 175 psi for 3 minutes. Along the windshield sill, there shall be installed a metal or plastic ducting having a capacity of not less than 150 cubic feet of air per minute. The duct shall have sufficient louvers or adjustable diffusers to direct a strong flow of properly heated air over the entire windshield surface. Windshield will have an equal volume of airflow provided to each side (left and right).

The heaters shall have the capability of providing evenly distributed heat, creating a temperature rise to 50 deg. F. inside the body shell in 20 minutes when soaked in an ambient temperature of 0 deg. F. for 15 hours. The Bus Body Heating System Test as defined in Appendix B of the 2005 National School Transportation Specifications and Procedures is the heater performance test to be used.

Note: Vehicle engine shall be capable of producing and maintaining 170 degree water within 12 minutes of normal operation at 25 degrees Fahrenheit ambient air temperature, or otherwise an auxiliary heating device shall be installed to fulfill this requirement in its entirety.

All 42 lift, 54, 66, and 72 passenger buses shall have an additional plumbed heater (min. 80,000 BTU on 54, 66 & 72 pass. and min. 50,000 BTU on 42 passenger lift). Rear heater is to be located aft of wheel well under seat. A switched transfer pump is required, activated when either the front heater switch or separate rear heater switch is turned on.

All fittings and installation shall be above the floor level of the body and contained in a track designed to prevent steam or water from contacting passengers in the event of a leak, fitting separation, or other malfunction. Heater hose shall conform to SAE specifications 20R3 class D1. Brass, copper elbows or rigid plastic sleeves shall be used in the water hose when it is necessary to make a 90-degree or greater bend in the lines. Rustproof adapters shall be installed in water hose connections to the engine. There shall be installed in the water lines, between the water manifold and the engine water pump, one all-brass master shutoff in each supply and return line. Regardless of plumbing configuration, each heater core within the bus body shall have a dedicated pair of shutoff valves located at the core, one valve in the supply line and one valve in the return line, except when doing so would conflict with FMVSS requirements for windshield defrosting. Shutoff valves to be of the quarter-turn ball valve type.

No rear heater required on 42-passenger non-lift bus. Heater location for flat floor units shall be aft of lift and on same side as lift. Front heater on all models shall be in manufacturer's standard location, to be approved at pilot.

**INSULATION**

**INSULATION MATERIAL AND LOCATION** - The inside of the skirting from the floor to its bottom edge shall be completely coated with an undercoating material conforming to the Federal Specifications No. TT-C-520-1 (or latest amendment). Underside of wheel housing shall be coated with same material. The space between the exterior and interior perforated roof panels shall be completely covered with a minimum 1-½ -inch thick layer of fiberglass or acceptable equivalent. Insulation must be installed above the perforated roof panels in such a manner as to prevent any insulation from filtering through the perforations into the passenger compartment. The space from the bottom of the side windows to the floor level shall be completely covered with a minimum 1-½ inch thick layer of fiberglass insulation or acceptable equivalent.

The rear wall of bus from the bottom of rear windows to the floor level shall be completely covered with a minimum 1-½ inch thick layer of fiberglass insulation or acceptable equivalent. The firewall area of the bus shall also be insulated against engine noise, heat loss and fire penetration in the event of an engine fire.

**DOORS**

All bus configurations shall be equipped with vandal prevention locking securement system that meets all FMVSS Standards. For the emergency door, slide-locks or similar devices are required; removable keys or removable plugs are not acceptable, since they could be lost and then prevent bus operation.

**ENTRANCE DOOR** - The entrance door shall be located at the front of the bus and on the driver's right. Entrance door shall be air operated on all chassis, panic free, outward opening under control of driver and so designed as to prevent accidental opening. The door switch is to be mounted to the left of the driver seat adjacent to the warning light switch. Door control mechanism shall be located overhead of door and concealed behind a removable panel and be secured with easily removed fasteners. Door shall seal against a stationary rubber and bottom step edge. An emergency release properly identified and located inside the body, forward of the entrance door is required. When activated, it releases pressure on the entrance door mechanism so that it may be pushed open if the driver's control is in the closed position. Entrance door shall be made of steel or aluminum. It shall be securely hinged with approved piano type hinges, two point steel pins, bronze bushing and/or bearing hinges or pivots. It shall be fastened to the adjoining member and shall be provided with suitable weather stripping top and bottom to prevent leaks. Minimum vertical clearance shall be 73 inches. An exterior handle for operating outward opening doors is required. A suitable safety pad shall be installed on interior of door header. Front and rear entrance door leafs to be sealed where door shafts extend into body to prevent dust and contamination from entering door actuator area. A decal shall be affixed adjacent to the emergency release valve giving instructions on the safe operation of the release valve.

The location of the decals is to be approved upon inspection of pilot model. (Decal to include explicit instructions for the operation of door release valve in an emergency and normal situation.)

