



# **SPECIFICATIONS**

STATE OF TEXAS

SCHOOL BUSES

NO. 070 - SB - 90

# **1990**



EFFECTIVE

JANUARY 1, 1990

PREPARED JOINTLY

BY

STATE PURCHASING AND GENERAL SERVICES COMMISSION  
TEXAS EDUCATION AGENCY  
DEPARTMENT OF PUBLIC SAFETY

**MAJOR CHANGES FOR 1990**

**TEXAS SCHOOL BUS SPECIFICATION**

No. 070-SB-90

The following is a list of some of the major changes made in the 1990 compared with the 1989 School Bus Specification as issued effective 1/1/89.

**Please note that this is not intended to be a comprehensive listing of all changes to the 1990 school bus specification.**

You may want to review the following changes as well as those not listed here before ordering or bidding on 1990 school buses:

<b>PAGE NO.</b>	<b>ADDITIONS, CHANGES, DELETIONS, ETC.</b>
i	Table of Contents (including Forms, Charts, etc.) added new.
xi	List of Figures and Tables added new.
4	Par. A.4.5. Odometer Disclosure Statement added new.
8	Par. A.11. Terms, Invoicing, and Payment has been revised.
14	Option 13 - Moisture Ejectors, Automatic deleted (required).
15	TEA ADM-040R89 School Bus Requisition Form has been revised. <b>Please discard previous editions.</b>
19	Par. C.1.8.3. School Name Lettering clarified by adding requirement that lettering be at the same level on either side of the bus.
22	Par. C.2.4.3. Installation (of Rub Rails) clarified to show right hand rub rails not required across service door.
32	Table 3 - Comparison of Small School Bus Bodies (including 24-passenger) added.
36	Figure 1 - Types of Chassis used with Small School Buses (including 24-passenger) added.

**General**

1. Figures showing location of lighting on the small and the large school buses have been deleted; refer to the SBMI Standard 001.
2. Note that the requirements for alternator outputs have been clarified (see paragraphs E.6.1, page 35, F.6.1.3.1., page 69 and H.1.1., page 90 and the Major Components Chart, page 99) for those buses equipped with self-contained air conditioning units.

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TEXAS SCHOOL BUSES

A. GENERAL INFORMATION, REQUIREMENTS, AND CONDITIONS

A.1. SCOPE -

1.1 SIZES OF BUSES - This school bus specification includes the minimum requirements for fourteen sizes of school buses used by Texas Schools participating in the Foundation School Program. This specification covers the purchase of bus bodies and chassis separately as well as the purchase of complete school buses. The bus sizes shall be designated in terms of passenger capacity (exclusive of the driver) as listed below for regular seating:

15* Passenger	19* Passenger	35* Passenger	59* Passenger	71* Passenger (Long WB)
16* Passenger	20* Passenger	47* Passenger	65* Passenger	77* Passenger
18* Passenger	24* Passenger	53* Passenger	71* Passenger (Short WB)	83* Passenger

\*NOTE: Seating capacity may necessarily be reduced from the above whenever wheelchair positions and/or maximum seat spacing are specified for a given size bus (see Par. A.1.3 and Par. B.1.).

1.2. TYPES OF BUSES - Each bus shall have seating arrangements for the capacities designated:

- 1.2.1. 15-passenger bus shall be the van conversion or commercial cutaway semi-forward control type.
- 1.2.2. 16-passenger bus shall be the commercial cutaway semi-forward control type.
- 1.2.3. 18-passenger bus shall be the van conversion type.
- 1.2.4. 19-passenger bus shall be the commercial cutaway semi-forward control type.
- 1.2.5. 20-passenger bus shall be the stripped chassis semi-forward control type.
- 1.2.6. 24-passenger bus shall be the stripped chassis semi-forward control type.
- 1.2.7. 35-passenger bus shall be the conventional or semi-forward control type.
- 1.2.8. 47-passenger bus shall be the conventional, forward\*, or semi-forward control type.
- 1.2.9. 53-passenger bus shall be the conventional, forward\*, or semi-forward control type.
- 1.2.10. 59-passenger bus shall be the conventional, forward\*, or semi-forward control type.
- 1.2.11. 65-passenger bus shall be the conventional, forward\*, or semi-forward control type.
- 1.2.12. 71-passenger bus shall be the conventional, forward\*, or semi-forward control type.
- 1.2.13. 77-passenger bus shall be the conventional, forward\*, or semi-forward control type.
- 1.2.14. 83-passenger bus shall be the forward control\* transit type.

\*Diesel only.

1.3. SPECIAL EDUCATION BUSES - Special education buses for impaired passengers may contain less than 15 passenger and wheelchair positions combined, but not less than 10 passenger positions combined or they cannot be certified as school buses. These vehicles, used for transporting special education school children, that contain fewer than 10 passenger positions are classified as Multipurpose Passenger Vehicles (MPVs) by the Federal Government. They will be designated by the State of Texas as "school buses" for the purposes of this specification. We require that MPVs used as school buses here shall meet the same standards they would meet if built to accommodate 10 or more passengers even though they must be certified as Multipurpose Passenger Vehicles.

A.2. DEFINITIONS -

- 2.1. ASHRAE means American Society of Heating, Refrigeration and Air Conditioning Engineers.
- 2.2. ANSI means American National Standards Institute.
- 2.3. ASTM means American Society for Testing and Materials.
- 2.4. BCI means Battery Council International.
- 2.5. Commission and SPGSC mean Texas State Purchasing and General Services Commission.
- 2.6. Conventional Bus means a school bus with all of the engine in front of the windshield and the service or entrance door behind the front wheels. Note: For purposes of this specification, semi-forward control buses (see Par. A.2.18. below) are also considered "conventional" school buses.
- 2.7. Department of Public Safety and DPS mean Texas Department of Public Safety.
- 2.8. Education Agency and TEA mean Texas Education Agency.
- 2.9. EPA means United States Environmental Protection Agency.
- 2.10. FMVSS means Federal Motor Vehicle Safety Standards.
- 2.11. Federal Standard No. 17 means Federal Highway Safety Program Standard Number 17.

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- 2.12. **Forward Control Bus** means a school bus with the steering wheel, pedals, instruments, and other driver controls mounted as far forward as possible, usually just behind the windshield. All of the engine is located behind the windshield, either at the front of the bus, or at the rear of the bus, or in between these positions. The service door is located forward of the front axle.
- 2.13. **Knee Space** means the horizontal distance from the front center of a seat back to the rear center of the seat back (or barrier) immediately ahead, measured at approximately 4 inches above the seat cushion.
- 2.14. **Manufacturer** means a fabricator of school buses, bodies, chassis, or components.
- 2.15. **MPV** means a multipurpose passenger vehicle accommodating ten or less people.
- 2.16. **SAE** means Society of Automotive Engineers.
- 2.17. **SBMI** means School Bus Manufacturer's Institute.
- 2.18. **Semi-forward Control Bus** means a bus in which part of the engine is beneath and/or behind the windshield and beside the driver's seat.
- 2.19. **Vendor** means a manufacturer's representative or dealer authorized to make sales and supply parts and services in Texas.
- 2.20. **VESC** means Vehicle Equipment Safety Commission.

**A.3. APPLICABLE SPECIFICATIONS AND STANDARDS -**

- 3.1 **FEDERAL HIGHWAY SAFETY PROGRAM STANDARD** - School bus bodies and chassis shall meet or exceed the minimum requirements of this specification and shall also meet all applicable requirements of the Highway Safety Program Standard No. 17. All requirements of this specification must be met unless they are in conflict with Standard No. 17 as it applies to school buses:
  - 3.1.1. **Federal Highway Safety Program Standard No. 17, Pupil Transportation Safety** - Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.
- 3.2. **FEDERAL MOTOR VEHICLE SAFETY STANDARDS** - School bus bodies and chassis shall meet or exceed the minimum requirements of this specification and shall also meet all applicable requirements of the Federal Motor Vehicle Safety Standards (FMVSS). All requirements of this specification must be met unless they are in conflict with the FMVSS as they apply to school buses:
  - 3.2.1. **Federal Motor Vehicle Safety Standards (Public Law 89-563)** - Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402:
    - (1) FMVSS No. 103 - Windshield Defrosting and Defogging Systems.
    - (2) FMVSS No. 105 - Brakes, Hydraulic Service, Emergency and Parking.
    - (3) FMVSS No. 108 - Lamps, Reflective Devices, and Associated Equipment.
    - (4) FMVSS No. 111 - Rearview Mirrors - Passenger Cars and Multipurpose Passenger Vehicles.
    - (5) FMVSS No. 121 - Air Brake Systems - Buses and Trailers.
    - (6) FMVSS No. 125 - Warning Devices.
    - (7) FMVSS No. 205 - Glazing Materials.
    - (8) FMVSS No. 208 - Occupant Crash Protection.
    - (9) FMVSS No. 209 - Seat Belt Assemblies - Passenger Cars, Multipurpose Passenger Vehicles, Trucks and Buses.
    - (10) FMVSS No. 210 - Seat Belt Assembly Anchorages.
    - (11) FMVSS No. 217 - Bus Window Retention and Release.
    - (12) FMVSS No. 220 - School Bus Rollover Protection.
    - (13) FMVSS No. 221 - School Bus Body Joint Strength.
    - (14) FMVSS No. 222 - School Bus Seating and Crash Protection.
    - (15) FMVSS No. 301 - Fuel System Integrity.
    - (16) FMVSS No. 302 - Flammability of Interior Materials - Passenger Cars, Multipurpose Passenger Vehicles, Trucks, and Buses.
- 3.3. **NATIONAL MINIMUM STANDARDS** - School bus bodies and chassis shall also meet or exceed the current National Minimum Standards for School Buses except when those requirements are in conflict with the requirements of this specification. In such cases, the requirements specified herein shall prevail:
  - 3.3.1. **National Minimum Standards for School Buses, 1985 Revised Edition**, National Standards Conference (May, 1985), National Safety Council, 425 North Michigan Avenue, Chicago, Illinois 60611.
- 3.4. **OTHER REFERENCES** - References to other specifications, standards, and test methods shall be to those in effect on the date of the Invitation for Bids. The following publications form a part of this specification to the extent specified herein:
  - 3.4.1. **American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018:**
    - (1) ANSI Z26.1 - Safety Glazing Materials for Glazing Motor Vehicles Operating on Land Highways, Safety Code for, including Supplement Z26.1a - 1969.



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- 3.4.2. American Plywood Association, P.O. Box 11700, Tacoma, Washington 98411:
- (1) U.S. Plywood Standard PS 1-83.
- 3.4.3. American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103:
- (1) ASTM A 446 - Standard Specification for Sheet Steel, Zinc Coated (Galvanized) by the Hot Dip Process, Structural (Physical) Quality.
  - (2) ASTM A 525 - Standard Specification for General Requirements for Steel Sheet, Zinc Coated (Galvanized) by the Hot-Dip Process.
  - (3) ASTM D 3574 - Standard Specification for Standard Test Method for Testing Cellular Materials - Slab Bonded and Molded Urethane Foam.
- 3.4.4. American Society of Heating, Refrigeration and Air Conditioning Engineers, Inc., Circulation Department, 345 East 47th Street, New York, NY 10017:
- (1) ASHRAE 16-69 - Methods of Testing for Rating of Room Air Conditioners.
- 3.4.5. Federal Specifications - Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402:
- (1) TT-C-490B - Cleaning Methods and Pretreatment of Ferrous Surfaces For Organic Coating.
  - (2) TT-C-520B - Coatings Compound, Bituminous, Solvent Type Underbody, (For Motor Vehicles).
  - (3) TT-E-489 - Enamel, Alkyd, Gloss (For Exterior and Interior Surfaces).
  - (4) V -T-295D - Thread, Nylon.
  - (5) ZZ-M- 71D - Matting, Rubber and Vinyl.
- 3.4.6. Federal Standards - Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402:
- (1) No. 595a - Colors.
- 3.4.7. School Bus Manufacturers' Institute, Engineering Committee, 7508 Ben Avon Road, Bethesda, Maryland 20817:
- (1) SBMI Standard No. 001 - Standard Code for Testing and Rating Automotive Bus Hot Water Heating and Ventilating Equipment.
- 3.4.8. Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, Pennsylvania 15096:
- (1) SAE J20e - Coolant System Hoses.
  - (2) SAE J377 - Performance of Vehicle Traffic Horns.
  - (3) SAE J383 - Motor Vehicle Seat Belt Anchorages - Design Recommendations.
  - (4) SAE J514 - Hydraulic Tube Fittings.
  - (5) SAE J516 - Hydraulic Hose Fittings.
  - (6) SAE J517 - Hydraulic Hose.
  - (7) SAE J561 - Electrical Terminals - Eyelet and Spade Type.
  - (8) SAE J588 - Turn Signal Lamps for use on motor vehicles less than 2032 mm in overall width.
  - (9) SAE J639 - Safety Practices for Mechanical Vapor Compression Refrigeration Equipment or Systems Used to Cool Passenger Compartments of Motor Vehicles.
  - (10) SAE J887 - School Bus Warning Lamps.
  - (11) SAE J994b - Alarm - Backup - Electric - Performance, Test, and Application.
  - (12) SAE J1133 - School Bus Stop Arm.
- 3.4.9. United States Environmental Protection Agency, Waterside Mall, 401 M Street, S.W., Washington, D.C. 20460:
- (1) EPA - Noise Emission Standards.
- 3.4.10. Vehicle Equipment Safety Commission, Suite 908, 1030 15th Street, N.W., Washington, D.C. 20005:
- (1) VESC - Regulation 6.
  - (2) VESC - Regulation 10.

**A.4. GENERAL INFORMATION AND REQUIREMENTS -**

- 4.1. **NEW MODELS** - Each bus body and bus chassis furnished under this specification shall be new school bus of the current year's production or the latest improved model in current production. The bidder represents that all units offered under this specification shall meet or exceed the minimum requirements specified herein.

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- 4.2. SERVICING AND EQUIPPING** - All bus bodies, chassis, or complete school bus units shall be completely assembled, adjusted, and all equipment installed. All parts not specifically mentioned herein which are necessary to provide a complete school bus, bus body, or chassis shall be furnished by the successful bidder and said parts shall conform in strength, quality of materials, and workmanship to recognized industry engineering practices.
- 4.3. EQUIPMENT INSTALLATION** - Requirements and accessories, either standard or optional, under this specification shall be installed by body, chassis, or product manufacturer except air conditioners, tachographs, tachometers, and wheelchair lifts may be installed by authorized service Representatives. Installation of such items shall conform in strength, quality, and workmanship to the accepted standards of the industry.
- 4.4. VENDOR GVWR SELECTION** - The requirements for gross vehicle weight ratings, gross axle weight ratings (front and rear), and tire size and load range for each size chassis are specified in Table Nos. 4-8 and 14-28, and are minimum requirements. These requirements are for small type school bus (15- through 20-passenger), conventional type school bus (24- through 77-passenger), forward control type school bus (47- through 77-passenger), and a transit type school bus (83-passenger) with standard equipment. The added weights of optional equipment such as air conditioning, luggage racks, lifts for the physically impaired and other heavy accessories were not considered in establishing the capacity ratings to be certified for the chassis. If additional optional equipment is ordered, which necessitates increased capacity ratings of either axles, springs, or tires, it is the responsibility of the vendor to furnish them so that proper certification can be made on the vehicle.
- NOTE:** Par. A.4.4. is not applicable for chassis only which are used by the State of Texas for remounting of bus bodies.
- 4.5. ODOMETER DISCLOSURE STATEMENT** - The Truth in Mileage Act requires the selling dealer to furnish a complete odometer statement to the purchaser. This statement must be complete and shall include mileage accrued at the point of delivery. In addition to the signature of the seller/agent certifying the odometer reading, both the dealership and the name of the agent shall be printed on the Odometer Disclosure Statement.

**A.5. CERTIFICATION AND COMPLIANCE -**

- 5.1. BIDDER CERTIFICATION** - By signing the bid, the bidder certifies that the equipment being offered meets or exceeds all requirements and conditions of this specification. Failure to comply with all the requirements and conditions of this specification will subject the bid to rejection.
- 5.2. SUCCESSFUL BIDDER CERTIFICATION** - The vendor (successful bidder) must certify on the face of the invoice that the equipment delivered meets or exceeds the requirements and conditions of this specification and that the equipment was manufactured in accordance with this specification. The burden of proof for compliance with this specification shall be the responsibility of the vendor, manufacturer, or both.
- 5.3. MANUFACTURER'S STATEMENT OF ORIGIN** - The vendor (successful bidder) shall furnish the Commission with the manufacturer's Statement of Origin (Certificate of Title will not meet this requirement). The manufacturer's New Vehicle Warranty and major component parts warranties (see Par. A.10.4.) shall be furnished to the receiving school district. (See Par. A.8. for Pre-delivery Service requirements.) The odometer statement required by law shall include the mileage accrued at the time of delivery to the school district.
- 5.4. CHASSIS PRODUCTION ORDER -**
- 5.4.1. Attachment** - One copy of the production order (line setting ticket) listing both standard and optional equipment installed on the chassis must accompany the chassis to which it pertains upon delivery of the chassis to the bus body manufacturer and to the final destination (receiving School District). The copy of this production order should be contained in a waterproof envelope and placed in the glove compartment, or it may be secured by other means which will assure positive attachment to the chassis (see Par. A.5.4.2. below). The production order shall be a printed form and not machine coded.
- 5.4.2. Alternative Plate** - In lieu of the production order, the information required above may be stamped on a metal plate, either on the truck identification plate regularly furnished or on an additional plate. The identification plate(s) shall be attached to the chassis in a conspicuous place and in an accessible position in order that it may be easily read.
- 5.4.3. Removal/Obliteration** - The production order (line setting ticket) or truck identification plate referred to above shall not be removed from the chassis by the body manufacturer since it is for the information of the receiving school district. The truck identification plate shall not be obliterated when undercoating or paint is applied to the area where the plate is mounted. The plate shall not be mutilated or covered when installing equipment such as the heater, heater hose, or electrical cables.

**A. GENERAL INFORMATION, REQUIREMENTS AND CONDITIONS**

- 5.5. **BUS BODY WORK ORDER** - The work order which accompanies the bus body through the production line during the process of manufacture must show the related Commission Purchase Order Number that was issued to the bus body company or the distributor. The work order must also show the appropriate item number of the purchase order or the name of the school. One copy of the work order must accompany the bus to its final destination.
- 5.6. **LITERATURE AND DRAWINGS** - Each bidder shall furnish the following:
- 5.6.1. **Literature** - The bidder shall have on file with both the State Purchasing and General Services Commission and the Education Agency the latest pamphlets, brochures, and printed literature on the equipment the bidder proposes to furnish to this specification.
- 5.6.2. **Drawings** - The bidder shall have on file with the Commission, detailed isometric drawings of the bus body showing floor panels, side posts, roof bows, bow-frames, strainers, longitudinal frame members, exterior panels, and front and rear end framing. Each component shall be identified in block form showing (first) the item number, (second) the type of steel, and (third) the decimal thickness of steel used in the construction. (Refer to Table No. 10 for steel requirements on 24-passenger and larger capacity buses.)
- 5.6.3. **Number of Drawings** - On construction items, one drawing will suffice; however, additional drawings shall be furnished on special items and changes or deviations from common construction whenever such change affects any size bus. All drawings submitted will be treated as confidential information. Drawings must be approved by the Commission.
- 5.7. **TEMPORARY LICENSE TAGS** - Temporary (Red) License Tags shall be issued by the vendor for use with each new bus delivered (see Par. B.4.1.).
- A.6. **AWARDS** - The Commission reserves the right to accept or reject any and all bids, in whole or in part, and to waive all technicalities when these actions are determined by the Commission to be in the best interest of the State of Texas. Failure to receive a satisfactory chassis or body bid shall not prohibit the awarding of contracts to others by the Commission, when in the best interest of the State.
- A.7. **INSPECTION** - Inspection shall be by and at the discretion of this Commission or its designated agent and may be performed either at the place of manufacture, at the vendor's facility in Texas, or at the final destination, or a combination of these. The authorized State Inspector shall have access to the manufacturer's plant during all normal working hours in order to make all necessary inspections during the process of manufacture and assembly. This does not preclude the school districts' personnel from making inspections during manufacture or after acceptance of delivery. The school district's personnel are urged to make detailed inspections, especially upon delivery, and report any discrepancy or discrepancies to the Commission. Any such discrepancies found during or after manufacturing shall be immediately corrected to the satisfaction of the Commission, at no charge, by the manufacturer or distributor.
- A.8. **PRE-DELIVERY SERVICE** - The vendor or the vendor's representative who is responsible for the final delivery shall attach a signed certificate to the bus stating that the following service was performed and that inspection indicates the bus is in good condition and ready for delivery. The following service on the chassis and body shall be performed before the bus is delivered to the receiving school district:
- 8.1. Pre-delivery inspection and service on chassis.
- 8.2. Complete chassis lubrication.
- 8.3. Check all fluid levels and maintain proper grade and types of fluids.
- 8.4. Clean and wash interior and exterior of bus.
- A.9. **DELIVERY** -
- 9.1. **DELIVERY PROCEDURE** - The delivery of a bus to any specified destination may be made by any normal delivery procedure which the manufacturer or distributor utilizes (see NOTE below). The bus body distributor must guarantee the equipment to be free of damage as a result of the type of delivery. If any damage is caused by or during delivery that can be established within six months after delivery to any school, then the school must be compensated for such damage by the contractor. It shall be the obligation and responsibility of each body manufacturer to check and inspect each chassis delivered to the body manufacturer's plant to ascertain that the chassis is free of any damage which might have occurred as a result of the type of delivery.
- NOTE:** Under no circumstances shall a bus be used as towing vehicle prior to or during delivery to its destination.
- 9.2. **TIME OF DELIVERY** - Buses may be delivered to the receiving school districts only between the hours of 8:00 a.m. and 4:00 p.m. Monday through Friday, excluding holidays. Deliveries at other times are not to be made without at least 24 hours notice and only then with the expressed consent and approval of the receiving school district. The person delivering the bus shall present the Inspection Report Forms to the responsible school personnel and obtain that school official's signature before delivery is considered complete. (See Par. A.8.)

**A. GENERAL INFORMATION, REQUIREMENTS AND CONDITIONS**

- 9.3. **DELIVERY ON SCHEDULE** - Delivery on schedule is critical. The ability to deliver as specified in the Invitation for Bids will be a factor in making awards. A vendor who fails to make delivery in accordance with terms of the purchase order may be liable for actual damage suffered by the State. The amount of such damages shall be determined by the Commission.
- 9.4. **LATE DELIVERIES** - Failure by the successful bidder to deliver buses, caused directly by Natural Disaster, War, Civil Disturbance, Federal Law and Regulations, or Labor Disputes, which is beyond control of the contractor, will not cause the damages described in Par. A.9.3. above to be assessed.
- 9.5. **NOTIFICATION OF LATE DELIVERY** - At least 20 days in advance of the final delivery date, the successful, complete unit bidder shall notify the Commission and the receiving school district in writing, when a known delay precludes delivery of a unit on time.

**A.10. WARRANTY AND SERVICE -**

- 10.1. **CONTRACTOR'S RESPONSIBILITY** - Each successful bidder is ultimately responsible for and must assure the State that any warranty service shall be performed to the satisfaction of the Commission, regardless of whether the successful bidder or the bidder's agent performs the warranty work on school buses (see Par. A.10.4.). If there is a question of whether it is the responsibility of the body or the chassis manufacturer to repair a given defect, then it shall automatically become the prime contractor's and/or successful bidder's responsibility to see that the repair(s) is made to the satisfaction of the receiving school district and this Commission.
- 10.2. **DEFECTIVE WORKMANSHIP** - In the event that an error is discovered or conclusive proof of defective workmanship and/or materials is found on any body or chassis after acceptance and payment has been made, the successful bidder shall make such repairs as required at the vendor's own expense.
- 10.3. **PENALTIES** - Upon refusal of the prime contractor and/or successful bidder to make satisfactory adjustment(s), the Commission reserves the right to claim and recover from said prime contractor and/or successful bidder by due process of law, such sums as may be sufficient to correct the error or make good the defect in material and/or workmanship.
- 10.4. **WARRANTY WORK AND GENERAL TERMS OF WARRANTIES** - The Commission's purchase orders for school buses are issued to a single distributor or vendor. This distributor or vendor has the ultimate responsibility of insuring the delivery of a bus that meets Texas specifications in all details and is free of defects in materials and workmanship. In addition, the bus body and chassis are warranted against defects in materials and workmanship by the bus body manufacturing company and the chassis manufacturer, respectively. The warranty on a school bus is thus a dual warranty. The following are general terms of the warranties; however, for specific coverage of any item on a school bus, please refer to the warranty literature provided at time of vehicle delivery.

**NOTE: WARRANTY REGISTRATIONS MUST BE COMPLETED AND MAILED TO INITIATE WARRANTY.**

- 10.4.1. **Bus Body** - A minimum of 12 months beginning on the date of delivery to the user. For service contact the vendor identified on the school bus purchase order issued by the Commission.
- 10.4.2. **Bus Chassis** - 12 months or 12,000 miles, whichever occurs first, beginning on the date of delivery (see delayed chassis warranty, Par. A.10.4.3., below). For warranty service and repairs on the bus chassis:
  - 10.4.2.1. **First**, contact the chassis dealer recommended by the vendor (as shown on the school bus purchase order issued by the Commission) or any other convenient chassis dealer. If the problems are not satisfactorily resolved,
  - 10.4.2.2. **Second**, call the Zone Service Manager, Representative, or Engineer listed below for assistance (the dealer Principal may be asked to assist in this contact):

**CHEVROLET**  
Conrad Tupper  
Light-Duty Fleet Service Manager  
713-460-7333

**DALLAS ZONE**  
David Matola  
Heavy Truck Service Engineer  
214-323-6303

**FORD**

**HOUSTON ZONE**  
Ron Canal  
Heavy Truck Service  
Engineer  
713-680-4269

**GMC**  
Jim Gresham  
Medium-Duty Fleet Zone Service Manager  
214-541-5150  
1-800-322-7181 Ext. 219

**NIC**  
Ray T. Barton  
Regional Service Manager  
214-881-3545

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10.4.2.3. Third, if the problems are still not satisfactorily resolved, notify the vendor by letter with a copy to:

Purchaser "U"  
State Purchasing and General Services Commission  
P. O. Box 13047  
Austin, Texas 78711-3047

10.4.2.4. Last, if the above action does not resolve the problem, you may use the form provided on page 94 of this specification to contact the Commission.

10.4.3. Delayed Chassis Warranty - In case the bus is delivered during the summer months and will not be placed in service or used until the start of the fall term, the school district can obtain a delayed warranty by:

- (1) Making application for the delayed warranty (which is the responsibility of the school district and must be done within 15 working days after the date the bus is delivered or the warranty starts at time of delivery) by,
- (2) Contacting the local chassis dealer for a delayed starting date for warranty service (e.g., start of school or date bus placed in service). Your local dealer will verify the chassis mileage and record the starting date for bus use.

However, if the bus is used before the starting date, then the delayed warranty date is voided and the warranty date automatically becomes the delivery date.

Any questions should be addressed to your local chassis dealer or to the Specification Section of the Commission.

10.4.4. Air Conditioner - Basic coverage for chassis and body parts is for 12 months as specified in manufacturer's warranty pamphlet. (For service on units provided by chassis manufacturer, contact local chassis dealer; for service on other makes, contact the vendor.)

10.4.5. Automatic Transmission - Basic coverage is for 12 months, 12,000 miles, whichever occurs first, and as more specifically defined in the manufacturer's warranty pamphlet included with delivery of the vehicle. (For service, contact the chassis or transmission dealer, or authorized service outlet as specified in the warranty pamphlet.)

- (1) Allison Transmission Division (ATD) transmissions (see below) are warranted for 50,000 miles or 12 months at 100% cost of parts and labor; 50,001 miles to 62,500 miles or 15 months at 80% cost of parts; 62,501 to 75,000 miles or 18 months at 60%; 75,001 to 87,500 miles or 21 months at 40%; and 87,501 to 100,000 miles or 24 months at 20%. An extended warranty is available at extra cost.
- (2) ATD transmissions on school buses delivered from 9-1-85 to 8-31-90 are warranted for 3 years and unlimited mileage at 100% cost of parts and labor.

10.4.6. Batteries - 12 months or 12,000 miles, whichever occurs first. (For service contact the local dealer as specified in the battery warranty pamphlet.) Battery warranties are included with the chassis warranty.

10.4.7. Mid-Range Diesel Engines (35-83 passenger) - 5 years or 50,000 miles, whichever occurs first. (For service contact the chassis dealer.)

10.4.8. Tires - Tires and tubes are covered by the tire manufacturer's adjustment policies as specified in the manufacturer's pamphlet included with the vehicle delivery.

10.4.9. Wheelchair Lifts - All component parts including frame welds, gear box, and motor are warranted for 12 months and are specifically defined in the manufacturer's pamphlet included with the vehicle delivery. Warranty on wheelchair lifts with frames manufactured of aluminum shall be a minimum of 24 months on the frame rails and a minimum of 18 months on the gear box and motor; all other components shall be warranted for 12 months (see Par. G.1.2.1.).

**A. GENERAL INFORMATION, REQUIREMENTS AND CONDITIONS**

**A.11 TERMS, INVOICING AND PAYMENT -**

**11.1 VENDOR'S INVOICE -**

- 11.1.1. **School District's Copies** - The vendor shall submit two copies of the State Purchasing and General Services Commission format invoice\* to the school district. All buses delivered at the same time on a single purchase order shall appear on a single invoice. The invoice must certify that the buses delivered meet or exceed the requirements and conditions of this specification. (See Par. A.5.2.)
- 11.1.2. **SPGSC's Copy** - The vendor shall submit one copy of the invoice to the Accounting Office, State Purchasing and General Services Commission.

**11.2 ISSUANCE OF WARRANT -** A warrant (check) will be issued to the vendor after the following documents are received by the Accounting Office, State Purchasing and General Services Commission:

- 11.2.1. **Vendor's Invoice** - One copy of the invoice submitted by the vendor.
- 11.2.2. **Certificate of Origin** - (not Certificate of Title) from the vendor made out in the name of the school district.
- 11.2.3. **Inspection Report** - Completed Inspection Report from the School District indicating the bus(es) were delivered.
- 11.2.4. **School District Check** - Check for payment of the bus(es) from the school district.

**NOTE: A WARRANT WILL NOT BE ISSUED UNTIL ALL FOUR OF THE ABOVE ARE RECEIVED IN THE ACCOUNTING OFFICE AT THE FOLLOWING ADDRESS:**

**ACCOUNTING OFFICE  
STATE PURCHASING AND GENERAL SERVICES COMMISSION  
BOX 13047  
AUSTIN, TEXAS 78711-3047  
(TELEPHONE: 512-463-3379)**

- 11.2 **PAYMENTS** - Payments shall be made by the Commission from the School Bus Revolving Fund as provided for in V.T.C.A., Education Code, Section 16.61, after the school's check has been received and deposited into the account.
- 11.3 **DISPUTED PAYMENTS** - If the school district believes that there is an error in an invoice submitted for payment, the school district shall notify the vendor who submitted the invoice of the alleged error not later than the 21st day after the date on which the invoice is received. A copy of the notice to the vendor shall be forwarded to the Accounting Office, State Purchasing and General Services Commission.

\*Available from Purchaser "U", State Purchasing and General Services Commission

**B. ORDERING INFORMATION**

**B.1. GENERAL INFORMATION -**

- 1.1. **PASSENGER CAPACITY** - The definition of passenger capacity, as used in this specification, has reference to seat space (width) allotted for each pupil. Based on national height and weight percentile averages specified in Federal Highway Safety Program Standard No. 17, approximately 13 inches per pupil has been established for designating bus body passenger capacities.
- 1.2. **REDUCED PASSENGER CAPACITY** - The 13-inch figure must be considered when ordering school buses since passenger capacity may be reduced when junior high, high school or adult students are primary passengers.

**B.2. ORDERING** - Complete school buses, school bus bodies, or school bus chassis shall be requisitioned using the Texas Education Agency School Bus Requisition Form furnished by TEA. Please refer to the facsimile requisition on the page following the options. More than one bus may be requisitioned on one form provided all are the same size. "Chassis" or "Bodies" only should be ordered on separate requisitions from "complete" school buses:

**2.1. PREPARATION OF THE REQUISITION -**

- 2.1.1. **COMPLETE UPPER SECTION** - All of the information requested in the upper portion of the requisition form should be completed by the ordering school with the exception of the space provided for the Commission Requisition Number. This space is for Commission use only. Note that automatic or manual transmission must be checked (vendor's choice otherwise). State quantity and the size of buses desired and specify the type (e.g., either Conventional/Semi-forward Control, or Forward Control) and the table number from which the bus is to be ordered.
- 2.1.2. **SELECT REGULAR OPTIONS** - Select from the list of regular options for the size bus being ordered, the option(s) desired by making a check mark (✓) or an "X" next to the number.
- 2.1.3. **COMPLETE LOWER SECTION** - The certification and approval on the lower portion of the requisition form must be completed before submitting to TEA.
- 2.2. **SPECIAL OPTIONS** - List, on the back of the requisition, or on a separate sheet of paper with the Requisitioning agency or school district letterhead, any optional equipment required that does not appear on the list of Regular Options. This second sheet should be dated and identified with your School Requisition Number.
- 2.3. **MAILING ADDRESS** - Mail the original and one copy to:

Texas Education Agency  
School Transportation Division  
1701 North Congress Avenue  
Austin, Texas 78701

**B.3. SERVICE OR SHOP MANUALS** - School districts desiring chassis service or shop manuals may obtain them separately from school buses ordered by corresponding directly with the following manufacturers:

ATD TRANSMISSIONS

Stewart & Stevenson  
P. O. Box 1637  
Houston, Texas 77001

FORD MOTOR COMPANY

Service Publications  
7388 North End Station  
Detroit, Michigan 48202

BLUE BIRD

Bridges-Hemphill  
1807 North Elm, Suite 120  
Denton, Texas 76201

CHEVROLET MOTOR DIVISION

General Motors Corporation  
P. O. Box 40911  
Houston, Texas 77040

GMC TRUCK AND COACH DIVISION

Service Department  
31 Judson  
Pontiac, MI 48058

CARPENTER

Statewide Bus Sales  
4000 Irving Blvd.  
Dallas, TX 75247

DODGE DIVISION

Dymet Distribution Service  
P. O. Box 360450  
Strongsville, OH 44136

NAVISTAR INTERNATIONAL COMPANY

P.O. Box 655334  
Dallas, Texas 75265

THOMAS

Longhorn Bus Sales  
6921 Homestead Road  
Houston, Texas 77028

**B. ORDERING INFORMATION**

**B.4. TEMPORARY LICENSE TAGS AND EXEMPT LICENSE PLATES -**

**4.1. TEMPORARY LICENSE TAGS -** The vendor shall issue with each bus delivered, temporary (red) license tags (see Par. A.5.7.). **THESE TEMPORARY TAGS ARE LEGAL TO USE FOR A PERIOD OF 20 DAYS ONLY.**

**4.2. EXEMPT LICENSE PLATES -** The following forms are required to obtain these plates at the address shown:

4.2.1. **MSO** (Manufacturer's Statement of Origin) or Title.

4.2.2. **Form 130 U**, "Application for Title."

4.2.3. **Form 62A**, "Application for Exempt Plates."

