
**NORTH CAROLINA
SCHOOL BUS & ACTIVITY BUS
SPECIFICATIONS**

Type C – Conventional School Bus

JANUARY, 2002

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

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NORTH CAROLINA TYPE – C
SCHOOL BUS SPECIFICATIONS
SPECIAL INSTRUCTIONS

BIDS – Sealed bids will be taken on Type – C school buses that are completely assembled, delivered, and serviced according to the specifications contained herein.

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 requirements of the 2000 “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.

PERFORMANCE OF BIDDER – Bidders shall indicate (in detail form) their proposal to meet the following criteria. 1) Ability to render prompt service including production capabilities; 2) Statement including engineering facilities and experience in manufacturing school buses; 3) Ability to manufacture school buses in strict conformity with these specifications and service requirements. Note: Failure to submit this information may subject your bid to rejection.

AWARD – Refer to the award statement contained in the bid document.

POST AWARD MEETING – Within 30-days after contract award, and prior to any buses being built, a meeting shall be held with representatives of DPI Transportation Services. This meeting will be held to clarify the intent of these specifications, acceptable components (“Or Equivalent Items”), pilot inspections, and to answer any questions that may arise. Vendor shall supply list of (“Or Equivalent Items”) and their ability to meet equivalent status. The location of the meeting will be determined after contract is awarded. No school/activity buses are to be built prior to this meeting.

DELIVERY - It will be the responsibility of the contractor to deliver the complete unit, to a centralized location within a 75-mile radius of the geographical center of the State (Asheboro). Unit bid price shall include any and all expenses involved in such deliveries. Contractor will be required to assume complete responsibility of the delivery of buses to these points and shall save the State harmless against fire, public liability and property damage.

DELIVERY PENALTY: LIQUIDATED DAMAGES - Contractor shall refer to contract bid for specifics concerning Liquidated Damages.

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SERVICE OUTLETS - Bidders must indicate the extent of their ability to render prompt service by furnishing a list of branch offices and authorized service agencies. These offices/agencies must maintain a complete stock of repair parts that may be secured by ordering by number and at such discount as may be quoted from time to time by the manufacturer of the school bus purchased under these specifications. It is the responsibility of the bidder to complete all recalls at their branch agencies or by their personnel on site at our facilities, and in a prompt and timely manner.

DOCUMENTS AND PUBLICATIONS - Bidders are **required** to furnish with their bids basic specifications, chassis/body layout drawings and a sample warranty. A list of all Special Equipment (including parts numbers, color code, etc.) used on the chassis/body must be furnished. 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. Warranty certificate covering all items chassis/body.
4. One (1) Parts and Service/Repair Manual (Total of 104) for body/chassis on CD-ROM per county or a downloadable PDF file containing the required information that can reside on DPI's web site. These files and CD's must contain an index with page numbers. These will be distributed by DPI Transportation Services. Note: Must be able to load CD-ROM on computer hard drive.
5. Manufacturer's Statement of Origin.
6. 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 to the DEPARTMENT OF PUBLIC INSTRUCTION, RALEIGH, NC. The service policy, warranty cards nor the line setting ticket shall be left in or with the chassis during shipment. (Exception: For activity bus chassis this information shall be delivered to the using agency.) One application for Certificate of Title for each unit purchased shall be properly filled out for vehicle identification section only.

WARRANTY - Bidder shall warrant for five (5) years/unlimited miles the entire power train (engine, transmission, differential, driveshaft and its bearings, engine electronic controls), water pump, alternator, starter, turbocharger, and all interior and exterior paint. Bidder shall warrant all other chassis items for the manufacturer's standard warranty period. Bidder shall warrant the body and all related items, including air conditioning, for the manufacturer's standard warranty period or two (2) years, whichever is greater.

All warranty periods are to commence on date the respective vehicle is placed in service by the State. DPI will notify bidder of such date. All parts and labor 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. Upon award, bidder will provide the State with original copies of warranties offered in accordance with the above requirements on all chassis and body items, except for those items covered above by the 5-year warranty. By execution of bid, bidder agrees to the 5-year warranty requirement in its entirety as specified above.

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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 approval is obtained from the contract administrator.

INSPECTION - Purchaser and/or their representative shall have inspection privileges during construction of school buses. Final inspection and acceptance will be at the delivery points specified in the contract. School Buses that do not comply with the grade of workmanship or type of materials in conformity with specifications and/or pilot model will not be accepted.

Authorized inspectors and representatives of the State Department of Public Instruction and Department of Administration shall be admitted to any part of the factory of the contractor at any time during normal working hours for the life of the contract. They shall be given all necessary assistance in making any tests deemed necessary to determine compliance with these specifications.

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

PILOT MODEL - A finished and mounted pilot model for each body size (41-P, 53-P, 66-P, and 72-P) shall be available at the manufacturer's assembly plant. Such model shall be subject to inspection of all materials and processes of manufacture and assembly. Pilot model inspections will be required on all configurations. No buses (school or activity) built under these specifications shall be delivered until Pilot Models have been inspected and approved. These inspections and dates will be discussed at "Post Award Meeting".

SERVICE - The complete bus shall be inspected and completely serviced before being placed in-service by the State. 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 with 30 gallons of diesel fuel.

Exceptions taken to these service requirements will be considered just cause to reject the bid from consideration.

TECHNICAL TRAINING - Successful bidder will be required to furnish training for North Carolina transportation personnel at various locations in the State as requested. This training shall be provided at no additional cost within a twelve-month period beginning at the bid award date. These training requirements are based on an order of 400 school buses. If fewer than 400 school buses are purchased training will be pro-rated. Vendors shall be responsible for producing coupons.

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Training to be structured as follows:

1. Engine Specific Training – 200 coupons (each coupon representing training for one (1) person). Training to be provided by chassis engine manufacturer and shall consist of at least six (6) hours of training per person.
2. Chassis Specific Training – 200 coupons (each coupon representing training for one (1) person). Training to be provided by chassis manufacturer and shall consist of at least fourteen (14) hours of training per person. Training shall consist of chassis related items and Allison Electronic (2000 series) Transmission.
3. Body Specific Training – 200 coupons (each coupon representing training for one (1) person). Training to be provided by body manufacturer and shall consist of at least twelve (12) hours of training per person. Training shall consist of body-related components and Air Conditioning.