**EMERGENCY DOOR** - An emergency door shall be located in the center of the rear of the body. It shall have a minimum horizontal clearance of 24 inches and a minimum vertical clearance of 48 inches. Door shall be hinged on the right side (when facing bus from rear) with an approved type of hinge meeting FMVSS 217 requirements. It shall open outward and shall be designed to open from both inside and outside of bus. Door should be equipped with a metal or approved strap doorstop, which shall limit its opening to a minimum of 95 degrees. A suitable safety pad shall be installed on interior of door header that will provide padding for vertical and horizontal surfaces. The words "EMERGENCY DOOR" shall be lettered on or above door on inside. Rear emergency door and side emergency door (if required by FMVSS 217) must be equipped with a hold open device which complies with FMVSS 217.

The emergency door is to be equipped with a gear and rack-fastening device or equivalent. Rack shall be 1-¼ inches by 5 ½ inches by 3/8-inch steel and shall be designed for 1 ¼ inch of travel in locking. Rod for operating lock should be a minimum of ½ inch by 4 ¾ inches long with non-detachable handles.



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**REARSCOPE LENS** - All buses shall be equipped with a Rearscope prismatic lens. This lens is to be mounted on the rear door upper glass area with the recently updated manufacturer's current and best mounting system. Materials to be a solid acrylic – reversing lens (size 14" x 14"),

**SAFETY ROOF VENTS** - All buses except 41-passenger shall be equipped with two roof hatch-type emergency exits: one to be located in the front 1/3 of the body and one to be located in the rear 1/3 of the body. The 41-passenger bus shall have one roof vent centrally located. Hatches must meet the following:

1. Shall comply with all requirements of FMVSS 217 for emergency exits. Note:
2. Simple release handles shall be provided permitting operation as emergency exit(s), accessible inside and outside the vehicle.
3. All emergency exits shall be marked with instructions for proper use and all emergency exits must be outlined with reflective tape which meets FMVSS 217.
4. Hatch to be supported on all four sides by structural bracing.

Hinged low profile roof escape hatch shall include an internal and external release mechanism and a buzzer (audible warning tone not allowed) which alerts the driver when the hatch is open. Hatch to be secured with adhesive to eliminate leaking. Specialty Model 9245-0200 or 9245-0300.

## WINDOWS AND WINDSHIELD

**SIDE WINDOWS** - There shall be installed on each side of the body an adjustable split sash window between each framing post. Bottom sash shall be stationary with a minimum clear vertical opening of not less than 12 inches. The 12-inch clear vertical opening would be accomplished by lowering the top sash. A finger touch type opener shall control window opening.

Window visors/drip rail are to be provided for all side windows. All side passenger windows shall be tinted glass as per requirements in Glass Section.

**EMERGENCY WINDOWS** -The minimum number of push out windows (location to be approved upon inspection of pilot model) must be installed in order to meet FMVSS 217. The same number of windows should be installed on each side. All push out windows must be marked with reflective tape which complies with FMVSS 217 and be of the side-hinged design. Use yellow tape on yellow buses, and white tape on all other colors of buses. Instructions to operate emergency exit windows shall be permanently affixed to both the inside and outside of the window glass. Both sets of instructions must be legible from the inside of the bus. Instructions shall be clear and concise for the operation of the emergency window handles. The words "EMERGENCY EXIT" to be lettered on inside at top of windows.

**DRIVER'S WINDOW** - There shall be installed to the left of the driver a window with a sliding sash, easily operated from the driver's seat, and which is to include a metal locking device. Adjoining the ventilator sash, there shall be a window, which will permit easy exit in case of emergency. Glass used in driver's window is to be installed in sash of the same quality as side windows.

**REAR DOOR WINDOWS** - There shall be installed in the rear door, two windows, which are set solid in a suitable and waterproof manner. The upper window shall have a minimum glass area of 400 square inches and the bottom window shall have a glass area of approximately 350 square inches. Rear door glass is to be tinted same as indicated below

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**REAR WINDOWS** - There shall be installed at the rear of the body on each side of the emergency door, a window set solid in a suitable and waterproof manner-to be tinted same as side passenger windows.

**ENTRANCE DOOR WINDOWS** - There shall be installed in each section of the entrance door one or two glasses.

**GLASS QUALITY** - All glass used in the body shall be of the laminated or tempered safety type conforming to requirements of the American Safety Code for Safety Glazing Materials. All glass should be legibly and permanently marked with safety code.

**WINDSHIELD GLASS** - The glass in windshield shall be heat-absorbent, laminated plate. It shall have a horizontal gradient band starting slightly above the line of the driver's vision and gradually decreasing in light transmission to 20 percent or less at top of windshield.

**WINDOW AND DOOR GLASS** - The glass used in the doors and windows shall be of the AS-2 quality meeting FMVSS 205.

Glass shall be high quality tinted safety glass.