Exempt license plates must be obtained from:

Texas Department of Highways  
and Public Transportation (TDHPT)  
Division of Motor Vehicles  
P.O. Box 26480  
Chimney Corners Station  
Austin, Texas 78755

**ATTN: Special Plates Section**



**B. ORDERING INFORMATION**

**B.5. REGULAR OPTIONS -**

**15- THROUGH 20-PASSENGER BUSES**

**REGULAR  
OPTION NO.**

**DESCRIPTION**

- 1. **Air Conditioning, Standard Cooling** (see Par. H.).
  - 2. **Air Conditioning, Extra Cooling** (see Par. H.).
- NOTE:** Special Requirements - Options 1 and 2 require Option 3 and 5/8" nominal thickness plywood installed over the steel floor.
- 3. **Alternator, 100 ampere minimum** (required with Option 1 or 2 or 34).
  - 7. **Diesel Engine** (see Tables 4 through 8).
  - 9. **Fuel Tank, Increased Capacity** (30-gallon minimum capacity; see Par. D.2.3.).
  - 10. **Glazing, Dark Tint, Minimum Light Transmittance of 30% and maximum Light Transmittance of 40%** (see Option 42 and paragraphs C.1.8.2. and C.2.10.2.).
  - 11. **Heater, Auxiliary** (see Par. C.3.5. for size and installation requirements).
  - 15. **Door, Service, Automotive Sedan Type** (for 18- and 19-passenger buses only; see Fig. 1 and Tables 6 and 7).
  - 16. **Knee Spacing** (maximum allowed by FMVSS No. 222; requires deleting some seats which will reduce seating capacity.

Regular Seating Capacity	15	16	18	19	20
Rows of Seats	3	3	4/5	3	3
Minimum Knee Space, inches	27	27	27	28	28

- 17. **School Name Lettering, both sides of bus** (see Par. C.1.8.4.).
  - 20. **Sound Abatement Insulation** (shall reduce interior noise 4 dB(A), minimum).
  - 21. **Stop Arm, left side of bus** (see Par. C.3.9.).
- Note:** Reflectorized surface must be specified, if required (see Par. 3.9.1.).
- 22. **Strobe Light, Roof-mounted** (see Par. C.3.8.).
  - 23. **System, Security Lock, All doors** (requires ignition disconnect on emergency door).
  - 24. **Tachograph, 0-80 mph, 12 volt** (with 7-day 4-7/8 inch disc chart and electronic clock/speedometer/recorder; see Par. D.4.6.).
  - 26. **Laminated Safety Plate Glass, AS-2 or better** (see Par. C.2.10.2.4.).
  - 31. **Tool Compartment** (see Par. C.3.11.).
  - 32. **Wheel, Spare** (without carrier, tire, or tube; see Par. D.3.5.2.).
  - 34. **Wheelchair Lift, Folding Platform Type** (floor-mounted on curb side of bus in front of or behind the rear wheelwell, at manufacturer's option; see Par. G.).
- NOTE:** For option 34, the school district **must** specify number of wheelchair positions required on bus.
- 37. **Wheelchair Restraints, Webbed-belt Type** (for unusual wheelchairs which cannot otherwise be restrained; see Par. G.2.1.2)
  - 42. **White Roof** (see Par. C.1.8.2.)

**B. ORDERING INFORMATION**

**REGULAR OPTIONS  
24- THROUGH 77-PASSENGER BUSES**

**REGULAR  
OPTION NO.**

**DESCRIPTION**

- 1. **Air Conditioning, Standard Cooling** (see Par. H.).
- NOTE:** Special Requirements - Option 1 requires a minimum 130 ampere alternator and 5/8" nominal thickness plywood installed over the steel floor.
- 3. **Alternator, 105 ampere minimum** (required with option 35 or 36; see Par. F.6.1.2..)
- 4. **Axle, Rear, Two-speed.**
- 5. **Brakes, Hydraulic** (for 59-, 65-, 71-, and 77-passenger buses only).
- 6. **Chassis, Long Wheelbase** (requires minimum 274-inch wheelbase for 71-passenger bus only; or 157-inch wheelbase for 24-passenger bus only).
- 7. **Diesel Engine** (for 24- through 77-passenger buses; see conventional buses in Tables 14 through 25).
- 8. **Differential, No-spin.**
- 9. **Fuel Tank, Increased Capacity** (for 24-passenger buses only; see Par. F.2.3.2.).
- 10. **Glazing, Dark Tint, Minimum Light Transmittance of 30% and maximum Light Transmittance of 40%** (see paragraphs E.1.92. and E.2.10.3.2.).
- 11. **Heater, Rear** (see Par. E.3.6. for size and installation requirements).
- 12. **Luggage Rack** (mounted on top of the bus; see Par. E.3.7.).
- 13. **Moisture Ejectors, Automatic** (for 59- through 77-passenger buses with air brakes only; see Par. F.3.2.1.3.).
- 14. **Mud Flaps, with Brackets, Mounted** (see Par. E.3.10.). **There shall be no advertisement on the mud flaps.**
- 16. **Knee Spacing** (maximum allowed by FMVSS no. 222; requires deleting some seats which will reduce seating capacity).

Regular Seating Capacity	24	35	47	53	59	65	71-S	71-L	77
Rows of Seats	4	5	7	8	9	10	11	11	12
Minimum Knee Space, inches	27	28	28	27.75	28	27.75	27.5	27.75	27.5

- 17. **School Name Lettering, both sides of bus** (see Par. E.1.9.4.).
- 18. **Seat Belts** (for each passenger seating position; see Par. E.3.12.).
- 19. **Slack Adjusters, Automatic, Two at front and two at rear** (for buses with air brakes only; see Par. F.3.2.1.4.).
- 20. **Sound Abatement Insulation** (shall reduce interior noise by 4 dB(A), minimum).
- 21. **Stop Arm, left side of bus** (see Par. E.3.14.).
- Note:** Reflectorized surface must be specified, if required (see Par. 3.14.1.).
- 22. **Strobe Light, Roof-mounted** (see Par. E.3.11.).
- 23. **System, Security Lock, All Doors** (with ignition disconnect on emergency door).
- 24. **Tachograph, 0-80 mph, 12 volt** (with 7-day 4-7/8 inch disc chart and electronic clock/speedometer/recorder; see Par. F.4.9.).
- 25. **Tachometer** (to indicate engine RPM).
- 26. **Laminated Safety Plate Glass, AS-2 or better** (see Par. E.2.10.2.4.).
- 27. **Tires, Tube Type, Steel Belted Radial** (see Par. F.3.5.1.)

**B. ORDERING INFORMATION**

28. Tires, Tubeless Type, Bias Belted (Standard on 24-passenger buses; see Par. F.3.5.1.).

29. Tires, Tube Type, Bias Belted (see Par. F.3.5.1.).

**NOTE:** Options 28 and 29 may reduce the GVWR of the bus.

30. Tires, Mud and Snow Tread (for Rear Wheels only).

31. Tool Compartment (see Par. E.3.16.).

32. Wheel, Spare (without carrier, tire, or tube; see Par. F.3.5.2.1.).

33. Wheel, Spare, Mounted (with carrier but not tire and tube; carrier not available on 24-passenger bus; see Par. F.3.5.2.2.).

35. Wheelchair Lift, Folding Platform Type, Front Curb Side Mounted (for 24- through 71-passenger bus only; see Par. G.).

36. Wheelchair Lift, Folding Platform Type, Rear Curb Side Mounted. Same as Option 35 above except floor-mounted on rear curb side of bus (see Par. G.). This option is recommended only for buses which will have a regular attendant in addition to the driver.

**NOTE:** For Option Nos. 35 and 36, the school district must specify the number of wheelchair positions required on bus.

37. Wheelchair Restraints, Webbed-belt Type (for unusual wheelchairs which cannot otherwise be restrained; see Par. G.2.1.2.).

39. Wheels, Cast Spoke, All Wheels (see Par. F.3.5.2.3.).

41. Seat Backs, Increased Height (see Par. E.2.14.5.).

42. White Roof (see Par. E.1.9.2.)

**B. ORDERING INFORMATION**

**REGULAR OPTIONS**

**83-PASSENGER BUSES**

**REGULAR  
OPTION NO.**

**DESCRIPTION**

1. Air Conditioning, Standard Cooling (See Par. H.).  
**NOTE:** Special Requirements - Option 1 requires a minimum 130 ampere alternator and 5/8" nominal thickness plywood installed over the steel floor.
8. Differential, No-Spin.
9. Fuel Tank, Increased Capacity (90 gallon minimum capacity; see Par. F.2.3.2.).
10. Glazing Dark Tint, Minimum Light Transmittance of 30% and maximum Light Transmittance of 40% (see paragraphs E.1.9.2. and E.2.10.3.2.).
11. Heater, Rear (see Par. E.3.5. for size and installation requirements).
12. Luggage Rack (mounted on top of the bus; see Par. E.3.7.).
14. Mud Flaps, with Brackets, Mounted (see Par. E.3.10.). There shall be no advertisement on the mud flaps.
16. Knee spacing (maximum allowed by FMVSS No. 222; requires deleting some seats which will reduce seating capacity).

Regular Seating Capacity	83
Rows of seats	13
Minimum Knee Space, inches	27
17. School Name Lettering, both sides of bus (see Par. E.1.9.4.).
18. Seat Belts, Passenger (for each passenger seating position; see Par. E.3.12.).
19. Slack Adjusters, Automatic, two at front and two at rear (see Par. F.3.2.1.4.).
20. Sound Abatement Insulation (shall reduce interior noise by 4 dB(A), minimum).
21. Stop Arm, left side of bus (see Par. E.3.14.).  
**Note:** Reflectorized surface must be specified, if required (see Par. 3.14.1.).
22. Strobe Light, Roof-mounted (see Par. E.3.11.).
23. System, Security Lock, All Doors (with ignition disconnect on emergency door).
24. Tachograph, 0-80 mph, 12 volt (with 7-day 4-7/8 inch disc chart and electronic clock/speedometer/recorder; see Par. F.4.9.).
26. Laminated Safety Plate Glass, A5-2 or better (see Par. E.2.10.2.4.).
30. Tires, Mud and Snow Tread (for Rear Wheels only).
31. Tool Compartment (see Par. E.3.16.).
33. Wheel, Spare, Mounted (with carrier but not tire and tube; see Par. F.3.5.2.2.).
41. Seat Backs, Increased Height (see Par. E.2.14.5.).
42. White Roof (see Par. E.1.9.2.).

**TEXAS EDUCATION AGENCY  
Transportation Division**

District Name \_\_\_\_\_

County-District No. \_\_\_\_\_

SCHOOL REQ. # _____
STATE REQ. # _____

**School Bus Purchase Requisition  
FY 19\_\_\_\_ - \_\_\_\_**

<b>FOR TEA USE ONLY</b>
Approved by: _____
Date: _____

**Authority for Data Collection:** TEC 11.12 and 21.161

**Planned Use of Data:** Required information necessary to purchase school buses.

**Instructions:** For information on bus options, see the current *Texas School Bus Specifications*. The completed form should be submitted as indicated below. For further information contact the Transportation Division at (512) 463-9185.

**Section I—Bus Requirements**

Quantity: \_\_\_\_\_ — Passenger School Bus  
Size: \_\_\_\_\_

Automatic Transmission: \_\_\_ Yes \_\_\_ No  
(For 24 thru 77 passengers)

Type: \_\_\_ Conventional  
      \_\_\_ Semi-forward Control  
      \_\_\_ Forward Control

**Section II—Standard Bus Options: Check all standard bus options to be included.**

- |   |  |
|---|--|
| <input type="checkbox"/> 1. Air conditioning, standard  | <input type="checkbox"/> 24. Tachograph  |
| <input type="checkbox"/> 2. Air conditioning, extra cooling (15- thru 20-passenger only)          | <input type="checkbox"/> 25. Tachometer  |
| <input type="checkbox"/> 3. Alternator, minimum 100 ampere  | <input type="checkbox"/> 26. Laminated safety plate glass  |
| <input type="checkbox"/> 4. Axle, rear, two-speed (24- thru 71-passenger only)                    | <input type="checkbox"/> 27. Tires, tube-type, steel belted radial   |
| <input type="checkbox"/> 5. Brakes, hydraulic (59- thru 77-passenger only)                        | <input type="checkbox"/> 28. Tires, tubeless-type, bias belted (standard on 24-passenger bus)  |
| <input type="checkbox"/> 6. Chassis, long wheelbase (24- and 71-passenger only)                   | <input type="checkbox"/> 29. Tires, tube-type, bias belted   |
| <input type="checkbox"/> 7. Diesel engine   | <input type="checkbox"/> 30. Tires, mud and snow tread, rear wheels  |
| <input type="checkbox"/> 8. Differential, no-spin (24- thru 71-passenger only)                    | <input type="checkbox"/> 31. Tool compartment  |
| <input type="checkbox"/> 9. Fuel tank, increased capacity (15- thru 24- and 83-passenger only)    | <input type="checkbox"/> 32. Wheel, spare (without carrier, tire, or tube)   |
| <input type="checkbox"/> 10. Glazing material, deep tint (min. 30% max. 40% light transmittance.) | <input type="checkbox"/> 33. Wheel, spare, mounted (with carrier but not tire or tube; 35- thru 83-passenger only)   |
| <input type="checkbox"/> 11. Heater, auxiliary  | <input type="checkbox"/> 34. Wheelchair lift, folding platform type, right curb side mounted (for 15- thru 20-passenger only; with _____ wheelchair positions) |
| <input type="checkbox"/> 12. Luggage rack (24- thru 83-passenger only)                            | <input type="checkbox"/> 35. Wheelchair lift, folding platform type, front curb side mounted (for 24- thru 71-passenger only; with _____ wheelchair positions) |
| <input type="checkbox"/> 13. Moisture ejectors, automatic (with air brakes only)                  | <input type="checkbox"/> 36. Wheelchair lift, folding platform type, rear curb side mounted (for 24- thru 71-passenger only; with _____ wheelchair positions)  |
| <input type="checkbox"/> 14. Mud flaps, mounted (with brackets)                                   | <input type="checkbox"/> 37. Wheelchair restraints, webbed-belt type (for 15- thru 71-passenger only)  |
| <input type="checkbox"/> 15. Door, Service-Automotive Sedan Type (18- and 19-passenger only)      | <input type="checkbox"/> 39. Wheels, chassis, cast spoke (all wheels)  |
| <input type="checkbox"/> 16. Knee spacing, maximum  | <input type="checkbox"/> 41. Seat backs, increased height  |
| <input type="checkbox"/> 17. School name lettering (type EXACTLY as required)                     | <input type="checkbox"/> 42. White roof  |
| <input type="checkbox"/> 18. Seat belts (standard on all 15- thru 20-passenger)                   |  |
| <input type="checkbox"/> 19. Slack adjusters, automatic (with air brakes only)                    |  |
| <input type="checkbox"/> 20. Sound abatement insulation   |  |
| <input type="checkbox"/> 21. Stop arm, left side  |  |
| <input type="checkbox"/> 22. Strobe light, roof-mounted   |  |
| <input type="checkbox"/> 23. Security lock system, all doors                                      |  |

NOTES: Discard all previous editions of this form. Use only this form to order 1990 school buses. NA means Not Available/Not Applicable.

Typed Name and Title of Contact Person	Mailing Address
	Bus Delivery Address if Different from Above

Typed Name of Superintendent	Date	Telephone	Signature
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Return original and one copy to:  
Texas Education Agency  
Transportation Division  
1701 North Congress Avenue  
Austin, Texas 78701

**Section III—Special Options:**

List any requested additional options that do not appear in current state specifications

A. \_\_\_\_\_

J. \_\_\_\_\_

B. \_\_\_\_\_

K. \_\_\_\_\_

C. \_\_\_\_\_

L. \_\_\_\_\_

D. \_\_\_\_\_

M. \_\_\_\_\_

E. \_\_\_\_\_

N. \_\_\_\_\_

F. \_\_\_\_\_

O. \_\_\_\_\_

G. \_\_\_\_\_

P. \_\_\_\_\_

H. \_\_\_\_\_

Q. \_\_\_\_\_

I. \_\_\_\_\_

R. \_\_\_\_\_

C. 15- THROUGH 20-PASSENGER BODY SPECIFICATIONS

C.1. GENERAL REQUIREMENTS -

1.1. **BODY PHYSICAL REQUIREMENTS** - The physical requirements for 15- through 20-passenger school bus bodies shall conform to the following table (see Option No. 16 and Par. A.1.3.):

TABLE NO. 1

PHYSICAL REQUIREMENTS

(1) MINIMUM SIZE Number of Passengers	(2) OVERALL BODY WIDTH inches, maximum	(3) KNEE SPACINGS inches, minimum	(4) SEAT WIDTH LEFT RIGHT inches, minimum	(5) CENTER AISLE WIDTH inches, minimum	(6) FLOOR-TO- CEILING HEIGHT inches, minimum
15	96	24	30* - 30	12	62
16	96	25	30* - 30	12	72
18	96	26	30 - 30	12	63
19	96	25	39* - 26	12	62
20	96	25	39 - 26	12	72

NOTES: Column (3) Knee space is defined as the horizontal distance from the front center of a seat back to the rear center of the seat back or barrier immediately ahead, measured at approximately 4 inches above the seat cushion.  
 Column (4) \*Left rear seat shall have minimum width of 26 inches.  
 Column (6) Floor-to-ceiling height shall be measured in the center of the body between the No. 2 pillar and the last side body pillar ahead of the rear roof slope.

1.1.1. **Interior Width** - 15- through 20-passenger school buses shall have a minimum interior width of 70 inches at the shoulder level of a seated 90 percentile male passenger.

1.2. **REAR BUMPER** - The rear bumper shall be either the chassis manufacturer's standard bumper or it shall be furnished by the body manufacturer. It shall be secured to rear chassis frame and it shall be designed so as to prevent "hitching of rides" by obtaining a toe-hold thereon. The bumper shall not be permanently attached to the bus body. The bumper fabricated by the bus body manufacturer shall be of pressed steel channel at least 3/16-inch thick by 5 inches high and shall wrap around the body, extending forward for at least 12 inches on each side. It must be bolted to the chassis frame and braced with material of at least equal impact ratio as the material in the bumper.

1.3. **CEILING** - The ceiling shall be free of all projections likely to cause injury to passengers. (See table above for ceiling height requirements and Par. C.2.11. for other ceiling requirements.)

1.4. **LAMPS, SIGNALS, AND WARNING DEVICES** - Each bus shall be furnished with the lamps listed below (see SBMI Standard No. 001):

1.4.1. **Alternately Flashing Signal Lamps** - Each school bus shall be equipped with eight warning signal lamps, four red and four amber, working in an automatic non-sequential integrated system. The signal lamps shall conform to the design, installation, location and operating requirements in Par. S4.1.4. of FMVSS No. 108:

"S4.1.4. Each school bus shall be equipped with a system of...:

...(b) Four red signal lamps designed to conform to SAE Standard J887, 'School Bus Red Signal Lamps', July 1964, and four amber signal lamps designed to conform to that standard, except for their color, and except that their candlepower shall be at least 2-1/2 times that specified for red signal lamps. Both red and amber lamps shall be installed in accordance with SAE Standard J887, except that:

(i) Each amber signal lamp shall be located near each red signal lamp, at the same level, but closer to the vertical centerline of the bus; and

(ii) The system shall be wired so that the amber signal lamps are activated only by manual or foot operation, and if activated, are automatically deactivated and the red signal lamps automatically activated when the bus entrance door is opened."

NOTE: The lamps shall be wired independently and not wired through the ignition switch. This will allow removal of the ignition key without affecting operation of the alternately flashing eight warning signal lamps.

1.4.1.1. **Band** - Each set of amber and red lamps shall have a minimum 3-inch black band around the set and a 3-inch band between the lamps in each set. The color of this band shall be black enamel (Color No. 17038 of Federal Standard No. 595a).

C. 15- THROUGH 20-PASSENGER BODY SPECIFICATION

If it is not possible to provide a 3-inch band between the lamps in the set, the manufacturer will then provide a band as wide as possible. Any visor or hood used to shade the lights and improve visibility shall not interfere with the intensity and photometric performance of the warning lights (see SBMI Standard No. 001).

- 1.4.1.2. Mounting - If exterior panels are cut to provide an opening for installation of flush mounted signal lamps, the lamps must have a closed cell sponge flange gasket with a minimum thickness of 3/16 inch. The gasket shall be the full width of the flange on the lamp. Proper installation of the lamps shall be made in order to prevent seepage of moisture into the opening.
- 1.4.1.3. Operating Instructions - Complete instructions for the detailed operation of the warning signal lamp system shall be furnished with each school bus.
- 1.4.2. Backup Lamps - The color, requirements, and mounting of backup lamps shall be in accordance with FMVSS No. 108, except two backup lamps are required by Texas specifications.
- 1.4.3. Identification Lamps - Each bus with an overall width of 80 or more inches shall be furnished with identification lamps installed on the front and rear - three amber lamps in the front and three red lamps in the rear. The lamps shall be installed as close as practicable to the top and vertical centerline with lamp centers spaced not less than six inches or more than twelve inches apart. Each identification lamp shall be the armored flush mounting type for protection of the lens from damage during normal operation. Armored protectors shall in no way interfere with the intended purpose of the lamps. The armored type protectors shall be Grote Manufacturing Company, Madison, Indiana 47250, Model Nos. 45012 and 45013, or KD Lamp Company, 1910 Elm Street, Cincinnati, Ohio 45210, Model Nos. 38469-901 and 40268-301, or approved equal. (See SBMI Standard No. 001 and FMVSS No. 108 for the types and proper location of these lamps.)  
  
Example of an approved equal: Peterson Model - PM 122.
- 1.4.4. Interior and Stepwell Lamps - A minimum of two interior dome lamps shall be installed to properly and adequately illuminate the entire aisle and emergency passageway. The stepwell shall be illuminated by a separate lamp activated by opening the service door. The stepwell lamp shall have a metal bezel.
- 1.4.5. License Plate Lamp - The color, requirements, and mounting of the license plate lamp shall be in accordance with FMVSS No. 108.
- 1.4.6. Operating Units and Flashers - The operating units and flashers for turn-signals and vehicular hazard warning signals shall meet the requirements of FMVSS No. 108.
- 1.4.7. Tail and Stop Lamps - The quantities, colors, requirements, and mounting of tail and stop lamps shall be in accordance with FMVSS No. 108.
- 1.4.8. Turn-Signal/Hazard Warning Lamps - The quantities, colors, requirements, and mountings of turn-signal/hazard warning lamps shall be in accordance with FMVSS No. 108.
- 1.4.9. Warning Devices - Each school bus shall be equipped with three triangular warning devices meeting the requirements of FMVSS No. 125. The devices shall be packed three per metal or heavy-duty plastic box, or they may be individually packed in metal or heavy-duty plastic boxes with the three boxes contained within a carrier. Warning devices shall be securely mounted either in the driver's compartment or under the rearmost row of seats. Triangular warning devices furnished shall be approved by the Texas Department of Public Safety.
- 1.5. WIRING - All wiring shall conform to the current standards of the SAE. Wiring as arranged in the circuits to manufacturer specifications are acceptable; however, the addition of another circuit for the alternately flashing signal lamps shall be provided.
  - 1.5.1. Color and Number Coding - Each body circuit shall be coded by a color and number.
  - 1.5.2. Accessory Wiring - Body-installed accessories shall be wired from the battery through a low voltage solenoid cut-off switch operated by the ignition key except for the eight light warning system and hazard warning lights.
- 1.6. LICENSE PLATE HOLDER - A license plate holder shall be mounted on the rear of the bus body. The holder shall be designed so that the license plate will receive illumination from the clear lens on the underneath side of the tail light, or by a separate lamp.
- 1.7. OPENINGS - All openings in the floorboard or firewall between chassis and passenger-carrying compartment, such as for gearshift lever, steering column, and auxiliary brake lever, shall be sealed. All openings between chassis and passenger-carry compartment made due to alterations by the body manufacturer must be sealed.



C. 15- THROUGH 20-PASSENGER BODY SPECIFICATION

- 1.8. **COLORS and LETTERING** - A first quality black enamel (Color No. 17038 of Federal Standard No. 595a) or decals shall be used for lettering and trim. The properties of the black enamel shall be equal to those of the finish coat enamel. Pressure-sensitive tape or decals are acceptable for trim or lettering (e.g., EMERGENCY DOOR, EMERGENCY EXIT, SCHOOL NAME LETTERING, etc. signs) provided they are made from Faison R 200, 3M Series 180, or approved equal material.
- 1.8.1. **Interior** - Unless otherwise specified in the Invitation for Bids, the interior of the complete bus body shall be finished in the manufacturer's standard color except where clear-coated galvanized steel or aluminum is used (see Par. C.2.11.).
- 1.8.2. **Exterior** - The exterior of the complete bus except for rub rails shall be finished in school bus yellow (Color No. 13432 of Federal Standard No. 595a). The hood may be coated with nonreflective school bus yellow paint. When so specified in the Invitation for Bids (see Option 42), the school bus roof shall be painted white. The paint on the roof shall extend from the back of the front cap to the front of the rear cap and from a point on each side of the bus which is no lower than the top of the windows and no higher than the start of the roof curvature. The paint shall be the same quality as the paint on the remainder of the school bus.
- 1.8.3. **School Bus Lettering** - The school bus bodies shall have the words "SCHOOL BUS" in neat, clearly defined block letters on the front, rear, and on both sides of the bus body using decals or with black paint (Color No. 17038 of Federal Standard No. 595a). The letters shall be 8 inches high and shall have 1-inch wide strokes. The words "SCHOOL BUS" shall be at the same level on each side of the bus (i.e., same height above bottom of skirt).
- 1.8.4. **School Name Lettering** - When so specified in the Invitation for Bids, the school district name shall be provided in black letters on both sides of the bus near the belt line using decals or with black paint. Lettering shall be minimum 5 inches high with minimum 5/8-inch block strokes. Paint, if used shall be equal in quality to that of the bus body paint; decals shall meet or exceed the requirements in Par. C.1.8. Maximum number of characters in one line of the name is limited to thirty. The school district should list in the space provided on the School Bus Requisition Form (see sample form on page 15), the name to be placed on the bus. Characters should be typed or printed plainly on this form to ensure accurate spelling (see Option 17).
- 1.8.5. **Emergency Door Lettering** - The rear emergency door exit shall be marked "EMERGENCY DOOR" or "EMERGENCY EXIT", both on the outside and on the inside with at least two-inch high lettering placed on top of, or directly above the exit.
- 1.8.6. **Logos** - No logo, trademark, insignia, or letters shall be placed on bumpers or mud flaps. A small metal or plastic plate designating body manufacturer's name may be attached to the bus body. A logo of reasonable size, which has been approved by the Specification Section, may be placed on the exterior bus body.
- 1.8.7. **Bumpers** - Bumpers shall be finished in black (Color No. 17038).
- 1.8.8. **Rub Rails** - All rub rails, except the pressed-in type window level rub rails, shall be painted black (Color No. 17038). The pressed-in type rub rails shall be painted either black (Color No. 17038) or school bus yellow (Color No. 13432) at the option of the manufacturer.
- 1.8.9. **Wheels** - Both sides of all wheels, including the spare, shall be finished in black (Color No. 17038).
- 1.8.10. **Wheel Covers** - Wheel covers may be bright metal.
- 1.8.11. **Grilles** - Grilles may be painted either the same color as the exterior of the bus body or they may be argent, gray, or a bright finish (chrome, chromed-plastic, or anodized aluminum).
- 1.8.12. **Exterior Mirror Backs** - The metal backs of all exterior mirrors, if painted, shall be finished in lusterless black (Color No. 37038; see Par. C.3.6.3.5.).
- 1.9 **UNDERCOATING** - Undercoating is required to provide for insulation, sound deadening, protection from road minerals, and rust prevention, as applicable, and shall meet the following:
- 1.9.1. **Material** - Insulating and undercoating materials shall be an asphalt base underbody coating conforming to Federal Specification TT-C-520B, such as R-477-139, manufactured by Daubert Chemical Co., Chicago, Illinois 60638 or Lion Nokorode Emulsion 331 as manufactured by Lion Oil Company, El Dorado, Arkansas 71730, or an approved equal. An example of an approved equal is Tectyl MC121B, manufactured by Ashland Petroleum Company, Box 391, Ashland, Kentucky 41101, applied to a dry film thickness greater than 20 mils.

C. 15- THROUGH 20-PASSENGER BODY SPECIFICATION

1.9.2. Application - The entire underside of the bus body, including floor members, wheelwells, side panels below the floor level, and all metal fenders or fenders with metal liners shall be coated with 1/8-inch thick material as specified above. The undercoating shall be applied in accordance with the undercoating manufacturer's instructions. Do not cover up or obliterate the truck identification plate (see Par. A.5.4.3.)

1.10. INSULATION - The ceilings and sidewalls shall be thermally insulated with a fire-resistant material approved by the Underwriters Laboratories Inc. to adequately reduce the noise level and to minimize vibrations. Buses shall have the equivalent of 1.5 inches of fiberglass or other insulation in the ceilings and walls including the interior of hat-shaped bows. Any insulation used shall have a minimum R-factor value of 5.77.

C.2. CONSTRUCTION -

2.1. GENERAL REQUIREMENTS -

2.1.1. Components - All components shall be of adequate design and shall be of sufficient strength and safety factor to support the entire weight of a complete bus when fully loaded, on its sides or top, without undue damage to the body structure. The body shall have sufficient frame members in the roof structure and corners to provide adequate safety and to resist damage on impact. Construction shall be such as to provide a reasonable dustproof and watertight unit.

2.1.2. Front Body Section - The front body section of the school bus from the windshield forward shall be of the bus body manufacturer's or chassis manufacturer's standard design and shall contain, but not be limited to, the following components:

2.1.2.1. Grille - A sufficiently reinforced grille assembly.

2.1.2.2. Lamps - Headlamps and parking/turn-signal lamps as required by FMVSS No. 108.

2.1.2.3. Hood - Hood cover with latching mechanism providing access to the forward part of the engine.

2.1.2.4. Fenders - Properly braced fenders with the total spread of the outer edges exceeding the total spread of the front tires when the front wheels are in the straight-ahead position.

2.1.3. Body-Chassis Attachment -

2.1.3.1. Chassis Manufacturer's Body - The body shall be attached to the chassis frame by the manufacturer's standard clip unless the chassis is provided with the manufacturer's unitized metal floor.

2.1.3.2. Other Bodies - If other than chassis manufacturer's standard metal floor is furnished, the body shall be attached to the chassis by the chassis manufacturer's standard clips and, in addition, the following:

(i) U-bolts - A minimum of two U-bolts shall also be used on each frame rail to attach the body to the chassis frame. The four U-bolts shall be fitted with lock washers and nuts and, after the nuts have been securely tightened, the threads of each U-bolt shall extend a minimum of 1/2 inch past the nuts. Minimum diameter of the U-bolt threads shall be 0.4375 inch.

(ii) Body-Chassis Insulation - Anti-squeak material in continuous strips or rubber pads shall be permanently and firmly attached to the frame rails or cross members to insulate the chassis from the body.

**NOTE:** School buses with floors installed by the body manufacturer and equipped with any combination of wheelchair lift positions and conventional seats shall have a minimum of four U-bolts (2 installed on each frame rail).

2.1.4. Bolts and Rivets - All bolts and rivets used in the manufacture of the school bus body shall be high strength metal. All bolts shall be equipped with lock washers or other acceptable devices to prevent loosening under vibration. All bolts, nuts, and washers except U-bolts, their nuts and washers, shall be parkerized, cadmium-plated, or otherwise rustproofed.

2.1.5. Other Fasteners - Sheet metal screws or self-tapping bolts of any type shall not be used in the construction of bodies except:

2.1.5.1. For alignment\* of doors or in conjunction with rivets, welds, or bolts for compliance with FMVSS No. 221, as applicable, or,

2.1.5.2. Seat construction (see Par. C.2.14.), or,

2.1.5.3. For interior panels which must be removed to give accessibility to other interior or concealed components, or,

2.1.5.4. For attachment of exterior mirrors in certain cases (see Par. C.3.6.3.4.), or,

- 2.1.5.5. In the installation of rub rails or emergency door handles and latches where it is impossible to use rivets or bolts, nuts, and lock washers and then only when these fasteners are used in conjunction with the manufacturer's standard metal adhesive which is used to meet joint strength requirements, or,
- 2.1.5.6. In window frames when applied with the metal adhesive, or,
- 2.1.5.7. In the installation of header pads over the doors, or
- 2.1.5.8. For electrical wire moldings and light fixtures.

\*When self-tapping bolts are used to align doors, they shall be tack-welded at the head or applied with the metal adhesive and shall not exceed the number of rivets, or bolts, nuts, and washers installed in the door hinges.

- 2.1.6. Caulking - A flexible, tenacious, high quality caulking compound or adhesive shall be applied to the top of all rub rails, all unwelded metal joints, and to any place where moisture could enter through the exterior panels. This does not include the fresh air intake or the heater or the drain openings at the bottom of the rub rails. The compound shall be applied to the required areas in a neat and workmanlike manner without voids or skips.

## 2.2. BODY FRAME -

- 2.2.1. Longitudinal Frame Members - The body frame shall contain, as a minimum, the following longitudinal frame members at the locations shown:
  - 2.2.1.1. Shoulder Level - There shall be one longitudinal side strainer (or impact rail) mounted at shoulder level (window sill level) and extending at least from the front post (excluding the front door entrance) to the rear corner reinforcement. This member shall be attached to each vertical structural member. Such strainer shall be a formed (not a flat) strip of metal.
  - 2.2.1.2. Other Side Longitudinal Frame Member - There shall be one longitudinal side strainer installed in the area between the bottom of the window and the bottom of the seat frame and extending from the front post to the rear corner reinforcement. This strainer may also be used as a means to fasten the angle used for the wall end seat support at the wheelhousing. Such strainer shall be formed and attached to each vertical structural member by huck-bolting, welding, or thread-forming bolts which are tack-welded to prevent bolts from vibrating loose. A backup channel for the exterior rub rails shall be provided and fastened to each vertical structural member. In lieu of a separate backup channel, the seat level longitudinal strainer may serve as a backup channel for the seat level rub rail.
  - 2.2.1.3. Roof Longitudinal Members - Two or more longitudinal members (or roof strainers) shall be provided to connect and space the roof bows and to reinforce the flattest portion of the roof skin. They shall be applied either externally or internally. They shall extend from the windshield header and shall function as continuous longitudinal members. These roof strainers shall be attached to other structural components by means of welding, riveting, or bolting. The completed roof shall meet the requirements of FMVSS No. 220.
  - 2.2.1.4. Rear Corner Frame - The rear corner framing between the floor and roof and between the emergency door posts and the body corner shall be applied horizontally or vertically, or in other combinations, to provide additional impact and penetration resistance equal to that provided by frame members in body side areas. Such structural members shall be securely attached at each end.

- 2.3. EXTERIOR PANELS - Exterior panels shall be steel; however, front door farings and front and rear endcaps only may be fiberglass or heavy-duty plastic.

- 2.3.1. Attachment and Installation - All exterior panels shall be attached to bow frames and strainers so as to act as an integral part of the structural frame. They shall be installed by lapping and riveting, lapping and bolting, or by flanging and bolting and in such a manner as to form watertight joints.

- 2.3.2. Joints - Joints shall meet the requirements of FMVSS No. 221.