PAYMENT - Payment will be made after each acceptable school bus has been delivered to the Local Education Agency (LEA) by DPI Transportation Services. Payment of invoices will be made at the same rate as buses are completed and delivered to the LEA's. The ordering unit or agency (Capital Outlay Purchases) will make payment within 30-days (interest free) upon acceptance of completed school or activity bus, or receipt of correct invoice, whichever is later.

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MINIMUM REQUIREMENTS OF A TYPE-C SCHOOL BUS CHASSIS

APPROVED LOW EMISSION ELECTRONIC DIESEL ENGINES

<u>MAKE</u>	<u>MODEL</u>	<u>HORSEPOWER</u>	<u>TORQUE</u>	<u>STANDARD</u>
Caterpillar	3126E LEV	216	520	2002 EPA
Cummins	ISB LEV	210	520	2002 EPA
International	T444E LEV	210	540	2004 EPA
<i>Mercedes-Benz</i>	<i>MBE900 6.4L LEV</i>	<i>210</i>	<i>520</i>	<i>2002 EPA</i>

Approved Chassis Requirements

Basic Pupil Load	<u>41</u>	<u>53</u>	<u>66</u>	<u>72</u>
Manufacturers GVWR	19,000	24,000	24,000	24,000
Cowl to Rear Axle (approximate inches)	125	192	229	253
Wheel base (approximate inches)	165-193	214-218	252-255	274-277
Front Axle Capacity (lbs.)	10,000	10,000	10,000	10,000
Rear Axle Capacity (lbs.)	15,000	19,000	19,000	19,000
Front Spring Capacity @Ground 5,000	5,000	5,000	5,000	
Transmission Speeds Forward	5	5	5	5

Approved Brake Sizes

All chassis required shall be equipped with air brakes. Stamped dust shields required for front and rear brake drums. Must be able to check brake lining condition without removing the shield.

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

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DETAIL REQUIREMENTS – TYPE C CONVENTIONAL SCHOOL BUS CHASSIS

AIR CLEANER - Chassis to be equipped with a dry, element-type air cleaner. The air cleaner and the element shall meet all appropriate SAE J726 tests, per engine application. All air cleaner assemblies shall be single-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 or Mobil) synthetic lube.

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. Axle shall be equipped with a magnetic fill plug, magnetic drain plug and filled to recommended level with 75W-90 synthetic lubricant (Emgard or Mobil). Rear Axle Ratio shall be designed to achieve maximum fuel economy using the following criteria. 1) A sustained pull on a 6% grade with speed not dropping below 28 mph on school buses with speed control set @ 45 mph. 2) A sustained pull on a 6% grade with speed not dropping below 28 mph on activity buses with speed control set @ 55 mph. Note: Scans for the Allison 2000 transmission have indicated the most efficient axle ratio for school buses with tire size 11R22.5 and equipped with the above listed engines is a 7:17 ratio. Scans for the Allison 2000 transmission have indicated the most efficient axle ratio for school buses equipped with the above listed engines/Flat Floors/and tire size 255/70R22.5 is a 6:43 ratio. Scans for the Allison 2000 transmission have indicated the most efficient axle ratio for activity buses with tire size 11R22.5 and equipped with the above listed engines is a 6:83 ratio.

NOTE: AT ANY TIME DURING THE FIVE (5) 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 at least one gauge, 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 on 53, 66, and 72 passenger units 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.

NOTE: ANY WIRES PASSING THROUGH THE FRAME RAILS SHALL BE GROMMETED TO PREVENT CHAFING.

BRAKES - The chassis shall be equipped with four wheel brakes. Approved brake shoe dimensions are specified by capacity size on page 10 in Minimum Requirements. *Drums to be equipped with stamped dust shields and must be able to check brake lining condition without removing shield.* 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 and identified as *to the* co-efficient of friction by bidder.

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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 approximately one (1) inch below the top of frame rail. Air tanks are to be equipped with manual Berg Lanyard moisture ejector with cord of sufficient length to attach to body exterior. Air compressor 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 or Cummins-Wabco 15.2 CFM). 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). Rear chamber to be no less than type 30/30 Long Stroke (MGM Model TR 30/30 LP3) and must be mounted on forward side of axle.

Anti-Lock Braking System (ABS) - Bendix or Rockwell four channel ABS. 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 to limit of 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, 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 manufacturers standard location. This control shall be clearly marked yellow. All air brake buses shall be equipped with service brake interlock.

Electronic Brake Stroke Monitor – All buses shall be equipped with a system to monitor brake stroke at all four (4) wheel positions. The display shall be easy to read LED and shall indicate if the system air brake chamber stroke is within limits in green color. If system air brake chamber stroke is out of limits, this shall be indicated in red color. System must be capable of monitoring and displaying brake chamber stroke at all wheel locations. Display shall be on right side of firewall (see picture for location).
(MGM E-Stroke)



BUMPER - The front bumper shall be of heavy duty, straight or wrap around/curved design and constructed of one-fourth (1/4) inch thick channel approximately 11 inches wide. Bumper must extend to outer edges of fenders at bumper top line with closed ends.

DRIVELINE - The torque capacity of the driveline assembly shall be equal to the maximum engine torque as developed through the lowest transmission gear reduction. 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. Guard to be 7/16-inch round u-bolt or 1 1/4 x 3/8 inch flat bar.

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ENGINE - 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.

Electronic Control Module Program Parameters and Password – All ECM program parameters and password shall be discussed and established at the Post Award Meeting.

EXHAUST SYSTEM - A total exhaust system, exhaust pipe, muffler and tail pipe shall be furnished by the chassis manufacturer, pre-engineered to terminate no less than 1 inch past a school bus body rear bumper location, nor positioned no further downward than 3 inches from the rear bumper. Tail pipe shall be deflected downward at the end of the exhaust pipe. Tail pipe should be minimum 16-gauge aluminized steel/stainless steel 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 mounting by the Body Company without extension. *At any point the exhaust system is 12" or less from the fuel tank, the fuel tank shall be properly insulated with metal shield.*

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. Chassis sheet metal shall not extend beyond rear face of cowl. Hood and fenders to be assembled as one unit and of the forward tilt type.