Percentage of light transmission shall be as specified below. "Light transmission" means the amount of natural light transmitted through the glass:

Side Windows: 26% -31% light transmission  
Driver's Window: 70% - 78% light transmission  
Rear Door Windows: 50% - 53% light transmission  
Rear Windows: 26% - 53% light transmission  
Entrance Door Windows: 70% - 76% light transmission

## **BATTERY CARRIER**

The body shall have a battery carrier with a pull-out roller bearing sliding tray located under the body floor with a lockable access door through the left body skirt panel. (All locks keyed the same.) Carrier must be protected against water and dirt and should have a drain shield over top of door. Inside of carrier should be primed and painted with (1) asphalt varnish, (2) acid resistant paint, or (3) E-coat primer with powder coat paint. Battery is to be fastened to pull-out roller bearing sliding tray for easy servicing and sliding tray is to be provided with locking device to securely hold it in place in the battery carrier. Battery box shall - be approximately 14 inches high x 25 inches wide x 16 inches deep. Battery box shall be capable of accommodating three (3) BCI Group 31 batteries with a total of no less than 1900 CCA. Battery door shall be lockable and keyed the same as any other lockable access panels and have metal pin-style hinge. The battery compartment door shall be identified with the word BATTERY in 2-inch Black lettering.

## **BUMPER (REAR)**

**REAR BUMPER SIZE** - The rear bumper shall be of pressed steel channel at least .1875 + or - .005 inch in thickness and minimum 8 inches (high). It shall be wrapped around the back corners of the bus and it is to extend forward a minimum of 12 inches, measured from the rear most point of the body at the floor line. Rear bumper shall be equipped with 2-inch yellow diagonal Reflexite or 3M yellow for yellow bus, white for activity buses.

**REAR BUMPER ATTACHMENT** - The bumper shall be attached to the chassis frame in such a manner as to be easily removed and be so braced as to develop the full strength of the bumper section. This is also to include rear or side impact and shall be so attached as to prevent hitching of rides. Rear bumper shall extend beyond the rear most part of the body surface at least one inch, measured at the floor line.

**MIRRORS**

**INTERIOR MIRROR** - There shall be securely installed on the windshield header a 6"x30" driver-adjustable rearview mirror (Tiger Model # 1444, Tiger Model # 1449, or Rosco Lever Lock Model 630LL) so located as to give the driver a clear view of the interior of the bus and the road behind. Interior mirror must be mounted securely enough to prevent mirror vibration over the life of the bus. Securement to be approved at pilot model. Manufacturer and model number shall be attached to mirror.

**REAR VIEW MIRROR SYSTEM** - There shall be installed on each side distortion-free glass mirrors. Mirrors shall be mounted on both the left and right side of the bus in an anodized or etched aluminum frame. Mirrors shall be fully adjustable so as to give the driver a clear view of the rear wheels of the bus and be mounted in accordance with FMVSS 111. The rear vision mirror system shall be capable of providing a view along the right and left sides of the vehicle which will provide the driver a view of the rear tires at ground level, and a minimum distance of 200 feet to the rear of the vehicle. Mirror system shall be Mirror Lite Super Double Nickels or Rosco Open View ES Mirror System, heated (all models), with remote controls. Both mirror heads must be of similar size and viewing area. Switch must be rocker type – no joystick.

Note: The mirror manufacturer and model number shall be stamped or permanent vinyl tag attached to mirror housing.

**CROSSOVER MIRROR SYSTEM** - There shall be installed on each front fender of the chassis one heated mirror. These mirrors shall be mounted on the front corners of the hood assembly. These mirror brackets shall have sufficient supports (steel plate or approved equivalent) located on the inside of the hood to prevent the fasteners from pulling through the hood assembly (Rosco Hawk-Eye Model 2365H).

Note: The mirror manufacturer and model number shall be stamped or permanent vinyl tag attached to mirror housing.

NOTE: The heating elements in rearview and crossover mirrors must all be controlled by a single momentary switch incorporated with a 15-20 minute timer located left of driver.

**ACCESSORIES**

**SUN VISOR** - There shall be installed on the windshield header an interior sun visor which is double bracketed, adjustable, and not less than 6 inches x 24 inches in size. Visor is to be mounted in a manner that will not interfere with opening and closing of the overhead storage compartments and centered with steering wheel and driver seat.

**WINDSHIELD WIPERS** – The bus shall be equipped with two heavy-duty electric windshield wipers. The wipers shall be equipped with one (1) or two (2) windshield wiper motors. The design of the wiper shall be such to afford the maximum wiped area and good driver view. If a single wiper motor is used, the system shall meet the requirements of SAE standard J198. Wiper motor(s) shall have a minimum of two (2) speeds with intermitting feature, operated by a single switch. Electric powered windshield washers shall be installed as per FMVSS 104 to operate through "wet" wiper arms, operated by the same switch.

**LICENSE PLATE HOLDERS** – Two license plate holders shall be located on the rear of the body with indentions on left and right sides. Holes for license plates shall be bored on the left and right sides.

**SAFETY INFORMATION LICENSE PLATE** – A safety information license plate shall be mounted on the left side license plate holder. The plate will be supplied by DPI and installed by vendor.