- 2.4. RUB RAILS - Two separate, one-piece continuous rub rails of the type, grade, and thickness of steel specified in Table No. 10 (or approved equal), shall be installed on the body as described below. The minimum finished width of all rub rails shall be 4 inches:

- 2.4.1. Location - One rub rail shall be installed at or near the floor level, and the other at the seat level, or at the window level, or in between the seat and window level.

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- 2.4.2. Construction - The rub rails shall be of ample strength to resist impact and to prevent crushing of the bus body and shall be a flanged-formed channel, longitudinally fluted, or corrugated rib surface. Ends shall be (1) smoothly closed, or (2) closed by a rounded or beveled metal end cap which shall be butt- or flash-welded to the rub rail, or (3) closed by a rounded or beveled metal end cap inserted with an approximate one-inch sleeve inside of the rub rail and riveted in position at the top and bottom of the rub rail, or riveted in position at the top and bottom of the rub rail flange, or riveted in the center of the end cap, and sealed in the same manner as the top flange of the rub rails.
- 2.4.3. Installation - All rub rails shall be bolted or riveted on top and bottom to each side post and riveted on top and bottom to the exterior paneling between the side posts (see exception in Par. C.2.1.5.5.). Provisions for one-piece rails may be accomplished by butt- or flash-welding. All welds, including those for the end caps, shall be dressed, sanded, and buffed.

Both rub rails shall be installed the full outside length of the body on the right side from the rear of the service door to the point of curvature at the rear of the bus and on the left side from the point of curvature near the outside cowl to the point of curvature at the rear of the bus. When the upper rub rail is extended to the rear of the bus and joining is by lapping or fastening with a sleeve, the joint shall be located at the rearmost body side post or preferably, the second post from the rear. Rub rails are not required on the left (driver's) door if this door is furnished by the chassis manufacturer.

- 2.4.4. Drainage - The bottom edge of each rub rail (except the pressed-in-type which may be used near the window line) shall have provisions for drainage of accumulated moisture. One of the following drainage methods shall be used:
- 2.4.4.1. Slots - The bottom flange of the rub rail shall have a minimum of one inch by 0.032 inch formed slots spaced on not more than 12-inch centers, or
- 2.4.4.2. Holes or Slots - One 0.25-inch diameter hole or slot per foot in the lowest part of the rub rail drilled prior to the priming, painting, and installation of the rub rail shall be provided. Holes drilled after rub rail installation or after priming and painting are not acceptable. Formed slots are preferred over drilled or cut holes.
- 2.4.5. Sealing - The top joint of the rub rail shall be sealed with a caulking compound or adhesive as specified in Par. C.2.1.6.

2.5. SKIRT REINFORCEMENT - Side skirts of 15- through 20-passenger buses, if on commercial cutaway or stripped chassis, shall be gusseted or braced, where required, for rigidity and to prevent undue vibration.

2.6. SERVICE OR ENTRANCE DOORS - 15- through 20-passenger buses shall be equipped with either a Style 1 or a Style 2 service or entrance door which shall be located on the right side near the front of the bus and in direct view of the driver (see Tables 4 through 8 and Option 15):

**Note:** 15-passenger buses may have either a Style 1 or a Style 2 service door at the manufacturer's option. 16-passenger buses shall have a Style 2 (tall) service door (no option). 18- and 19-passenger buses shall have a Style 2 (tall) service door unless Option 15 is designated by the ordering school district. 20-passenger buses shall have a Style 2 (tall) service door (no option). (See comparison of small buses on page 32).

- 2.6.1. Style 1 Service Door - This service or entrance door shall be of one piece and shall have a minimum horizontal opening of approximately 28 inches and a minimum vertical opening of approximately 54 inches. The door shall be manually operated. The door control must be the hand lever type, driver-operated, and shall be designed to afford easy release and to prevent accidental opening. When so specified in the Invitation for Bids (see Option 15), 18- and 19-passenger buses shall be furnished with (sedan type) style 1 service doors.
- 2.6.2. Style 2 (Tall) Service Doors - This service or entrance door shall be the two-piece or folding type and shall have a minimum horizontal opening of approximately 24 inches and a minimum vertical opening of approximately 68 inches. The doors shall be operated from controls at or near the bus driver's seated position. The doors shall be either operated manually or actuated electrically or by air pressure or vacuum and shall allow manual opening in case of an emergency. To prevent accidental opening while the bus is in motion, the door opening system shall require at least a 125-pound force applied to its center in order to manually open the door. Both vertical closing edges of the door shall be equipped with rubber or rubberized materials to protect passenger's fingers.
- 2.6.3. Driver's Visibility - Service or entrance doors shall have lower and upper glass panels, or a system of mirrors to provide the driver a clear view of entering passengers as well as the passenger landing area. (See Par. C.2.10.2. for installation requirements of glass panels.) Whichever style of door is used, provision shall be made using either glass panels or

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mirrors to give the seated driver a view of at least the upper 7 1/2 inches of a 30-inch rod placed upright on the ground at any point along a line one foot outboard from the service door entrance and between the front and rear of the service door.

- 2.6.4. Attachment - The hinges for the service entrance doors shall be attached with rivets or bolts, nuts, and lock washers. Metal screws or self-tapping bolts are not acceptable. Metal screws may be used for alignment of doors while installing rivets. Self-tapping bolts may be used for alignment if the bolt heads are tack-welded to the hinges (see Par. C.2.1.5.1.).
- 2.6.5. Header Board - The head impact area on the inside top of the service or entrance door shall be protected by an energy-absorbing, padded header board of sufficient size (width, depth, and length) to prevent injury when accidentally impacted.
- 2.7. SERVICE ENTRYWAY - The entrance door steps shall be designed so that the first step shall not be more than 14 inches from the ground when the bus is unloaded. Steps of adequate width and length shall be fabricated and installed outside or inside the body to meet this requirement. Provisions shall be made to prevent road splash from the wheel from accumulating on steps installed outside the body. The surface of all entrance steps shall have a nonskid material applied. (See Par. C.2.16.3. for handrail installation requirement in the service entryway.)
- 2.8. EMERGENCY DOORS - Buses furnished to this specification shall be equipped with emergency doors meeting the description below. 15- and 18-passenger buses shall be equipped with emergency doors meeting the requirements of either Style 1 (two-door type) or Style 2 (single door type). 16-, 19-, and 20-passenger buses shall be furnished with Style 2 door only; double rear emergency doors will not be accepted. Either style emergency door shall be furnished with upper glass panels, permanently closed, set in rubber or sealed against rubber. (See Par. C.2.10. for glazing requirements and Par. C.1.8.5. for lettering.) No seat or other object shall be placed in the body that restricts the passageway to the emergency door to less than 12 inches. There shall be no steps leading to the emergency door.
- 2.8.1. Style 1 Emergency Door (Two Door Type - 15- and 18-passenger buses only) - Both of the rear doors shall be for emergency exit use and provided with the following:
- 2.8.1.1. Latch - Both the key type and/or the inside push-pull type rear cargo door locks, as installed by the original vehicle manufacturer, shall be either completely removed or shall be made inoperable. If made inoperable, precautions shall be taken to assure that the lock mechanism(s) cannot, through vibration or other means, cause the emergency exit door to become locked either from the inside or the outside of the bus.
- 2.8.1.2. Fastening - The two-door emergency exit, located at the rear of the bus, shall be equipped with a fastening device that will secure each door at the top and at the bottom. The fastening device on the first-opened door shall permit opening of the door from both the inside and the outside of the bus. The fastening device shall permit opening of the other door from the inside of the bus. Both fastening devices shall be designed to be quickly released but shall offer protection against accidental release. A suitable instruction sign shall be located on the inside of the door near the fastening device on the first-opened door, to indicate its method of operation. The outside handle when in the closed position, shall extend vertically downward from its pivot center.
- 2.8.1.3. Switch - The emergency door shall be equipped with an electrical switch connected to an audible signal automatically operated and located in the driver's compartment which shall indicate the unlatching of this door and the switch shall be enclosed to prevent tampering. Wires leading from the switch shall be concealed in the walls. No cut-off switch shall be installed in the circuit.
- 2.8.2. Style 2 Emergency Door (Single Door Type) -
- 2.8.2.1. Design - The emergency door shall be located in the center rear of the body and shall have a minimum horizontal opening of 30 inches and a minimum vertical opening of 48 inches measured from the floor level. It shall be properly sealed against moisture and dust.
- 2.8.2.2. Latch - The emergency door shall be equipped with a slide bar rack and pinion (cam) operated latch. The slide bar shall be approximately 1.25 inches wide and 0.375 inch thick and shall have a minimum stroke of 1.125 inches. The slide bar shall be spring loaded so as to retain the bar in the closed position and have a minimum of one inch of horizontal bearing surface beyond the edge of the door frame when the door lock is in a latched position.

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- 2.8.2.3. Latch Handle - The movement of the latch handle through its full arc of operation shall not be obstructed by, or extended into the area behind the rear seats at the emergency door. The handle, when in the closed position, shall meet the requirements of FMVSS No. 217. The design of the latch handle shall allow quick release, but shall offer protection against accidental release. Control of the fastening devices from the driver's seat shall not be permitted. A pull handle shall be installed on the inside of the emergency door so that the door can be securely closed for positive fastening. Provisions for opening from the outside shall consist of a handle (device) designed to prevent "hitching a ride" yet allowing the door to be opened when necessary. The outside handle, when in the closed position, shall extend vertically downward from its pivot center.
- 2.8.2.4. Switch - The emergency door latch shall be equipped with a heavy-duty electric plunger type switch connected to a warning buzzer located in the driver's compartment. The switch shall be enclosed in an adequately protected case, and wires leading from switch shall be concealed in the walls. The switch shall be installed so that the buzzer will sound before the door handle is turned far enough to permit the door to open. The switch shall be Cole-Hersee's No. 9118 having an upset end (knob) on the plunger head.
- 2.8.2.5. Attachment - The emergency door may be hinged on the right or left side of the body, shall open outward, and shall be designed to permit opening from both inside and outside of the bus. It shall be properly sealed against moisture and dust.
- 2.8.3. Header Board - The head impact area on the inside at the top of the emergency door shall be protected by an energy-absorbing, padded header board of sufficient size (width, depth, and length) to prevent injury when accidentally impacted.
- 2.9. SIDE DOORS OF CONVERTED VANS - The side doors of converted van shall be made inoperable by one of the following:
- 2.9.1. Removal - The cargo doors on the side of converted vans shall be removed and the area reinforced and covered with riveted-on exterior and interior paneling.
- 2.9.2. Other Means - The doors may be left in place but shall be reinforced and made permanently inoperable by means other than the use of rub rails on the outside of the body.
- 2.10. WINDSHIELD AND WINDOWS -
- 2.10.1. General Design -
- 2.10.1.1. Windshield - The maximum width of the windshield center post shall not exceed 2.5 inches.
- 2.10.1.2. Passenger Side Windows - There shall be one vertical opening side window for each passenger seat. These windows shall open from the top only and shall operate freely. All side windows except the driver's and the service door window, shall be the split sash type with positive latch. Side windows that can be latched in an uneven position are not acceptable. They shall be furnished with a latching mechanism which will allow each window to be latched in a position not more than six inches from the top. The passenger side windows shall provide an unobstructed opening 22 inches wide and between 9 and 10 inches high.
- 2.10.1.3. Service Door and Emergency Door Windows - The windows of either style emergency door (see Par. C.2.8.) and Style 2 service doors (see Par. C.2.6.2.) shall be furnished with upper glass panels permanently closed and set in rubber or sealed in rubber.
- 2.10.2. Glazing - Glass shall be installed in rubber channel gasket material or approved equivalent material. The glass shall be mounted so that the permanent identification mark is visible from either inside or outside of the bus. All safety glazing materials shall be approved by the Department of Public Safety. All exposed edges of glass shall be banded. The glass shall be as follows:
- 2.10.2.1. Windshield - The windshield shall be minimum 0.21875-inch thick safety plate glass and shall be heat-absorbent, laminated AS-1 safety glass meeting ANSI Standard Z26.1, as amended.
- 2.10.2.2. Passenger Side Windows - The glass in all passenger side windows shall be a minimum of 0.125-inch safety plate glass and shall be AS-2 grade or better, as specified in ANSI Safety Code Z26.1.

C. 15- THROUGH 20-PASSENGER BODY SPECIFICATION

- 2.10.2.3. Other Windows - The glass in all other window including the driver's side windows, emergency door windows, and rear (side) windows shall be a minimum of 0.125-inch safety plate glass and shall be AS-2 grade or better as specified in ANSI Safety Code Z26.1.
- 2.10.2.4. When so specified in the Invitations for Bids (see Option 26), all windows shall be AS-2 grade or better laminated safety plate glass.

2.10.3. Tinting -

- 2.10.3.1. Windshield - The windshield shall have a horizontal gradient band (tinted) starting slightly above the driver's line of vision with approximately 90% light transmittance and gradually decreasing to a minimum of 70% light transmittance at the top of the windshield, or the entire windshield shall be tinted to meet the requirements of FMVSS No. 205.
- 2.10.3.2. Passenger Side Windows - When so specified in the Invitation for Bids (see Option 10), passenger side windows only shall be tinted to minimum 30%, maximum 40% light transmittance using AS-3 grade glass or better. This is defined as "dark tinting" and is not permitted on the windshield or any window used for driving purposes.

**Note:** All safety glazing materials must be approved by the Department of Public Safety.

- 2.11. INTERIOR PANELS - All interior wall and ceiling panels shall be steel and of the body manufacturer's standard design except the panels beneath the windows shall be clear-coated galvanized embossed steel meeting ASTM A446. Also the stepwell and riser panels in the service door entryway shall be clear-coated galvanized steel (embossing not required). Galvalume, aluminized steel, and aluminum over steel panels are acceptable for use beneath the windows and in the entryway. Interior panels made of 0.032-inch, 3105-H14 aluminum may be used in 15-passenger buses only.

- 2.11.1. Design - Front and rear panels shall be formed to present a smooth, pleasing appearance. Roof panels shall be continuous from header to header. If the ceiling is constructed so as to contain lapped joints, the forward panel shall be lapped by the rear panel and all exposed edges shall be beaded, hemmed, flanged, or otherwise treated to minimize sharp edges.
- 2.11.2. Attachment - All interior panels shall be attached to the frame structure by bolts, rivets, or by any well-designed method utilizing self-locking panels, locking panel strips, or clips. Regardless of the method used, the panels shall be attached so that vibration, rumbling, and popping shall be at a minimum.

- 2.12. FLOOR - The standard floor construction of the bus body manufacturer shall be used if a steel floor is not furnished with the bus chassis. If the floor is furnished with the chassis, then the floor shall be covered with material as described below:

- 2.12.1. Material - The floor shall be covered with plywood securely attached to the existing steel floor. The plywood shall be 5/8-inch nominal thickness, A-C or B-B Exterior grade manufactured in conformance with U.S. Product Standard PS 1-83. CDX interior grade plywood with exterior glue is acceptable when all surfaces including the edges of the wood are covered or sealed against the exterior environment.
- 2.12.2. Installation - Plywood shall be installed in the areas under all seats including the driver's seat. It may be cut to fit around any permanently-attached driver's seat provided by the chassis manufacturer.

2.13. FLOOR COVERING -

- 2.13.1. Aisle Material - Floor covering in the aisle shall be the aisle-type, fire-resistant rubber or equivalent, and shall be nonskid, wear-resistant, and ribbed. Minimum overall thickness shall be 0.1875 inch measured from tops of ribs. Rubber aisle floor covering shall meet Federal Specification ZZ-M-71D.
- 2.13.2. Underseat Material - The floor in the underseat area (including wheelwells, and the areas under the driver's seat and wheelchairs) shall be covered with fire-resistant, rubber floor covering or equivalent having minimum overall thickness of 0.125 inch.
- 2.13.3. Installation - Floor covering (except that on the toe board) shall be permanently bonded to the floor with waterproof adhesive material and shall not crack when subjected to sudden temperature changes. All seams shall be sealed with waterproof sealer.
- 2.13.4. Trim - Seams shall be covered with the bus body manufacturer's standard aluminum trim using countersunk flat or oval screws.

2.14. PASSENGER SEATING REQUIREMENTS - The bus passenger seats shall meet or exceed the knee spacing and crash protection requirements of FMVSS No. 222 and shall conform to the following:

2.14.1. Seat Frames -

2.14.1.1. Design and Material - The seat frames shall be constructed of steel of the type, size, and gauge necessary to meet the seat load deflection requirements of FMVSS No. 222. Seat frames legs shall be two, four, or six pedestal type. The seat backs shall slope backward to provide a comfortable seating angle. Seat backs that are set in a vertical plane or tilt forward are not acceptable.

2.14.1.2. Painting Requirements - The entire seat frame, except that section of the back frame which is padded and upholstered, shall be thoroughly cleaned, primed, and painted. The paint shall have adhesive qualities which will not permit the removal of the paint by means of the thumbnail-scratch method without first chipping a starting place.

2.14.2. Seat Installation -

2.14.2.1. Aisle Width - The minimum aisle width between rows of seats shall be 12 inches. (See Par. G.2.1.1.3 for aisle width requirements on wheelchair lift-equipped buses.)

2.14.2.2. Attachment - Each leg shall be attached to the floor with at least 2 bolts, flat washers, lock washers, and nuts, or approved equal. Where it is impossible to use bolts and nuts at certain floor points due to main cross members or floor sill interference, thread-forming or cutting bolts and lock washers may be used.

2.14.2.3. Knee Spacing - The seats shall provide knee spacing as normally furnished by the manufacturer for this seating capacity but not less than 24 inches for the 15-passenger bus. (See Par. A.2.13. for the definition of knee space.) Knee spacing for the 16- through 20-passenger bus shall be not less than 25 inches (see Table No. 1 and Option 16).

2.14.3. Seat Cushions - All seat cushion units 30 inches wide or less shall be designed to adequately support two passengers of 125 pounds each. All seat cushions over 30 inches wide shall be designed to adequately support three passengers of 125 pounds each. The seat cushion shall consist of a base, foam cushion, and upholstery meeting the following requirements:

2.14.3.1. Base - The base shall be nominal 1/2-inch thick, interior grade, C-D plywood with exterior grade glue, identification index 32/16, manufactured in conformance with U.S. Product Standard PS 1-83 and identified as to veneer grade and glue bond type by the trademarks of an approved testing agency. Plywood with blue stain in sapwood is not acceptable.

Alternatively, the base may be made of "Donnite" material, manufactured by the Donnite Corporation, Flora & Harrison, Plymouth, Indiana 45563, of equal or better strength and thickness.

2.14.3.2. Foam Cushion - The bus body manufacturer's standard full dimension urethane foam material shall be used for the seat cushion material.

2.14.3.3. Upholstery - The seat cushion unit shall be covered on top and four sides with a vinyl resin-coated upholstering material as follows:

(i) Material - These materials shall have a regular fire-resistant treatment and shall be artificial leather equal to the coated fabrics listed in Table No. 2.

(ii) Welting - There shall be welting on exposed seams of the seat back and cushion.

(iii) Thread - The upholstery material shall be securely sewn with a thread meeting the requirements of Federal Specification V-T-295d. The thread in the needle and the thread in the looper (bobbin) of double-thread machines shall be size F, Type II (Twisted Bonded Multiple Cord), and size E, Type I (Twisted Soft Multiple Cord), respectively. The thread used in the needle and through the looper shall be Size F (Monofilament), Type III, for single thread machines.



TABLE NO. 2  
UPHOLSTERY

MANUFACTURER	FABRIC	WEIGHT		BACKING
		OZ/YD <sup>2</sup>	OZ/LIN YD	
Naugahyde	1037R	28.0	42.0	1.06 broken twill
Athol	1042FR	28.0	42.0	polyester cotton knit
Masland-Dura	6042 MXP-076	25.5	38.0	polyester cotton twill
General Tire*	2.73	24.0	38.0	polyester drill
Uniroyal*	E 7097-1	25.5	38.0	polyester knit
Athol*	536FR	25.5	38.0	polyester twill

\*Approved equal

2.14.4. Seat Belts, Passenger - Seat belts conforming to FMVSS Nos. 209 and 210 shall be provided for each passenger position on 15- through 20-passenger school buses, including those with GVWR of more than 10,000 lbs. The seat belts shall meet the following requirements:

2.14.4.1. Design - Seat belts shall have a buckle end and an attaching end which are adjustable to fit passenger sizes as required by FMVSS 208 and 209. Buckles shall be of the plastic-covered push button design. Long and short ends shall be mounted alternately with the short end on the aisle. If possible, the design shall prevent fastening the belts across the aisle.

2.14.4.2. Colors - The belt assemblies shall be alternately color coded with contrasting colors. All aisle seats on the same side of the bus shall have belts with the same color. Two-position seats shall use two colors; three-position seats may use two or three colors.

#### 2.15. SEATING REQUIREMENTS, DRIVER -

2.15.1. Seat Design - The base of the driver's seat shall be of the adjustable pedestal type or the platform type having an adjustment range of approximately 4 inches "Fore and Aft". The back of the driver's seat shall be heavily padded and formfitted.

2.15.2. Installation - The driver's seat, when installed by the body manufacturer, shall be mounted with bolts, flat washers, lock washers, and nuts except where it is impossible to use bolts and nuts at certain floor points due to main cross members or floor sill interference. Thread-forming or cutting bolts and lock washers may be used at these points.

2.15.3. Seat Belts and Seat Belt Assembly - A seat belt assembly conforming with FMVSS No. 209 shall be provided for the driver. The belt assembly shall be equipped with a reel-type locking retractor incorporated into the assembly. The location of the seat belt anchorage shall conform to SAE Standard J383 with the driver's seat adjusted to its rearmost position. A Type 2 seat belt with a standard shoulder harness, when provided, does not require a retractor at the stationary fastening bracket; however, this mounting bracket must be within easy reach of the seated driver. The seat belt assembly shall be anchored in such a manner or guided at the seat frame so as to prevent the driver from sliding sideways from under the belt.

2.16. SEAT BARRIERS AND PANELS - Barriers, or a system of padded guard rails, stanchions, and modesty panels, or a combination padded stanchion-guard rail with padded modesty panel, shall be installed in front of each front passenger seat or in front of any wheelchair position. The requirements for these barriers and modesty panels are as follows:

2.16.1. Buses (with GVWR Greater than 10,000 lbs) - Buses with GVWR of more than 10,000 pounds shall have restraining barriers installed in front of each front passenger seat in accordance with the requirements of FMVSS No. 222.

2.16.2. Other Buses - Buses with GVWR of 10,000 pounds or less shall have one of the following: (a) a restraining barrier similar to that required by FMVSS No. 222, (2) a padded stanchion, a padded guard rail, and a padded modesty panel, or (3) a combination padded stanchion-guard rail with padded modesty panel as follows:

2.16.2.1. Material - All stanchions and guard rails or combination stanchions and guard rails shall be of steel or equivalent strength tubing having a minimum outside diameter of 1 inch. These stanchions and guard rails shall be padded.

2.16.2.2. Stanchions or Stanchion/Guard Rails - Stanchion(s) or combination stanchions and guard rails shall be installed at the rear of the entrance stepwell and at the rear of the driver's seat. The placement of stanchions shall neither restrict the entrance passageway at any level to less than 24 inches nor aisle width to less than 12 inches.

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2.16.2.3. Guard Rail or Guard Rail/Stanchion - One guard rail or combination guard rail-stanchion shall be installed from the stepwell stanchion to the right-hand wall and a similar guard rail or combination guard rail stanchion shall be installed from the driver's side stanchion to the left-hand wall. These guard rails shall be positioned approximately 28 inches above the floor. The right-hand guard rail shall not restrict the entrance passageway to less than 24 inches at any level. The left-hand guard rail (behind the driver's seat) shall not restrict rearward travel of the driver's seat.

2.16.2.4. Padded Modesty Panel -

- (i) General - A padded modesty panel shall be installed beneath each of the two guard rails and shall extend down from each guard rail to within one inch or less of the bus floor and from approximately one inch from the outside wall to within approximately one inch of the stanchion or vertical portion of the guard rail-stanchion. These modesty panels shall be securely attached to the guard rails and other supports in a manner so that rattles and loosening will not occur. The modesty panels shall be padded on both sides.
- (ii) Right-Hand Modesty Panel - If the right-hand modesty panel extends over or into the entrance stepwell opening, it must be flanged at the floor line so as to close any opening between this panel and the floor. The right-hand modesty panel shall not restrict the entrance passageway to less than 24 inches.
- (iii) Left-Hand Modesty Panel - The left-hand modesty panel shall neither interfere with the rearward travel of the driver's seat nor with the placement of required safety and operating equipment.

2.16.3. Handrail - A grab handle or handrail of sufficient length to assist entering and exiting passengers shall be installed on the forward side of the right barrier or modesty panel. The outside surface of this handle shall be stainless steel, polished aluminum, or chrome-plated steel.

2.16.4. Knee Space - Knee space between these modesty panels and the front of each front passenger seat shall be at least 24 inches for 15-passenger and 25 inches for 16- through 20-passenger buses when measured from the modesty panel to the front of the seat back at the center of the seat approximately 4 inches above the seat cushion.

2.17. WHEELHOUSING - The wheelhousing shall be the manufacturer's standard design. (See Par. C.1.9. for undercoating requirements.)

2.18. VENTILATION - The bus body shall be equipped with a suitable, controlled ventilation system of sufficient capacity to maintain a satisfactory ratio of outside to inside air under normal operating conditions without opening windows except in warm weather.

2.19. ACCESS PANELS - Any panel used for access to the engine radiator or radiator overflow container and installed in the passenger compartment shall have a keyed lock. (This does not include the engine cover.)

C.3. ACCESSORIES, REQUIRED AND OPTIONAL -

3.1. BACKUP ALARM - An automatic, audible backup warning alarm meeting the requirements of type C, 97 dB(A), SAE J994b (except for 12-volt system) shall be installed behind the rear axle.

3.2. DEFROSTERS - Defrosting equipment shall keep the windshield, the window to the left of the driver, and the glass in the service door clear of fog, frost, and snow, using heat from the heater and circulation from fans. All defrosting equipment shall meet the requirements of FMVSS No. 103. Any circulating fan used in defogging and installed on the curb side of the bus front shall be mounted on the windshield header so as to protect the fingers, hair, and clothing of entering and departing passengers.

3.3. FIRE EXTINGUISHERS - School buses shall be equipped with one of the fire extinguishers listed below:

3.3.1. Standard Fire Extinguisher - Each bus shall be equipped with at least one refillable stored pressure Multi-purpose Dry Chemical type (or approved equal) fire extinguisher of minimum 5-pounds capacity, mounted in extinguisher manufacturer's automotive type bracket, and located in driver's compartment in full view of and readily accessible to driver. The fire extinguisher shall bear the Underwriters Laboratory Listing Mark of no less than 2A 10-B:C rating. Extinguishers shall be furnished with a hose, pressure gauge, and metal head.

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- 3.3.2. Halon Type Fire Extinguisher - An approved equal fire extinguisher is the American Safety Products (ASP) Model 13000, 2A 40-B:C Rating. (For those who prefer this type, this fire extinguisher is available with a 13-pound charge of combined halon gas. It is not permissible to transport these units after refilling, therefore the manufacturer offers a five-year warranty and replacement of discharged units with a new unit at half price.)
- 3.4. **FIRST AID KIT** - Buses shall have a removable metal first aid kit container mounted in an accessible place within the driver's compartment. The compartment shall be marked to indicate the location of the kit. Number of units and contents for each kit shall be as follows:
- 2 - 1 in. x 2 1/2 yds. adhesive tape rolls
  - 24 - sterile gauze pads 3 in. x 3 in.
  - 100 - 3/4 in. x 3 in. adhesive bandages
  - 12 - 2 in. bandage compress
  - 12 - 3 in. bandage compress
  - 2 - 2 in. x 6 yds. sterile gauze roller bandages
  - 2 - nonsterile triangular bandage approx. 40 in. x 54 in., 2 safety pins
  - 3 - sterile gauze pads 36 in. x 36 in.
  - 3 - sterile eye pads
  - 1 - rounded end scissors
- 3.5. **HEATERS AND ASSOCIATED COMPONENTS** -
- 3.5.1. Standard Heater - Each bus shall be equipped with a factory-installed fresh air type heater regularly offered as standard vehicle manufacturer's accessory for this type of vehicle. Controls shall be mounted on the dash.
- 3.5.2. Auxiliary Heater - When so specified in the Invitation for Bids (see Option 11), an auxiliary hot water type heater shall be furnished and installed in the passenger compartment of the bus. Heated conduits inside the bus shall be insulated or shielded to prevent injury to the driver or passengers.
- 3.5.3. Bleeder Valves - Any heater(s) installed by the body manufacturer shall have accessible air bleeder valves installed in the return lines.
- 3.5.4. Service Accessibility - Heater motors, cores, and fans shall be readily accessible for service. Access panels (removable without removing driver's seat) shall be provided as required for maintenance.
- 3.6. **EXTERIOR MIRRORS** - Exterior mirrors shall conform to the requirements of FMVSS No. 111. Each 15-through 20-passenger school bus shall be provided with exterior mirrors and brackets as described below:
- 3.6.1. Crossover Mirrors - An exterior wide angle (crossview) mirror (minimum 40 square inches of surface area) shall be installed on the left front of the bus and shall comply with the requirements of Section IV B.1.e of Federal Safety Standard No. 17, or as amended. This mirror shall have a tripod bracket assembly. Mirror mounting and backing shall be of steel or a high-impact plastic such as a polycarbonate/polyethylene terephthalate blend, or approved equal.
- Example of an approved equal:** Mirror Lite Bus Boy with single bracket and six mounting fasteners.
- 3.6.2. Localized Viewing Mirror - A minimum 40 square inch convex mirror shall be installed on the right front of each bus to provide localized viewing.
- 3.6.3. Rearview Mirrors - Exterior rearview mirrors shall be adjustable to allow any driver to have visibility beyond the rear wheels at ground level. Mirrors and brackets shall be provided for the various size buses as follows:
- 3.6.3.1. 15-passenger Buses (Below Eye-level Mirrors) - 15-passenger buses shall have the following mirrors and brackets furnished:
- 3.6.3.1.1. Mirrors - Two metal-backed (or high impact plastic backing such as polycarbonate/polyethylene terephthalate blend), exterior clear-vision below eye-level rear-view mirrors with unit magnification and not less than fifty square inches of reflective surface shall be mounted outside, one to the left and one to the right of the driver. The right-side rearview mirror shall be the split view (dual view) type made up of a minimum 50 square inches flat mirror and a convex mirror. The convex mirror shall have approximate minimum of 19 square inches reflective surface.

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- 3.6.3.1.2. Bracket - Each mirror shall be mounted on tripod type mounting brackets, such as K-D Lamp Company, Model 112-7308, or approved equal. General Motors bracket number D-44 is approved as an equal.
- 3.6.3.2. 16- through 20-passenger Buses (with Bodies Extending Laterally Beyond the Bus Cab) - These buses shall have mirrors and brackets meeting Par. C.3.6.3.1. above in the dual view configuration, e.g., mirrors on each side made up of a minimum 50 square inch flat mirror and one minimum 19 square inch convex mirror in the dual view configuration.
- 3.6.3.3. 16- through 20-passenger Buses (with Bodies Not Extended Laterally Beyond the Bus Cab) - These buses shall have mirrors and brackets meeting either Par. C.3.6.3.2. above or the following:
- 3.6.3.3.1. Mirrors - Two metal-backed (or high impact plastic backing such as polycarbonate/polyethylene terephthalate blend), exterior, clear-vision rearview mirrors not less than 6 inches wide by 16 inches long shall be mounted outside, one to the left and one to the right of the driver. The right-side rearview mirror shall be the split view (dual view) type, such as the Grote Model 16041, or the Duplex "T" No. T-616 as manufactured by Elmsford Diecasting Company, 4 Vernon Lane, Elmsford, New York 10523; or a split view mirror with a prefocused convex (blind spot) mirror such as Sure-View Model 7002, manufactured by Sure-View, Inc., 1337 North Meridian Street, Wichita, Kansas 67203, or approved equal.
- 3.6.3.3.2. Bracket - Each exterior mirror shall be mounted in the brackets and assemblies shown on Texas State Purchasing and General Services Commission Drawings Numbered 040-35(a), 040-35(3), 040-35(4), 040-35(5), 040-35(6) and 040-35(7), dated November 15, 1968. The brackets shall be mounted on the left front and right front of the bus body and cowl. The parts, as shown on Drawings Numbered 040-35(2) and 040-35(3), must be formed to fit the individual configuration of each manufacturer's body and cowl design. Long dimensions of Texas mirror brackets may be adjusted as required to fit the configurations of buses. General Motors bracket number D-44 is an approved equal.
- 3.6.3.4. Mounting - Mounting of exterior mirrors to the bus body shall be by means of bolts, nuts, and lock washers, where possible; otherwise No. 10 hexagon head sheet metal bolts with star lock washers or No. 10 hexagon head sheet metal screws with serrated surface shall be used.
- 3.6.3.5. Painting Requirements - Brackets and assemblies of all exterior rearview and crossover mirrors shall be cleaned and prepared for painting in accordance with Federal Specification TT-C-490B, Type I or II. The metal backs of stainless steel, aluminum, and chrome-plated exterior and crossover mirrors, if painted, and the backs of all other metal-backed exterior and crossover mirrors shall be finished in black (Color No. 37038 of Federal Standard No. 595a).

**NOTE:** Care must be exercised to guard against reducing exterior mirror sizes below minimums. The required field of view shall not be impaired.

- 3.7. Interior Mirror - A clear-vision interior rearview mirror conforming to FMVSS No. 111, with at least 6" x 16" size vision area, affording a good view of the road to the rear as well as of the passengers, shall be furnished and installed. The mirror shall be made of safety glass and have rounded corners and protected edges.
- 3.8. REVOLVING STROBE LIGHT - When so specified on Invitation for Bids (see Option 22), an optional white flashing strobe light meeting the following requirements shall be provided:
- 3.8.1. Design - The lamp shall have a single clear lens emitting light revolving 360 degrees around a vertical axis. The light source shall be minimum of 50 candlepower and flash 60-120 times per minute. The base of the lamp shall be metal or approved equal and installed by a method which seals out dust and moisture. A manual switch is required for operation and a pilot light to indicate when the light is in operation shall be included. Wiring shall be installed inside the bus walls.
- 3.8.2. Mounting - The strobe light shall be permanently installed near the centerline on the school bus roof and not more than one-third of the body length forward of the rear edge of the bus roof. It shall not extend above the roof more than approximately 6.5 inches.

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**3.9. STOP ARM** - When so specified on Invitation for Bids (see Option 21), a school bus stop arm meeting SAE J1133 and the following requirements shall be provided:

3.9.1. Design - The sign shall be octagon-shaped, constructed of zinc-coated steel or aluminum and painted with a polyurethane finish. It shall have a minimum 1/2-inch wide white border and the word "STOP" in white letters at least 6 inches high against a red background on both sides. Double-faced red, alternately flashing lamps, one each at the top and bottom (visible from each side of the structure) shall be connected to, and flash with the required school bus red flashing signal lamp circuit when the arm is extended. The arm mechanism may be activated by air pressure, electricity, or by vacuum. The school may specify a reflectorized surface if desired.

3.9.2. Mounting - The stop arm shall be installed on the left side of the school bus near the front cowl section.

**3.10 SUN VISOR** - An adjustable sun visor with a minimum size of 5 inches by 16 inches shall be installed above the interior windshield on the driver's side. The sun visor shall not interfere with the driver's full view of the rearview mirrors. A right sun visor is manufacturer's option.