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 36,000 psi). Cross members and components attached to frame shall be installed with grade 8 fasteners. Routing of all brake lines and/or electrical wiring shall be located within the frame rail flanges. Convoluted tubing as to protect lines from chafing and wear shall protect openings in cross members for such routing.

FUEL TANK - The fuel tank shall conform to FMVSS 301 in construction and mounting. Fuel system to have an approved fuel filter and water separator (Racor only) between fuel tank and engine mounted in an accessible location for service. Tank to be equipped with a minimum of two internal baffles. Tank capacity must be at least 60 gallons with aluminized interior. *Tank shall be equipped for at least a 93-95% draw.* Note: One (1) tank with a 60-gallon capacity is to be provided on all chassis.

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 easily accessible high position equivalent mount. All chassis on order are to be equipped with the same brand name alternator (Leece-Neville 4870JB).

Serpentine belts shall be furnished to drive alternator and fan. Cowl and frame shall be grounded to engine by use of suitable grounding straps.

Chassis manufacturer shall install a readily accessible electrical 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.

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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 shall be provided. All wiring shall be required to meet Society of Automotive Engineering (SAE) Codes.

ROAD SPEED CONTROL - The electronically controlled engine is to be programmed to establish the maximum road speed stated on order. Note: 45mph 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 headlights and two turn signal lights. A cartridge type fuse 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 of the chassis terminals for the connection of the body tail lights, stop lights, backup light and license well light. Turn signal lights shall be wired to operate through the ignition switch.

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 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.

BY-PASS OIL FILTER SYSTEM – Chassis shall be equipped with an oil by-pass filtering system that is adequate for the engine sump capacity and separate from the standard full-flow oil filter. The system shall not draw more than 10% of the oil pump's capacity at any given time and be capable of filtering all the oil every ten minutes. The by-pass filter element shall be of the spin-on variety for replacement and disposal purposes. The system shall be certified per SAE J806 to filter particles of one (1) micron at an efficiency rate exceeding 70%. The system shall also remove water and rust. The filter element shall have a life expectancy exceeding 24,000 vehicle miles. (AMSOIL Dual-Guard Model BMK-12 system equipped with 2 BE-110 filters). It shall also include a BK-13 Oil Sampling Kit. (See picture for location on left front frame rail).



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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 1995 National Standards for School Transportation. It is the responsibility of the chassis manufacturer to reduce the interior noise to acceptable levels.

PAINT - All paint shall be unleaded. The hood, fenders and cowl shall be painted with National School Bus Yellow polyurethane or an approved acceptable equal paint which meets Federal Standard No. 595a, color 13432. Bumper, frame, driveline and wheels shall be painted with jet-black enamel.

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, and shall incorporate 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. Cooling system shall be equipped with an approved water filter. The cooling fan, mechanically belt driven, shall be equipped with a thermostatically controlled air clutch to facilitate ease of operation and maintenance and meet or exceed OEM requirements. Coolant is to be of the Fully Formulated, Non-Organic, heavy-duty type and shall protect cooling system to -30 degrees Fahrenheit. (Fleet-Charge SCA Precharged)

Note: The chassis/body supplier shall fill the cooling system with Fully Formulated, Non-Organic, heavy-duty coolant having a mix of (50%) water and (50%) coolant. Coolant type and additives shall meet all requirements of the respective engine manufacturer and radiator supplier.

HOSE AND HOSE CLAMPS - All hoses shall be silicone type construction or equivalent 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 tension clamps* (Breeze Clamps).

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 and shall conform in capacity to table shown herein. 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 configuration 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 bushings shall be constructed of bronze material. The steering column shall be equipped with tilt and telescopic feature. Tie rod ends, drag links and kingpins shall be equipped with zerk type grease fittings unless permanently sealed.

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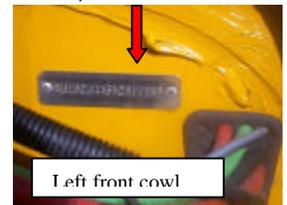
TIRES - The chassis shall be equipped with six (6) "fully balanced tires", two on the front and four on the rear. Tires shall be of the tubeless type with full steel belted radial construction (sidewall and tread area). Tires furnished shall be tire manufacturer's top line tires and listed in the tire 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 with the exception of the flat floor chassis, which will be sized per manufacturer recommendation for the GVW rating. Tires shall be equal in quality to the following named brand, but are not restricted to this brand: (Goodyear G-159 or Michelin XZE)

NOTE: Power lift school buses designed to provide a solid platform for the flat floor body configuration, must be equipped with 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. Each chassis to be equipped with a spare wheel/rim. All rims to be painted black.

TRANSMISSION - Chassis shall be equipped with an Allison 2000 series automatic transmission filled with Castrol TranSynd Fluid. Automatic transmission shall have an integral torque converter. Vehicle to be equipped with Pall external transmission filter assembly P/N HZ7434A12TTRFL with electrical differential pressure indicator (M.S. style 3-pin connector). A "change filter" light that is easily viewed by driver will be installed in the dash of the vehicle using Pall FMT-800 light kit (16-ft. lead) with harness and M.S. connector. FMT-800L may also be used (30-ft. lead). 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. Transmission shift control shall have a position lock shift lever for each shift position. 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).

SERIAL NUMBER LABEL - Label shall be furnished showing the Vehicle Identification Number, G.V.W. R. and permanently affixed in a location and position for maximum visibility and legibility (location to be approved). Letters and numerals shall be of the cut or embossed (metal) type. The serial letters and numerals should be at least one-fourth inch in height. (See picture for location).



TOW HOOKS - Two heavy-duty tow hooks shall be furnished and factory installed, one on each frame rail at front in an approved manner and capable of towing the fully loaded vehicle.