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**FIRST AID KIT** - There shall be installed a Grade A first aid kit in a transparent box which shall contain the following contents:

4-inch bandage compresses	2 pkg.
2-inch bandage compresses	2 pkg.
1-inch adhesive compress (16 per pkg.)	2 pkg.
40-inch triangular bandage with two safety pins	2 pkg.
Non-latex exam gloves 2 pair (1 medium, 1 large)	

First aid kit to be secured in "Safety Equipment Storage Box" and is to include breakable tamper seal.

**FIRE EXTINGUISHER** - One 5-pound dry chemical stored pressure type with pressure gauge meeting UL and U.S. Coast Guard requirements is required. Fire extinguisher shall have an all metal discharge head and valve (no plastic valves). The fire extinguisher is to be secured in "Safety Equipment Storage Box" in a universal mount that will accept any 5 lb fire extinguisher. In addition the fire extinguisher shall be labeled: Property of North Carolina Public Schools.

**WARNING DEVICES** – Each school bus shall contain at least three reflective triangle road- warning devices enclosed in a storage box which is mounted in the "Safety Equipment Storage Box" and must meet requirements of FMVSS 125.

**BELT CUTTER** - A Tie-Tech belt cutter shall be installed on all school buses in the side pouch on left side of driver seat cushion.

**BODY FLUID CLEAN-UP KIT** - Each bus shall have a removable and moisture-proof body fluid clean-up kit accessible to the driver. It shall be properly mounted and identified as a body fluid clean-up kit in a transparent box.

Kit shall contain:

- 1 - 2 oz. package T.I.L.S.C. powder, sanitizes-deodorizes-encapsulates
- 1 - Odor reducing mask
- 1 - pr. – non-latex exam gloves (large)
- 2 - Antiseptic wipes
- 2 - Paper crepe towels
- 1 - Scraper
- 1 - Plastic disposal bag w/scoop and tie

Body fluid clean-up kit to be secured in the "Safety Equipment Storage Box" and is to include breakable tamper seal.

**OVERHEAD STORAGE COMPARTMENT** - A lockable compartment, separate from the safety equipment storage box, shall be located left of driver over side window or in other approved location. Compartment is to have a hinged door and metal prop rod is required.

**SAFETY EQUIPMENT STORAGE BOX** – Each bus shall be equipped with a safety equipment storage box of sufficient size to house the fire extinguisher, first aid kit, body fluid clean-up kit and road warning triangles. Each item in the box should be easily accessible and this compartment shall be located in the front bulkhead. In the event structural bracing will not allow space for safety equipment in the specified location, the storage box shall be located left of driver over side window. The approved location shall not interfere with the driver fan. Outside lid of box is to be lettered in 2" vinyl lettering with the following "SAFETY EQUIPMENT INSIDE".

All latches shall be equipped with locks, all keyed the same as other lockable compartments, and all locks shall be attached to the vehicle warning buzzer and ignition interlock system.

The compartment door shall be hinged and metal prop rod is required.

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**WINDSHIELD STEPS** - There shall be installed on each side of the body on the lower section of the cowl, a folding windshield step and a suitably located handle for easy cleaning of windshield. Handle may be either chrome-plated, black poly material, or painted National School Bus Yellow.

**FUEL FILLER OPENING COVER** - A latch able door of 20-gauge metal is to be installed over fuel filler opening on side of body. The door must be held in the open and closed positions with a spring device. A suitable panel in the body floor shall provide access to the fuel sending unit and fuel lines. Fuel capacity shall be permanently labeled on the inside of fuel door.

**CROSSING CONTROL ARM** - An air-operated polycarbonate crossing control arm shall be mounted on the right end of front bumper and operated through stop arm switch in conjunction with a switch mounted on front door control. Arm shall extend approximately 5 ½ feet when in operation. Crossing arm is to have an independent solenoid valve and regulator (Specialty Model 28000 series air operated or Specialty 8100 series). An electro-magnetic mount (or other approved retention mechanism; NOTE: approval must be requested no later than 10 days before bid opening) shall be installed on the left side of the front bumper that secures the crossing arm stationary when the ignition switch is in the on position. Arm shall not exceed 90 degrees when fully deployed and be parallel to ground. Magnetic mount shall be Specialty Model 8101 or equivalent. Note: Crossing control arm not required on activity buses.

**DRIVER'S FAN** - A 12 volt electric fan shall be installed in the driver's vicinity or a suitable automotive style ventilating system providing air conditioning and heat through ducted vents in the driver's compartment shall be provided. (Standard dashboard ducting for air conditioning may be eliminated if driver's electric fan is provided.) The driver's fan shall have a separate switch with high, low and off positions. The fan shall be a Bergstrom motor # 202270 having a metal housing, mounting bracket, fan guard, and blade. Fan shall be fully adjustable and not block view of right side rear view mirror.