**3.11. TOOL COMPARTMENT** - When so specified in the Invitation for Bids (see Option 31), a metal container of adequate strength and capacity shall be provided for storage of tire chains, tow chains, and such tools as may be necessary for minor emergency repairs. This storage container shall be located either inside or outside the passenger compartment. However, if it is located inside the passenger compartment, it shall be provided with a separate cover; a seat cushion shall not be used as this cover. This tool compartment shall be capable of being securely latched and shall be fastened to the floor in the right front or the right rear of the bus.

**3.12 WINDSHIELD WIPERS AND WASHERS** -

3.12.1. Wipers - Each bus shall be equipped with two, 2-speed or variable speed, electric motor-driven windshield wipers.

3.12.2. Washers - A vacuum- or electrical-operated windshield washer shall be furnished and installed. The washer shall have a minimum reservoir capacity of one quart of fluid and shall direct a stream of water into the path of travel of each windshield wiper blade each time the actuating button is operated.

**C.4. APPROVAL OF NEW BUS BODIES** - Procedures for approving a new bus body for 15- through 20-passenger school buses shall be as follows:

**4.1. SUBMISSION OF REQUEST** - Submit a written request that the body be approved along with the following:

4.1.1. Letter - Letter stating that the body meets or exceeds each and every applicable requirement in Texas specification No. 070-SB-90.

4.1.2. Literature and drawings - See Par. A.5.6.

**4.2. REVIEW OF REQUEST** - The Specification Section will review the literature and drawings and advise the vendor or manufacturer by letter of the results of this review. A copy of this letter will be furnished to the School Bus Committee. If this review verifies the bus body meets or exceeds the requirements of this specification, the vendor or manufacturer shall contact the SPGSC Purchaser to arrange for the testing of the bus body. The Purchaser will consult with the TEA Representative and inform the vendor or manufacturer of the name(s) of the school district(s) willing to test a bus body.

**4.3. SCHOOL DISTRICT COOPERATION** - The vendor or manufacturer must obtain the cooperation of one of the named school districts in agreeing to test the bus according to the paragraph below on test procedures and to provide a report to the SPGSC Specification Section on the form provided (see copy of the Form entitled, "Three-Month Test of New School Bus Bodies" on page 95).

**4.4 ORDERING** - The vendor or manufacturer shall then contact the SPGSC Purchaser and TEA Representative about ordering the school bus with the subject body.

**4.5. TEST PROCEDURES** - The bus shall be tested for a period of not less than three months during the regular nine-month school term, preferably on a variety of routes and on activity trips. The vendor or manufacturer shall request the school district to complete the report (see Par. 4.3. above) and mail to the SPGSC.

4.5.1. The vendor or manufacturer shall arrange for the school bus to be brought to Austin, Texas before, during, or after the three-month test for inspection by the members of the School Bus Committee.

4.5.2. The bus body shall be inspected by the Specification Section using the current School Bus Inspection Check List.

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- 4.6. **INSPECTION** - The State Inspector shall visit the manufacturer's plant and observe manufacturing components and fabrication of a typical bus body, preferably built to Texas specifications. A report of this inspection will be made available to the School Bus Committee.
- 4.7. **REVIEW OF SCHOOL DISTRICT'S REPORT** - Upon receipt of the school district's report and after inspection by the School Bus Committee and the State Inspector, the Specification Section will review the reports and make a recommendation at the next meeting of the School Bus Committee that the new body model be either approved or disapproved.
- 4.8. **SCHOOL BUS COMMITTEE ACTION** - The School Bus Committee will act on this recommendation and, if approved, the bus body will be added to the Class 070-APL.

**NOTE:** Once a bus body is approved for one passenger capacity, other capacities of this same body differing only in length and capacity need not be tested prior to approval. The vendor or manufacturer shall request by letter that these other body models be added to the Approved Products List.

- C.5 **COMPARISON OF SMALL BUS BODIES** - Table 3 lists the features of the various body configurations for 15-through 24-passenger school buses. (See Figure 1 for the various chassis types available for these school bus bodies.)

**TABLE 3**  
**COMPARISON OF SMALL SCHOOL BUS BODIES**

Passenger Capacity	Service Door	Emergency Door	Rear Wheels	Min. Body Width	Body Sides	Min. Interior Height	Chassis Type	Body Mfg. & Model/Name/No.
15	Sedan	Dual	Single	70"	Sloping	62"	Van	Econo, Bantam, Super Bantam, Reddi-Bus, Van
15	Tall	Dual	Dual	70"	Sloping	72"	Cutaway	Micro-Bird, Minatour,
15	Tall	Single	Dual	87"	Straight	62"	Cutaway	Busette
16	Tall	Single	Dual	90"	Straight	72"	Cutaway	Chaperone, Clipper, Micro-Bird, VSS
18	Tall	Dual	Single	75"	Sloping	64"	Van	Bantam, Super Bantam, Lewis (Diesel only)
18 (with Op. 15)	Sedan	Dual	Single	75"	Sloping	64"	Van	Bantam, Super Bantam, Lewis (Diesel only)
19	Tall	Single	Dual	87"	Straight	72"	Cutaway	Chaperone, Clipper, Micro-bird, Minatour, V
19 (with Op. 15)	Sedan	Single	Dual	87"	Straight	62"	Cutaway	Bussette, Vanguard
20	Tall	Single	Dual	78"	Straight	72"	Stripped	Cadet, Mighty-Mite, Mini-Bird
24	Tall	Single	Dual	90"	Straight	72"	Stripped	Cadet, Mighty-Mite, Mini-Bird

Note: Bantam = Collins      Econo = Collins      Reddi-Bus = Lewis  
 Bussette = Wayne      Micro-Bird = Blue Bird      Super Bantam = Collins  
 Cadet = Thomas      Mighty-Mite = Thomas      VSS = Ward  
 Chaperone = Wayne      Mini-Bird = Blue Bird      Van Con = Van Con  
 Clipper = Carpenter      Minatour = Thomas

## D. CHASSIS SPECIFICATIONS

### D.1. GENERAL REQUIREMENTS -

- 1.1. **GENERAL SPECIFICATIONS** - The requirements for gross vehicle weight ratings, gross axle weight ratings (front and rear) and tire sizes and load ranges, as specified in Table Nos. 4 through 8 for each size chassis are minimum requirements (see Par. A.4.4.). The requirements are for school buses with standard equipment. The added weights of optional equipment, such as air conditioning, luggage racks, lifts for the physically impaired, or other heavy accessories were not considered in establishing the capacity ratings to be certified for the chassis. If additional optional equipment is ordered which necessitates increased capacity ratings of either axles, springs or tires, it is the responsibility of the vendor to furnish them so that proper certification can be made on the vehicle.
- 1.2. **COLOR** - The chassis, including bumpers and wheels, shall be painted black (Color 17038); cowl, fenders, and hood shall be painted school bus yellow (Color 13432).

### D.2. CHASSIS FRAME AND RELATED COMPONENTS -

- 2.1. **CHASSIS FRAME SIDE MEMBERS** - Each frame side member shall be of one-piece construction. If the frame side members are extended, such extension shall be designed, furnished, and guaranteed by the installing manufacturer. The installation shall be made by either the chassis or body manufacturer. Extensions of frame lengths are permissible only when such alterations are welded on behind the hanger of the rear spring. This specification does not permit wheelbase extensions. Any welding, heating (for frame straightening or repairs), or the drilling of holes in chassis frame members shall be in accordance with chassis manufacturer's recommendations.
- 2.2. **BUMPERS, FRONT AND REAR** - Front and rear bumpers shall be chassis manufacturer's standard except the rear bumper furnished by body manufacturer shall be of the size and type and attached to frame as described in Paragraph C.1.2. The bumpers shall be painted black (Color No. 17038).
- 2.3. **FUEL TANKS** - Standard and auxiliary fuel tanks shall meet FMVSS No. 301-75 as applicable to school buses and shall meet the current design objectives of the SBMI:
  - 2.3.1. **Standard Fuel Tanks** - The standard fuel tank shall have a minimum capacity of 21 gallons. The tank shall be mounted, filled, and vented entirely outside the body (see Section D.4.4.2.)
  - 2.3.2. **Auxiliary Fuel Tank(s)** - When so specified in the Invitation for Bids, (see Option 9), the bus shall be furnished with a minimum capacity 30-gallon fuel tank or tanks furnished and installed by the chassis manufacturer.
- 2.4. **STEERING, POWER** - The bus shall be furnished with the chassis manufacturer's standard power steering which will provide safe and accurate performance at maximum load and speed.

### D.3. AXLES, SUSPENSION, AND RELATED COMPONENTS -

- 3.1. **AXLES** - Axle capacities and gross axle weight ratings (GAWR's) shall be as specified in Table Nos. 4 through 8 for each make of vehicle. Increased axle capacities shall be furnished to accommodate optional equipment such as diesel engines or other heavy accessories as required (see paragraphs A.4.4., D.1.1., and G.1.7.2.)
- 3.2. **BRAKES AND RELATED COMPONENTS** -
  - 3.2.1. **Service Brakes** - Service brakes shall be manufacturer's standard front power disc brakes and rear disc or drum brakes meeting FMVSS No. 105-83 as applicable to school buses.
  - 3.2.2. **Low Fluid Warning** - Hydraulic assist-boosters shall audibly and visually warn of fluid or power loss.
- 3.3. **SHOCK ABSORBERS** - Two front and two rear heavy-duty, double-acting shock absorbers shall be installed.
- 3.4. **SPRINGS** - The ground ratings for the front and rear springs shall be as specified in Table Nos. 4 through 8 for each make of vehicle (see paragraphs A.4.4., D.1.1., and G.1.8.2.).
- 3.5. **TIRES AND WHEELS** -
  - 3.5.1. **Tires** - All standard tires shall be the steel belted radial tubeless type. All tires shall be new and the tread style furnished shall be the tire manufacturer's standard design and the brand normally furnished on regular production orders unless otherwise specified in the Invitation for Bids. All tires shall be "Original Equipment Line Quality." For tire size and load range for each size chassis, see Table Nos. 4 through 8 and the major components chart.

#### D. 15- THROUGH 20-PASSENGER CHASSIS SPECIFICATIONS

3.5.2. Spare Wheel - When so specified in the Invitation for Bids (see Option 32), the bus shall have a spare wheel; however carrier for spare wheel will not be provided under this option.

3.6. HUBODOMETERS - Each chassis shall be equipped with one hubodometer with standard mounting bracket which shall be calibrated in miles and installed by the manufacturer. The preferred mounting location is on the right rear axle drive wheel. The hubodometer shall be one of the following:

3.6.1. Accu-Trak, Standard Car Truck, Park Ridge, IL 60068.

3.6.2. Engler Instruments, 250 Culver Ave., Jersey City, NJ 07305.

3.6.3. Veeder-Root, Hartford, CT 06102.

#### D.4. ENGINE AND RELATED COMPONENTS -

4.1. ENGINES - Approved engines listed in each table for the various size buses are the engines for which the vendor has requested approval and are usually the smallest engine in terms of performance that will meet the requirements listed below. Other approved engines which the vendor may provide with a given chassis will be listed also in an Approved Products List (APL). The APL will be updated as new engines or additional versions of current engines are approved. Please note that only those engines approved as specified below and listed either in the Texas School Bus Specification or in the Class 070-SB-APL will be acceptable for school buses.

4.1.1. Gasoline Engines - Engines for the 15- through 20-passenger buses shall be of the gasoline type unless otherwise specified in the Invitation for Bids. Approved engines are listed in Tables Nos. 3 through 7 and in the Class 070-SB-APL.

4.1.2. Diesel Engines - When so specified in the Invitation for Bids, the 15-, 16-, 18-, 19-, or 20-passenger school bus chassis shall be furnished with a 4-cycle diesel engine (see Option 7).

4.1.3. Power Requirements - Each bus shall be furnished with an engine that meets or exceeds the following minimum criteria (see second note at the end of Par. D.4.1.4.8.), when tested at or above the GVWR required for a given bus capacity and with all accessories except air conditioning compressor on and operating:

4.1.3.1. Acceleration from 0 to 50 mph in 60 seconds or less.

4.1.3.2. Gradeability of 1.5% minimum at 50 mph.

4.1.3.3. Gradeability of 5.0% minimum at 25 mph.

4.1.3.4. Startability of 20% minimum.

4.1.3.5. Top speed of 55 mph minimum at the Manufacturer's rated rpm for the governed engine.

4.1.4. Approval of New Engines - Procedures for approving new school bus engines for 15- through 20-passenger school buses shall be as follows:

4.1.4.1. Submit to the Specification Section, a letter certifying that the proposed engine meets or exceeds each requirement of Par. D.4.1.3. when installed in the largest size bus for which approval is requested.

4.1.4.2. The Specification Section will review the request and advise the vendor or manufacturer by letter that their request for engine approval and their statement on engine performance have been received. Copies will be furnished to the School Bus Committee.

4.1.4.3. After receipt of this letter, the vendor or manufacturer shall contact the SPGSC Purchaser to arrange for the testing of the engine in the largest size school bus for which approval is requested. The Purchaser will consult with the TEA Representative and inform the vendor of the name(s) of the school district(s) from which to select a participating school district.

4.1.4.4. The vendor must obtain the cooperation of one of the named school districts in agreeing to test the bus and to provide a report to the SPGSC Specification Section on the form provided. (See copy of the Form entitled, "Three Month Test of New School Bus Engines", on page 96.)

4.1.4.5. The vendor or manufacturer shall then contact the SPGSC Purchaser and TEA School Bus Committee Representative about ordering the school bus with the subject engine.

4.1.4.6. The bus shall be tested for a period of not less than three months during the regular nine-months school term, preferably on a variety of routes and on activity trips.



#### D. 15- THROUGH 20-PASSENGER CHASSIS SPECIFICATIONS

- 4.1.4.7. Upon receipt of the school district's report, the Specification Section will make a recommendation at the next meeting of the School Bus Committee that the engine be accepted or rejected.
- 4.1.4.8. The School Bus Committee will act on this recommendation and, if approved, the engine will be added to the Class 070-SB APL.

**NOTES:** Once an engine is approved in one horsepower and torque version, other power versions of this same engine need not be tested in a school bus prior to approval. For approval, the vendor or manufacturer shall follow Par. D.4.1.4.1., and, in addition, state the rear end ratio recommended for the size bus for which approval is requested. Then the engine will be added to the Class 070-SB-APL which will show the net horsepower and torque as well as the rear end ratio for the particular application.

**THE VALUES OF DISPLACEMENT, HORSEPOWER, AND TORQUE LISTED IN THE FOLLOWING TABLES UNDER EACH MANUFACTURER ARE NOT MINIMUM VALUES AND SHOULD NOT BE CONSTRUED AS SUCH. THE ONLY MINIMUM REQUIREMENTS FOR THE PERFORMANCE OF ENGINES IN 15- THROUGH 20-PASSENGER SCHOOL BUSES IN THE STATE OF TEXAS ARE THE FIVE REQUIREMENTS LISTED IN PAR. D.4.1.3. (There are additional requirements for engines, either implied or specified, separate from the above performance requirements.)**

- 4.2. **AIR CLEANER** - Each chassis shall be equipped with a factory-installed maximum capacity, replaceable dry element type air cleaner.
- 4.3. **COOLING SYSTEM** - The cooling system radiator shall be of sufficient capacity to cool the engine at all speeds in all gears. The cooling system fan shall be the heavy-duty reinforced type.
- 4.4. **EXHAUST SYSTEM** -
  - 4.4.1. **Component Placement** - The exhaust pipe, muffler, and tailpipe shall be mounted under the bus and attached to the chassis frame.
  - 4.4.2. **Tailpipe Exit** - The tailpipe of a gasoline-powered bus shall not exit the side of the bus anywhere within 12 inches of a vertical plane through the center of the fuel filler opening and perpendicular to the side of the bus, unless protected with a metal shield to divert spilled fuel away from tailpipe.
  - 4.4.3. **Noise Level** - The noise level shall neither exceed EPA "Noise Emission Standards" nor 90 dB(A) at the ear of the occupant in the bus nearest the noise source.
- 4.5. **OIL FILTER** - Each chassis shall be equipped with a factory-installed, minimum one-quart capacity oil filter with a replaceable filter element.
- 4.6. **TACHOGRAPH** - When so specified in the Invitation for Bids (see Option 24), a tachograph containing a combination clock/speedometer/recorder shall be installed on the dashboard. The tachograph shall be Argo Model 1310-6, Veeder-Root Model 1407, or approved equal.

#### D.5. TRANSMISSION AND RELATED COMPONENTS -

- 5.1. **AUTOMATIC TRANSMISSION, STANDARD** - The standard automatic transmission shall be the 3- or 4-forward speed automatic type, and shall be one of the following:
  - 5.1.1. - Chrysler Motor Corporation's "A727 LoadFlite",
  - 5.1.2. - Ford Motor Company's "SelectShift" or,
  - 5.1.3. - General Motors Corporation's "Turbo Hydramatic."
- 5.2. **DRIVE SHAFT GUARD** - Each drive shaft section shall be equipped with protective metal guard or guards to prevent the shaft from whipping through the floor or dropping to the ground when broken.

#### D.6. ELECTRICAL SYSTEM AND RELATED COMPONENTS -

- 6.1. **ALTERNATOR** - The electrical output of the alternator in amperes shall be as listed in Table Nos. 4 through 8 and Par H. A minimum 75-ampere alternator is required for gasoline engines; a minimum 60-ampere alternator is required with the optional diesel engine. A minimum 100-ampere alternator is required with either engine on buses with a wheelchair lift, and on buses equipped with an air conditioning unit except those self-contained units having sufficient generating capacity to provide all of the electrical power for air conditioning operation including the blowers.
- 6.2. **BATTERY AND RELATED COMPONENTS** - The storage battery furnished on each chassis shall have sufficient capacity to supply current for adequate operation of the engine starter, lights, signals, heater, and all other electrical equipment. The batteries furnished for 15- through 20-passenger school buses shall have a potential of 12 volts and meet the following:

**D. 15- THROUGH 20-PASSENGER CHASSIS SPECIFICATIONS**

6.2.1. Battery (for Gasoline Engines) - The minimum performance level shall be a BCI cold cranking capacity of no less than 360 amperes @ 0°F with a minimum 100-minute reserve capacity.

6.2.2. Battery (for Diesel Engines) - The batteries furnished with diesel engines shall be as specified by the chassis manufacturer. When two batteries are provided, they shall both be installed under the hood or one shall be installed under the hood and the other shall be installed in a battery box having outside access. Single batteries shall be installed under the hood.

6.3. HORNS - Each bus shall be equipped with horn or horns of standard make. Each horn shall be capable of producing audible sounds in a range between 82 and 102 decibels. The sound level measurements shall be made at a distance of 50 feet directly in front of the vehicle in accordance with SAE J377.

6.4. INSTRUMENTS AND INSTRUMENT PANEL - The bus shall be equipped with the following nonglare illuminated instruments (controlled by an independent rheostat\*), and gauges mounted for easy maintenance and repairs and clearly visible to the seated driver. Indicator warning lights in lieu of gauges are permissible as shown below:

- (1) Speedometer
- (2) Odometer
- (3) Fuel Gauge
- (4) Oil Pressure Gauge and/or Warning Light
- (5) Water Temperature Gauge and/or Warning Light
- (6) Ammeter or Voltmeter with graduated charge and discharge indications
- (7) Vehicle manufacturer's standard Keyed Ignition Switch
- (8) Glow Plug Indicator Light (for diesel buses with glow plugs only).

\*Note: If the intensity of the body-installed panel lamps is controlled, then the intensity control shall not be accomplished by the same rheostat that controls the chassis instrument lamps, unless the body company designs and installs the rheostat to accomplish both.

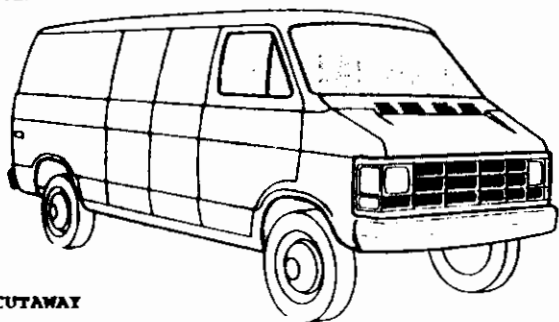
6.5. LAMPS - Each bus shall be equipped with at least two white headlamps meeting the requirements of FMVSS No. 108 and a dimmer switch located at the far left of steering column. Adequate parking lamps operated by a switch in common with the headlamps shall be provided.

6.6. TURN-SIGNAL AND VEHICULAR WARNING SIGNAL OPERATING UNITS AND FLASHERS - The operating units and flashers for turn-signals and vehicular hazard warning signals shall meet the requirements of FMVSS No. 108 (see Paragraphs C.1.4. and C.1.5.).

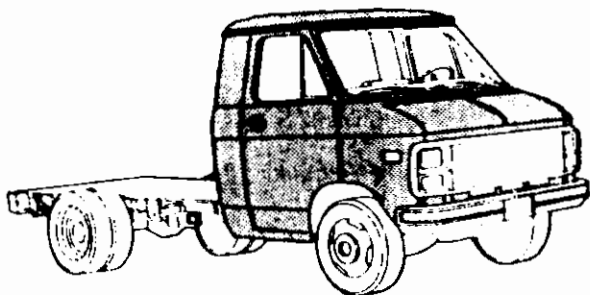
D. CHASSIS TYPES - Figure 1 shows the types of chassis available for small school buses.

**FIGURE 1**

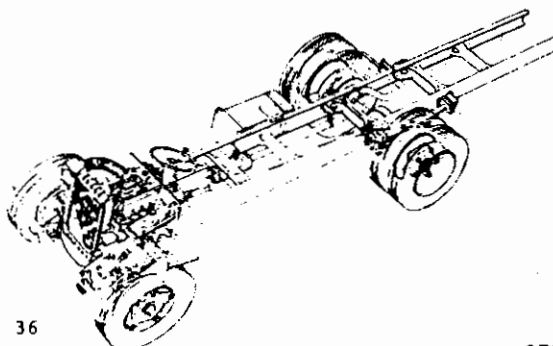
**VAN**



**CUTAWAY**



**STRIPPED CHASSIS**



15-PASSENGER BUS TABLE

TABLE 4  
15-PASSENGER BUS CHASSIS

15-Passenger ITEM	1990 Min. Rqmts.	Refer to General Requirements, Page 3			
		Chevrolet/GMC G31305/G31303	Chevrolet/GMC G31605 (Extended)	Dodge B 350	Ford E 350**
GVWR, lbs	8510	8600/10000	8600	8510	9400
GAWR, lbs, - Front	3170	3900	3900	3170	4200
- Rear	5340	5360/7200	5360	5340	6084
Axle Capacity, lbs - Front	3600	3900	3900	3600	4200
- Rear	5500	5700/7500	5700	5500	6340
Wheelbase, in	125.0	125.0	146.0	127.6	138.0
Chassis Length, in	as required	202.2/197.6	223.1	222.9	226.8
Track, in - Front	67.8	68.6/69.3	68.6	67.8	68.4
- Rear	65.1	67.4/74.0	67.4	65.1	66.0
Gasoline Engine CID	*	350-V8EFI	350-V8EFI	360-V8	**
SAE Gross Horsepower	*	201	201	190	**
SAE Gross Torque, lb-ft	*	318	318	292	**
Transmission	Auto	A3	A3	A3	A3
Truck Steel Belt Radial Tires Size & Load Range	Tubeless as shown	8.75R16.5E/ LT225/75R16D	8.75R16.5E	LT225/ 75R16E	LT235/ 85R16E
Wheels, Rear	as shown	Single/Dual	Single	Single	Single
Alternator, amperes	75	85	85	75	100

\*See minimum power requirements in Par. D.4.1.3.  
\*\*Furnished with diesel engine only (see Option 7).

Diesel Engine (Option 7)

15-passenger ITEM	1990 Min. Rqmts.	Chevrolet/GMC G31605 G31305/G31303	Ford E 350
Engine Displacement, l.	*	6.2N-V8	7.3N-V8
SAE Gross Horsepower	*	164	180
SAE Gross Torque, lb-ft	*	286	345
Alternator, amperes	60	66	100

\*See minimum power requirements in Par. D.4.1.3.

Engines listed on this page are approved to meet or exceed power requirements under normal operating conditions. Other engines must be submitted for approval by the School Bus Committee (see Par. D.4.1.3.).

15-PASSENGER BODIES

15-Passenger ITEM	1990 Min. Rqmts.	Blue Bird Micro-Bird	Collins Bantam/Econo	Lewis Reddi-Bus	Van-Con	Wayne Busette
Interior Headroom, in	62.0	74.0	63.0	65.0	63.5	63.00
Interior Width:						
Floor Line, in	72.0	90.5	75.0	75.0	72.0	89.25
Shoulder Line, in	70.0	90.5	75.0	75.0	70.0	87.42
Service Door Type	as shown	Tall	Sedan	Tall	Sedan	Sedan
Rear Wheels	as shown	Dual	Single	Single	Single	Dual
Chassis Type	as shown	Cutaway	Van	Van	Van	Cutaway

TABLE 5

## 16-PASSENGER BUS CHASSIS

Refer to General Requirements, Page 3

16-Passenger ITEM	1990 Min. Rqmts.	Chevrolet/GMC G31303	Ford E 350***
GVWR, lbs	10000	10000	10000
GAWR, lbs - Front	3850	3900	3850
- Rear	7500	7500	7672
Axle Capacity, lbs - Front	3900	3900	4200
- Rear	7500	7500	7800
Wheelbase, in	125	125	138
Chassis Length, in	as required	197.6	232.4
Track, in - Front	68.4	69.3	68.4
- Rear	73.2	74.0	73.2
Gasoline Engine CID	*	350-V8EFI	**
SAE Gross Horsepower	*	201	**
SAE Gross Torque, lb-ft	*	318	**
Transmission	Auto	A3	A3
Truck Steel Belt Radial Tires Size & Load Range	Tubeless as shown	LT225/ 75R16D	LT215/ 85R16D
Wheels, Rear	Dual	Dual	Dual
Alternator, amperes	75	85	100

\*See minimum power requirements in Par. D.4.1.3.

\*\*Furnished with diesel engine only, Option 7.

## DIESEL ENGINE (Option 7)

16-Passenger ITEM	1989 Min. Rqmts.	Chevrolet/GMC G31303	Ford E 350
Engine Displacement, l.	*	6.2N-V8	7.3N-V8
SAE Gross Horsepower	*	164	180
SAE Gross Torque, lb-ft	*	286	345
Alternator, amperes	60	66	100

\*See minimum power requirements in Par. D.4.1.3.

Engines listed on this page are approved to meet or exceed power requirements under normal operating conditions. Other engines must be submitted for approval by the School Bus Committee (see Par. D.4.1.3.).

The following bodies are available on commercial cutaway chassis in this configuration:

16-PASSENGER BODIES  
(Wide Body, Straight Side, Style 2 Service Door\*)

16-Passenger ITEM	1989 Min. Rqmts.	Antran/Ward VSS16	Blue Bird Micro-Bird	Carpenter SCL	Thomas Minotour**	Wayne Chaperone
Interior Headroom, in	72	74	74.0	74	72	72.00
Interior Width, in	90	90	90.5	90	90	90.75

\*Conventional Bus Door - minimum 68" tall and 24" wide, folds or separates in the middle to open.

\*\*Not available with a diesel engine except as a wheelchair-equipped bus (14-passenger).

TABLE 6

18-PASSENGER DIESEL BUS CHASSIS

Refer to General Requirements, Page 3

18-Passenger ITEM	1990 Min. Rqmts.	Ford E 350
GVWR, lbs	9500	9500
GAWR, lb - Front	4200	4200
- Rear	6080	6080
Axle Cap., lbs - Front	4200	4200
- Rear	6340	6340
Wheelbase, in	138	138
Chassis Length, in		
Engine, l.	*	7.3N-V8
SAE Gross HP	*	180
SAE Gross Torque, lb-ft	*	345
Transmission	Auto	A3
Truck Steel Belt Radial Tires Size & Load Range	Tubeless as shown	LT235/ 85R15E
Wheels, Rear	Single	Single
Alternator, amperes	60	60

\*See minimum power requirements in Par. D.4.1.3.

Engines listed on this page are approved to meet or exceed power requirements under normal operating conditions. Other engines must be submitted for approval by the School Bus Committee (see Par. D.4.1.3.)

The following bodies are available on van conversion chassis:

18-PASSENGER DIESEL BUS BODIES  
(With Dual Rear Emergency Door)

18-Passenger ITEM	1990 Min. Rqmts.	Collins Super Bantam	Lewis Reddi Bus
Overall Length	245.0	246.8	245.0
Interior Height	64	64	65
Interior Width	75	75	75
Entrance Door Height*	70	74	70
Passenger Seats (30" Benches):			
Left Side, rows	5	5	5
Curb Side, rows	4	4	4
Knee Space, in	26	26	26
Aisle Width, in	15	15	15

\*Option 15 allows automotive type (Style 1) service doors.

TABLE 7  
19-PASSENGER BUS CHASSIS

19-Passenger ITEM	Refer to General Requirements, Page 3	
	1990 Min. Rqmts.	Chevrolet/GMC G31303
GVWR, lbs	10000	10000
GAWR, lbs - Front	3900	3900
- Rear	7500	7500
Axle Capacity, lbs - Front	3900	3900
- Rear	7500	7500
Wheelbase, in	125	125
Chassis Length, in	as required	197.6
Track, in - Front	69.3	69.3
- Rear	74.0	74.0
Gasoline Engine CID	*	350-V8EFI
SAE Gross Horsepower	*	201
SAE Gross Torque, lb-ft	*	318
Transmission	Auto	A3
Truck Steel Belt Radial Tires Size & Load Range	Tubeless as shown	LT225/ 75R16D
Wheels, Rear	Dual	Dual
Alternator, amperes	75	85

\*See minimum power requirements in Par. D.4.1.3.

DIESEL ENGINE (Option 7)

19-Passenger ITEM	1990 Min. Rqmts.		Chevrolet/GMC G31303
	Engine Displacement, l.	*	
SAE Gross Horsepower	*	164	
SAE Gross Torque, lb-ft	*	286	
Alternator, amperes	60	66	

\*See minimum power requirements in Par. D.4.1.3.

Engines listed on this page are approved to meet or exceed power requirements under normal operating conditions. Other engines must be submitted for approval by the School Bus Committee (see Par. D.4.1.3.).

The following bodies are available on commercial cutaway chassis in this configuration:

19-PASSENGER BUS BODIES

19-Passenger ITEM	1989 Min. Rqmts.	Amtran/Ward Vanguard*/ VSS19	Blue Bird Micro-Bird	Carpenter SCL Clipper	Thomas Minotour	Wayne Busette/ Chaperone
Interior Headroom, in	62	74	74	74	72	63/72
Interior Width, in	87	90	90.5	90	90	84.72/90.75
Service Door	as shown	Sedan/Tall	Tall	Tall	Tall	Sedan*/Tall

\*Available only with Option 15, Sedan-type Service Door.

20-PASSENGER BUS TABLE

TABLE 8

20-PASSENGER BUS CHASSIS

20-Passenger ITEM	Refer to General Requirements, Page 3	
	1990 Min. Rqmts.	Chevrolet/GMC P30842
GWR, lbs	11500	11500
GAWR, lbs - Front	4400	4400
- Rear	7900	7900
Axle Capacity, lbs - Front	5000	5000
- Rear	7900	7900
Wheelbase, in	125	125
Chassis Length, in	as required	228.9/234.6
Track, in - Front	65.2	65.2
- Rear	64.7	64.7
Gasoline Engine CID	*	350-V8EFI
SAE Gross Horsepower	*	201
SAE Gross Torque, lb-ft	*	318
Transmission	Auto	A3
Truck Steel Belt Radial Tires Size & Load Range	Tubeless as shown	8R19.5E
Wheels, Rear	Dual	Dual
Alternator, amperes	75	105

\*See minimum power requirements in Par. D.4.1.3.

DIESEL ENGINE (Option 7)

20-Passenger ITEM	1990 Min. Rqmts.	Chevrolet/GMC P30842
Engine Displacement, l.	**	6.2N-V8
SAE Gross Horsepower	**	164
SAE Gross Torque, lb-ft	**	286
Alternator, Amperes	60	66

\*\*See minimum power requirements in Par. D.4.1.3.

Engines listed on this page are approved to meet or exceed power requirements under normal operating conditions. Other engines must be submitted for approval by the School Bus Committee (see Par. D.4.1.3.)

The following bodies are available on stripped chassis:

20-PASSENGER BUS BODIES  
(Straight Side, Style 2 Service Door\*)

20-Passenger ITEM	1990 Min. Rqmts.	Amtran/Ward VSF	Blue Bird Mini-Bird	Carpenter Cadet	Thomas Mighty Mite
Interior Headroom, in	72	74	77	77	73
Interior Width, in	78	78	90.5	90	78
Service Door	as shown	Tall	Tall	Tall	Tall

\*Conventional bus door - minimum 68" tall and 24" wide, folds or separates in the middle to open.

E. 24- THROUGH 83-PASSENGER BODY SPECIFICATIONS

E.1. GENERAL REQUIREMENTS -

1.1. BODY PHYSICAL REQUIREMENTS - Physical requirements for the 24- through 83-passenger school buses shall conform to the following table (see Option No. 16 and Par. A.1.3.):

TABLE NO. 9  
PHYSICAL REQUIREMENTS

(1) MINIMUM SIZE Number of Passengers	(2) OVERALL BODY WIDTH inches, Maximum	(3) ROWS OF SEATS Each	(4) KNEE SPACINGS inches, Minimum	(5) SEAT WIDTH LEFT RIGHT inches, Minimum		(6) CENTER AISLE WIDTH inches, Minimum	(7) FLOOR-TO- CEILING HEIGHT inches, Minimum
24	96	5	24	39*	26	12	72
35	102	6	25	39*	39	12	72
47	102	8	25	39*	39	12	72
53	102	9	25	39*	39	12	72
59	102	10	25	39*	39	12	72
65	102	11	25	39*	39	12	72
71-S	102	12	24-3/4	39*	39	12	72
71-L	102	12	25	39*	39	12	72
77	102	13	25	39*	39	12	72
83	102	14	24-3/4	39*	39	12	72

NOTES: Column (4) Knee space is defined as the horizontal distance from the front center of a seat back to the rear center of the seat back or barrier immediately ahead, measured at approximately 4 inches above the seat cushion. Knee space may be reduced to 24 3/8 inches, only on those 83-passenger bus seats where it is impossible to achieve 24 3/4 inch space.

Column (5) \*Left rear seat shall have minimum width of 26 inches.

Column (6) Floor-to-ceiling height shall be measured in the center of the body between the No. 2 pillar and the last side body pillar ahead of the rear roof slope.

1.1.1. Overall Length - The overall length of a complete school bus shall not exceed 40 feet.

1.2. BUMPER, REAR - The rear bumper shall be furnished by the body manufacturer. It shall be secured to rear chassis frame and it shall be designed so as to prevent "hitching of rides" by obtaining a toehold thereon. The bumper shall not be permanently attached to the bus body, but shall wrap around the body, extending forward for at least 12 inches on each side. The bumper shall be of pressed steel channel at least 3/16-inch thick by 8 inches high. It must be bolted to the chassis frame and braced with material of at least equal impact ratio as the material in the bumper.