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MINIMUM REQUIREMENTS FOR NORTH CAROLINA TYPE-C SCHOOL BUS BODIES

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.

The following table shall govern the body lengths:

<u>Maximum Seating Capacity</u>	<u>Approximate Body Length</u>
41-42	244-268"
53-54	302-314"
65-66	358-376"
71-72	387-402"

Height, Length, Weight Data Plate - A data plate including the actual bus height, actual bus length, and actual bus weight shall be included in the vehicle data plate in a location that is easily readable. Note: Actual weight does not refer to G.V.W.R. It means the actual weight of the completed bus full of fuel (60 gal.) and fluids.

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). 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

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

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.

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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 and shall be covered with a minimum of 5/8-inch, water resistant, minimum grade A, 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 a 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. Floor in driver's compartment shall have a removable section for servicing and access of transmission. Access shall be provided through removable cover that provides access to fuel sending unit.

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 bodies 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 as per the 1995 National Standards. All areas of the stepwell except the step treads are to be covered with black sound abatement. The top step riser is to include approximate 2 inch lettering on a metal plate stating "USE HANDRAIL" and "NO TRESPASSING". This plate is to be attached to the top step riser.

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.



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Floor Covering - The floor under seat area, including wheel housings and driver's compartment, shall be covered with black, smooth finish rubber covering, at least 1/8-inch thick. The aisle and entrance area shall be covered with black, ribbed pattern rubber at least 3/16-inch thick. The frontal area around the driver compartment is to be covered with black sound abatement. The adhesive for laminating the covering to the floor shall be a water-resistant type of trowel or spray consistency. A rustproof molding strip shall be applied over all edges and joints of the covering. If the chassis is equipped with transmission cover, the cover shall be placed on top of floorboard and securely fastened and sealed. Transmission cover fasteners shall be of the hexagon head, cap screw type.

BODY FRAME

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, 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 inches to the 3rd power.

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.

A roof bow shall be located at each post to form a bow frame or bow frames may be formed in one 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. If side post members and bow frames are not one continuous piece. 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 shall submit with their proposal complete detailed engineering drawings of the joint connection.

Roof Stringers - Two or more roof stringers or longitudinal members equal in strength to roof bows 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 means of welding, riveting or bolting. If stringers are applied internally, they shall be fastened to each roof bow so that the joint is equal in strength to the cross section of the weaker member. 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.

After the load, as called for in the static load test, has been removed, none of the following defects shall be evident:

1. Failure or separation at the joints where stringers are fastened to the roof bow.
2. Appreciable difference in deflection between adjacent stringers and roof bows.
3. Twisting, buckling or deformation of the stringer crosses section or fastening.

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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 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.

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. 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 4th 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-gauge formed header or stringer (not a flat strip). It shall have a depth of at least 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.

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EXTERIOR PANELING

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 shall be of 12-gauge or heavier metal, or cowl panel may be 14-gauge metal with 12-gauge framing.

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 and shall be 16-gauge or heavier.

GUARD RAILS

Number - 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 elevations: floor level or seat ledge level, and windowsill level.* When bus is equipped with side emergency door, the guardrails shall extend across door also. 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 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, 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 Screws/ or Drive Rivets in all attaching positions.*



BODY TEST

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

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 unperforated 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 to be 22-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 with sheet metal screws or rivets to meet FMVSS 221.

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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 and 15 inches deep. 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, and 302 (Fire Block Test). They shall also be designated for CSRS that meet FMVSS 225. All CSRS attachment hardware and anchorage systems must meet FMVSS 210, Seat Belt Anchorage or FMVSS 225, Tether Anchorage and Child Restraint Anchorage Systems. (Only CE White Model CR39 will be accepted) Seat upholstery material shall meet FMVSS 302 and shall match seat upholstery material used on all other seats. Any required decals must be placed on the exterior of the bus window and must be clearly visible from the inside of the bus.



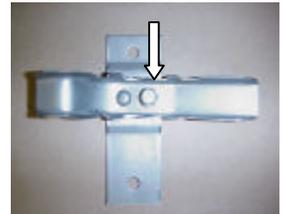
CSRS compliant seats shall be installed in the following locations:

- | | |
|-----------------------------------|---|
| 41 – 42 passenger configuration – | 1 st Row (total of 2 seats) |
| 53 – 54 passenger configuration – | 1 st Row (total of 2 seats) |
| 65 – 66 passenger configuration – | 1 st Two Rows (total of 4 seats) |
| 71 – 72 passenger configuration – | 1 st Two Rows (total of 4 seats) |

Belt Cutter - A Tie-Tech belt cutter shall be installed in the Safety Equipment storage box on all school buses. It is to be attached with Velcro on the inside part of the door assembly.



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. 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.



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.

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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 upholstery 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 Bostrom #2239488-A78 or National Air Model 195.

NOTE: THE DRIVER'S SEAT SHALL BE EQUIPPED WITH A SEAT BELT RETAINER, ATTACHED TO THE RIGHT SIDE OF THE DRIVER'S SEAT, DESIGNED TO CAUSE THE SEAT BELT TO TRACK FORE AND AFT AS THE SEAT MOVES THROUGH ITS FULL EXTENSION.

Driver Seat Belt - A Type II lap belt/shoulder harness that meets the requirements of FMVSS 209 shall be installed. The belt shall have metal connections and the buckle shall be designed for push button release. The female connector shall be located on the driver's right and no higher than top seat cushion. The male connector shall be on the driver's left. The belt assembly shall be equipped with an emergency locking retractor (ELR) for the shoulder belt and an automatic locking retractor (ALR) for the lap belt. The seat belt shall be anchored per FMVSS 210 and in such a manner that the fabric part of the belt will be protected from floor to seat level. The shoulder harness anchor point shall be adjustable, and meet the requirements of FMVSS 209 and 210. This adjustment shall accommodate drivers ranging in size from a (50) percentile adult female to the (95) percentile adult male.

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 undyed 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.: Athol or Kevlar Mfg.

Brand: Proform

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.