**PASSENGER ADVISORY SYSTEM** – Each school bus shall be equipped with a passenger advisory system that is armed when the red lights are turned on at first passenger stop. If the driver attempts to exit the bus prior to deactivation procedures, the horn shall sound immediately. The proper procedure for deactivation is by placing the ignition key in the "OFF" position and then pressing a button located on the rear bulkhead on driver's side of bus prior to opening passenger door to exit. The deactivation device shall be tamper-proof such that it cannot be disabled by students or other passengers. Explicit instructions for operating this system shall be installed above entrance door. Instructions shall be on a plastic type material that will adhere to the applied surface.

Note: Passenger advisory system is not to sound the horn unless passenger door or rear emergency door are opened prior to system deactivation, at which time the immediate sounding of horn shall occur. Timer delays of any type are prohibited.

**SPLASHGUARDS** – Each school bus and activity bus shall be equipped with rubber front and rear splashguards to prevent debris from being thrown under the bus body. Width to be approved at pilot model inspection.

**CHASSIS MOUNTING**

**CHASSIS PREPARATION** - In preparing the chassis frame for body mounting, rivet heads shall not be removed except on the extreme rear cross member and then only when necessary to move rear cross member to conform to body length. If tail pipe brackets must be removed due to body obstructions, they shall be replaced with new ones of equal strength as supplied by the chassis manufacturer.

**CHASSIS INSTALLATION** - The bid price shall include mounting the body upon the chassis. The body shall be securely attached to each chassis side rail. At the front and rear ends of the body on each chassis side rail there shall be installed a through bolt of not less than seven-sixteenth inch in diameter. Bolts to be grade 5 with S.A.E. threads and lock nut. All attachments shall be made at main body sills. In addition to the above required tie downs, the following minimum number of approved type tie downs will be required: 41 passenger - 6; 54 passenger - 8; and 66 passenger - 10. Bolts for these attachments shall be not less than 7/16 inch in diameter with S.A.E. threads and lock nuts.

Rubber and fiber inserts, equal to or thicker than chassis rivet heads, shall be securely attached to each body sill and installed at all points of contact between sills and chassis.

At any point where body sill sits on a rivet head, the rubber and fiber insert shall deform so that floor will be smooth.

**METAL TREATMENT AND PAINTING**

**METAL TREATMENT** - All metal used in construction of bus body is to be mill applied zinc-coated, copper bearing steel, aluminum-coated, or treated by an equivalent process before bus is constructed. (Included is such items as structural members, inside and outside panels, floor panels and floor sills; excluded are door handles, grab bar handles, stanchions, interior decorative parts, and other interior plated parts.) All structural members lighter than 12-gauge, wheelbase and step well, are to be mill applied zinc-coated steel or equivalent. All metal parts that are to be painted shall be, in addition to above requirements, chemically cleaned etched, zinc-phosphate coated, and zinc-chromate or epoxy-primed or conditioned by equivalent process. Documentation to be provided upon request. In providing for these requirements, particular attention shall be given to lapped surfaces, welded connections of structural members, cut edges, punched or drilled hold areas in sheet metal, closed or box sections, non-vented or non-drained areas, and surfaces subjected to abrasion during vehicle operation.

Note: 10 year no-rust-through warranty is required on all exterior sheet metal, sheet metal flooring components, and rub rails (if metal).

**PAINT** - All paint shall be unleaded. The body, hood, fenders, and cowl of all school buses shall be painted with National School Bus Yellow polyurethane paint which meets Federal Standard No. 595a, color 13432. The same brand of paint must be used on the body and chassis. Bumper, frame, driveline, and wheels shall be painted with jet-black enamel, e-coated or powder coated. The paint shall be covered by a 5 year unlimited-mileage warranty against all defects in materials and workmanship.

**EXTERIOR PAINT** - The exterior of the complete school bus body shall be painted with National School Bus Yellow polyurethane per Federal Standard No. 595a. The same brand of paint must be used on the body and chassis. The applied primer and polyurethane shall yield a dry film thickness of 2 to 3 mils. A 1 1/2-inch thick black border shall be painted around the flashing stoplights with approved type polyurethane or high grade black vinyl overlay. Rear bumper shall be painted black and shall be equipped with 2-inch yellow diagonal Reflexite or 3M. School bus rub rails shall be painted National School Bus Yellow same as bus body. Activity bus colors may vary. Activity bus rub rails may be painted different colors (no decals).

Add one (1) full length reflective stripe minimum 1-3/4" width, position reflective strip below floor level guard rail. Yellow on yellow bus, white on activity buses.

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**INTERIOR PAINT** - The entire interior paneling of the bus, except the sections of aluminized steel and /or clear coated metal, shall be painted. Paint color to be approved. All other interior items such as the heater, instrument control panel, seat frames, chassis cowl and modesty panel may be painted a compatible color. One prime coat and finish coat shall be required.

**FLOOR AND STRUCTURAL METAL PAINT** - The underside of the floor, including the chassis metal fenders and cowl and all other exposed structural metals used in the body, shall be painted with black enamel or undercoated. Air brake control valves and brake lines are color-coded and are not to be undercoated.