1.3. CEILING - The ceiling shall be free of all projections likely to cause injury to passengers. (See table above for ceiling height requirements and Par. E.2.11. for other ceiling requirements.)

1.4. LAMPS, SIGNALS, AND WARNING DEVICES - Each bus shall be furnished with the lamps listed below (see SMBI Standard No. 001):

1.4.1. Alternately Flashing Signal Lamps - Each school bus shall be equipped with eight warning signal lamps, four red and four amber, working in an automatic non-sequential integrated system. The signal lamps shall conform to the design, installation location and operating requirements of Paragraph S4.1.4. of FMVSS No. 108:

"S4.1.4. Each school bus shall be equipped with a system of ...:

... (b) Four red signal lamps designed to conform to SAE Standard J887, 'School Bus Red Signal Lamps', July 1964, and four amber signal lamps designed to conform to that standard, except for their color, and except that their candlepower shall be at least 2-1/2 times that specified for red signal lamps. Both red and amber lamps shall be installed in accordance with SAE Standard J887, except that:

(i) Each amber signal lamps shall be located near each red signal lamp at the same level, but closer to the vertical centerline of the bus; and

(ii) The system shall be wired so that the amber signal lamps are activated only by manual or foot operation, and if activated, are automatically deactivated and the red signal lamps automatically activated when the bus entrance door is opened."



**E. 24- THROUGH 83-PASSENGER BODY SPECIFICATIONS**

**NOTE:** The lamps shall be wired independently and not wired through the ignition switch. This will allow removal of the ignition key without affecting operation of the alternately flashing eight warning signal lamps.

- 1.4.1.1. Band - Each set of amber and red lamps shall have a minimum 3-inch black band around the set and a 3-inch band between the lamps in each set. The color of this band shall be black (Color No. 17038, Black Enamel of Federal Standard 595a). If it is not possible to provide a 3-inch band between the lamps in the set, the manufacturer will then provide a band as wide as possible. Any visor or hood used to shade the lights and improve visibility will not interfere with the intensity and photometric performance of the warning lights (see SMBI Standard No. 001).
- 1.4.1.2. Mounting - If exterior panels are cut to provide an opening for installation of flush-mounted signal lamps, the lamps must have a closed cell sponge flange gasket with a minimum thickness of 3/16 inch. The gasket shall be the full width of the flange on the lamp. Proper installation of the lamps shall be made in order to prevent seepage of moisture into the opening.
- 1.4.2. Backup Lamps - The color, requirements, and mounting of backup lamps shall be in accordance with FMVSS No. 108, except two backup lamps are required by Texas Specifications.
- 1.4.3. Clearance, Identification and Side Marker Lamps - Each bus shall be furnished with the lamps listed below. The quantities, colors, requirements, and mountings shall be in accordance with FMVSS No. 108. Each identification, clearance, and side marker lamp installed to indicate school bus height and/or width shall be the armored flush mounting type for protection of lens from damage during normal operation. The armored protectors shall in no way interfere with the intended purpose of the lamps. The armored type protectors shall be Grote Manufacturing Company, Madison, Indiana 47250, Model Nos. 45012 and 45013, or KD Lamp Company, 1910 Elm Street, Cincinnati, Ohio 45210, Model Nos. 38469-901 and 40268-301, or Weldon Model No. 5050, or approved equal. (See SMBI Standard No. 001 and FMVSS No. 108 for the types and proper location of these lamps.)

Example of an approved equal: Peterson Model - PM122.

- 1.4.3.1. Clearance Lamps.
- 1.4.3.2. Identification Lamps.
- 1.4.3.3. Intermediate Side Marker Lamps (not required on buses less than 30 feet long).
- 1.4.3.4. Side Marker Lamps.
- 1.4.4. Interior and Stepwell Lamps - Interior lamps shall be installed to properly and adequately illuminate the entire aisle and emergency passageway. The stepwell shall be illuminated with a separate lamp activated by opening the service door. The fixtures shall have white or clear plastic lenses attached to metal receptacles. The stepwell lamp shall also have a metal bezel. The lamps shall be designed for a 12-volt electrical system and shall have installed a minimum 15 candlepower lamp bulb. The fixtures shall be mounted so as to provide adequate illumination of the passenger and driver's compartment. Spacing of the lamp fixtures shall be the option of the bus body manufacturer.
- 1.4.4.1. Quantity - The quantity of interior lamps required for each bus shall be as listed below:

SCHOOL BUS SIZE (Number of Passengers)	INTERIOR CEILING LAMPS (Minimum Required per Bus)
24 and 35	3
47 and 53	4
59 and 65	5
71, 77, and 83	6

1.4.4.2 Approved interior and stepwell lamps are as follows:

Manufacturer	Catalog Number	
	Dome Lamps	Stepwell Lamps
Arrow Safety Device Co.	043, 036	(Equivalent lamps
Cardinal Mfg. Co.	1271-G1	with metal bezels)
Grote Mfg. Co.	230 (61031)	
K-D Lamp Co.	KD530-12	
Weldon Inc.	8005	

- 1.4.5. License Plate Lamp - The color, requirements, and mounting of the license plate lamp shall be in accordance with FMVSS No. 108.

E. 24- THROUGH 83-PASSENGER BODY SPECIFICATIONS

1.4.6. Reflex Reflectors and Intermediate Reflex Reflectors - The quantities, colors, requirements, and mounting of reflex and intermediate reflex reflectors shall be in accordance with FMVSS No. 108, except one amber reflex reflector on the front, one amber intermediate reflex reflector on buses 30 feet or longer, and one red reflex reflector on the rear shall be mounted on each side of the bus body. The amber reflex reflectors mounted near the front and on each side of the chassis are required on Texas buses in addition to the reflectors required by FMVSS No. 108.

1.4.7. Tail and Stop Lamps - The quantities, colors, requirements, and mounting of tail and stop lamps shall be in accordance with FMVSS No. 108, except stop lamps shall be 7 inches in diameter and mounted at approximately the belt line level of the bus. A set of minimum 4-inch tail/stop lamps shall be installed below the 7-inch set. Base of lamps shall be metal or durable plastic preferably with screw lens. Lenses shall be secured to lamps by a fastening method which requires a tool to remove the lens. The lamps shall be Grote 78002 or 78102 taillight, KD Lamp Company Models 258-2601 or 258-2605, or approved equal.

Example of an approved equal: Truck-Lite Model 90-91.

1.4.8. Turn-Signal/Hazard Warning Lamps - The quantities, colors, requirements, and mountings of turn-signal/hazard warning lamps shall be in accordance with FMVSS No. 108, except rear turn-signal lamps shall be 7 inches in diameter. The front turn-signal lamps shall be the double-face pedestal type or they shall be of the "wrap-around type" (except single-faced type on forward control buses). They shall be mounted in such a manner so as to be capable of withstanding all normal vibrations. On double-faced pedestals, the front lens shall be amber; the rear lens shall be red or amber, or a shade between red and amber. (See Figures 3 and 4 for mounting locations of front turn-signal lamps.) The operating units and flasher for turn-signals and vehicular hazard warning signals shall meet the requirements of FMVSS No. 108.

1.4.8.1. Installation - If exterior panels are cut to provide an opening for installation of flush-mounted turn-signal lamps, the lamps must have a closed cell sponge flange gasket with a minimum thickness of 3/16 inch. The gasket shall be the full width of the flange on the lamp. Proper installation of the lamp shall be made in order to prevent seepage of moisture into the opening.

1.4.8.2. Wiring - The exposed wiring to the signal lamps shall be enclosed in a one-piece waterproof loom, or equivalent, leading directly from the lamp body to the interior of the bus body. The wiring shall be supported at the lamp body and at intervals of not more than 6 inches until it enters the bus body.

1.4.9. Warning Devices - Each school bus shall be equipped with three triangular warning devices meeting the requirements of FMVSS No. 125. The devices shall be packed three per metal or heavy-duty plastic box, or they may be individually packed in metal or heavy-duty plastic boxes with the three boxes contained within a carrier. Warning devices shall be securely mounted either in the driver's compartment or under the rearmost row of seats. Triangular warning devices furnished shall be approved by the Texas Department of Public Safety.

1.5. WIRING - All wiring shall conform to the current standards of the SAE. All connections shall be made by soldering or by an industry-approved connector. All wires shall be insulated and all wiring shall be enclosed in a fibrous loom, or equal, for protection from external damage and short circuits. The wires shall be securely attached to the body and chassis at intervals of 24 inches or less.

1.5.1. Main Circuits - The electrical system wiring shall have at least nine main circuits as follows:

- (1) Head, tail, stop (brake), and instrument panel lamps.
- (2) Clearance and stepwell lamps.
- (3) Dome lamps.
- (4) Starter motor.
- (5) Ignition and emergency door signal.
- (6) Turn-signal (directional).
- (7) Alternately flashing signal lamps.
- (8) Horn.
- (9) Heater and defroster.

1.5.2. Fusing - Each circuit, except starting and ignition, shall be fused separately or shall have an adequate circuit breaker. Two extra fuses for each size of fuse installed on the bus by the body manufacturers, shall be conveniently mounted on the bus body.

1.5.3. Color and Number Coding - Each body circuit shall be coded by a color and number, and a diagram of the circuits shall be attached to the body in a readily accessible location.

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- 1.5.4. Accessory Wiring - Body-installed accessories shall be wired from the battery through a low voltage solenoid cut-off switch operated by the ignition key except for the eight light warning system and hazard warning lights.
- 1.6. LICENSE PLATE HOLDER - A recessed license plate holder shall be mounted on the left rear of the bus body. The recess shall be minimum of 3/8-inch deep at the top and shall be located so that the license plate will receive illumination from the clear lens on the underneath side of the tail light, or by a separate lamp.
- 1.7. OPENINGS - All openings in the floorboard or firewall between chassis and passenger-carrying compartment, such as for gearshift lever, steering column, and auxiliary brake lever, shall be sealed. All openings between chassis and passenger-carrying compartment made due to alterations by the body manufacturer must be sealed.
- 1.8. PAINTING -
- 1.8.1. Surface Preparation and Cleaning -
- 1.8.1.1. Surface Preparation - The method used in the cleaning and preparation of all surfaces to be primed shall be equal to that specified by Federal Specification TT-C-490B for equivalent use. The final preparation for priming shall include a careful inspection to make certain that all surfaces to be primed will permit optimum adhesion of all paint films.
- 1.8.1.2. Surface Cleaning - All interior and exterior panels and rub rails to be painted or coated shall be thoroughly cleaned to remove all rust, grease, weld slag, and other foreign material prior to priming. Any welds on the components for the bus body or chassis shall be dressed, sanded, buffed, and thoroughly cleaned to remove any slag and to properly prepare the welds for priming. After proper cleaning, these components shall be thoroughly rinsed. Neither the cleaning process nor the rinses shall impair the zinc phosphate coating of the panels or rub rails.
- 1.8.2. Primer Coat - After the components have been thoroughly cleaned and prepared as described above, they shall be totally primed and dried. These components may be primed and dried either prior to or after installation. All components such as rivet or bolt heads and damaged areas shall be thoroughly cleaned and primed.
- NOTES:** Components of the body frame system need not be primed, except for welds. All processes and methods used in the priming operation shall be in accordance with the best recognized industrial practices. Primers shall be those recommended by the paint manufacturer supplying the finish coat enamels. Primers may be any color.
- Clear-coated panels are required below the passenger windows and in the stepwell (see Par. E.2.11.).
- 1.8.3. Finish Coat - After all interior and exterior panels and rub rails have been prepared, cleaned, and primed as specified above, they shall be finished with a first quality baking enamel, applied and baked according to the paint manufacturer's instructions. These enamels, when applied over the paint manufacturer's recommended primer, shall have properties equal to or better than those specified by Federal Specification TT-E-489F, Class B. Both interior and exterior enamel finish coats shall have a minimum dry film thickness of 2 mils, when tested with a "dry film thickness gauge" (such as the "Elcometer Dry Film Thickness Gage", Gardner Laboratory, Inc., Bethesda, Maryland 20014) conforming to Federal Specification TT-C-490B. All processes and methods used in the enamel finish coat operation shall be in accordance with the best recognized industrial practices. In no instance shall the enamel finish coat be applied over an unprimed surface.
- NOTE:** Alternate methods for preparing metal surfaces and painting procedures will be considered on an individual basis. Manufacturers shall submit their procedural data to the Specification Section of the Commission for approval where methods are used that differ from those specified above.
- 1.9. COLORS and LETTERING - A first quality black enamel (Color No. 17038 of Federal Standard No. 595a) or decals shall be used for lettering and trim. The properties of the black enamel shall be equal to those of the finish coat enamel. Pressure-sensitive tape or decals are acceptable for trim or lettering (e.g., EMERGENCY DOOR, EMERGENCY EXIT, etc. signs), provided they are made from FAISON R 200, 3M Series 180, or approved equal material.
- 1.9.1. Interior - Unless otherwise specified in the Invitation for Bids, the interior of the complete bus body shall be finished in the manufacturer's standard color except where clear-coated galvanized steel is required (see E.2.11.).

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- 1.9.2. Exterior - The exterior of the complete bus except for rub rails shall be finished in school bus yellow (Color No. 13432 of Federal Standard No. 595a). The hood may be coated with non-reflective school bus yellow paint. When so specified in the Invitation for Bids (see Option 42), the school bus roof shall be painted white. The paint on the roof shall extend from the back of the front cap to the front of the rear cap and from a point on each side of the bus which is no lower than the top of the windows and no higher than the start of the roof curvature. The paint shall be the same quality as the paint on the remainder of the school bus.
- 1.9.3. School bus Lettering - The school bus bodies shall have the words "SCHOOL BUS" painted in neat, clearly defined block letters on the front, rear, and on both sides of the bus body with black paint (Color No. 17038 of Federal Standard No. 595a). The letters shall be 8 inches high and shall have 1-inch wide strokes. The words "SCHOOL BUS" shall be at the same level on each side of the bus (i.e., same height above bottom of skirt).
- 1.9.4. School Name Lettering - When so specified in the Invitation for Bids, the school district name shall be provided in black letters on both sides of the bus near the belt line. Lettering shall be minimum 5 inches high with minimum 5/8-inch block strokes. Paint, if used shall be equal in quality to that of the bus body paint; decals shall meet or exceed the requirements in Par. E.1.9. Maximum number of characters in one line of the name is limited to the bus length. The school district should list in the space provided on the School Bus Requisition Form (see sample form on page 15), the name to be placed on the bus. Characters should be typed or printed plainly on this form to ensure accurate spelling (see Option 17).
- 1.9.5. Emergency Door Lettering - The rear emergency door exit shall be marked "EMERGENCY DOOR" or "EMERGENCY EXIT", both on the outside and on the inside with at least two-inch high lettering placed on top of, or directly above the exit.
- 1.9.6. Logos - No logo, trademark, insignia, or letters shall be placed on bumpers or mud flaps. A small metal or plastic plate designating body manufacturer's name may be attached to the bus body. A logo of reasonable size, which has been approved by the Specification Section, may be placed on the exterior bus body.
- 1.9.7. Bumpers - Bumpers shall be finished in black (Color No. 17038).
- 1.9.8. Rub Rails - All rub rails except the pressed-in type window level rub rails, shall be painted black (Color No. 17038). The pressed-in type rub rails shall be painted either black (Color No. 17038) or school bus yellow (Color No. 13432) at the option of the manufacturer.
- 1.9.9. Exterior Mirror Backs - The metal backs of all exterior mirrors, if painted, shall be finished in lusterless black (Color No. 37038; see Par. E.3.8.4.4.).
- 1.10. UNDERCOATING - Undercoating is required to provide for insulation, sound deadening, protection from road minerals, and rust prevention, as applicable, and shall meet the following:
- 1.10.1 Material - Insulating and undercoating materials shall be an asphalt base underbody coating conforming to Federal Specification TT-C-520B, such as R-477-139, manufactured by Daubert Chemical Co., Chicago, Illinois 60638 or Lion Nokorode Emulsion 331 as manufactured by Lion Oil Company, El Dorado, Arkansas 71730, or an approved equal. An example of an approved equal is Tectyl MCI21B, manufactured by Ashland Petroleum Company, Box 391, Ashland, Kentucky 41101, applied to a dry film thickness greater than 20 mils.
- 1.10.2. Application - The entire underside of the bus body, including floor members, wheelwells, side panels below the floor level, and all metal fenders or fenders with metal liners shall be coated with 1/8-inch thick material as specified above. The undercoating shall be applied in accordance with the undercoating manufacturer's instructions. Do not cover up or obliterate the truck identification plate (see Par. A.5.4.3.).
- 1.11. INSULATION - The ceilings and sidewalls shall be thermally insulated with a fire-resistant material approved by the Underwriters Laboratories Inc. to adequately reduce the noise level and to minimize vibrations. Buses shall have the equivalent of 1.5 inches of fiberglass or other insulation in the ceilings and walls including the interior of hat-shaped bows. Any insulation used shall have a minimum R-factor value of 5.77.

**K. 24- THROUGH 83-PASSENGER BODY SPECIFICATIONS**

**K.2. CONSTRUCTION -**

**2.1. GENERAL REQUIREMENTS -** The bodies shall be reasonable dustproof and watertight. The main steel components are listed below and their requirements are listed in Table 10. They shall be constructed of Type 1 steel except as noted there:

**2.1.1. Components -** The main structural components of the body shall consist of:

**2.1.1.1. The Body Frame System -** posts, bow frames, strainers, front and rear framing, longitudinal frame members, and emergency door posts.

**2.1.1.2. The Floor System -** floor panels, main cross members, auxiliary cross members, wheelhousing, steps, and stepwell bracing.

**2.1.1.3. The Exterior Paneling -** side panels, rub rails, service doors, emergency doors, skirts, roof panels, window jambs (post caps), window sills, and front and rear panels including front cowl.

**2.1.1.4. The Interior Paneling -** side and ceiling panels.

**2.1.2. Chassis Frame Alterations -** The body manufacturer shall not in any manner alter the 24-through 83-passenger chassis frame except to cut off the rear portion of the frame where necessary to weld bumper braces, and to lengthen the frame in order to comply with the requirements of Par. F.2.1. None of the rivets in the chassis frame shall be cut flush with the frame or removed. The body manufacturer may alter the chassis frame to adapt standard chassis to forward control. (Any change must have body manufacturer's warranty.)

**2.1.3. Bus Body Length -** The bus body shall extend to, or farther than, the end of the chassis frame so that all main cross members and auxiliary cross members will rest upon the chassis frame. The distance from the end of the chassis frame and the rear of the body shall not exceed 6 inches.

**2.1.4. Front Body Section, Semi-forward Control Bodies -** On semi-forward control 24- through 71-passenger buses, the front body section of the school bus from the windshield forward shall be of the bus body manufacturer's standard design and shall contain, but not be limited to, the following components:

**2.1.4.1. Grille -** A sufficiently reinforced grille assembly.

**2.1.4.2. Lamps -** Headlamps and parking/turn-signal lamps as required by FMVSS No. 108.

**2.1.4.3. Hood -** Hood cover with latching mechanism providing access to the forward part of engine.

**2.1.4.4. Fenders -** Properly braced fenders with the total spread of the outer edges exceeding the total spread of the front tires when the front wheels are in the straight-ahead position.

**2.1.5. Body-Chassis Attachment -** The body shall be attached to the chassis frame by means of U-bolts with 7/16" diameter threads and a minimum 10,000 lbs tensile pull strength per arm, and the manufacturer's standards clips to prevent slippage between the chassis frame and the bus body. The U-bolts shall be fitted with lock washers and nuts and, after the nuts have been securely tightened, the threads of each U-bolt shall extend a minimum of 1/2 inch past the nuts. Each bus shall be furnished with the following as indicated:

**2.1.5.1. U-Bolt number and placement shall be as follows:**

<u>BUS SIZE*</u>	<u>NO. OF U-BOLTS, Min*</u>	<u>PLACEMENT</u>
24	4 (2 on each frame rail)	1/3 and 2/3 length of bus
35, 47, & 53	6 (3 on each frame rail)	1 at each end; one in center
59, 65, 71, 77, & 83	8 (4 on each frame rail).	1 at each end; one about one-third and one about two-thirds of length of bus.

**\*NOTE:** School buses equipped with any combination of wheelchair lift positions and conventional seats shall have as a minimum, the number of U-bolts as if the bus were equipped with all conventional seating (e.g., a 71-passenger school bus body equipped with any combination of wheelchair positions and conventional seats shall have at least 8 U-bolts (four installed on each frame rail).

**2.1.5.2. Other Devices -** All other main cross members on all sizes of bodies shall be attached to the chassis with the manufacturer's standard fastening devices where possible. Shear bolts or other equally effective devices approved by the Specification Section of the Commission, may be used in addition to U-bolts and standard clips to eliminate slippage.

TABLE NO. 10

**STEEL COMPONENTS  
NOMINAL METAL THICKNESSES AND ZINC COATING DESIGNATIONS**

ITEM NUMBER	COMPONENTS	THICKNESS, in	METAL ZINC-COATING DESIGNATION
1	Bows, Frames	.0635	G60
2	Bows, Roof	.0635	G60
3	Cowl, Front	.0635	G60
4	Doors, Emergency and Service:		G60
4a	Exterior Panel	.0396	G60
4b	Interior Panel	.0336	G60
5	Door Posts:		
5a	Emergency Door	.0785	G60
6	Floor Panels	.0785	G60
7	Longitudinal Frame Members:		
7a	Floor Line	.0635	G60
7b	Seat Line	.0635	G60
7c	Belt Line	.0635	G60
7d	Window Header Line	.0635	G60
8	Panels, Exterior:		
8a	Front	.0396	G60
8b	Rear	.0396	G60
8c	Roof	.0396	G60 or A60
8d	Side	.0396	G60 or A60
8e	Skirts	.0396	G60
9	Panels, Interior:		
9a	Headlining	.0336	G60 or A60
9b	Front Lap	.0336	G60 or A60
9c	Rear Lap	.0336	G60 or A60
9d	Lower (below windows)	.0336	G60 or A60*
10	Posts, Side	.0635	G60
11	Rub Rails:		
11a	Skirt Line	.0635	G60
11b	Floor Line	.0635	G60
11c	Seat Line	.0635	G60
11d	Window Line	.0396	G60
12	Wheel Housing	.0635	G60
13	Window Sills	.0396	G60**

\*NOTE: Lower interior embossed panels (Item No. 9d) and stepwell wall panels shall be clear-coated galvanized steel, ASTM designation A446-76, or Galvalume, aluminized steel, or aluminum over steel.

\*\*NOTE: It is mandatory that all components listed in Table No. 10 be of the following types of steel, unless otherwise specified, and except Item No. 13 may be of aluminum alloy 6063-T6 having a minimum thickness of 0.062 inch. Any and all other metal components not listed in Table No. 9 may also be zinc-coated steel:

TYPE I (Regular) - ASTM Specification A525, coating designation G60, as specified, mill zinc-coated steel. Coated steel, except components not to be primed and painted, shall have a smooth minimized spangle surface which has been zinc phosphate treated by the steel mill or by the bus body manufacturer.

TYPE II (Alloyed) - ASTM Specification A525, coating designation A60, mill zinc-coated steel which has been zinc phosphate treated by the steel mill or by the bus manufacturer.

Standard A.I.S.I. tolerances allowed for metal thickness requirements.

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- 2.1.5.3. **Body-Chassis Insulation** - Anti-squeak material in continuous strips or rubber pads shall be permanently and firmly attached to the frame rails or cross members to insulate chassis from the body.
- 2.1.6. **Body-Cowl Attachment** - Buses equipped with chassis manufacturer's cowl shall be furnished with the body securely attached to the rear face of the chassis cowl with a minimum of 9 bolts, nuts, and lock washers. On all such buses the junction between cowl and body shall be sealed to form a gastight and watertight seam. The sealant used shall be either the best grade of molded or extruded rubber weather stripping or a good quality, pressure applied, silicone elastomer sealant.
- 2.1.7. **Bolts and Rivets** - All bolts and rivets used in the manufacture of the school bus body shall be high strength metal. All bolts shall be equipped with lock washers or other acceptable devices to prevent loosening under vibration. All bolts, nuts, and washers except U-bolts, their nuts and washers, shall be parkerized, cadmium-plated, or otherwise rustproofed.
- 2.1.8. **Other Fasteners** - Sheet metal screws or self-tapping bolts of any type shall not be used in the construction of bodies except:
- 2.1.8.1. For alignment\* of doors or in conjunction with rivets, welds, or bolts for compliance with FMVSS No. 221, as applicable, or,
  - 2.1.8.2. Seat construction (See Par. E.2.14), or,
  - 2.1.8.3. For interior panels which must be removed to give accessibility to other interior or concealed components, or,
  - 2.1.8.4. For attachment of exterior mirrors in certain cases (see Par. E.3.8.4.3.), or,
  - 2.1.8.5. In the installation of rub rails or emergency door handles and latches where it is impossible to use rivets or bolts, nuts, and lock washers and then only when these fasteners are used in conjunction with the manufacturer's standard metal adhesive which is used to meet joint strength requirements, or,
  - 2.1.8.6. In window frames when applied with the metal adhesive, or,
  - 2.1.8.7. In the installation of header pads over the doors, or
  - 2.1.8.8. For electrical wire moldings and light fixtures.
- \*When self-tapping bolts are used to align doors, they shall be tack-welded at the head or applied with the metal adhesive and shall not exceed the number of rivets, or bolts, nuts, and washers installed in the door hinges.
- 2.1.9. **Caulking** - A flexible, tenacious, high quality caulking compound or adhesive shall be applied to the top of all rub rails, all unwelded metal joints, and to any place where moisture could enter through the exterior panels. This does not include the fresh air intake or the heater or the drain openings at the bottom of the rub rails. The compound shall be applied to the required areas in a neat and workmanlike manner without voids or skips.
- 2.1.10. **Exhaust Pipe Extension** - The body manufacturer shall furnish and install an exhaust pipe extension when necessary in order to insure compliance with the chassis requirements of the exhaust system (see Par. F.4.5.). The tail pipe shall not extend beyond the rear bumper.
- 2.1.11. **Fuel Filler Opening** - The body manufacturer will provide an opening in the body panel of sufficient size to allow easy access and entry of fuel nozzle to the fuel tank filler neck opening. This opening in the panel must be so positioned that the filler neck, when viewed at right angles from the side, is approximately centered in the cut-out. This opening shall be provided with a hinged cover so designed and constructed to remain open when fueling is in progress and remain in a totally closed position at all other times (see Par. E.2.4.3.3).
- 2.1.12. **Identification Plate** - Each body shall bear in a prominent place a permanently attached plate showing the name of the manufacturer and the body serial number (see Par. A.5.4.2.).
- 2.1.13. **Wood** - The use of wood shall be limited to the construction of passenger seats, seat backs, or header pads, and the bottom of any tool compartment or to insulate floors.
- 2.2. **BODY FRAME** - The complete body frame shall be formed, welded, riveted, or lock bolted, assembled and constructed in accordance with recognized engineering practices within the bus body industry.
- 2.2.1. **Material** - The body frame system (see Par. E.2.1.1.) shall be of the type, grade, and thickness of steel specified in Table No. 10 or approved equal, and shall meet the requirements of FMVSS No. 220.
  - 2.2.2. **Design** - The frame shall have a formed shape with a minimum cross sectional depth of 1.25 inches. Frame members, running from one side main cross member to the other side main cross member, may be continuous bow frames, or they may consist of side posts and roof bows. If side posts and roof bows are used, every pair of side posts must be connected by a roof bow to form the equivalent of a continuous bow frame. The side posts shall be set on not more

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than 30-inch centers, except that one side post and bow or one bow frame may be set on a maximum of 38.75-inch center, or three bow frame sections not exceeding 36.5 inches may be used in any one body. Each of the side posts or bow frames shall be securely welded, riveted, or lock bolted to the floor system at each main cross member or to the longitudinal frame member which is located at the floor line. Each side post and/or bow frame must also be attached, as specified above, to the remaining longitudinal frame members.

- 2.2.3. Longitudinal Frame Members - The body frame shall have not less than four individual side longitudinal frame members extending the full length of the body (except as interrupted by side posts or when cut for an opening for the wheelhousing). One each shall be located at the floor line, the seat line, the belt line, and at the window header line. The belt line longitudinal member may be replaced by an exterior rub rail, e.g., an extra rub rail in the belt line area. This rub rail shall meet requirements specified under RUB RAILS, Par. E.2.4.
- 2.2.4. Front Frame Section - The front frame shall be a unitized framework of formed sections designed with the necessary stress members required to withstand the torsional stresses set up by or in the chassis. The corner posts shall extend from the bottom of the body to the windshield header and shall not cause or produce a "blind spot" for the driver. The front assembly shall be securely attached to the floor system by lock bolting, welding, or riveting and shall be securely bolted to the chassis cowl in such a manner as to cause no undue strain (see E.2.2.2.).
- 2.2.5. Rear Frame Section - The rear frame shall consist of a formed sill, two posts (one on either side of the emergency door, extending from the sill to the roof bow and intersected by a rear header at the proper point), and suitable strainers to form a rigid framework. This framework shall be assembled and attached to the floor system by welding, riveting, or lock bolting.

### 2.3. EXTERIOR PANELS -

- 2.3.1. Material - All exterior panels (see Par E.2.1.1.3.) shall be of the type, grade, and thickness of steel specified in Table No. 10 or approved equal.
- 2.3.2. Design - The front and rear exterior panels shall be formed into the desired contours to give a smooth, pleasing appearance to the bus. The front and rear exterior roof panels shall be of not more than three pieces welded or riveted together to form a continuous piece over the front and rear frame.
- 2.3.3. Attachment and Installation - All exterior panels shall be attached to bow frames and strainers so as to act as an integral part of the structural frame. They shall be installed by lapping and riveting, lapping and bolting, or by flanging and bolting and in such a manner as to form watertight joints. The exterior side panels shall be installed either vertically or longitudinally. Vertical panels shall be one-piece and shall extend from the window line to or below the floor line. Longitudinal panels shall be installed starting at or below the floor line and extending upward to the window line with each ascending panel overlapping the preceding panel. Rub rails shall not be considered as part of the paneling for covering the side except for pressed-in window rails.
- 2.3.4. Undercoating - All exterior panels shall be completely sprayed on the inside of the main exposed surfaces, and shall featheredge to the edge of the attaching members, with 1/16-inch thick material conforming to that specified in Par. E.1.10. The spraying shall be done after the panels are installed.
- 2.3.5. Joints - Joints shall meet the requirements of FMVSS No. 221.

### 2.4. RUB RAILS - Four separate, one-piece, continuous rub rails of the type, grade, and thickness of steel specified in Table No. 10 or approved equal, shall be installed on the body as described below. The minimum finished width of all rub rails shall be 4 inches:

- 2.4.1. Location - One rub rail shall be installed at the skirt level, one at or near the floor, one at or near the seat level, and one near the window line. One additional rub rail may be furnished in lieu of one longitudinal frame member (see Par. E.2.2.3.).
- 2.4.2. Construction - The rub rails shall be of ample strength to resist impact and to prevent crushing of the bus body and shall be a flanged-formed channel, longitudinally fluted or corrugated rib surface. Ends shall be (1) smoothly closed, or (2) closed by a rounded end cap which shall be butt- or flash-welded to the rub rail, or (3) closed by a rounded end cap inserted with an approximate one-inch sleeve inside of the rub rail, riveted in position at the top and bottom of the rub rail flange, and sealed in the same manner as the top flange of the rub rails.



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- 2.4.3. Installation - All rub rails shall be bolted or riveted on top and bottom to each side post and riveted on top and bottom to the exterior paneling between the side posts (see Exception in Par. E.2.1.8.5.). Provisions for one-piece rails may be accomplished by butt- or flash-welding. All welds, including those for the end caps, shall be dressed, sanded, and buffed. These rub rails shall be installed on both sides of the bus body as follows:
- 2.4.3.1. Window Level - The window level rub rail shall be installed the full outside length of the body on the right side from the service door to the rear corner radius and on the left side from the point of curvature near the outside cowl to the rear corner radius. The splice, if necessary, shall be located at the body post behind the rear wheelhouse, by lapping the full width of the supporting part of the post.
- 2.4.3.2. Seat Level - The seat level rub rail shall be installed from the service door completely around the bus body (except for emergency door and rear engine bus) to the point of curvature near the outside cowl on left side. The rails may be two-piece with the joint being near the rear side of the bus body. The rail extension shall be joined to the continuous side rail by one of the following (1) butt welding, (2) jogged lapped by not less than one inch and riveted, or (3) butted with a sleeve riveted over the joint. When joining is by lapping or fastening with a sleeve, the joint must be made at the rearmost body side post or preferably, the second post from the rear.
- 2.4.3.3. Floor and Skirt Level - The floor and skirt level rub rails and the additional rub rail furnished in lieu of one longitudinal frame member shall be installed the full outside length of the body (except at wheelhousings) on the right side from the service door to the rear corner radius and on the left side from the point of curvature near the outside cowl to the rear corner radius. One of the floor level rails may be cut to provide an opening for the gas tank filler neck only if fuel tank furnished to meet FMVSS No. 301-75 requires the opening to be enlarged, or to meet the requirements in E.2.1.11.
- 2.4.4. Drainage - The bottom edge of each rub rail (except the pressed-in-type which may be used near the window line) shall have provisions for drainage of accumulated moisture. One of the following drainage methods shall be used:
- 2.4.4.1. Slots - The bottom flange of the rub rail shall have a minimum of one inch by 0.32 inch formed slots spaced on not more than 12-inch centers, or
- 2.4.4.2. Holes or Slots - One 0.25-inch diameter hole or slot per foot in the lowest part of the rub rail drilled prior to the priming, painting, and installation of the rub rail shall be provided. Holes drilled after rub rail installation or after priming and painting are not acceptable. Formed slots are preferred over drilled or cut holes.
- 2.4.5. Sealing - The top joint of the rub rail shall be sealed with a caulking compound or adhesive as specified in Par. E.2.1.9.
- 2.5. SKIRT REINFORCEMENTS - Side skirts shall be gusseted or braced on not more than 30-inch centers and wherever required for rigidity and to prevent vibration. If the body sections are authorized to be longer than 30 inches, no more than three sections of skirt reinforcement shall be on centers up to a maximum of 36 inches, or no more than one section shall be on centers up to a maximum of 38-3/4 inches.
- 2.6 BATTERY COMPARTMENT - If the battery is mounted on the chassis frame (which is required on diesel-powered buses), the bus body manufacturer shall provide a battery compartment beneath the floor of the bus body. This compartment shall be a skirt type container, reinforced and equipped with a pullout receptacle and an outside access door. The battery compartment shall provide complete weather protection for the battery as well as total access for servicing (see Par. F.6.2.3.). Battery cables of sufficient length shall be provided to accommodate the mounting of the battery in this compartment, and the body manufacturer shall mount the battery in the compartment. This compartment is not available on rear engine buses.
- 2.7. SERVICE OR ENTRANCE DOORS - The service door shall be of the type, grade, and thickness of steel specified in Table No. 10 or approved equal:
- 2.7.1. Design - The service doors may be the folding type (e.g., open in the middle) or the folding (or jackknife) type. These doors shall have a minimum horizontal opening of approximately 24 inches and a minimum vertical opening of about 68 inches. The service door shall have lower and upper glass panels to permit the driver to see entering passengers as well as the passenger landing area. These glass panels shall be set in rubber. Vertical closing edge or edges of these doors shall be equipped with rubber or rubberized material to protect passengers' fingers. There shall be no door on the left of the driver.