Flammability Testing:

FMVSS - 302

Far 25.8583

Welt cord reinforced seams

Boston bag

National School Bus Standards fire block material

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All sewing on cushions and backs to be securely stitched with all seams lock stitched or double stitched with Kevlar thread or equal fire block thread. Seam ends should be backstitched to prevent unraveling. Cushion and backs with welt cord to be of same material as upholstery and properly stitched. The same grade of material and construction shall be used in all activity buses. Seat color is to be blue. Welt of 42-oz. upholstery on passenger seat backs, seat cushions, and barriers shall have same fire blocking properties as seat and barrier upholstery.

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 or firewall area. Assist handle shall be made from 1 inch OD round stainless architectural tubing or 1 inch OD anodized aluminum.

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.

ELECTRICAL SYSTEM

Wiring - 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 of fibrous loom, or equivalent covering. 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 metal 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.

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 approved constant service, heavy-duty master relays which 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 to supply current for the dome lights, stepwell light, windshield wipers, emergency door buzzer and heater and defroster.

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

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Interior Lighting - Interior lights shall consist of at least four flush mounted ceiling lights or light bar located above passenger windows 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.

LIGHTING NOTE: ALL LIGHTING SYSTEMS SHALL MEET OR EXCEED ALL APPLICABLE FMVSS REQUIREMENTS.

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. 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 35200Y (yellow) and 35200R (red) or equivalent.

Eight Light Warning Systems LED (light emitting diode) – Each school bus and activity bus shall be equipped with four (4) LED-flashing stoplights. The lens shall be red polycarbonate and designed to give illumination throughout 180 degrees. They shall also be clearly visible for a minimum of 500 feet. Lens shall be at least seven inches in diameter and the light assembly shall be of LED design. Location of lights and direction of beam are to be approved. 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 driver seat and adjacent to the air door switch and will actuate the relay from the ignition switch (location to be approved). *The flasher light activation switch is to be red in color. Lights shall be Sound Off, INC P/N E7WIEBOR (red) and P/N E7WIEBOA (amber). The flasher shall be electronic (Weldon 7000). System shall also include a Sound-Off LED Flicker Circuit Flasher – P/N ETLEDFC1. If Weldon flasher is not needed with the Sound-Off flasher it may be eliminated.*

In addition to four red lamps described in the above section, four (4) 7 inch amber LED- lamps with polycarbonate lens shall be installed as follows: one amber lamp P/N E7WIEBOA shall be located near each red signal lamp at same level, but closer to vertical centerline of bus. 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 not required on activity buses).

Flashing Stop Arm – Each school and activity bus shall be equipped with an air operated strobe flashing stop signal. This signal shall be equipped with (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 (Reflectorized Diamond Grade ASTM TYPE 4) sheeting or equivalent. The word “STOP” shall be placed on both sides of the blade in letters 6 inches high. Specialty Model Number 2360. The stop arm is to be operated by a 6-inch rubber diaphragm and air supply is to have an independent solenoid valve and regulator. Airline to be metal or nylon with suitable fittings. Assembly shall be installed as recommended by arm manufacturer.

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Directional 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 directional turn signals. Lights shall be Truck-Lite Model 91251Y. 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 21261Y.

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, combination brake/tail lights. Lights shall be Truck-Lite 91252R.
2. Each school and activity bus shall be equipped with two (2) red LED (light emitting diode), recessed, 4 inch brake/tail lights. Lights shall be Truck-Lite 44002R. Lights shall be placed on the rear of the body between the belt line and the floor. The stop lamps, both 7 inch and 4 inch shall be activated by the service brakes and the tail lamps by the parking lamp circuit.

Strobe Light - A strobe light is to be mounted on top of the bus body centered above the rear emergency door approximately 12 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 (11 Joules minimum) low amp draw/ high light output bulb. A replaceable remote power pack is to be mounted inside the bus body above the rear door inside the panel area with access provided. 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. (See picture for approved light location)



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 44) Backup lights shall be wired to the switch on transmission and be activated in reverse gear only.

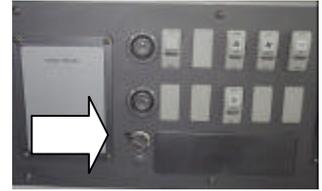
License Plate Lights LED (light emitting diode) – Each school and activity bus shall have two (2) LED (light emitting diode) license plate lights. These lights shall be installed in black mounts on the rear of the bus in the appropriate locations. (Truck-Lite Model 15205)

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.

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 a 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.

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Accessory Power Point Receptacle – Panel location to be approved and must be mounted in the driver's area on a flat surface.



HEATING AND VENTILATION

Heater - All 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 removal. A heavy duty, fresh air, heater shall be provided which uses the hot engine water as a heat source. All heaters shall be plumbed to provide each heater with its own source of hot water. The heat exchange shall be of the coil type and capable of withstanding an internal pressure of 300 psi. Heater shall be mounted on the left of the driver with a duct to distribute the heated air approximately 8 feet towards the rear of the bus. 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. Both sides of the windshield will have provided an equal volume of airflow to each side.

Heater shall have at least three fans of approximately equal capacity for circulating air two for coach heating only and one or more for defroster only. Each fan motor to be on a separate rocker type switch. Heater shall have a capacity of not less than 80,000 BTU's per hour at a temperature differential of 150 degrees between the hot water and the ambient air temperature.

All fittings and installation shall be above the floor level of the body. Heater hose shall conform to SAE specifications 20R1 class D2. 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 line, between the heater and the engine water pump, one all brass shutoff. Motors and fans shall be easily accessible and serviceable. Rear heaters shall be installed in all buses with rear lifts. Location of rear heater is to be approved. All heater cores (front & rear) shall have shutoff valves located at heater core. Cutoff valves to be of the quarter-turn ball valve type (location to be approved).