**ACTIVITY BUS PAINT** - Activity bus paint must meet the same standards as the school bus paint except the bus manufacturer shall be required to paint the hood and cowl to match final body color. This cost shall be included in bid price. Bus bodies shall be painted one solid color with appropriate lettering from manufacturer's selection of standard colors.

**MANUFACTURER LOGO** - No manufacturer logo or names are permitted on the bus exterior except a small nameplate may be installed on the bus exterior in a location to be approved upon inspection of the pilot model. (Note: includes activity bus body).

**LETTERING**

**LETTERING TYPE** - Lettering and numbering shall conform to "Series B of Standard Alphabets for Highway Signs".

**VINYL LETTERING** - The material should be a premium 2-mil high gloss cast vinyl for solvent resistance, fade resistant and withstand severe weather and handling conditions. The vinyl will have permanent acrylic adhesive with an adhesion factor of 4/lbs per square inch and should not lose its shape or adhesion due to extreme temperatures from -40 to 100+ degrees Fahrenheit. The backing paper sheet for the vinyl should be standard #78 lb. Kraft liner.

**INTERIOR LETTERING**- Above the windshield or other approved acceptable location; the words "SEATING CAPACITY" shall be in letters at least 1 inch high. The seating capacity will be based upon the number of seats installed and listed as follows:

<u>14 Seats</u>	<u>18 Seats</u>	<u>22 Seats</u>	<u>24 Seats</u>
K-5 (42Pupils)	K-5 (54 Pupils)	K-5 (66 Pupils)	K-5 (72 Pupils)
6-8 (35 Pupils)	6-8 (44 Pupils)	6-8 (54 Pupils)	6-8 (60 Pupils)
9-12 (28 Pupils)	9-12 (36 Pupils)	9-12 (44 Pupils)	9-12 (48 Pupils)

Note: Any lift-equipped bus must reflect the seating capacities for K-5, 6-8, and 9-12 plus 2 wheelchair positions. Activity bus capacities must be adjusted for optional seating configurations.

Note: K-5 capacity may need to be adjusted due to the small rear seat.

**SCHOOL BUS LETTERING**

**SIDE LETTERING – SCHOOL BUS** - The words "North Carolina Public Schools" shall be on each side of body in letters 6 inches high. The county number assigned to bus shall be on each side of the bus in an approved place in numerals 6 inches high. The name of the county or school unit to which bus is assigned shall be placed below the words "North Carolina Public Schools" on each side in letters 3 inches high.

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**FRONT LETTERING – SCHOOL BUS** - On the roof panel of outer visor shall be the words "SCHOOL BUS" in letters not less than 8 inches high. County number assigned to bus shall be on front of body or chassis in an approved location in letters 6 inches high. "SCHOOL BUS" shall be on retro-reflective high intensity material (Reflexite or 3M).

**REAR LETTERING – SCHOOL BUS** - On the rear of the body "SCHOOL BUS" shall be in letters not less than 8 inches high. On or over the emergency door shall be the words "EMERGENCY DOOR" in letters 2 inches high. "SCHOOL BUS" shall be on retro-reflective high intensity material (Reflexite or 3M). County number assigned to bus shall be centered on rear door in letters 6 inches high.

See "Disability Identification Symbol" section for proper placement of ADA symbols.

### **ACTIVITY BUS LETTERING**

**SIDE LETTERING – ACTIVITY BUS** - The applicable school system name is to be on each side of the body in letters approximately 6 inches high; such to be designated on the purchase order or by the owner.

**FRONT LETTERING – ACTIVITY BUS** - On the roof panel of outer visor shall be the words "ACTIVITY BUS" in letters 8 inches high. County number assigned to bus shall be on front of body or chassis in an approved location in letters 6 inches high. "ACTIVITY BUS" to be in retro-reflective high intensity or equal material (Reflexite or 3M).

**REAR LETTERING – ACTIVITY BUS** - On the rear of the body, "ACTIVITY BUS" shall be in letters 8 inches high. On or over the emergency door, shall be the words "EMERGENCY DOOR" in letters 2 inches high. "ACTIVITY BUS" to be on retro-reflective high intensity material (Reflexite or 3M). County number assigned to bus shall be on rear in letters 6 inches high.

NOTE: Any particular bus number and/or color lettering will be designated on the purchase order or by the owner. Bus bodies to be painted standard one solid color with appropriate lettering from manufacturer's standard body color selections.

### **POWER LIFT** (when requested)

All lift-equipped buses shall be equipped with Braun NL917series or Ricon S5510 series. Lift must meet all ADA regulations and FMVSS 403 and 404.

Note: Front or rear mount pump to be determined by bus manufacturer.

1. The lift shall have a rated lifting capacity of 800 pounds and shall have been successfully tested to a minimum static load of 2400 pounds. Lift to be of the gravity down power-up type.
2. When the platform is in the fully up position, it shall be locked in position mechanically by means other than a support or lug in the door.
3. Controls shall be provided that enables the operator to easily open and close the lift door from inside the bus. The door control mechanism and handle shall be located adjacent to the lift door in a readily accessible location. The handle shall be padded. The lift mechanism must be operable from either inside or outside the bus. There shall be means of operating the lift in the event of power failure.
4. Power lifts shall be so equipped that they may be manually raised in the event of power failure of the power lift mechanism.