**E. 24- THROUGH 83-PASSENGER BODY SPECIFICATIONS**

**2.7.2. Location and Operation -**

- 2.7.2.1. **Conventional Bus Doors** - The entrance door for conventional buses shall be operated manually. The door control shall be the hand lever type, driver-operated, and shall be designed to afford easy release and to prevent accidental opening. The two-piece or folding type service door shall be located on the right side near the front of the bus in direct view of the driver.
- 2.7.2.2. **Semi-forward Control Bus Doors** - On semi-forward control buses, the entrance door shall be operated from controls at or near the bus driver's seated position. The doors shall be operated manually, or actuated electrically or by air pressure or vacuum and shall allow manual opening in case of an emergency. To prevent accidental opening while the bus is in motion, the system shall require at least a 125-pound force applied to its center in order to manually open the door.
- 2.7.2.3. **Forward Control Bus Doors** - The doors on forward control buses shall be operated either manually or actuated electrically or by air pressure or vacuum. If manually operated, the door control shall be the hand lever type, driver-operated, and shall be designed to afford easy release and to prevent accidental opening. The service door shall be located on the right side near the front of the bus. At least two-thirds of its opening width shall be ahead of the point opposite the back of the driver's seat.
- 2.7.3. **Attachment** - The hinges for the service or entrance doors shall be attached with rivets or bolts, nuts, and lock washers. Metal screws or self-tapping bolts are not acceptable. Metal screws may be used for alignment of doors while installing rivets. Self-tapping bolts may be used for alignment if the bolts heads are tack-welded to the hinges (see Par. E.2.1.8.1.).
- 2.7.4. **Header Board** - The head impact area on the inside at the top of the service or entrance door shall be protected by an energy-absorbing, padded header board of sufficient size (width, depth, and length) to prevent injury when accidentally impacted.

**2.8. SERVICE ENTRYWAY -**

- 2.8.1. **Step Design** - The entrance door steps shall be designed so that the first step shall be not less than 12 inches and not more than 16 inches from the ground when the bus is unloaded. Service door entrance may be equipped with two-step or three-step entrance. Risers in each case shall be approximately equal. (See Par. E.2.11. for material requirements.) The stepwell shall not protrude beyond the side body line and shall be fully enclosed to prevent accumulation of ice, snow, and dust.
  - 2.8.2. **Floor Material** - All steps and the floor line platform area shall be covered with 0.1875 inch rubber metal-backed treads with at least 1.5 inch white nosing as an integral piece without any joint. A three-inch white rubber step edge with metal back may be substituted in the floor line platform area. Step tread minimum overall thickness shall be 0.1875 inch ribbed design similar to the ribbed design of the aisle rubber. Metal back of tread, minimum 24-gauge cold rolled steel, shall be permanently bonded to ribbed rubber. Grooved design shall be such that said grooves run at 90-degree angle to long dimension of step tread. The rubber portion of the step trends shall have the following characteristics:
    - 2.8.2.1. Special compounding for good abrasion resistance and high coefficient of friction.
    - 2.8.2.2. Sufficient flexibility so that it can be bent around a 0.5-inch mandrel both at 130°F and 20°F without breaking, cracking, or crazing.
    - 2.8.2.3. Shore A Durometer or equivalent hardness of 85 to 95.
  - 2.8.3. **Handrails** - A grab handle not less than 20 inches in length shall be provided and placed in an unobstructed location inside the doorway. The outside surface of this handle shall be stainless steel, polished aluminum, or chrome-plated steel.
  - 2.8.4. **Entryway Access** - There shall be a minimum of 12 inches of unrestricted access from the service door to the center aisle.
- 2.9. EMERGENCY DOORS** - The emergency door shall be of the type, grade, and thickness of steel specified in Table No. 10 or approved equal. Emergency doors on buses furnished to this specification shall be equipped with doors meeting the requirements below. Emergency doors shall be furnished with upper glass panels, permanently closed, set in rubber or sealed against rubber. (See Par. E.2.10.2. for glazing requirements and Par. E.1.9.5. for lettering.) No seat or other object shall be placed in the body that restricts the passageway to the emergency door to less than 12 inches. There shall be no steps leading to the emergency door.

## **E. 24- THROUGH 83-PASSENGER BODY SPECIFICATIONS**

- 2.9.1. Design - The emergency door on all except rear-engine buses\* shall be located in the center of the rear of the body and shall have a minimum horizontal opening of 30 inches and a minimum vertical opening of 48 inches measured from the floor level. The door shall be hinged on the right side of the body (forward side for rear engine buses), shall open outward, and shall be designed to permit opening from both inside and outside of the bus. It shall be properly sealed against moisture and dust.
- \*A left rear emergency door meeting the requirements of FMVSS No. 217, shall be provided on rear engine buses.
- 2.9.2. Latch - The emergency door shall be equipped with a slide bar rack and pinion (cam) operated latch. The slide bar shall be approximately 1.25 inches wide and 0.375 inch thick and shall have a minimum stroke of 1.125 inches. The slide bar shall be spring loaded so as to retain the bar in the closed position and have a minimum of one inch of horizontal bearing surface beyond the edge of the door frame when the door lock is in a latched position.
- 2.9.3. Latch, Handle - The movement of the lock handle through its full arc of operation shall not be obstructed by, or extended into the area behind the rear seats at the emergency door. The handle, when in the closed position, shall meet the requirements of FMVSS No. 217. The design of the latch handle shall allow quick release, but shall offer protection against accidental release. Control of the fastening devices from the driver's seat shall not be permitted. A pull handle shall be installed on the inside of the emergency door so that the door can be securely closed for positive fastening. Provisions for opening from the outside shall consist of a handle (device) designed to prevent "hitching a ride" yet allowing the door to be opened when necessary. The outside handle, when in the closed position, shall extend vertically downward from its pivot center.
- 2.9.4. Switch - The emergency door latch shall be equipped with a heavy-duty electric plunger-type switch connected to a warning buzzer located in the driver's compartment. The switch shall be enclosed in an adequately protected case, and wires leading from the switch shall be concealed in the walls. The switch shall be mounted plumb, parallel, and perpendicular to the striker plate of the lock slide bar. The switch shall be installed so that the buzzer will sound before the door handle is turned far enough to permit the door to open. The switch shall be Cole-Hersee's No. 9118, having an upset end (knob) on the plunger head.
- 2.9.5. Attachment - The hinges for the emergency doors shall be attached with rivets or bolts, nuts, and lock washers. Metal screws or self-tapping bolts are not acceptable. Metal screws may be used for alignment of doors while installing rivets. Self-tapping bolts may be used for alignment if the bolts heads are tack-welded to the hinges (see Par. E.2.1.8.1.).
- 2.9.6. Glass Panels - The glass in the emergency door shall have an area of not less than 299 square inches and shall be set solid in a waterproof manner (see Par. E.2.10.1.3.). The installation of glass in the lower portion of the door is required and shall meet the same requirements (lower glass panels not required in the emergency doors of rear engine buses). The lower glass panels shall be the body manufacturer's standard size. These glass panels shall be installed securely to prevent removal by hand.
- 2.9.7. Header Board - The head impact area on the inside at the top of the emergency door shall be protected by an energy-absorbing, padded header board of sufficient size (width, depth, and length) to prevent injury when accidentally impacted.

### **2.10. WINDSHIELD AND WINDOWS -**

#### **2.10.1. General Design -**

- 2.10.1.1. Windshield - The maximum width of the windshield center post shall not exceed 2.5 inches.
- 2.10.1.2. Passenger Side Windows - There shall be one vertical opening side window for each passenger seat. These windows shall open from the top only and shall operate freely. All side windows except the driver's and the service door window, shall be the split sash type with positive latch. Side windows that can be latched in an uneven position are not acceptable. They shall be furnished with a latching mechanism which will allow each window to be latched in a position not more than six inches from the top. The passenger side windows shall provide an unobstructed opening 22 inches wide and between 9 and 10 inches high.

NOTE: 77-passenger and 83-passenger rear-engine buses may have one less set of passenger windows than rows of seats.

- 2.10.1.3. Emergency Door Windows - The emergency door shall be furnished with an upper and lower glass panels (see Par. E.2.9.6.) permanently closed, and set in rubber or sealed against rubber.

**E. 24- THROUGH 83-PASSENGER BODY SPECIFICATIONS**

2.10.1.4. Driver's Side Window - The driver's window shall be a 2-piece window of either of the following types:

- (i) Two-piece Sliding-sash Type - This type will be acceptable only when the bus is equipped with an adequate air scoop to draw outside air into the driver's compartment. When the driver's ventilation is drawn through the heater system, this air shall be shielded from the heat sources and a hot water cut-off valve shall be provided in the driver's compartment.
- (ii) Other Type - This type of window shall have the front part opening either in or out and rear part lowering and raising by use of a regulating handle.

2.10.1.5. Rear Window - Rear windows (not emergency door windows)\* shall be installed on each side of the rear emergency door. Each rear window glass shall have a minimum area of 140 square inches and shall be set solid in a waterproof manner. These windows shall be installed securely to prevent removal by hand.

\*A rear "push-out" window, meeting the requirements of FMVSS No. 217, shall be provided on rear engine buses.

2.10.2. Glazing - Glass shall be installed in rubber channel gasket material or approved equivalent material. The glass shall be mounted so that the permanent identification mark is visible from either inside or outside of the bus. All safety glazing materials shall be approved by the Department of Public Safety. All exposed edges of glass shall be banded. The glass shall be as follows:

2.10.2.1. Windshield - The windshield shall be minimum 0.21875-inch thick safety plate glass and shall be heat-absorbent, laminated AS-1 safety glass meeting ANSI Standard Z26.1, as amended.

2.10.2.2. Passenger Side Windows - The glass in all passenger side windows shall be a minimum of 0.125-inch safety plate glass and shall be AS-2 grade or better, as specified in ANSI Safety Code Z26.1 (see Par. E.2.10.2.4.).

2.10.2.3. Other Windows - The glass in all other window including the driver's side windows, emergency door windows, and rear (side) windows shall be a minimum of 0.125-inch safety plate glass and shall be AS-2 grade or better as specified in ANSI Safety Code Z26.1.

2.10.2.4. All Windows - When so specified in the Invitation for Bids (see Option 26), all windows shall have AS-2 grade or better grade laminated safety plate glass.

2.10.3. Tinting -

2.10.3.1. Windshield - The windshield shall have a horizontal gradient band (tinted) starting slightly above the driver's line of vision with approximately 90% light transmittance and gradually decreasing to a minimum of 70% light transmittance at the top of the windshield, or the entire windshield shall be tinted to meet the requirements of FMVSS No. 205.

2.10.3.2. Passenger Side Windows - When so specified in the Invitation for Bids (see Option 10), passenger side windows only shall be tinted to minimum 30%, maximum 40% light transmittance using AS-3 grade glass or better. This is defined as "dark tinting" and is not permitted on the windshield or any window used for driving purposes.

Note: All safety glazing materials must be approved by the Department of Public Safety.

2.11. INTERIOR PANELS - All interior wall and ceiling panels shall be steel and of the body manufacturer's standard design except the panels beneath the windows shall be clear-coated galvanized embossed steel meeting ASTM A446. Also the stepwell and riser panels in the service door entryway shall be clear-coated galvanized steel (embossing not required). Galvalume, aluminized steel, and aluminum over steel panels are acceptable for use beneath the windows and in the entryway.

2.11.1. Design - Front and rear panels shall be formed to present a smooth, pleasing appearance. Roof panels shall be continuous from header to header. If the ceiling is constructed so as to contain lapped joints, the forward panel shall be lapped by the rear panel and all exposed edges shall be beaded, hemmed, flanged, or otherwise treated to minimize sharp edges.

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- 2.11.2. Attachment - All interior panels shall be attached to the frame structure by bolts, rivets, or by any well-designed method utilizing self-locking panels, locking panel strips, or clips. Regardless of the method used, the panels shall be attached so that vibration, rumbling, and popping will be at a minimum.
- 2.12. FLOOR - The floor system (see Par. E.2.1.1.2.) shall be of the type, grade, and thickness of steel specified in Table No. 10 or approved equal (see Par. E.3.1. for requirements for access port to fuel sending unit).
- 2.12.1. Construction and Installation - The floor panels shall run the full width of the floor and shall be supported on all outside edges by a longitudinal frame member. The floor panels shall be welded, riveted, or bolted to the main and auxiliary cross members and shall be joined so as to form a leakproof and dustproof floor. The main and auxiliary cross members shall extend the full interior width of the floor panels. The side posts or bow frames shall be securely welded, riveted, or bolted to the floor system and to the longitudinal frame members or gussets.
- 2.12.2. Cross Members - The cross members shall be spaced not more than 10 inches center-to-center. The floor panels and cross members shall be designed so as to completely and adequately support all fixed and changeable loads under all operating conditions without deformation of the underbody structure, strains to body, or fractures of member joints. The design and strength of the understructure shall be sufficient to eliminate the necessity of installing outriggers attached to the chassis except at the front entrance. The undersurface of the entire floor structure, including wheelhousing and stepwell, shall be sprayed with material at least 1/8-inch thick conforming to that specified in Par. E.1.10.
- 2.12.3. Insulation - When air conditioned is ordered (see Option Nos. 1 and 2 and Par. H.1.2) the floor shall be covered with 5/8-inch nominal thickness A-C or B-B exterior grade plywood manufactured in accordance with U.S. Product Standard PS 1-83. CDX interior grade plywood with exterior glue is acceptable when all surfaces including the edges of the wood are covered or sealed against the exterior environment. See Par. C.2.12.2. for plywood installation requirements.
- 2.13. FLOOR COVERING -
- 2.13.1. Aisle Material - Floor covering in the aisle shall be the aisle type, fire-resistant rubber or equivalent, and shall be nonskid, wear-resistant, and ribbed. Minimum overall thickness shall be 0.1875 inch measured from tops of ribs. Rubber aisle floor covering shall meet Federal Specification ZZ-M-71D.
- 2.13.2. Underseat Material - The floor in the underseat area (including wheelwells, and the areas under the driver's seat, wheelchairs, and toeboard except transmission inspection plate) shall be covered with fire-resistant rubber floor covering or equivalent having minimum overall thickness of 0.125 inch. Floor covering on toeboard shall be held in place by trim strip or molding.
- 2.13.3. Installation - Floor covering (except that on the toeboard) shall be permanently bonded to the floor with waterproof adhesive material and shall not crack when subjected to sudden temperature changes. All seams shall be sealed with waterproof sealer.
- 2.13.4. Trim - Seams shall be covered with extruded aluminum metal strips of a minimum 0.1875 inch high and 1 inch wide that shall be installed on each side of the aisle, the full length of the aisle, so as to secure both the edges of the aisle covering and adjoining edges of the underseat covering. Each aisle strip shall consist of not more than three pieces of the metal stripping. The strips shall be secured to the flooring with flush-mounted flat or low profile oval head screws; holes for the screws shall be countersunk. The screws shall be placed not more than 9-inches apart for the full length of the metal strips except that the ends of each piece of stripping shall have screws placed at not more than 0.75 inch from each end. Screws may be placed 9.5 inches apart only to avoid interference with floor sill members.
- 2.14. PASSENGER SEATING REQUIREMENTS - The bus passenger seats shall meet or exceed the knee spacing and crash protection requirements of FMVSS No. 222 and shall conform to the following:
- 2.14.1. Seat Frames -
- 2.14.1.1. Design and Material - The seat frames shall be constructed of steel of the type, size, and gauge necessary to meet the seat load deflection requirements of FMVSS No. 222. Seat frames legs shall be two, four, or six pedestal type. The seat backs shall slope backward to provide a comfortable seating angle. Seat backs that are set in a vertical plane or tilt forward are not acceptable.

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2.14.1.2. **Painting Requirements** - The entire seat frame, except that section of the back frame which is padded and upholstered, shall be thoroughly cleaned, primed, and painted. The paint shall have adhesive qualities which will not permit the removal of the paint by means of the thumbnail-scratch method without first chipping a starting place.

**2.14.2. Seat Installation -**

2.14.2.1. **Aisle Width** - The minimum aisle width between rows of seats shall be 12 inches. (See Par. G.2.1.1.3. for aisle width requirements on wheelchair lift-equipped buses.)

2.14.2.2. **Attachment** - Each leg shall be attached to the floor with at least 2 bolts, flat washers, lock washers, and nuts, or approved equal. Where it is impossible to use bolts and nuts at certain floor points due to main cross members or floor sill interference, thread-forming or cutting bolts and lock washers may be used.

2.14.2.3. **Knee Spacing** - Allowing for manufacturing tolerances, Texas requires the maximum allowable knee space on buses consistent with the overall standard body lengths (see Par. A.2.13. for the definition of knee spacing and Option No. 16 for increased knee space on all 24- through 71-passenger buses). These minima are generally not less than the following (see Table No. 9):

- (i) 24 inches for the 24-passenger bus
- (ii) 24 3/4 inches for the short wheelbase 71- and the 83-passenger buses.
- (iii) 25 inches for all other 35- through 77-passenger buses.

2.14.3. **Seat Cushions** - All 26-inch and all 39-inch seat cushions shall be designed to adequately support, respectively, two and three passenger of 125 pounds each. All seat cushion materials shall meet or exceed the requirements of FMVSS No. 302. The seat cushion shall be either of one-piece construction or may be constructed of more than one piece at the manufacturer's option. The seat cushion unit shall consist of a base, a one- or two-piece polyurethane foam cushion, and upholstery, meeting the following requirements:

2.14.3.1. **Base** - The base shall be nominal 1/2-inch thick, interior grade, C-D plywood with exterior grade glue, identification index 32/16, manufactured in conformance with U.S. Product Standard PS 1-83 and identified as to veneer grade and glue bond type by the trademarks of an approved testing agency. Plywood with blue stain in sapwood is not acceptable.

Alternatively, the base may be made of "Donnite" material, manufactured by the Donnite Corporation, Flora & Harrison, Plymouth, Indiana 45563, of equal or better strength and thickness.

**2.14.3.2. Two-piece Polyurethane Foam Cushion Assembly -**

- (i) **Design** - The two-piece foam cushion assembly shall be constructed of unfilled polyurethane foam conforming to the physical requirements in Table No. 11 (rebonded polyurethane foams are not acceptable for seat cushion or seat stiffeners):

**TABLE NO. 11**

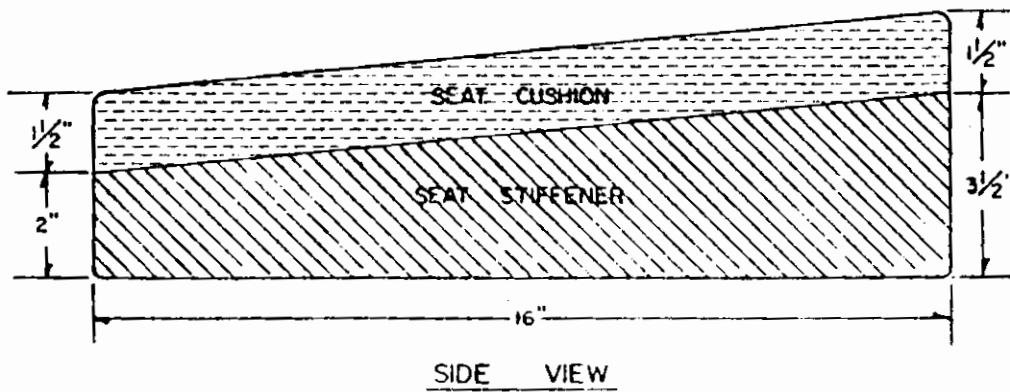
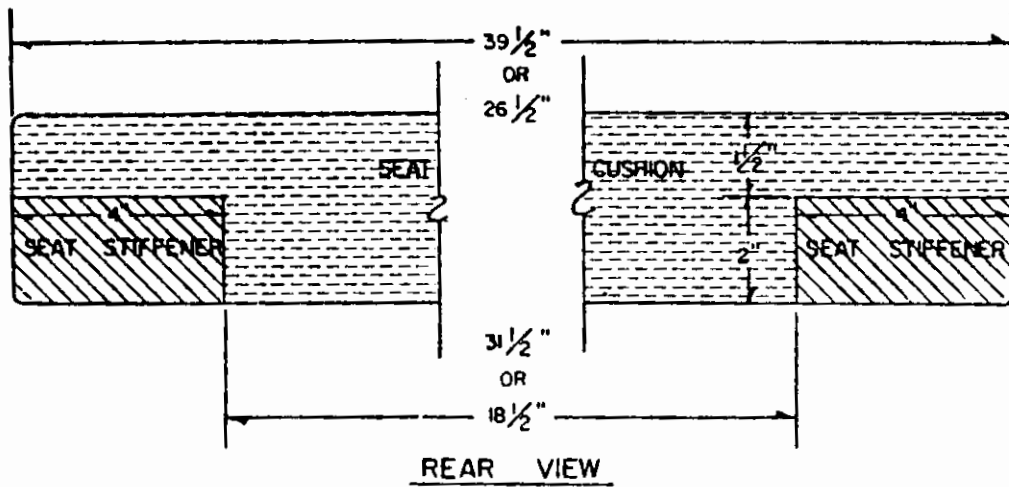
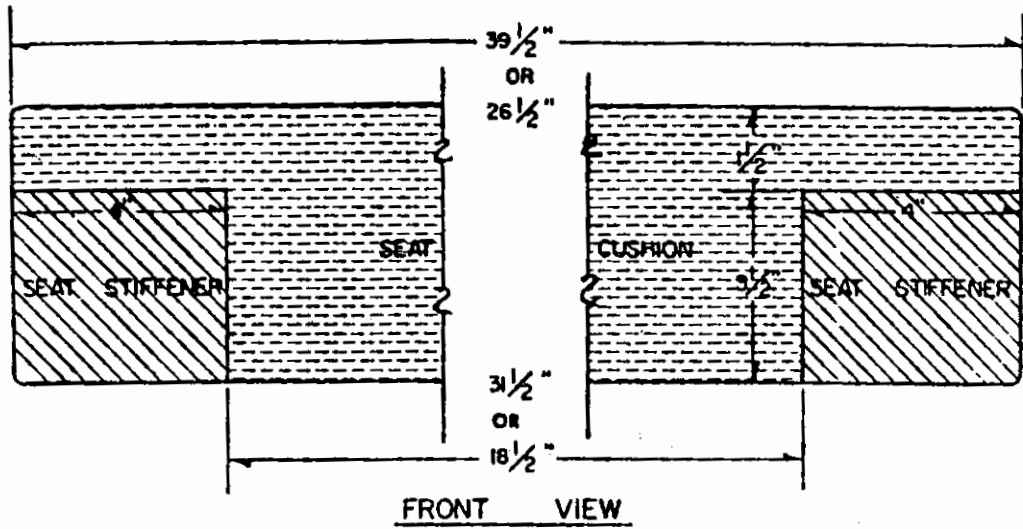
**TWO-PIECE CUSHION ASSEMBLY  
PHYSICAL PROPERTIES  
(ASTM D 3574)**

ITEM	SEAT CUSHION	SEAT STIFFENERS
Density, lbs/cubic foot, Min	1.8	2.4
Load Deflection, 4" thick @ 25% Indentation Min	38	80
Indentation Load, Ratio, 65%/25%, Min	1.9	2.5
Compression Set, 50% Deflection (22 hrs @ 158°F), Max	20	20
Tensile Strength, lbs/square inch, Min	12	12
Tensile Elongation, %, Min	225	75
Tear Resistance, lbs/inch, Min	2.0	1.5

- (ii) **Construction** - The seat cushion assembly shall be fabricated in accordance with the nominal dimensional requirements as shown in Fig. 2. In the two-piece assembly, the top 1.5 inches of the cushion shall be of one continuous foam piece. All parts of the seat cushion and the seat stiffeners shall be securely cemented or otherwise bonded together to form the seat cushion assembly shown in Fig. 2.

FIGURE 2

SEAT CUSHION ASSEMBLY



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2.14.3.3. One-Piece Polyurethane Foam Cushion Assembly -

- (i) Design - The one-piece foam cushion shall be solid polyurethane foam conforming to the physical requirements in Table No. 12 (rebonded or molded polyurethane foams are not acceptable for seat cushion):

TABLE NO. 12

ONE-PIECE CUSHION  
PHYSICAL PROPERTIES  
(ASTM D 3574)

ITEM	ONE-PIECE SEAT CUSHION
Density, lbs/cubic foot, Min	3.0
Load Deflection, 4" thick @ 25% Indentation, Min	50
Indentation Load, Ratio, 65%/25%, Min	2.3
Compression Set, 50% Deflection (22 hrs @ 158°F), Max.	20
Tensile Strength, lbs/square inch, Min	7.5
Tensile Elongation, %, Min	110
Tear Resistance, lbs/inch, Min	1.5

- (ii) Construction - The seat cushion dimensions shall be in accordance with the nominal dimensional requirements as shown in Fig. 2.

2.14.3.4. Upholstery - The seat cushion unit shall be covered on top and four sides with a vinyl resin-coated upholstering material as follows:

- (i) Material - These materials shall have a regular fire-resistant treatment and shall be artificial leather equal to the coated fabrics listed in Table No. 13.
- (ii) Welting - There shall be welting on exposed seams of the seat back and cushion.
- (iii) Thread - The upholstery material shall be securely sewn with a thread meeting the requirements of Federal Specification V-T-295d. The thread in the needle and the thread in the looper (bobbin) of double thread machines shall be size F, Type II (Twisted Bonded Multiple Cord), and size E, Type I (Twisted Soft Multiple Cord), respectively. The thread used in the needle and through the looper shall be Size F (Monofilament), Type III, for single thread machines.

TABLE NO. 13

UPHOLSTERY

MANUFACTURER/ BRAND NAME	FABRIC	BACKING	WEIGHT	
			Oz./yd <sup>2</sup>	Oz./lin.yd.
Naugahyde	1037R	1.06 Broken Twill	28.0	42.0
Athol	1042FR	Polyester Cotton Knit	28.0	42.0
Masland-Dura	6042 MXP-076	Polyester Cotton Twill	25.5	38.0
*General Tire	2.73	Polyester Drill	24.0	38.0
*Uniroyal	E 7097-1	Polyester Knit	25.5	38.0
*Athol	536FR	Polyester Twill	25.5	38.0

\*Approved equal

2.14.4. Passenger Seat Belts, Optional - (see Par. E.3.12.).

2.14.5. Seat Back Heights - When so specified in the Invitation for Bids (see Option 41), seat back heights shall be increased 4 inches over the seat back heights required by FMVSS No. 222.

2.15. SEATING REQUIREMENTS, DRIVER -

2.15.1. Seat Design - The base of the driver's seat shall be of the adjustable pedestal type or the platform type having an adjustment range of approximately 4 inches "Fore and Aft", and a separate minimum one-inch vertical adjustment. The back of the driver's seat shall be heavily padded and formfitted.



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- 2.15.2. Installation - The pedestal or platform shall be mounted with bolts, flat washers, lock washers, and nuts except where it is impossible to use bolts and nuts at certain floor points due to main cross members or floor sill interference. Thread-forming or cutting bolts and lock washers may be used at these points.
- 2.15.3. Seat Belts and Seat Belt Assembly - A type 1 or 2 seat belt assembly conforming to FMVSS No. 209 shall be provided for the driver. The belt assembly shall be equipped with at least one reel-type locking retractor incorporated into the mounting bracket. The location of the seat belt anchorage shall conform to SAE Standard J383 with the driver's seat adjusted to its rearmost position. The anchored ends of the belt assembly shall be fitted with a minimum 8-inch semirigid plastic boot which will prevent that portion of the belt between the buckle and the retractor reel from contacting the floor and to keep the belt from hitting the feet of the passengers in the front seat directly behind the driver. The seat belt assembly shall be anchored in such a manner or guided at the seat frame so as to prevent the driver from sliding sideways from under the belt.
- 2.15.4. Driver's Seat Access - There shall be unrestricted access to the driver's seated position from either the aisle or the right service door without the operator having to climb over the engine cover or any other object. The minimum space between the driver's seat (in the rearmost position) and the engine cover or other object (except seat belt anchorage) at the floor and at the seat level shall be not less than 6 inches.
- 2.16. **SEAT BARRIERS** - Seat barriers shall be furnished and installed in accordance with FMVSS No. 222. The front barriers shall not infringe upon the area required for safety and operating equipment. The seat barrier on the right front shall have a hand rail installed on its front side for use by passengers entering or exiting the bus (see Par. E.2.8.3.). These grab handles shall be stainless steel, polished aluminum, or chrome-plated steel. Method of attachment shall be the body manufacturer's option.
- 2.17. **WHEELHOUSING** - The wheelhousing shall be of the type, grade, and thickness of steel specified in Table No. 10 or approved equal. The wheelhousing shall be constructed of a maximum of three pieces and of arched design and shall be attached in such a manner so as to form a waterproof and dustproof seam. The size of the wheelhousing shall be such that tire chains will have proper clearance. The edges inside the bus shall be rounded to prevent injury to the passengers. The wheelhousing shall be such that when attached to the body, the strength of the resulting structure shall be equivalent to or greater than that section of body that has been removed to receive the wheelhousing. (See Par. E.1.10. for undercoating requirements.)
- 2.18. **VENTILATION** - The bus shall be equipped with a suitable, controlled ventilation system of sufficient capacity to maintain a satisfactory ratio of outside to inside air under normal operating conditions without opening windows except in warm weather. A static-type, nonclosable exhaust ventilator shall be installed in the low-pressure area of roof.
- 2.19. **ACCESS PANELS** - Any panel used for access to the engine radiator or radiator overflow container and installed in the passenger compartment shall have a keyed lock. (This does not include the engine cover.)

## **E.3. ACCESSORIES, REQUIRED AND OPTIONAL -**

- 3.1. **ACCESS PORT** - An access port with cover plate shall be installed above the fuel sending unit. It shall be of sufficient size to service fuel sending units and fuel pumps installed in the fuel tank. An access port is not required on the 24-passenger bus or on buses with front-mounted wheelchair lifts (see G.1.8.3.).
- 3.2. **BACKUP ALARM** - An automatic, audible backup warning alarm meeting the requirements of type C, 97 dB(A), SAE J994 (except for 12-volt system) shall be installed behind the rear axle.
- 3.3. **DEFROSTERS** - Defrosting equipment shall keep the windshield, the window to the left of the driver, and the glass in the service door clear of fog, frost, and snow, using heat from the heater and circulation from fans. All defrosting equipment shall meet the requirements of FMVSS No. 103. Any circulating fan used in defogging and installed on the curb side of the bus front shall be mounted on the windshield header so as to protect the fingers, hair, and clothing of entering and departing passengers.
- 3.4. **FIRE EXTINGUISHERS** - School buses shall be equipped with one of the fire extinguishers listed below:
- 3.4.1. **Standard Fire Extinguishers** - Each bus shall be equipped with at least one refillable stored pressure Multipurpose Dry Chemical type (or approved equal) fire extinguisher of minimum 5-pounds capacity, mounted in an extinguisher manufacturer's automotive type bracket, and located in the driver's compartment in full view of and readily accessible to the driver. The fire extinguisher shall bear the Underwriters Laboratory Listing Mark of not less than 2A 20-B:C rating. Extinguishers shall be furnished with a hose, pressure gauge, and metal head.

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3.4.2. Halon type Fire Extinguisher - An approved equal fire extinguisher is the American Safety Products (ASP) Model 13000, 2A 40-B:C Rating. (For those who prefer this type, this fire extinguisher is available with a 13-pound charge of combined halon gas. It is not permissible to transport these units after refilling, therefore the manufacturer offers a five-year warranty and replacement of discharged units with a new unit at half price.)

3.5. FIRST AID KIT - Buses shall have a removable metal first aid kit container mounted in an accessible place within the driver's compartment. The compartment shall be marked to indicate the location of the kit. Number of units and contents for each kit shall be as follows:

- 2 - 1 in x 2 1/2 yds. adhesive tape rolls
- 24 - sterile gauze pads 3 in x 3 in
- 100 - 3/4 in x 3 in adhesive bandages
- 12 - 2 in bandage compress
- 12 - 3 in bandage compress
- 2 - 2 in x 6 yds. sterile gauze roller bandages
- 2 - nonsterile triangular bandage approx. 40 in x 54 in, 2 safety pins
- 3 - sterile gauze pads 36 in x 36 in
- 3 - sterile eye pads
- 1 - rounded end scissors

### 3.6. HEATERS AND RELATED COMPONENTS -

3.6.1. Standard Heater - Each bus shall be equipped with a heavy-duty combination fresh air and recirculating air heater(s). The heater(s) shall be a hot water type. The BTU/hr rating shall be in accordance with Standard SBMI No. 001. These standard heaters shall have minimum free flow output ratings as follows:

3.6.1.1. 24- and 35-passenger Buses - 45,000 Btu/hr.

3.6.1.2. 47-passenger and Larger Buses - 80,000 Btu/hr.

3.6.2. Auxiliary Heater - When so specified in the Invitation for Bids (see Option 11), a second recirculating heater shall be furnished. It shall be mounted near the rear of the bus and in such a manner so as not to interfere with the securing of seats to the floor, as specified in Par. E.2.14.2.2. The BTU/hr rating shall be in accordance with SBMI Standard No. 001. Heated conduits inside the buses shall be insulated or shielded to prevent injury to the driver or passengers. The heater shall have a minimum output rating (recirculating air rating - not fresh air intake rating) as follows:

3.6.2.1. 24- and 35-passenger Buses - 40,000 Btu/hr.

3.6.2.2. 47-passenger and Larger Buses - 60,000 Btu/hr.

**NOTE:** Auxiliary heaters on diesel-powered buses shall be furnished with a water circulating pump.

3.6.3. Installation - The standard heater shall be installed near the front of the bus body with the controls readily accessible to the driver; the auxiliary heater shall be installed near the rear of the bus. Heater hose connections shall be installed above the floor of the bus body and through the firewall to the engine compartment. Heated conduits inside the bus shall be insulated or shielded to prevent injury to the driver or passengers. The length of the hot water hoses shall be as short as possible consistent with good installation practices; however, the hoses shall not be installed in such a manner so as to interfere with normal engine maintenance operations, such as the removal of the engine air cleaner. The hoses shall not dangle or rub against the chassis or sharp edges and shall not interfere with or restrict the operation of any motor function, such as the spark advance of an automatic distributor. Heater hose shall conform to SAE 20R3, Class C, as defined in SAE Standard J20e. Each heater installation shall include two all brass shutoff valves or cocks. Installation of the shutoff valves or cocks shall be as close as possible to the water pump and motor block outlets. The hoses shall be adequately supported to guard against excessive wear due to vibration. These cutoff valves or cocks shall be installed as follows:

3.6.3.1. One between the heater hose connection and the water pump outlet, and

3.6.3.2. One between the heater hose connection and the engine block.

3.6.4. Bleeder Valves - Any heater(s) installed by the body manufacturer shall have accessible air bleeder valves installed in the return lines.

3.6.5. Service Accessibility - Heater motors, cores, and fans shall be readily accessible for service. Access panels (removable without removing driver's seat) shall be provided as required for maintenance.