Note: The bus body company shall replenish the cooling system and fill the body heater system with Fully Formulated, Non-Organic, Heavy Duty Coolant having a mix of (50%) water and (50%) coolant. Coolant type and additives shall meet all requirements of the respective engine manufacturer and radiator supplier. (Fleet-Charge SCA Precharged)

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 1-½ -inch thick layer of fiberglass or mineral wool.* 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 1-½ inch thick layer of fiberglass or mineral wool insulation.*

DOORS

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. Door shall seal against a stationary rubber and bottom step edge. An emergency release, properly identified and located inside the body, near 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. Service 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 73-75 inches. *An exterior handle mounted on the outside of the entrance door is required to assist driver in opening the door from the outside.* 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. (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 120 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.

Rearscope Lens - All buses shall be equipped with a rearscope prismatic lens and this lens is to be mounted on the rear door, upper glass area. Materials to be a solid acrylic-reversing lens (size 14x14 inches).



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.

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2. Simple release handles shall be provided permitting operation as emergency exit(s), accessible inside and outside the vehicle. Units shall be installed with the hinge toward the front so as the front unit opens to permit air to be taken in and rear unit opens to permit air to escape rearward for proper vent action.

3. All emergency exits shall be marked with instructions for proper use and all emergency exits must be outlined with reflective tape, which meet FMVSS 217.

Hinged roof escape hatch shall include an internal and external release mechanism and a buzzer which alerts the driver when the hatch is open (Specialty Model 8945-1204 or Transpec Model 1100).

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.

There shall be installed on each 41 and 53 passenger bus midway of bus on each side, one push out window for exit in case of an emergency. On the 66 and 72 passenger buses, on each side, there shall be installed two-side push out windows (location to be approved). All push out windows must be marked with reflective tape, which complies with FMVSS 217 and be of the side-hinged design. Instructions to operate emergency exit windows shall be located on the outside of the window glass. Any required decals must be placed on the exterior of the bus window and must be clearly visible from the inside of the bus.

The words "EMERGENCY EXIT" to be lettered on inside at top of windows. Glass for window shall be set in an approved galvanized steel channel or extruded aluminum with black finish and shall furnish ample protection from weather and must be guaranteed against leakage from rain. Window visors of approved design are to be provided for all side windows. All side passenger windows shall be tinted glass as per requirements in Glass Section.

Driver's Window - There shall be installed to the left of the driver a window with a sliding ventilator easily operated from the driver's seat with an approved control. 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 side passenger windows.

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. Window sash is 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.

Windshield - The windshield shall be of at least two-piece flat glass construction and shall be set solid and installed in an approved waterproof manner. It shall provide a wide angle of vision, shall have a slight tint to prevent glare, and shall be large enough in its vertical dimension for the driver to see the road immediately ahead of the bus.

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GLASS

Quality - All glass used in the body shall be of the "Safety Glass" type conforming to requirements of the American Safety Code for Safety Glazing Materials. All glass should be legibly and permanently marked.

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 meeting or exceeding the requirements of AS-3. Adhesive surface film will not be accepted.

Percentage of light transmission shall be as follows:
Side Windows: 28% - 31% light transmissions
Driver's Window: 70% - 73% light transmissions
Rear Door Windows: 28% - 31% light transmissions
Rear Windows: 28% - 31% light transmissions
Entrance Door Windows: 70% - 73% light transmissions
Windshield: Manufacturer standard

BATTERY CARRIER

Location and Type - 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 keyed the same.) Thirty-six passenger buses may have battery mounted on the right side. Carrier must be sealed against water and dirt and should have a drain shield over top of door. Inside of carrier should be primed and painted with asphalt varnish or acid resistant 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 two or three (2-3) BCI Group 31 (or equivalent) 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. (All vehicles keyed the same). The word "BATTERY" or "BATTERIES" on the battery compartment door shall identify the location of the battery (ies) in 2-inch lettering.

REAR BUMPER

Size - The rear bumper shall be of pressed steel channel at least .1875 + or - .005 inch in thickness and 8 inches wide (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 Diamond Grade sheeting. This sheeting is required on all school and activity buses.*

Attachment of Bumper - 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.

ACCESSORIES

Interior Mirror - There shall be securely installed on the windshield header an adjustable rear view mirror so located as to give the driver a clear view of the entire interior of the bus and the road behind. Mirror to be distortion free glass at least 6 inches by 30 inches in size, shall have a metal frame and back and be rubber or vinyl mounted. Plastic washers to be installed between mirrors and mirrors bracket to allow mirror adjustment and reduce mirror damage.

Exterior Mirror System - All buses purchased shall be equipped with a mirror system complying with 49 CFR part 471, FMVSS 111 as adopted by the National Highway Traffic Safety Administration.

The Rear View Mirror System - Mirrors are to be installed in a manner to allow viewing through front windshield on all chassis. 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 Rosco Eurostyle heated, with remote controls and breakaway arms. These are to be attached with overhang mounts. *Driver's left side mirror may be mounted on lower portion of windshield post.*

The Crossover Mirror System - There shall be installed on each front fender of the chassis one (quadrispherical) mirror. These mirrors shall be mounted on the front corners of the hood assembly. These mirror brackets shall have sufficient supports (steel plate) located on the inside of the hood to prevent the fasteners from pulling through the hood assembly. They shall also be mounted to give the driver the best possible view of the front and sides of the bus. The cross view mirror system shall be capable of providing a view at ground level from the front bumper forward to where direct visibility is possible. It must also include the entire width of the vehicle, around the left and right front corners including front tires and services entrance door to a point where it overlaps with the rear vision mirror system. This mirror system shall also provide a view from the rear tire to at least 12 feet perpendicular from the side of the bus at the rear axle (Rosco Hawk-Eye Model 2365).

Windshield Wipers - The bus shall be equipped with two approved heavy-duty electric windshield wiper motors. These motors shall be operated by one heavy-duty rocker type switch. Wiper motors shall be two- (2) speed with intermitting feature and of sufficient strength to operate a 14-inch blade on a 15-inch arm under all driving conditions. Minimum length of blade shall be 14 inches. Wiper arm shall be rust proofed and installed as per FMVSS 107. Electric powered windshield washers shall be installed as per FMVSS 104 to operate through "wet" wiper arms.

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 by 24 inches in size. Visor is to be mounted in a manner that will not interfere with opening and closing of the overhead storage compartment.