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5. Lift travel shall allow the lift platform to rest securely on the ground.
6. All edges of the platform shall be designed to protect the wheelchair, wheelchair occupant's feet and operator's feet from being entangled during the raising and lowering process.
7. Platform (minimum size of 33 inches in width and 51 inches in length) shall be fitted on both sides and rear with full width shields (which extend above the floor line of the lift platform).
8. A restraining device shall be affixed to the outer edge (curb end) of the platform that fully extends to ground level.
9. A self-adjusting, skid-resistant plate (ramp) shall be installed on the outer edge of the platform to minimize the incline from the lift platform to the ground level. This plate, if so designated, may also suffice as the restraining device described in the above item. The lift platform must be skid resistant.
10. A circuit breaker or fuse shall be installed between the power source and lift motor.
11. The lift mechanism shall be equipped with adjustable limit switches or by-pass valves to prevent excessive pressure from building in the hydraulic system when the platform reaches the full up position.
12. Lights shall be provided in the wheelchair area, over lift mechanism and exterior position (location to be approved upon inspection of pilot model). Doorways in which lifts are installed shall have, when a lift is to be used, illumination sufficient to light the entrance, and on the lift, when deployed at the vehicle floor level or at ground level.

Note: Lighting must meet the above requirements and the FMVSS requirements.

13. All sharp edges in power lift area, including door, shall be properly padded.

Note: Rear heater housing edges to be rounded or may have a rounded cap securely and permanently affixed thereto. Exposed sharp edges are not acceptable.

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

**DISABILITY IDENTIFICATION SYMBOL** – Buses with power lifts used for transporting individuals with disabilities shall display below the window line the International Symbol of Accessibility. Such emblems shall be white on blue background, shall be approximately four (4") to six (6") inches in size, and shall be of high-intensity reflective material meeting U.S. Department of Transportation's Federal Highway Administration (FHWA) FP-85 Standards. Location of symbols to be as follows: (A) on the rear door adjacent to bus number; (B) on the right lettering belt, rear of entrance door after bus number; (C) fore or aft of the stop sign.



**FIRE BLANKET** - Each lift-equipped school bus shall be equipped with a Tietech Model #1007 fire blanket. It shall be a 62" x 80" wool blanket. The blanket shall be enclosed in a non-metallic pouch. It shall be identified on the front as to the contents. The pouch shall be mounted on the left side interior wall in the buffer zone, behind the left rear seat as close to the rear entrance door opening as practical on a horizontal and vertical line no higher than the horizontal metal portion of the seat frame.



**POWER LIFT DOOR** - The door shall be located on the right side (when facing bus from the rear) of the bus. It shall have a minimum horizontal clearance of 42 inches and a minimum vertical clearance of 58.5 inches. Door shall be hinged on the forward side with an approved type of hinge and open outward meeting FMVSS 217 requirements. Door is to be designed to open and close from inside of the bus. Door release and opening and closing device to be approved upon inspection of pilot model. Lift door closing handle to be equipped with a stop to prevent handle from swinging out of reach of operator during lift operation. On interior lift door latch assembly, the handle in closed position is to be horizontal positioned and pointed toward rear of bus, and in the open position is to be vertical with the handle pointing upward. Latch must be of the same design as the rear emergency door latch. Lift door shall be metal, double wall and shall be provided with suitable weather stripping to prevent leaks. An audible buzzer shall sound when the lift door is opened and will deactivate when the lift door reaches the fully opened position. A red light shall be activated in the dash area (location to be approved) at all times that the lift door is opened.

Note: Must have handle which is easily reachable from inside the bus to assist in closing door during latch procedure.



### **WHEELCHAIR ANCHORS AND OCCUPANT SECUREMENT SYSTEM**

1. The Mobility Aid Securement and Occupancy Restraint System shall be designed, installed and operated to accommodate passengers in a forward facing orientation within the vehicle.
2. For each Mobility Aid Securement System provided, a Type 2, three point occupant restraint system consisting of a lap (pelvic) belt and a shoulder (upper torso) belt complying with all applicable provisions of 49CFR, Part 571, shall be provided for use by mobility aid users.
3. The Occupant Restraint System shall be equipped with a single point, push-button "quick disconnect" for the lap belt and the lower end of the shoulder belt, to provide immediate release of the occupant in the event of an emergency evacuation.
4. The shoulder belt system shall provide a vertical height adjuster with 12 inches of vertical adjustment for proper placement of the shoulder belt.
5. The Mobility Aid Securement System shall utilize four adjustable securement strap assemblies that attach to structural members of the mobility aid at four separate points: two strap assemblies for attachment to the front of the mobility aid, and two strap assemblies for attachment to the rear of the mobility aid.
6. Each front securement strap assembly shall be capable of withstanding a minimum static load force of 5,000 pounds. Each rear securement strap assembly shall be capable of withstanding a minimum static load force of 6,000 pounds.
7. The Mobility Aid Securement System shall utilize positive-locking anchorage and attachment hardware to prohibit accidental or inadvertent release of the system.