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**3.7. LUGGAGE RACK** - When so specified in the Invitation for Bids (see Option 12), a luggage rack shall be mounted on top of the bus meeting the following requirements:

**3.7.1. Design and Material** - The floor or bottom of the luggage rack shall consist of minimum 19-gauge steel stiffened by the application of spot-welded pressed channels or pressed-in panels. The bottom shall be flat and shall be adequately perforated for water drainage. The side rails shall be a minimum of 0.75 inch O.D. steel tubing having a wall thickness of at least 0.0625 inches or channels of equal strength. The rack shall have a minimum of three side rails on all four sides. The top rail shall be approximately 12 inches above the flat bottom floor of the rack. The right and left sides of the rack shall have a minimum of four footman loops each to accommodate tarpaulin tie downs straps. The vertical posts shall not extend above the top rail. The ends and sides from the flat bottom floor to the roof of the bus shall be enclosed with metal flashing. The rack shall have no sharp or rough edges to cause excessive tarpaulin wear. A metal ladder mounted at the rear of the bus shall provide access to the luggage rack. (Folding steps are not acceptable.) The minimum width shall be 60 inches and the length dimensions of the rack furnished for the various sizes of buses shall be:

**3.7.1.1. 53-passenger Bus or Less** - Minimum of 81 inches, and

**3.7.1.2. 59-passenger Bus and Larger** - Minimum of 135 inches.

**3.7.2. Installation** - The luggage rack shall be mounted to the roof with rivets or bolts, nuts, and lock washers attached to each roof bow under the rack and where required by standard industry practices.

**3.7.3. Color** - The complete luggage rack shall be painted either black or yellow in accordance with the manufacturer's standard practice.

**3.8. EXTERIOR MIRRORS** - Exterior mirrors shall conform to the requirements of FMVSS No. 111. Each school bus shall be provided with exterior mirrors and brackets as described below:

**3.8.1. Crossover Mirrors** - An exterior wide angle (crossview) mirror (minimum 40 square inches of surface area) shall be installed on the left front of the bus and shall comply with the requirements of Section IV B.1.e of Federal Safety Standard No. 17, or as amended. This mirror shall have a tripod bracket assembly. Mirror mounting and backing shall be metal or a high-impact plastic such as a polycarbonate/polyethylene terephthalate blend, or approved equal.

**Example of an approved equal:** Mirror Lite Bus Boy with single bracket and six mounting fasteners.

**3.8.2. Localized Viewing Mirror (all Buses)** - A minimum 40 square inch convex mirror shall be installed on a tripod bracket assembly on the right front fender of each bus (right front of forward control buses; see Par. E.3.8.3. below). This mirror shall provide localized viewing of the total front area and right-side area back to the service door. This mirror shall be one of the following or approved equal:

**3.8.2.1. Grote Model No. 12182/3, or**

**3.8.2.2. Sure Plus Model No. 1010.**

**3.8.3. Localized Viewing Mirror (Forward-control Buses Only)** - At the option of the body manufacturer, in lieu of the above localized viewing mirror, one or two convex mirrors may be furnished on the right side only, either mounted securely to the bracket of the exterior rearview mirror, or on a separate tripod bracket with the following provisions: 1) the mirror shall be adjusted to provide for localized viewing of the area from the front right corner of the bus back to the rear of the service door, and 2) the mirror(s) shall also provide a view of the front of the bus which is not within the direct view of the driver. The mirrors shall be the type described in Par. E.3.8.2. above.

**3.8.4. Rearview Mirrors** - Exterior rearview mirrors shall be adjustable to allow any driver to have visibility beyond the rear wheels at ground level. Mirrors and brackets shall be provided as follows:

**3.8.4.1. Mirrors** - Two metal-backed (or high impact plastic backing such as polycarbonate/polyethylene terephthalate blend), exterior, clear-vision rearview mirrors not less than 6 inches wide by 16 inches long shall be mounted outside, one to the left and one to the right of the driver. The right-side rearview mirror shall be the split view (dual view) type, such as the Grote Model 16041, or the Duplex "T" No. T-616 as manufactured by Elmsford Diecasting Company, 4 Vernon Lane, Elmsford, New York 10523; or a split view mirror with a prefocused convex (blind spot) mirror such as Sure-View Model 7002, manufactured by Sure-View, Inc., 1337 North Meridian Street, Wichita, Kansas 67203, or approved equal. Comparable

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models in flat mirror configuration of the same brands are approved for use on the left side.

- 3.8.4.2. Bracket - Each exterior mirror shall be mounted in the brackets and assemblies shown on Texas State Purchasing and General Services Commission Drawings numbered 040-35(a), 040-35(3), 040-35(4), 040-35(5), 040-35(6) and 040-35(7), dated November 15, 1968. The brackets shall be mounted on the left front and right front of the bus body and cowl. The parts, as shown on Drawings numbered 040-35(2) and 040-35(3), must be formed to fit the individual configuration of each manufacturer's body and cowl design. Long dimensions of Texas mirror brackets may be adjusted as required to fit the configurations of buses.
- 3.8.4.3. Mounting - Mounting of exterior mirrors to the bus body shall be by means of bolts, nuts, and lock washers, where possible; otherwise No. 10 hexagon head sheet metal bolts with star lock washers or No. 10 hexagon head sheet metal screws with serrated surface shall be used.
- 3.8.4.4. Painting Requirements - Brackets and assemblies of all exterior rearview and crossover mirrors shall be cleaned and prepared for painting in accordance with Federal Specification TT-C-490B, Type I or II. The metal backs of stainless steel, aluminum, and chrome-plated exterior and crossover mirrors, if painted, and the backs of all other metal-backed exterior and crossover mirrors shall be finished in black (Color No. 37038 of Federal Standard No. 595a).

**NOTE:** Care must be exercised to guard against reducing exterior mirror sizes below minimums. The required field of view shall not be impaired.

- 3.9. **INTERIOR MIRROR** - A clear-vision, interior rearview mirror conforming to FMVSS No. 111, with at least 6" x 30" size vision area, affording a good view of the road to the rear as well as of the passengers, shall be furnished and installed. The mirror shall be made of safety glass and have rounded corners and protected edges.
- 3.10. **MUD FLAPS** - When so specified in the Invitation for Bids, (see Option 14), mud flaps of durable, heavy-duty rubberized construction, complete with brackets, shall be installed behind each set of rear wheels. The mud flaps shall be comparable in size to the width of rear wheelhousing and shall reach within approximately 8 inches of the ground when the bus is empty. They shall be mounted at a distance from the wheels that will permit free access to spring hangers for lubrication, and to prevent their being pulled off when the bus is moving in reverse. There shall be no advertisement on the mud flaps.
- 3.11. **REVOLVING STROBE LIGHT** - When so specified on Invitation for Bids (see Option 22), an optional white flashing strobe light meeting the following requirements shall be provided:
  - 3.11.1. Design - The lamp shall have a single clear lens emitting light revolving 360 degrees around a vertical axis. The light source shall be minimum of 50 candlepower and flash 60-120 times per minute. The base of the lamp shall be metal or approved equal and installed by a method which seals out dust and moisture. A manual switch is required for operation and a pilot light to indicate when the light is in operation shall be included. Wiring shall be installed inside the bus walls.
  - 3.11.2. Mounting - The strobe light shall be permanently installed near the centerline on the school bus roof and not more than one-third of the body length forward from the rear edge of the bus roof. It shall not extend above the roof more than approximately 6.5 inches.
- 3.12. **SEAT BELTS, PASSENGER** - When so specified in the Invitation for Bids (see Option 18), seat belts conforming to FMVSS Nos. 209 and 210 shall be provided for each passenger position. The seat belts shall meet the following requirements:
  - 3.12.1. Design - Seat belts shall have a buckle end and an attaching end which are adjustable to fit passenger sizes as required by FMVSS Nos. 208 and 209. Buckles shall be of the plastic-covered push button design. Long and short ends shall be mounted alternately with the short end on the aisle. If possible, the design shall prevent fastening the belts across the aisle.
  - 3.12.2. Colors - The belt assemblies shall be alternately color coded with contrasting colors. All aisle seats on the same side of the bus shall have belts with the same color. Two-position seats shall use two colors; three-position seats may use two or three colors.
- 3.13. **STIRRUP STEPS** - There shall be one stirrup step and a suitably located handle on each side of the bus body front for easy accessibility in cleaning the windshield and lamps. The stirrup step on forward-control buses shall be on or in the bumper. Stirrup steps are not required on the 24-passenger bus unless necessary to clean windshield and windows.

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**3.14. STOP ARM** - When so specified on Invitation for Bids (see Option 21), a school bus stop arm meeting SAE J1133 and the following requirements shall be provided:

3.14.1. Design - The sign shall be octagon-shaped, constructed of zinc-coated steel or aluminum and painted with a polyurethane finish. It shall have a minimum 1/2-inch wide white border and the word "STOP" in white letters at least 6 inches high against a red background on both sides. Double-faced red, alternately flashing lamps, one each at the top and bottom (visible from each side of the structure) shall be connected to and flash with the required school bus red flashing signal lamp circuit when the arm is extended. The arm mechanism may be activated by air pressure, electricity, or by vacuum. The school may specify a reflectorized surface if desired.

3.14.2. Mounting - The stop arm shall be installed on the left side of the school bus near the front cowl section.

**3.15. SUN VISOR** - A two-post, adjustable sun visor with a minimum size of 6 inch by 30 inches and a minimum thickness of 0.125 inches and constructed of tinted plexiglass shall be furnished on each bus. Means shall be provided for tension adjustment. It shall be installed above the interior windshield on the driver's side or it may be mounted to the inside rearview mirror at each end using lock type nuts. If this type of mounting is used, the mirror shall have an adjustable reinforcing bracket at each end to reduce any vibration distortion caused by the weight of the sun visor.

**3.16. TOOL COMPARTMENT** - When so specified in the Invitation for Bids (see Option 31), a metal container of adequate strength and capacity shall be provided for storage of tire chains, tow chains, and such tools as may be necessary for minor emergency repairs. This storage container shall be located either inside or outside the passenger compartment. However, if it is located inside the passenger compartment, it shall be provided with a separate cover; a seat cushion shall not be used as this cover. This tool compartment shall be capable of being securely latched and shall be fastened to the floor in the right front or the right rear of the bus.

**3.17. WINDSHIELD WIPERS AND WASHERS** -

3.17.1. Wipers - Each bus shall be equipped with two, 2-speed electric motor-driven heavy-duty windshield wipers. The arms and blades shall be of sufficient size to provide clear vision for the driver during a heavy rain. The motors furnished shall be guaranteed to operate the wipers under all driving conditions and shall be American Bosch Model WWC, or approved equal.

3.17.2. Washers - A vacuum-, electric-, or air-operated windshield washer shall be furnished and installed. The washer shall have a minimum reservoir capacity of one quart of liquid and shall direct a stream of water into the path of travel of each windshield wiper blade each time the actuating button is operated.

**E.4. APPROVAL OF NEW BUS BODIES** - Procedures for approving a new bus body for 24- through 83-passenger school buses shall be as follows:

**4.1. SUBMISSION OF REQUEST** - Submit a written request that the body be approved along with the following:

4.1.1. Letter - Letter stating that the body meets or exceeds each and every applicable requirement in Texas specification No. 070-SB-90.

4.1.2. Literature and drawings - See Par. A.5.6.

**4.2. REVIEW OF REQUEST** - The Specification Section will review the literature and drawings and advise the vendor or manufacturer by letter of the results of this review. A copy of this letter will be furnished to the School Bus Committee. If this review verifies the bus body meets or exceeds the requirements of this specification, the vendor or manufacturer shall contact the SPGSC Purchaser to arrange for the testing of the bus body. The Purchaser will consult with the TEA Representative and inform the vendor or manufacturer of the name(s) of the school district(s) willing to test a bus body.

**4.3. SCHOOL DISTRICT COOPERATION** - The vendor or manufacturer must obtain the cooperation of one of the named school districts in agreeing to test the bus according to the paragraph below on test procedures and to provide a report to the SPGSC Specification Section on the form provided (see copy of the Form entitled, "Three-Month Test of New School Bus Bodies" on page 95).

**4.4. ORDERING** - The vendor or manufacturer shall then contact the SPGSC Purchaser and TEA Representative about ordering the school bus with the subject body.

**4.5. TEST PROCEDURES** - The bus shall be tested for a period of not less than three months during the regular nine-month school term, preferably on a variety of routes and on activity trips. The vendor or manufacturer shall request the school district to complete the report (see Par. 4.3. above) and mail to the SPGSC.

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4.5.1. The vendor or manufacturer shall arrange for the school bus to be brought to Austin, Texas before, during, or after the three-month test for inspection by the members of the School Bus Committee.

4.5.2. The bus body shall be inspected by the Specification Section using the current School Bus Inspection Check List.

4.6. **INSPECTION** - The State Inspector shall visit the manufacturer's plant and observe manufacturing components and fabrication of a typical bus body, preferably built to Texas specifications. A report of this inspection will be made available to the School Bus Committee.

4.7. **REVIEW OF SCHOOL DISTRICT'S REPORT** - Upon receipt of the school district's report and after inspection by the School Bus Committee and the State Inspector, the Specification Section will review the reports and make a recommendation at the next meeting of the School Bus Committee that the new body model be either approved or disapproved.

4.8. **SCHOOL BUS COMMITTEE ACTION** - The School Bus Committee will act on this recommendation and, if approved, the bus body will be added to the Class 070-APL.

**NOTE:** Once a bus body is approved for one passenger capacity, other capacities of this same body differing only in length and capacity need not be tested prior to approval. The vendor or manufacturer shall request by letter that these other body models be added to the Approved Products List.

## F. 24- THROUGH 83-PASSENGER CHASSIS SPECIFICATIONS

### F.1. GENERAL REQUIREMENTS -

- 1.1. **GENERAL SPECIFICATIONS** - The requirements for gross vehicle weight ratings, gross axle weight ratings (front and rear) and tire sizes and load ranges, as specified in Table Nos. 14 through 28 for each size chassis are minimum requirements (see Par. A.4.4.). The requirements are for school buses with standard equipment. The added weights of optional equipment, such as air conditioning, luggage racks, lifts for the physically impaired or other heavy accessories were not considered in establishing the capacity ratings to be certified for the chassis. If additional optional equipment is ordered which necessitates increased capacity ratings of either axles, springs or tires, it is the responsibility of the vendor to furnish them so that proper certification can be made on the vehicle.
- 1.2. **COLOR** - The chassis, including bumpers and wheels, shall be painted black (Color 17038); cowl, fenders, and hood shall be painted school bus yellow (Color 13432).

### F.2. CHASSIS FRAME AND RELATED COMPONENTS -

- 2.1. **CHASSIS FRAME SIDE MEMBERS** - Each frame side member shall be of one-piece construction. If the frame side members are extended, such extension shall be designed, furnished, and guaranteed by the installing manufacturer. The installation shall be made by either the chassis or body manufacturer. Extensions of frame lengths are permissible only when such alterations are welded on behind the hanger of the rear spring. This specification does not permit wheelbase extensions. Any welding, heating (for frame straightening or repairs), or the drilling of holes in chassis frame members shall be in accordance with chassis manufacturer's recommendations.
- 2.2. **BUMPER, FRONT** - The front bumper shall be furnished by the chassis manufacturer and must extend to the outer edges of the body at the bumper top line (to assure maximum fender protection). The front bumper on the 83-passenger bus shall be heavy duty transit type, not less than 0.1875 inch by 9.75 inch steel. It must be of sufficient strength to permit pushing a vehicle of equal gross weight without permanent distortion to the bumper, or vehicle. The bumper shall be painted black (color No. 17038).
- 2.3. **FUEL TANKS** - Standard and auxiliary fuel tanks shall meet FMVSS No. 301-75 as applicable to school buses and shall meet the current design objectives of the SBMI:
  - 2.3.1. **Standard Fuel Tanks** - The standard fuel tank for 47- through 83-passenger school buses shall have a minimum capacity of 60 gallons, except the 47-passenger forward control bus may have a minimum capacity of 45 gallons. The 24- and the 35-passenger buses shall have fuel tanks with minimum capacities of 20 and 30 gallons, respectively. The tank(s) shall be mounted, filled, and vented entirely outside the body (see Par. F.4.5.3.).
  - 2.3.2. **Auxiliary Fuel Tank(s)** - When so specified in the Invitation for Bids (see Option 9), the 24- and the 83-passenger buses shall be furnished with minimum capacity fuel tank or tanks of 30 and 90 gallons, respectively. The auxiliary fuel tank for the 24-passenger bus shall be furnished and installed by the chassis manufacturer. 35- through 77-passenger buses do not have auxiliary fuel tanks available.
  - 2.3.3. **Material** - Each tank (including auxiliary fuel tanks) shall be constructed of 16-gauge terneplate or equivalent and shall be equipped with baffles. Each tank may be mounted on either the right or left side of the chassis.
- 2.4. **HOOD, TILTING** - A forward-tilting hood, giving access to the engine compartment shall be furnished on conventional bus chassis (except 24- and 83-passenger buses).
- 2.5. **STEERING, POWER** - The bus shall be furnished with the chassis manufacturer's standard power steering which will provide safe and accurate performance at maximum load and speed. The mechanism must provide for easy adjustment for lost motion unless the unit doesn't require adjustment due to design. No changes shall be made in the power steering apparatus which are not approved by the chassis manufacturer.

### F.3. AXLES, SUSPENSION, AND RELATED COMPONENTS -

#### 3.1. AXLES -

- 3.1.1. **Axle Capacities** - Axle capacities and gross axle weight ratings (GAWRs) shall be as specified in Table Nos. 14 through 28 for each make of vehicle. Increased axle capacities shall be furnished to accommodate optional equipment such as diesel engines or other heavy accessories as required (see paragraphs A.4.4., F.1.1., and G.1.8.2.).
- 3.1.2. **Rear Axle Ratios** - Rear axle ratios shall be compatible with the required engines and gradeability requirements for school buses driven at governed top rated road speeds of 55 MPH minimum (see Par. F.4.1.4.).

**F. 24- THROUGH 83-PASSENGER CHASSIS SPECIFICATIONS**

**3.2. BRAKES AND RELATED COMPONENTS -**

- 3.2.1. Air Brakes and Associated Equipment - Each 59-, 65-, 71-, 77- and 83-passenger chassis shall be equipped with full air brake and parking brake systems as standard equipment. Full air brake systems shall meet the requirements of FMVSS No. 121 as applicable to school buses. The following equipment shall be furnished as follows:
- 3.2.1.1. Air Compressor - The air compressor on 83-passenger buses shall have a minimum 12 cu.ft. capacity. Other sizes of buses equipped with air brakes shall have an air compressor of sufficient capacity to provide adequate air pressure for the air brake system.
  - 3.2.1.2. Air Tanks - The air tank(s) for 83-passenger buses shall be equipped with automatic valves to drain condensation from the tanks.
  - 3.2.1.3. Automatic Moisture Ejectors - When so specified in the Invitation for Bids (see Option 13), automatic moisture ejectors shall be furnished and installed (for air brake equipped buses only; not applicable to 83-passenger buses).
  - 3.2.1.4. Automatic Slack Adjusters - When so specified in the Invitation for Bids (see Option 19), four automatic slack adjusters shall be furnished and installed, two at the front and two at the rear (for air brake equipped buses only).
- 3.2.2. Hydraulic Brakes - The 24-, 35-, 47- and 53- passenger school bus chassis shall have as standard, hydraulic service brakes, emergency stopping system, and parking brakes meeting the requirements of FMVSS No. 105-83. If so specified in the Invitation for Bids (see Option 5), the 59-, 65-, 71-, and 77-passenger school buses shall be equipped with hydraulic brakes.

3.3. SHOCK ABSORBERS - Two front heavy-duty, double-acting shock absorbers shall be installed.

3.4. SPRINGS - Springs or suspension assemblies shall be of ample resiliency under all load conditions and of adequate strength to sustain the loaded bus without evidence of overload. Springs or suspension assemblies shall be designed to carry their proportional share of the gross vehicle weight as shown in Tables Nos. 14 through 28. Rear springs shall be of the progressive type. If leaf type front springs are used, stationary eyes shall be protected by a fullwrapper leaf in addition to the main leaf.

**3.5. TIRES AND WHEELS -**

- 3.5.1. Tires - All standard tires shall be the steel belted radial tubeless type except the 24-passenger bus shall have bias belted tires as standard. All tires and tubes shall be new and the tread style furnished shall be the tire manufacturer's standard design and the brand normally furnished on regular production orders unless otherwise specified in the Invitation for Bids (see Options 27, 28, 29, and 30). All tires shall be "Original Equipment Line Quality". Schools may order tube type steel belted radial, or tubeless type bias belted, or tube type bias belted tires as optional equipment on 35- through 77-passenger buses by selecting Option Nos. 27, or 28, or 29, respectively, on their bid requisition. For tire size and load range for each size chassis, see Table Nos. 14 through 28 and the major components chart.
- 3.5.2. Wheels - Each chassis shall be equipped with 6 standard steel disc type wheels. When so specified in the Invitation for Bids (see Options 32, 33, and 39), the following optional wheels and carrier shall be furnished on the chassis as indicated:

- 3.5.2.1. Wheel, Spare, (without Carrier, Tire, or Tube) - (for 24- through 77-passenger buses; see Option No. 32).
- 3.5.2.2. Wheel, Spare, Mounted (with Carrier but not tire or tube; for 35- through 83-passenger only; see Option No. 33). **NOTE:** Carrier not available for 24-passenger bus; spare wheel only is available on this option.
- 3.5.2.3. Wheels, Chassis, Cast Spoke (All Wheels) - (for 35- through 77-passenger bus - See Option No. 39).

3.6. HUBODOMETERS - Each chassis shall be equipped with one hubodometer with standard mounting bracket which shall be calibrated in miles and installed by the manufacturer. The preferred mounting location is on the right rear axle drive wheel. The hubodometer shall be one of the following:

- 3.6.1. Accu-Trak, Standard Car Truck, Park Ridge, IL 60068.
- 3.6.2. Engler Instruments, 250 Culver Ave., Jersey City, NJ 07305.
- 3.6.3. Veeder-Root, Hartford, CT 06102.



**F. 24- THROUGH 83-PASSENGER CHASSIS SPECIFICATIONS**

**F.4. ENGINE AND RELATED COMPONENTS -**

**4.1. ENGINES -** Approved engines listed in each table for the various size buses are the engines for which the vendor has requested approval and are usually the smallest engine in terms of performance that will meet the requirements listed below. Other approved engines which the vendor may provide with a given chassis will be listed also in an Approved Products List (APL). The APL will be updated as new engines or additional versions of current engines are approved. Please note that only those engines approved as specified below and listed either in the Texas School Bus Specification or in the Class 070-SB-APL will be acceptable for school buses.

**4.1.1. Gasoline Engines -** Engines for the 24- through 71-passenger conventional (and semi-forward control) and the 77-passenger school buses shall be of the gasoline type unless otherwise specified in the Invitation for Bids. Approved engines are listed in Tables Nos. 14 through 23 and in the Class 070-SB APL.

**4.1.2. Diesel Engines -** When so specified in the Invitation for Bids (see Option 7), a bus chassis having a gasoline engine listed as standard, shall be furnished with a 4-cycle diesel engine. (Diesel engines are standard for 47- through 77-passenger and the 83-passenger forward control buses ).

**4.1.3. Power Requirements -** Each bus shall be furnished with an engine that meets or exceeds the following minimum criteria (see second note at the end of Par. F.4.1.4.8.), when tested at or above the GVWR required for a given bus capacity and with all accessories except air conditioning compressor on and operating :

4.1.3.1. Acceleration from 0 to 50 mph in 60 seconds or less.

4.1.3.2. Gradeability of 1.5% minimum at 50 mph.

4.1.3.3. Gradeability of 5.0% minimum at 25 mph.

4.1.3.4. Startability of 20% minimum.

4.1.3.5. Top speed of 55 mph minimum at the manufacturer's rated rpm for the governed engine.

**4.1.4. Approval of New Engines -** Procedures for approving new school bus engines for 24- through 83- passenger school buses shall be as follows:

**4.1.4.1. Submit to the Specification Section, a recent computer scan (not the typed results of a scan) showing that the proposed engine meets or exceeds each requirement of Par. F.4.1.3. under the following conditions:**

- (i) GVWR equal to or greater than that of the largest bus for which approval is requested.
- (ii) Minimal frontal area of 75 square feet, or actual frontal area, if different.
- (iii) AT-545, MT-643, or chassis manufacturer's standard automatic transmission, as applicable (see Par. F.5.).
- (iv) Radial tires of the size specified in the table for the particular bus capacity (Bias belted required for 24-passenger.)
- (v) Air resistance coefficient = 0.550 or relative drag coefficient of 88, whichever the manufacturer uses.
- (vi) All engine accessories on and operating including fan clutch, alternator, power steering pump, air compressor, and any other powered accessory except air conditioning compressors.
- (vii) Other parameters shall be of the manufacturer's standard values for the coefficient of friction on smooth concrete, driveline efficiency, etc.

**4.1.4.2. The Specification Section will review the scan and advise the vendor or manufacturer by letter of the results of this review. Copies will be furnished to the School Bus Committee.**

**4.1.4.3. If this review verifies the engine meets the requirements of this specification, the vendor or manufacturer shall contact the SPGSC Purchaser to arrange for the testing of the engine in the largest size school bus for which approval is requested. The Purchaser will consult with the TEA Representative and inform the vendor of the name(s) of the school district(s).**

**4.1.4.4. The vendor must obtain the cooperation of one of the named school districts in agreeing to test the bus and to provide a report to the SPGSC Specification Section on the form provided (see copy of the Form entitled, "Three-Month Test of New School Bus Engines", on page 96).**

**4.1.4.5. The vendor or manufacturer shall then contact the SPGSC Purchaser and TEA School Bus Committee Representative about ordering the school bus with the subject engine.**

**F. 24- THROUGH 83-PASSENGER CHASSIS SPECIFICATIONS**

- 4.1.4.6. The bus shall be tested for a period of not less than three months during the regular nine-months school term, preferably on a variety of routes and on activity trips.
- 4.1.4.7. Upon receipt of the school district's report, the Specification Section will make a recommendation at the next meeting of the School Bus Committee that the engine be accepted or rejected.
- 4.1.4.8. The School Bus Committee will act on this recommendation and, if approved, the engine will be added to the Class 070-SB APL.

**NOTES:** Once an engine is approved in one horsepower and torque version, other power versions of this same engine need not be tested in a school bus prior to approval. For approval, the vendor or manufacturer shall follow Par. F.4.1.4.1. If the Specification Section finds the scan shows conformance with the "five criteria", the engine will be added to the APL which will show the SAE gross horsepower and SAE gross torque as well as the rear end ratio used in the scan.

**THE VALUES OF DISPLACEMENT, HORSEPOWER, AND TORQUE LISTED IN THE FOLLOWING TABLES UNDER EACH MANUFACTURER ARE NOT MINIMUM VALUES AND SHOULD NOT BE CONSTRUED AS SUCH. THE ONLY MINIMUM REQUIREMENTS FOR THE PERFORMANCE OF ENGINES IN 24- THROUGH 83-PASSENGER SCHOOL BUSES IN THE STATE OF TEXAS ARE THE FIVE REQUIREMENTS LISTED IN PARAGRAPH F.4.1.3. (There are additional requirements for engines, either implied or specified, separate from the above performance requirements.)**

- 4.2. **AIR CLEANER** - Each chassis shall be equipped with a factory-installed maximum capacity, heavy-duty replaceable dry element type air cleaner.
- 4.3. **COOLING SYSTEM** - The cooling system radiator shall be heavy-duty with increased capacity to cool the engine at all speeds in all gears. The cooling system fan shall be the heavy-duty reinforced type with a fan clutch. Thin pressed fan blades are not acceptable.
- 4.4. **ENGINE WARNING SYSTEM** - An engine warning system shall be provided for the 35- through 83-passenger diesel-powered buses and shall be chassis factory-installed. Audible (which may be also be visual) signals shall indicate to the driver when the oil pressure is too low and/or the engine temperature is too high for safe operation. These signals shall begin within 8 seconds or less after the condition begins in order that the engine can be shut down before permanent damage occurs. A manual engine shut-down device is preferred.
- 4.5. **EXHAUST SYSTEM** -
  - 4.5.1. **Component Placement** - The exhaust pipe, muffler, and tailpipe shall be mounted under the bus and attached to the chassis frame.
  - 4.5.2. **Tailpipe** - The tailpipe shall be constructed of seamless or electrically welded tubing of 16-gauge steel or equivalent, and shall extend at least 5 inches beyond the chassis frame. The size of the tailpipe shall not be reduced after it leaves the muffler.
  - 4.5.3. **Tailpipe Exit** - The tailpipe of a gasoline-powered bus shall not exit the side of the bus anywhere within 12 inches of a vertical plane through the center of the fuel filler opening and perpendicular to the side of the bus, unless protected with a metal shield to divert spilled fuel away from tailpipe.
  - 4.5.4. **Noise Level** - The noise level shall neither exceed EPA "Noise Emission Standards" nor 90 dB(A) at the ear of the occupant nearest to the noise source in the bus. **When so specified in the Invitation for Bids, (see Option No. 20), the bus shall be furnished with the noise level not exceeding 86 dB(A) measured at the same place.**
- 4.6. **FUEL FILTER** - Each diesel engine shall be equipped with a full-flow fuel filter and a primary and a separate secondary fuel filter installed between the fuel tank and the injector pumps.
- 4.7. **GOVERNOR** - A governor set to the manufacturer's recommended maximum engine speed (RPM) shall be installed by the chassis manufacturer.
- 4.8. **OIL FILTER** - Each chassis shall be equipped with a factory-installed, minimum one-quart capacity oil filter with a replaceable element or cartridge type. It shall be connected by flexible oil lines if it is not of the built-in or engine-mounted design.
- 4.9. **TACHOGRAPH** - **When so specified in the Invitations for Bids (see Option 24), a tachograph containing a combination clock/speedometer/recorder shall be installed on the dashboard. The tachograph shall be Argo Model 1310-6, Veeder-Root Model AB-1407, or approved equal.**

**F. 24- THROUGH 83-PASSENGER CHASSIS SPECIFICATIONS**

**F.5. TRANSMISSION AND RELATED COMPONENTS** - The 24- through 77-passenger school buses shall be equipped with a manual or an automatic transmission, **WHICHEVER IS SELECTED BY THE SCHOOL DISTRICT ON THE SCHOOL BUS REQUISITION FORM.**

- 5.1. **AUTOMATIC TRANSMISSION, CHASSIS MANUFACTURER'S** - Unless otherwise specified in the Invitation for Bids, the 24-passenger bus shall be furnished with a minimum three forward speed automatic transmission which shall be the chassis manufacturer's standard automatic transmission for this type of chassis.
- 5.2. **AUTOMATIC TRANSMISSION** - Unless otherwise specified in the Invitation for Bids, the 35- through 71-passenger and the 77-passenger conventional buses shall be furnished with a minimum four forward speed automatic transmission. The transmission shall be the ATD Model AT 545, or approved equal (see Par. F.5. above), unless an ATD Model MT-643 is required to match engine torque.
- 5.3. **AUTOMATIC TRANSMISSION** - Unless otherwise specified in the Invitation for Bids, the 77- and 83-passenger forward control buses shall be furnished with a minimum four forward speed automatic transmission. The transmission shall be the ATD Model MT-643, or approved equal.
- 5.4. **MANUAL TRANSMISSIONS** - Unless otherwise specified in the Invitation for Bids, the manual type transmission shall be furnished on all 24- through 77-passenger buses (but not the 83-passenger bus, which requires an automatic transmission). The transmission shall be the synchromesh (all gears except first and reverse) type. It shall be of sturdy construction, and the input torque capacity shall be at least 10 percent above the maximum net torque developed by the engine. Its design shall provide for four or five forward and one reverse speeds for 24-, 35-, 47, and 53-passenger chassis, and five forward (direct in fifth) and one reverse speeds for 59-, 65-, 71-, and 77-passenger chassis.
- 5.5. **CLUTCH, MANUAL TRANSMISSION** - The clutch in buses equipped with manual transmissions shall have a torque capacity not less than 10 percent in excess of the maximum net torque output of engine. The diameter of the clutches for the various sizes of buses equipped with manual transmissions shall be as follows:
  - 5.5.1. 12-Inch Clutch - All chassis for the 24-, 35-, 47-, 53-, and 59-passenger buses with manual transmissions shall be equipped with a minimum 12-inch diameter clutch..
  - 5.5.2. 13-Inch Clutch - All chassis for 65-, 71-, and 77-passenger buses with manual transmissions shall be equipped with a minimum 13-inch diameter clutch or a clutch with equivalent performance.
- 5.6. **DRIVE SHAFT GUARD** - Each drive shaft section shall be equipped with protective metal guard or guards to prevent the shaft from whipping through the floor or dropping to the ground when broken.

**NOTE:** Drive shaft guard is not required on rear engine, rear-drive bus.

**F.6. ELECTRICAL SYSTEM AND RELATED COMPONENTS** -

- 6.1. **ALTERNATORS** - The 12-volt alternators with rectifier shall have the electrical outputs and the minimum charging rates shown below when tested in accordance with SAE rating at the manufacturer's recommended engine idle speed. These alternators shall be ventilated and voltage controlled and, if necessary, current controlled. Dual belt drive or a single serpentine belt shall be used with the alternators provided on the 35- through 83-passenger buses:
  - 6.1.1. **Standard Alternator** - The 24- through 77-passenger buses shall have a standard alternator with a minimum electrical output of 90 amperes and a minimum charging rate of 40 amperes at idle. The 83-passenger bus shall have a standard alternator with a minimum electrical output of 100 amperes and a minimum charging rate of 50 amperes at idle.
  - 6.1.2. **Optional Alternator** - When so specified in the Invitation for Bids, (see Option 3), the 24- through 77-passenger chassis shall have an alternator with a minimum electrical output of 100 amperes and a minimum charging rate of 50 amperes at idle.
  - 6.1.3. **Other Alternators** - School buses equipped with the following equipment shall have alternators meeting the following requirements:
    - 6.1.3.1. **Air-conditioned Buses** - Buses equipped with air conditioning shall have alternators with a minimum electrical output of 130 amperes and a minimum charging rate of 58 amperes at idle except those self-contained air conditioning units having sufficient generating capacity to provide all of the electrical power for air conditioning operation including the blowers.
    - 6.1.3.2. **Wheelchair Lift-equipped Buses** - Buses equipped with wheelchair lifts shall have alternators with a minimum electrical output of 105 amperes and a minimum charging rate of 50 amperes at idle.