License Holder - One license holder shall be located on the left rear of the body.

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Name Plate - There shall be installed on the inside of each body, a manufacturer's name plate which can be easily read, on which shall be shown the name of the manufacturer, the serial number of body, seating capacity, and date built. Plate to be metal or equivalent durable laminated decal.

First Aid Kit - There shall be installed a Grade A first aid kit 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.
Plastic gloves (1 pair medium and 1 pair large)	2 sets

First aid kit to be secured in "Safety Equipment Storage Box".

Fire Extinguisher - One 5-pound dry chemical stored pressure type with pressure gauge meeting UL, I.C.C. 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 addition the fire extinguisher shall be stenciled: Property of North Carolina Public Schools.

Body Fluid Clean-Up Kit - There shall be installed a body fluid clean-up kit that complies with National Standards and contains the following contents:

- 1 - 2 oz. package T.I.L.S.C. powder, sanitizes-deodorizes-encapsulates
- 1 - odor reducing mask
- 1 - pr. - latex 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".

Overhead Storage Compartment/Video Camera Box - A compartment shall be located over the windshield header. Compartment is to have a hinged door (prop required) and shall be equipped with boxed ends that protect the wiper motors from loose articles. These ends are to be easily removable for service to the wiper motors. In addition, the compartment shall have a box mounted on the inside to accept installation of a 7 ½-inch long video camera (camera not required) and shall be securely mounted to prevent vibration. The inside video box shall include hinged lockable door with one way glass (approximately 4 inches in diameter) and tray with mechanism to raise and lower the camera as required. The storage compartment door shall have a glass installed in such a manner that the video camera when installed views the entire passenger compartment of the vehicle. A series of small slots are required in the compartment door for audio pickup. A wire shall be provided to the camera box, which operate through the ignition switch. An LED indicator light wired through the ignition switch shall be mounted in the storage compartment door above the glass opening. If multiple locks are provided for accessories on the vehicles, they shall be keyed alike.

Safety Equipment Storage Box – Each bus shall be equipped with a safety equipment storage box. This box is to be approximately 8" deep, 13" high, and 33" wide. It shall also have a locking mechanism that is keyed the same as all lockable compartments. This compartment shall be located in the upper left corner of the bus body and shall not interfere with the driver fan or access to the storage compartment in the front bulkhead. Outside lid of Box is to be lettered in 2" vinyl lettering with the following "SAFETY EQUIPMENT INSIDE".



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Outside Storage Compartment – An outside storage compartment shall be installed on all configurations of school buses. The location to be on the right side of the body in front of the rear wheels and labeled in letters two inches high “STORAGE.” The storage compartment shall be approximately thirteen inches (13”) high, fifteen (15”) inches deep, and twenty-five inches (25”) wide and be located under the floor in the body skirt. The door and box shall be sealed to minimize water and dust leakage. All doors shall be equipped with locks and keyed the same as all other external locks.



Warning Devices – Each school bus shall contain at least three reflective triangle road- warning devices that are enclosed in a storage box. These shall be mounted in the “Safety Equipment Storage Box” and must meet requirements in FMVSS 125.

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 or painted chrome yellow or black fiberglass.

Tow Hooks - Two tow hooks shall be attached to the rear of chassis frame. The hooks shall be located under the rear bumper in an approved location and are to be attached to the chassis rails independent of the rear bumper.

Fuel Filler Opening Cover - A suitable lockable door of 20-gauge metal is to be installed over fuel filler opening on side of body. A suitable panel in the body floor shall provide access to the fuel sending unit and fuel lines.

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.

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. The mechanism, arm and all components, plus installation are to be approved. Crossing arm is to have an independent solenoid valve and regulator. It shall meet the following criteria: Specialty Model 28500. An electro-magnetic mount 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. Magnetic mount shall be *Specialty Model 8101*. (Crossing control arm not required on activity buses).

Driver's Fan - A 12 volt electric fan shall be installed in the driver's vicinity. It shall have a separate switch with high, low and off positions. The fan shall be a Bergstrom model B-1465, having a metal housing, mounting bracket, fan guard, and blade. (See picture for approved light location)



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Passenger Advisory System – Each school and activity bus shall be equipped with a passenger advisory system that activates the vehicle horn after a preset period of time. This system shall be activated when the driver places the ignition switch in the OFF position. This system shall require the driver to travel to the rear of the interior of the bus to deactivate. The control module is to be mounted in the driver area and have an adjustable activation delay. The horn is to sound until the driver deactivates the system with the deactivation switch mounted in the rear of the bus. Explicit instructions for operating this system shall be installed on the inside lid of the Emergency Equipment Storage Box so that the driver can view it when the lid is open. Instructions shall be on a plastic type material that will adhere to the box lid.

Air Tank Drain Control - Cable operated Berg drain valves mounted on all wet air reservoir tanks. Remote mounted cables are to be located below the body side sheets on one side of the bus.

Splashguards – Each school bus and activity bus shall be equipped with front and rear splashguards. Front and rear splashguards are to be 22" wide rubber. Installation shall be where the guards can prevent the most debris from being thrown under the bus body.

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.

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 washer. 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 washers.

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. 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.

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As evidence that above requirements have been met, samples of materials and sections used on construction of bus body, when subjected to Chrysler Chipping Corrosion Testing LP-463PB-52-01 Change A or equal testing system, shall be provided. There shall be no more than 3 mills (across the scribe as a total) of creep back, based on a three panel average. These panels are not to lose more than 10 percent of material by weight when subjected to the 1,000-hour salt spray test. This is provided for in latest revision of ASTM Designation: B117 that is the "Standard Method of Salt Spray (Fog) Testing."

Paint - All paint shall be unleaded. Paint shall meet National Standards for color and should have a finished gloss rating of at least 85 at 60 degrees. The paint shall be covered by a 5 year unlimited mileage warranty against all defects in materials and workmanship.