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8. The Mobility Aid Securement Strap Assemblies shall be composed of a different size or color of material than the Occupant Restraint Belts to provide quick visual identification of the two systems and to distinguish the separate function.
9. Each of the individual securement straps and restraint belt assemblies shall be marked with the manufacturer's name, part number, month and year of manufacture.
10. The Mobile Aid Securement and Occupant Restraint System shall be subjected to, and successfully pass, a dynamic 30mph/20g force Impact Test per Society of Automotive Engineer's SAEJ2249 Wheelchair Tie down and Occupant Restraint Systems for use in Motor Vehicles document. The testing shall be performed by experienced personnel using an impact simulator and proven ability to provide reliable, accurate and repeatable results. The mobility aid used for testing purposes shall be a powered wheelchair with batteries (or weights to simulate batteries) that weighs a minimum of 150 pounds, or an approved surrogate. A 50<sup>th</sup> percentile male test dummy, weighing a minimum of 165 pounds, shall be used in the test. Test results shall be provided upon request.
11. A storage container shall be provided for each securement station to allow for clean storage of the system straps and belts when not in use. A separate space within the container shall also be provided to insert detailed operation instructions for use of the entire system.



### OCCUPANT SECUREMENT

All wheelchair positions shall be equipped with a "Type II" occupant protection and securement system meeting the requirement of FMVSS 209 and 210. The design of the securement system shall reference, as a standard, the Surelock or Q'Straint four point wheelchair anchorment part number FF612-4c-7 or -9 Continuous button tracking (4 pieces) for wheelchair and passenger securement is required from rear of passenger seat forward of wheelchair area to rear wall of bus, which meets all ADA requirements.

NOTE: All lift-equipped school buses shall be equipped with shoulder attachments for two (2) wheelchair positions and have reinforcement full length of bus to allow additional button type track installation (not to include flat floor buses).

(See Flat Floor Power Lift School Bus section for flat floor requirements.)

### FLAT FLOOR - POWER LIFT SCHOOL BUS (Additional/requirements/specifications and/or modifications)

**BODY DESIGN FOR FLAT FLOOR CONFIGURATION** - The floor shall be designed to provide a solid platform for the flat floor body configuration that allows the elimination of wheelhouse intrusion.

This floor design shall have been successfully crash tested to provide compliance with FMVSS. In addition, the floor shall be equipped with (4 pieces) continuous aluminum button tracks full length of bus floor to include wheel chair securement and CSRS seats. Button style tracking shall be installed continuous length of bus above all windows on flat floor buses for shoulder belt attachment. This will provide maximum flexibility in seating and wheelchair positions. Fully seat remainder of bus with 39-inch seats and leave space for two wheel chair positions.

Note: Flat floor buses shall come equipped with securement belts for two wheelchairs.

Rivet heads or other protrusions inside the mounting track shall be low enough to allow attachment in any position in the track.

**AIR CONDITIONING**

Air conditioning shall be provided and installed on all configurations of North Carolina school buses. Air conditioning should be capable of reducing school bus inside air temperature by 20 degrees F within a 20-minute time frame. Test results shall be provided upon request. All buses shall be equipped with one (1) inside roof-mounted free blow type unit mounted in passenger compartment and one (1) flush mounted unit in rear bulkhead or inside roof mounted free blow type on side in rear portion of passenger compartment (in approved location) with driver controlled thermostat for each unit located left of driver except for the 41-passenger size, which shall be equipped with one (1) inside free blow type unit mounted at the midpoint of the passenger compartment from front to rear of bus with driver controlled thermostat located left of driver. Drawings will be required showing exact location of units prior to approval being granted for location. Optional location for driver controlled A/C Thermostat, for all passenger sizes, shall be dash panel right of driver if bus is equipped with additional ventilation controls in that location. All refrigerant lines located in rear wheel well area shall be shielded by metal protective covering. All refrigerant lines in A/C system shall be assembled using automotive grade crimp style fittings (as pictured below). Barb style fittings with screw or crimp style clamps will not be accepted.



Sight glass required with moisture indicator.

Note: Carrier, Transair, Rifled, ACC & MCC are acceptable manufacturers. All A/C manufacturers shall use Model # TM21 compressors.

- 41 - passenger – 60,000 BTU minimum  
One compressor  
One condenser
- 53 - passenger - 96,000 BTU minimum  
Two compressors  
Two condensers
- 66 - passenger - 120,000 BTU minimum  
Two compressors  
Two condensers
- 72 - passenger - 120,000 BTU minimum  
Two compressors  
Two condensers

NOTE: Air conditioning is optional on all activity buses.

**-----END OF SPECIFICATION-----**