Exterior - The exterior of the complete bus body shall be painted with two coats of National School Bus Yellow polyurethane as per Federal Standard No. 595a. The applied primer and polyurethane paint shall yield a dry film thickness of 2 to 3 mills. A 1 ½-inch black circle shall be painted around the flashing stoplights with approved type polyurethane. Rear bumper shall be painted black and shall be equipped with 2-inch yellow diagonal Reflexite or 3M Diamond Grade sheeting. Rub rails shall be painted National School Bus Yellow same as bus body.

Interior - The entire interior paneling of the bus, except the sections of aluminized steel and /or clear coated, 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 two finish coats shall be required.

Floor and Structural Metal - 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 an approved black enamel or undercoated with an approved material. Air brake control valves and brake lines are color-coded and are not to be undercoated.

Activity Buses - Body manufacturer shall be required to paint chassis, hood and cowl to match final body color. This cost shall be included in bid price. Bus bodies to 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 in an approved area of the bus exterior. (Note: includes activity bus body).

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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.

Sides - 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.

Front - 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" to be on retro-reflective high intensity material (Reflexite or 3M).

Rear - 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" to be on retro-reflective high intensity material (Reflexite or 3M).

County number assigned to bus shall be on rear in an approved location in letters 6 inches high.

Interior - Above the windshield or other approved acceptable location; the words "SEATING CAPACITY" shall be in letters 2 inches 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 (41 Pupils)	K-5 (53 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 Lettering

Sides - 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 - 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 - 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 or equal 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.

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POWER LIFT (when requested)

All lift-equipped buses shall be equipped with Braun L917IB series lift. Lift must meet all ADA regulations. Buses equipped with lifts also require the installation of tracking above the windows (for 2 positions) for wheelchair securement. On all lift equipped buses header panels shall be installed behind the interior panel covering above the windows that will allow the installation of additional tracking, if needed.

1. Lifting mechanism shall be able to lift minimum payload of 1000 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 preventing the lift platform from failure while in operation due to 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.
5. Lift travel shall allow the lift platform to rest securely on the ground.
6. All edges of the platform shall be designed to restrain wheelchair and operator's feet from being entangled during the raising and lowering process.
7. Platform (minimum size of 32 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 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. Extra lights shall be provided in wheelchair area, over lift mechanism and in an approved exterior position. Doorways in which lifts are installed shall have, when a lift is to be used, illumination sufficient to light the entrance, lift, and on the lift, when deployed at the vehicle floor level.

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13. All sharp edges in power lift area, including door, shall be properly padded.
14. All buses equipped with a wheelchair lift shall have an additional heater with cutoff in wheel chair area (min. 80,000 BTU on 54 & 66 pass. and min. 50,000 BTU on 36 pass.). Rear heater is to be located on same side and to the rear of the power lift. Quarter turn ball valve cutoff required (location to be approved).
15. All upholstery material used on seats in buses with lifts shall be of the type known as fire block and shall be blue in color.
16. All buses equipped with a wheelchair lift shall include shoulder belt reinforcement supports above all passenger windows and between bow frames to allow for in the field mounting of wheelchair occupant securing system shoulder belt anchor. Suggested installation procedures for in the field mounting of shoulder belt anchorage shall be provided.
17. 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.
18. 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 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: (1) on the rear center portion of the rear emergency door; (2) on the right and left lettering belt, adjacent to the entrance door; and (3) aft of the stop arm.



19. Support Equipment – Support equipment, not applicable to be housed in the under-skirt storage compartment shall require a securement system that would retain securement when a force of 20G's is applied in any direction.

Belt Cutter - A belt cutter shall be installed on all lift-equipped school buses (Tie-Tech).

Fire Blanket - Each lift-equipped school bus shall be equipped with an Evac Aid fire blanket. It shall be at least eighteen (18) square feet in size, having a minimum width of 29 inches. The Evac Aid shall be enclosed in a non-metallic enclosure cabinet of no more than five and one half inches (5 ½”) in depth, eight and one half inches (8 ½”) x ten and one half inches (10 ½”) in length and width. 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. The blanket and cabinet combined weight shall be less than ten (10) lbs. And shall be attached to the interior wall in a manner that would retain the pouch to the wall when a 20G force is applied to the cabinet in any direction. The location of the fire blanket shall be in the rear of the bus in a location that is accessible.



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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 60 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. Lift door shall be metal, double wall and shall be provided with suitable weather stripping to prevent leaks.

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 12.00 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.
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 Tiedown 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 weigh a minimum of 150 pounds, or an approved surrogate. A 50th percentile male test dummy, weighing a minimum of 165 pounds, shall be used in the test.
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.



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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 Kinedyne four point wheelchair anchorage part number FF630 and the physical dimensions of an Everest & Jennings manual wheelchair, Model T8A200, to determine the seating reference point and the design angle of pull of the torso belt for passenger protection between the average size six (6) year old and fifty (50) percentile male. Adjustable attachment points of the overhead torso belt connectors shall be identified in some manner that a prudent operator would assure achieving the design angle of pull relative to the physical dimensions of the person being transported.

NOTE: All lift-equipped school buses shall be equipped with securement and tie-downs for two (2) wheelchair positions, (2) C.E. White CSRS seats, and remainder of floor space seated with regular 39" seats unless otherwise ordered.

ALTERNATE POWER LIFT SCHOOL BUS (Additional/requirements/specifications and/or modifications)

Flat Floor Body Design - 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 aluminum button tracks (full length of floor unless CSRS seats prohibit) to provide maximum flexibility in seating and wheelchair positions. Fully seat left side of bus body with 39-inch seat or acceptable alternative. NOTE: The flat-floor body design is an option on all size body configurations.

AIR CONDITIONING – Air conditioning shall be provided and installed by OEM 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. All buses shall be equipped with free blow type units. NOTE: Air conditioning is optional on all activity buses.

- 41 - passenger - 52,000 BTU minimum
 - One compressor
 - One condenser
- 53 - passenger - 96,000 BTU minimum
 - Two compressors
 - Two condensers
- 66 - passenger - 104,000 BTU minimum
 - Two compressors
 - Two condensers
- 72 - passenger – 104,000 BTU minimum
 - Two compressors
 - Two condensers

END SPECIFICATIONS

2/11/2002