**F. 24- THROUGH 83-PASSENGER CHASSIS SPECIFICATIONS**

- 6.2. BATTERY AND RELATED COMPONENTS** - The storage batteries furnished on each chassis shall have sufficient capacity to supply current for adequate operation of the engine starter, lights, signals, heater, and all other electrical equipment. The batteries for 24- through 83-passenger school buses shall have an potential of 6 or 12 volts and meet the following:
- 6.2.1. **Battery (Gasoline Engines)** - Batteries shall be 12 volts with a minimum performance level of BCI cold cranking capacity (CCA) of not less than 360 amperes @ 0°F with a minimum 100-minute reserve capacity.
  - 6.2.2. **Batteries (Diesel Engines)** - Batteries shall be single or dual 12 volt or dual 6 volt as specified by the chassis manufacturer. The minimum performance level shall be a BCI cold cranking capacity (CCA) of not less than 450 amperes @ 0°F with a minimum 130-minute reserve capacity except for the 24-passenger bus which shall have 360 CCA and 100-minute reserve capacity.
  - 6.2.3. **Mounting** - The preferred battery mounting location for gasoline-powered buses is outside the body shell under the hood in an adequate carrier and readily accessible for maintenance and removal from above or outside. (See Par. E.2.6. for requirements of diesel-powered buses and other battery mounting locations.)
  - 6.2.4. **Cables** - The battery cables shall be one piece and of sufficient length to allow pull out or lift out of the battery for servicing or removal and arranged so as to prevent damage to the battery posts when removed.
- 6.3. HORNS** - Each bus shall be equipped with horn or horns of standard make. Each horn shall be capable of producing audible sounds in a range between 82 and 102 decibels. The sound level measurements shall be made at a distance of 50 feet directly in front of the vehicle in accordance with SAE J377.
- 6.4. INSTRUMENTS AND INSTRUMENT PANEL** - The bus shall be equipped with the following nonglare illuminated instruments (controlled by an independent rheostat\*), and gauges mounted for easy maintenance and repair and clearly visible to the seated driver. Indicator warning lights in lieu of gauges are not acceptable.
- ( 1) Speedometer
  - ( 2) Odometer
  - ( 3) Fuel Gauge
  - ( 4) Oil Pressure Gauge
  - ( 5) Water Temperature Gauge
  - ( 6) Ammeter or Voltmeter with graduated charge and discharge indications
  - ( 7) Vehicle manufacturer's standard Keyed Ignition Switch
  - ( 8) High Beam Headlamp Indicator
  - ( 9) Air Pressure Gauge (where air brakes are used)
  - (10) Glow Plug Indicator Light (for diesel buses with glow plugs only)
- \*Note: If the intensity of the body-installed panel lamps is controlled, then the intensity control shall not be accomplished by the same rheostat that controls the chassis instrument lamps, unless the body company designs and installs the rheostat to accomplish both.
- 6.5. LAMPS** - Each bus shall be equipped with at least two white headlamps meeting the requirements of FMVSS No. 108 and a dimmer switch located on or near the steering column. Adequate parking lamps operated by a switch in common with the headlamps shall be provided.

TABLE 14  
24-PASSENGER BUS CHASSIS

Refer to General Requirements, Page 3

24-Passenger ITEM	1990 Min. Rqmts.	GMC/Chevrolet P31042/P31442
GVWR, lbs	14500	14500
GAWR, lbs - Front	5000	5000
- Rear	11000	11000
Axle Capacity, lbs - Front	5000	5000
- Rear	11000	11000
Wheelbase, in	133/157	133/157
Chassis Length, in	as shown	263.6/291.6
Track, in - Front	65.2	65.2
- Rear	66.7	66.7
Gasoline Engine CID*	**	350-V8EFI
SAE Gross Horsepower	**	201
SAE Gross Torque, lb-ft	**	318
Transmission:		
Automatic, Gears	3 spd	A3
Manual, Fwd. Gears	4 spd	M4/NA
Truck Bias Belt Tires	Tubeless	
Size & Load Range	as shown	8-19.5E
Wheels, Rear	Dual	Dual
Alternator, amperes	90	105

\*See diesel engine Option 7.

\*\*See minimum power requirements in Par. F.4.1.3.

DIESEL ENGINES (Option 7)

24-Passenger ITEM	1990 Min. Rqmts.	GMC/CHEVROLET P31042/P31442
Engine Displacement, l.	**	6.2N-V8
SAE Gross Horsepower	**	164
SAE Gross Torque, lb-ft	**	286

\*\*See minimum power requirements in Par. F.4.1.3.

Engines listed on this page are approved to meet or exceed power requirements under normal operating conditions. Other engines must be submitted for approval by the School Bus Committee (see Par. F.4.1.3.).

The following bodies are available on stripped chassis:

24-PASSENGER BUS BODIES

24-Passenger ITEM	1990 Min. Rqmts.	AmtTram/Ward VSS	Blue Bird Mini-Bird	Carpenter Cadet	Thomas Mighty Mite
Interior Headroom, in	72	77	77	77	73
Interior Width, in	90	90	90.5	90	90
Service Door	as shown	Tall	Tall	Tall	Tall

35-PASSENGER CONVENTIONAL BUS TABLE

TABLE 15

35-PASSENGER CONVENTIONAL BUS

Refer to General Requirements, Page 3

35-Passenger Conv. ITEM	1990 Min. Rqmts.	Ford B-600*	GMC/CHEVROLET B6P042	NIC 3700*
GVWR, lbs	21500	23000	22000	21500
GAWR, lbs - Front	6000	8000	7500	6000
- Rear	15000	15000	15000	15500
Axle Capacity, lbs - Front	6000	8000	7500	6000
- Rear	15000	15000	15000	15500
Wheelbase, in	149	151	149	152
Cowl-to-Axle, in	125	127	125	127
Cowl-to-Frame End, in	217	231	228	217
Gasoline Engine CID**	***	*	366-V8EFI	*
SAE Gross Horsepower	***	*	215	*
SAE Gross Torque, lb-ft	***	*	344	*
Transmission:				
Automatic, Gears/Model	4 spd	AT-545	AT-545	AT-545
Manual, Fwd. Gears	4 spd	M5	M4	M5
Brakes - Front Disc Rotor, in	as shown	15.38 x 1.53	14.75 x 1.31	15 x 1.43
- Rear Lining, in	as shown	15.00 x 6.00	14.75 x 1.31	15 x 1.43
Truck Steel Belt Radial Tires Size & Load Range	Tubeless 9R22.5F	9R22.5F	9R22.5F	9R22.5F
Wheels - Rear	Dual	Dual	Dual	Dual
- Rim Size, in	6.75	6.75	6.75	6.75

\*Furnished with diesel engine only, Option 7.

\*\*See diesel engine option 7.

\*\*\*See minimum power requirements in Par. F.4.1.3.

DIESEL ENGINES (Option 7)

35-Passenger ITEM	1990 Min. Rqmts.	Ford B 600	GMC/Chevrolet B6P042	NIC 3700
Engine Displacement, l.	***	6.6T-I6	8.2N-V8	7.3N-V8
SAE Gross Horsepower	***	165	170	170
SAE Gross Torque, lb-ft	***	400	394	332
Front GAWR	6000	8000	7500	6000

\*\*\*See minimum power requirements in Par. F.4.1.3.

Engines listed on this page are approved to meet or exceed power requirements under normal operating conditions. Other engines must be submitted for approval by the School Bus Committee (see Par. F.4.1.3.).

TABLE 16  
47-PASSENGER BUS\*

Refer to General Requirements, Page 3

47-Passenger ITEM	1990 Min. Rqmts.	Blue Bird TC2000**	Ford B 600**	GMC/Chevrolet B6P042	NIC 3700**
GVWR, lbs	21500	26500	22500	22000	21500
GAWR, lbs - Front	6000	10300	8000	7000	6000
- Rear	15000	15500	15000	15000	15500
Axle Capacity, lbs - Front	6000	10800	8000	7500	6000
- Rear	15000	15500	15000	15000	15500
Wheelbase, in	132	132	193	189	193
Cowl-to-Axle, in	165	N/A	169	165	168
Cowl-to-Frame End, in	268	N/A	280	268	274
Gasoline Engine CID***	****	**	**	366-V8EFI	**
SAE Gross Horsepower	****	**	**	215	**
SAE Gross Torque, lb-ft	****	**	**	344	**
Transmission:					
Automatic, Gears/Model	4 Spd	AT-545	AT-545	AT-545	AT 545
Manual, Fwd. Gears	4 Spd	M5	M5	M4	M4
Brakes - Front Disc Rotor, in	as shown	15 x 1.438	15.38 x 1.33	14.75 x 1.31	15 x 1.43
- Rear Lining, in	as shown	15 x 1.438	15.00 x 6.00	14.75 x 1.31	15 x 1.43
Truck Steel Belt Radial Tires Size & Load Range	Tubeless 9R22.5F	10R22.5F	9R22.5F	9R22.5F	9R22.5F
Wheels - Rear	Dual	Dual	Dual	Dual	Dual
- Rim Size, in	6.75	7.5	6.75	6.75	6.75
Chassis Type	as shown	FC	Conv	Conv	Conv

\*Buses order in this capacity (47-passenger) may be regular conventional, semi-forward, or forward control configuration at the option of the manufacturer, unless conventional buses are specified.

\*\*Furnished with diesel engine only, Option 7.

\*\*\*See diesel engine option 7.

\*\*\*\*See minimum power requirements in Par. F.4.1.3.

## DIESEL ENGINES (Option 7)

47-Passenger ITEM	1990 Min. Rqmts.	Blue Bird TC2000	Ford B 600	GMC/Chevrolet B6P042	NIC 3700
Engine Displacement, l.	***	5.9T-16	6.6T-16	8.2N-V8	7.3N-V8
SAE Gross Horsepower	***	180	165	170	170
SAE Gross Torque, lb-ft	***	445	400	394	332
Front GAWR	6000	10300	8000	7000	6000

\*\*\*See minimum power requirements in Par. F.4.1.3.

Engines listed on this page are approved to meet or exceed power requirements under normal operating conditions. Other engines must be submitted for approval by the School Bus Committee (see Par. F.4.1.3.).

TABLE 17

## 53-PASSENGER BUS\*

53-Passenger ITEM	1989 Min. Rqmts.	Blue Bird TC2000**	Refer to General Requirements, Page 3		
			Ford B 600**	GMC/Chevrolet B6P042	NIC 3700**
GVWR, lbs	21500	26500	23000	22500	21500
GAWR, lbs - Front	6000	10300	8000	7500	6000
- Rear	15000	15500	15000	15000	15500
Axle Capacity, lbs - Front	6000	10800	8000	7500	6000
- Rear	15000	15500	15000	15000	15500
Wheelbase, in	146	146	217	218	218
Cowl-to-Axle, in	193	NA	193	194	193
Cowl-to-Frame End, in	295	NA	323	295	305
Gasoline Engine CID***	****	**	**	366-V8EFI	**
SAE Gross Horsepower	****	**	**	215	**
SAE Gross Torque, lb-ft	****	**	**	344	**
Transmission:					
Automatic, Gears/Model	4 Spd	AT-545	AT-545	AT-545	AT-545
Manual, Fwd. Gears	4 Spd	M5	M5	M4	M5
Brakes - Front Disc Rotor, in	as shown	15 x 1.438	15.38 x 1.53	14.75 x 1.31	15 x 1.43
- Rear Lining, in	as shown	15 x 1.438	15.00 x 6.00	14.75 x 1.31	15 x 1.43
Truck Steel Belt Tires Size & Load Range	Tubeless 9R22.5F	10R22.5F	9R22.5F	9R22.5F	9R22.5F
Wheels - Rear	Dual	Dual	Dual	Dual	Dual
- Rim Size, in	6.75	7.5	6.75	6.75	6.75
Chassis Type	as shown	FC	Conv	Conv	Conv

\*Buses ordered in this capacity (53-passenger) may be regular conventional, semi-forward, or forward control configuration at the option of the manufacturer, unless conventional buses are specified.

\*\*Furnished with diesel engine only, Option 7.

\*\*\*See diesel engine option 7.

\*\*\*\*See minimum power requirements in Par. F.4.1.3.

## DIESEL ENGINES (Option 7)

53-Passenger ITEM	1990 Min. Rqmts.	Blue Bird TC2000	Ford B 600	GMC/Chevrolet B6P042	NIC 3700
Engine Displacement, l.	***	5.9T-I6	6.6T-I6	8.2N-V8	7.3N-V8
SAE Gross Horsepower	***	180	165	170	170
SAE Gross Torque, lb-ft	***	445	400	390	332
Front GAWR	6000	10300	8000	7000	6000

\*\*\*See minimum power requirements in Par. F.4.1.3.

Engines listed on this page are approved to meet or exceed power requirements under normal operating conditions. Other engines must be submitted for approval by the School Bus Committee (see Par. F.4.1.3.).



59-PASSENGER CONVENTIONAL BUS TABLE

TABLE 18

59-PASSENGER CONVENTIONAL BUS  
(Full Air Brake Standard)

59-Passenger Conv. ITEM	Refer to General Requirements, Page 3			
	1990 Min. Rqmts.	Ford B 700*	GMC/Chevrolet B6P042	NIC 3700*
GVWR, lbs	25500	25500	25580	25500
GAWR, lbs - Front	7500	9000	7500	8000
- Rear	17500	17500	18080	17500
Axle Capacity, lbs - Front	7500	9000	7500	8000
- Rear	17500	17500	19000	17500
Wheelbase, in	235	237	235	236
Cowl-to-Axle, in	211	213	211	211
Cowl-to-Frame End, in	323	345	323	329
Gasoline Engine CID**	***	*	366-V8EFI	*
SAE Gross Horsepower	***	*	215	*
SAE Gross Torque, lb-ft	***	*	344	*
Transmissions:****				
Automatic, Gears/Model	4 spd	AT-545	AT-545	AT 545
Manual, Fwd. Gears	5 spd	M5	M5	M
Brake Linings, in - Front	15.0 x 3.5	15.0 x 4.0	15.0 x 4.0	15.0 x 3.5
- Rear	16.5 x 6.0	16.5 x 7.0	16.5 x 7.0	16.5 x 6.0
Truck Steel Belt Radial Tires Size & Load Range	Tubeless 10R22.5F	10R22.5F	10R22.5F	10R22.5F
Wheels - Rear	Dual	Dual	Dual	Dual
- Rim Size, in	7.5	7.5	7.5	7.5
Chassis Type	as shown	Conv	Conv	Conv

\*Furnished with diesel engine only, Option 7.

\*\*See diesel engine option 7.

\*\*\*See minimum power requirements in Par. F.4.1.3.

\*\*\*\*Direct in fourth gear (automatic); direct in fifth gear (manual).

DIESEL ENGINES (Option 7)

59-Passenger Conv. ITEM	1990 Min. Rqmts.	Ford B 600	GMC/Chevrolet B6P042	NIC 3700
Engine Displacement, l.	***	6.6T-16	8.2N-V8	7.3N-V8
SAE Gross Horsepower	***	165	170	170
SAE Gross Torque, lb-ft	***	400	394	332
Front GAWR	7500	9000	7500	8000

\*\*\* See minimum power requirements in Par. F.4.1.3.

Engines listed on this page are approved to meet or exceed power requirements under normal operating conditions. Other engines must be submitted for approval by the School Bus Committee (see Par. F.4.1.3.).

TABLE 19

59-PASSENGER FORWARD CONTROL DIESEL BUS  
(Full Air Brake Standard)

Refer to General Requirements, Page 3

59-Passenger FC ITEM	1990 Min. Rqmts.	Blue Bird TC2000	GMC/Chevrolet S7T042	NIC 3900	Thomas SAF-T-LINER MVP 3189***
GVWR, lbs	26500	26500	28380	26500	28380
GAWR, lbs - Front	10300	10300	10300	10300	10300
- Rear	17000	17000	18080	17000	18080
Axle Capacity, lbs - Front	10800	10800	12000	10800	13200
- Rear	17000	17000	19000	17000	19000
Wheelbase, in	160	160	170	160	184
Engine Displacement, l.	*	5.9T-16	8.2N-V8	5.9T-16	8.2T-V8/ 10.4T-V8
SAE Gross Horsepower	*	180	170	185	210
SAE Gross Torque, lb-ft	*	445	394	435	468/500
- Transmission:**					
Automatic, Gears/Model	4 Spd	AT-545	AT-545	AT-545	AT-545
Manual, Fwd. gears	5 Spd	M5	M5	M5	M5
Brake Lining, in - Front	15.0 X 4	15.0 X 4	16.5 X 5	15.0 x 4	15.0 x 4
- Rear	16.5 X 6	16.5 X 6	16.5 X 7	16.5 X 6	16.5 X 7
Truck Steel Belt Radial Tires Size & Load Range	Tubeless 10R22.5F	10R22.5F	10R22.5F	10R22.5F	10R22.5F
Wheels - Rear	Dual	Dual	Dual	Dual	Dual
- Rim Size, in	7.5	7.5	7.5	7.5	7.5

\*See minimum power requirements in Par. F.4.1.3.

\*\*Direct in fourth gear (automatic); direct in fifth gear (manual).

\*\*\*Rear Engine.

Engines listed on this page are approved to meet or exceed power requirements under normal operating conditions. Other engines must be submitted for approval by the School Bus Committee (see Par. F.4.1.3.).

NOTE: The NIC 5.9T is the model DTA-360 diesel engine.

65-PASSENGER CONVENTIONAL BUS TABLE

TABLE 20

65-PASSENGER CONVENTIONAL BUS  
(Full Air Brake Standard)

Refer to General Requirements, Page 3

65-Passenger Conv. ITEM	1990 Min. Rqmts.	Ford B 700*	GMC/Chevrolet B6P042	NIC 3700*
GVWR, lbs	25500	26500	25580	27500
GAWR, lbs - Front	7500	9000	7500	10000
- Rear	17500	17500	18080	17500
Axle Capacity, lbs - Front	7500	9000	7500	10000
- Rear	17500	17500	19000	17500
Wheelbase, in	254	255	254	254
Cowl-to-Axle, in	229	231	230	229
Cowl-to-Frame End, in	349	377	349	359
Gasoline Engine CID**	***	*	366-V8EFI	*
SAE Gross Horsepower	***	*	215	*
SAE Gross Torque, lb-ft	***	*	315	*
Transmission:****				
Automatic, Gears/Model	4 Spd	AT-545	AT-545	AT-545
Manual, Fwd. Gears	5 Spd	5	5	5
Brake Lining, in - Front	as shown	15.0 x 4.0	15.0 x 4.0	15.0 x 3.5
- Rear	as shown	16.5 x 7.0	16.5 x 7.0	16.5 x 6.0
Truck Steel Belt Radial Tires Size & Load Range	Tubeless 10R22.5F	10R22.5F	10R22.5F	10R22.5F
Wheels - Rear	Dual	Dual	Dual	Dual
- Rim Size, in	7.5	7.5	7.5	7.5

\*Furnished with diesel engine only, Option 7.

\*\*See diesel engine option 7.

\*\*\*See minimum power requirements in Par. F.4.1.3.

\*\*\*\*Direct in fourth gear (automatic); direct in fifth gear (manual).

DIESEL ENGINES (Option 7)

65-Passenger Conv ITEM	199089 Min. Rqmts.	Ford B 600	GMC/Chevrolet B6P042	NIC 3700
Engine Displacement, l.	***	6.6T-16	8.2N-V8	7.3N-V8
SAE Gross Horsepower	***	165	170	170
SAE Gross Torque, lb-ft	***	400	394	332
Front GAWR, lbs	9000	9000	9000	10000

\*\*\* See minimum power requirements in Par. F.4.1.3.

Engines listed on this page are approved to meet or exceed power requirements under normal operating conditions. Other engines must be submitted for approval by the School Bus Committee (see Par. F.4.1.3.).

65-PASSENGER FORWARD CONTROL DIESEL BUS TABLE

TABLE 21

65-PASSENGER FORWARD CONTROL DIESEL BUS  
(Full Air Brake Standard)

65-Passenger FC ITEM	1990 Min. Rqmts.	Blue Bird TC2000	Refer to General Requirements, Page 3		
			GMC/Chevrolet S7T042	NIC 3900	Thomas SAF-T-LINER MVP 3189***
GVWR, lbs	26500	26500	28380	26500	28380
GAWR, lbs - Front	10300	10800	10300	10300	10300
- Rear	17000	17000	18080	17000	18080
Axle Capacity, lbs - Front	10800	10800	12000	10800	13200
- Rear	17000	17000	19000	17000	19000
Wheelbase, in	174	174	187	174	184
Diesel Engine Displacement, l.	*	5.9T-16	8.2N-V8	5.9T-16	8.2T-V8
SAE Gross Horsepower	*	180	170	185	180
SAE Gross Torque, lb-ft	*	445	390	435	406
Transmission:**					
Automatic, Gears/Model	4 Spd	AT-545	AT-545	AT-545	AT-545
Manual, Fwd. Gears	5 Spd	M5	M5	M5	M5
Brake Lining, in - Front	as shown	15.0 x 4	16.5 x 5	15.0 x 4	15.0 x 4
- Rear	as shown	16.5 x 6	16.5 x 7	16.5 x 6	16.5 x 7
Truck Steel Belt Radial Tires Size & Load Range	Tubeless 10R22.5F	10R22.5G	10R22.5F	10R22.5F	10R22.5F
Wheels - Rear	Dual	Dual	Dual	Dual	Dual
- Rim Size, in	7.5	7.5	7.5	7.5	7.5

\*See minimum power requirements in Par. F.4.1.3.

\*\*Direct in fourth gear (automatic); direct in fifth gear (manual).

\*\*\*Rear Engine.

Engines listed on this page are approved to meet or exceed power requirements under normal operating conditions. Other engines must be submitted for approval by the School Bus Committee (see Par. F.4.1.3.).

NOTE: The NIC 5.9T is the Model DTA-360 diesel engine.

71-PASSENGER SWB CONVENTION BUS TABLE

TABLE 22

71-PASSENGER CONVENTIONAL BUS  
(Short Wheelbase, Full Air Brake Standard)

Refer to General Requirements, Page 3

71-Passenger SWB Conv ITEM	1990 Min. Rqmts.	Ford B 700*	GMC/Chevrolet B6P042	NIC 3700*
GVWR, lbs	26500	28000	28000	28000
GAWR, lbs - Front	7500	9000	9000	9000
- Rear	19000	19000	19000	19000
Axle Capacity, lbs - Front	7500	9000	9000	9000
- Rear	19000	21000	19000	19000
Wheelbase, in	254	255	254	254
Cowl-to-Axle, in	229	231	230	229
Cowl-to-Frame End, in	349	377	349	349
Gasoline Engine CID**	***	*	366-V8EFI	*
SAE Gross Horsepower	***	*	215	*
SAE Gross Torque, lb-ft	***	*	344	*
Transmission:****				
Automatic, Gears/Model	4 Spd	AT-545	AT-545	AT-545
Manual, Fwd. Gears	5 Spd	M5	M5	M5
Brake Lining, in - Front	15.0 x 4	15.0 x 4	16.5 x 5	15.0 x 4
- Rear	16.5 x 7	16.5 x 7	16.5 x 7	16.5 x 7
Truck Steel Belt Radial Tires Size & Load Range	Tubeless 11R22.5G	11R22.5G	11R22.5G	11R22.5G
Wheels - Rear	Dual	Dual	Dual	Dual
- Rim Size, in	8.25	8.25	8.25	8.25

\*Furnished with diesel engine only, Option 7.

\*\*See diesel engine option 7.

\*\*\*See minimum power requirements in Par. F.4.1.3.

\*\*\*\*Direct in fourth gear (automatic); direct in fifth gear (manual).

DIESEL ENGINES (Option 7)

71-Passenger SWB Conv ITEM	1990 Min. Rqmts.	Ford B 700	GMC/Chevrolet B6P042	NIC 3700
Engine Displacement, l.	***	6.6T-16	8.2N-V8	7.3N-V8
SAE Gross Horsepower	***	170	170	170
SAE Gross Torque, lb-ft	***	412	394	332
Front GAWR, lbs	9000	9000	9000	9000

\*\*\* See minimum power requirements in Par. F.4.1.3.

Engines listed on this page are approved to meet or exceed power requirements under normal operating conditions. Other engines must be submitted for approval by the School Bus Committee (see Par. F.4.1.3.).

TABLE 23

**71-PASSENGER CONVENTIONAL BUS**  
(Long Wheelbase, Full Air Brake Standard)

71-Passenger LWB Conv. ITEM	Refer to General Requirements, Page 3			
	1990 Min. Rqmts.	Ford B 700*	GMC/Chevrolet B6P042	NIC 3700*
GVWR, lbs	28000	28000	28000	28000
GAWR, lbs - Front	9000	9000	9000	9000
- Rear	19000	21000	19000	19000
Axle Capacity, lbs - Front	9000	9000	9000	9000
- Rear	19000	21000	19000	19000
Wheelbase, in	274	275	274	276
Cowl-to-Axle, in	250	251	250	251
Cowl-Frame-End, in	368	387	368	387
Gasoline Engine CID**	***	*	366-V8EFI	*
SAE Gross Horsepower	***	*	215	*
SAE Gross Torque, lb-ft	***	*	344	*
Transmission:****				
Automatic, Gears/Model	4 Spd	AT-545	AT-545	AT-545
Manual, Fwd. Gears	5 Spd	M5	M5	M5
Brake Lining, in - Front	15.0 x 4	15.0 x 4	16.5 x 5	15.0 x 4
- Rear	16.5 x 7	16.5 x 7	16.5 x 7	16.5 x 7
Truck Steel Belt Radial Tires Size & Load Range	Tubeless 11R22.5G	11R22.5G	11R22.5G	11R22.5G
Wheels - Rear	Dual	Dual	Dual	Dual
- Rim Size, in	8.25	8.25	8.25	8.25

\*Furnished with diesel engine only, Option 7.

\*\*See diesel engine option 7.

\*\*\*See minimum power requirements in Par. F.4.1.3.

\*\*\*\*Direct in fourth gear (automatic); direct in fifth gear (manual).

**DIESEL ENGINES (Option 7)**

71-Passenger LWB Conv. ITEM	1990 Min. Rqmts.	Ford B 700	GMC/Chevrolet B6P042	NIC 3700
Engine Displacement, l.	***	6.6T-I6	8.2N-V8	7.3N-V8
SAE Gross Horsepower	***	170	170	170
SAE Gross Torque, lb-ft	***	412	394	332
Front GAWR, lbs	9000	9000	9000	9000

\*\*\*See minimum power requirements in Par. F.4.1.3.

Engines listed on this page are approved to meet or exceed power requirements under normal operating conditions. Other engines must be submitted for approval by the School Bus Committee (see Par. F.4.1.3.).

71-PASSENGER FORWARD CONTROL DIESEL BUS TABLE

TABLE 24

71-PASSENGER FORWARD CONTROL DIESEL BUS  
(Full Air Brake Standard)

71-Passenger FC ITEM	1990 Min. Rqmts.	Blue Bird TC2000	Refer to General Requirements, Page 3		
			GMC/Chevrolet S7T042	NIC 3900	Thomas SAF-T-LINER MVP 3399**
GVWR, lbs	26500	26500	30500	26500	30000
GAWR, lbs - Front	10800	10800	12000	10800	11000
- Rear	17000	17000	18500	17000	19000
Axle Capacity, lbs - Front	10800	10800	12000	10800	13200
- Rear	17000	17000	19000	17000	19000
Wheelbase, in	195	195	206	195	212
Diesel Engine Displacement, l.	*	5.9T-16	8.2T-V8	5.9T-16	8.2T-V8/ 10.4T-V8
SAE Gross Horsepower	*	180	180	185	210/210
SAE Gross Torque, lb-ft	*	445	410	435	468/500
Transmission:**					
Automatic, Gears/Model	4 Spd	AT-545	AT-545	AT-545	AT-545
Manual, Fwd. Gears	5 Spd	M5	M5	M5	M5
Brake Lining, in - Front	15.0 X 4	15.0 X 4	16.5 X 5	15.0 X 6	15.0 X 4
- Rear	16.5 X 6	16.5 X 6	16.5 X 7	16.5 X 7	16.5 X 7
Truck Steel Belt Radial Tires Size & Load Range	Tubeless 10R22.5G	10R22.5G	11R22.5G	10R22.5G	10R22.5G
Wheels - Rear	Dual	Dual	Dual	Dual	Dual
- Rim Size, in	7.5	7.5	8.25	7.5	7.5

\*See minimum power requirements in Par. F.4.1.3.

\*\*Direct in fourth gear (automatic); direct in fifth gear (manual).

\*\*\*Rear Engine.

Engines listed on this page are approved to meet or exceed power requirements under normal operating conditions. Other engines must be submitted for approval by the School Bus Committee (see Par. F.4.1.3.).

NOTE: The NIC 5.9T is the Model DTA-360 diesel engine.

TABLE 25

77-PASSENGER CONVENTIONAL BUS  
(Full Air Brake Standard)

Refer to General Requirements, Page 3

CHASSIS		F	G	N
77-Passenger Conv.	1990	Ford	GMC/Chevrolet	NIC
ITEM	Min.	B 700*	B6P042	3700*
	Rqmts.			
GVWR, lbs	28000	28000	28000	28000
GAWR, lbs - Front	9000	9000	9000	9000
- Rear	19000	21000	19000	19000
Axle Capacity, lbs - Front	9000	9000	9000	9000
- Rear	19000	21000	19000	19000
Wheelbase, in	274	275	274	276
Gasoline Engine CID**	***	*	366-V8EFI	*
SAE Gross Horsepower	***	*	215	*
SAE Gross Torque, lb-ft	***	*	330	*
Transmission:****				
Automatic, Gears/Model	4 Spd	AT-545	AT-545	AT-545
Manual, Fwd. Gears	5 Spd	M5	M5	M5
Brake Lining, in - Front	15.0 x 4	15.0 x 4	15.0 x 4	15.0 x 4
- Rear	16.5 x 7	16.5 x 7	16.5 x 7	16.5 x 7
Truck Steel Belt Radial Tires	Tubeless			
Size & Load Range	11R22.5G	11R22.5G	11R22.5G	11R22.5G
Wheels - Rear	Dual	Dual	Dual	Dual
- Rim Size, in	8.25	8.25	8.25	8.25

\*Furnished with diesel engine only, Option 7.

\*\*See diesel engine Option 7.

\*\*\*See minimum power requirements in Par. F.4.1.3.

\*\*\*\*Direct in fourth gear (automatic); direct in fifth gear (manual).

## DIESEL ENGINES (Option 7)

77-Passenger Conv.	1990	Ford	GMC/Chevrolet	NIC
ITEM	Min.	B 700	B6P042	3700
	Rqmts.			
Engine Displacement, l.	***	6.6T-16	8.2N-V8	7.3N-V8
SAE Gross Horsepower	***	170	170	170
SAE Gross Torque, lb-ft	***	412	394	332

\*\*\*See minimum power requirements in Par. F.4.1.3.

Engines listed on this page are approved to meet or exceed power requirements under normal operating conditions. Other engines must be submitted for approval by the School Bus Committee (see Par. F.4.1.3.).

The following Body/Chassis combinations are available as indicated:

BODIES	Amtran/Ward	Blue Bird	Carpenter	Thomas	Wayne
Model	3306	3310	3310	3310	3403
Chassis available	F,G,N	F,G,N	F,G,N	F,G,N	F,G,N



77-PASSENGER FORWARD CONTROL DIESEL BUS TABLE

TABLE 26

77-PASSENGER FORWARD CONTROL DIESEL BUS  
(Full Air Brake Standard)

CHASSIS 77-Passenger FC ITEM	Refer to General Requirements, Page 3				
	1990 Min. Rqmts.	B Blue Bird All American/ 3611/TC2000*	G GMC/Chevrolet S7T042	N NIC 3900	T Thomas SAP-T-LINER MVP 3649
GVWR, lbs	28000	33280/29800	31700	28000	30000
GAWR, lbs - Front	9000	12080/12000	13200	9000	11000
- Rear	18500	21200/19000	18500	19000	19000
Axle Capacity, lbs - Front	9000	13200/12000	13000	9000	13200
- Rear	19000	23000/19000	19000	19000	19000
Wheelbase, in	205	223/216	226	205	241
Diesel Engine Displacement, l.	**	8.2T-V8/ 5.9T-16	8.2T-V8	5.9T-16	8.2T-V8/ 10.4-V8
SAE Gross Horsepower	**	210/180	180	185	210/210
SAE Gross Torque, lb-ft	**	468/445	410	435	468/500
Transmission:***					
Automatic, Gears/Model	4 Spd	MT643	MT643	MT643	MT643
Manual, Fwd. Gears	5 Spd	M5	M5	M5	M5
Brake Lining, in - Front	15.0 X 4	16.5 X 5/ 15.0 X 5	16.5 X 5	15.0 X 4	15.0 X 4
- Rear	16.5 X 7	16.5 X 7	16.5 X 7	16.5 X 7	16.5 X 7
Truck Steel Belt Radial Tires Size & Load Range	Tubeless 11R22.5G	11R22.5G	11R22.5H	11R22.5G	11R22.5G
Wheels - Rear	Dual	Dual	Dual	Dual	Dual
- Rim Size, in	8.25	8.25	8.25	8.25	8.25

\*Available late in Model Year.

\*\*See minimum power requirements in Par. F.4.1.3.

\*\*\*Direct in fourth gear (automatic); direct in fifth gear (manual).

Engines listed on this page are approved to meet or exceed power requirements under normal operating conditions. Other engines must be submitted for approval by the School Bus Committee (see Par. F.4.1.3.).

The following Body/Chassis combinations are available as indicated:

BODIES	Amtran/Ward	Blue Bird	Carpenter	Thomas	Wayne
Models	3708	3611/3700*	3700	3649	3803
Chassis Available	G, N	B	G, N	T	G, N

\*Available late in Model Year.

NOTE: The 5.9T-16 is the NIC DTA-360 diesel engine.

83-PASSENGER FORWARD CONTROL (FRONT ENGINE) DIESEL BUS TABLE

TABLE 27

83-PASSENGER FORWARD CONTROL DIESEL BUS  
(Front Engine, Full Air Brake Standard)

Refer to General Requirements, Page 3

CHASSIS		B	G	N
83-Passenger FC (Front Engine)	1990	Blue Bird	GMC/Chevrolet	NIC
ITEM	Min. Rqmts.	All American 3903	S7T042	3900
GVWR, lbs	33180	36200	33200	33180
GAWR, lbs - Front	13180	13200	13200	13180
- Rear	20000	23000	20000	20000
Axle Capacity, lbs - Front	13200	13200	13200	13500
- Rear	20000	23000	21000	20000
Wheelbase, in	236	245	246	236
Engine Displacement, l.	*	8.2T-V8	8.2T-V8	7.6T-16
SAE Gross Horsepower	*	210	210	185
SAE Gross Torque, lb-ft	*	468	468	435
Transmission, Automatic**	MT643	MT643	MT643	MT643
Brake Lining, in - Front	16.5 X 5	16.5 X 5	16.5 X 5	16.5 x 5
- Rear	16.5 X 7	16.5 X 7	16.5 X 7	16.5 x 7
Truck Steel Belt Radial Tires	Tubeless			
Size & Load Range	11R22.5H	11R22.5H	11R22.5H	11R22.5H
Wheels - Rear	Dual	Dual	Dual	Dual
- Rim Size, in	8.25	8.25	8.25	8.25

\*See minimum power requirements in Par. F.4.1.3.

\*\*Direct in fourth gear.

Engines listed on this page are approved to meet or exceed power requirements under normal operating conditions. Other engines must be submitted for approval by the School Bus Committee (see Par. F.4.1.3.).

The following Body/Chassis combinations are available as indicated:

BODIES	Antran/Ward	Blue Bird	Carpenter	Wayne
Models	3911	3903	3904	3900
Chassis Available	G,N	B	G,N	G,N

83-PASSENGER FORWARD CONTROL (REAR ENGINE) DIESEL BUS TABLE

TABLE 28

83-PASSENGER FORWARD CONTROL DIESEL BUS  
(Rear Engine, Full Air Brake Standard)

Refer to General Requirements, Page 3

CHASSIS		B	T
83-Passenger FC (Rear Engine)	1990	Blue Bird	Thomas
ITEM	Min. Rqmts.	All American 3903	Pusher 3885
GVWR, lbs	34000	34000	36200
GAWR, lbs - Front	13200	13200	13200
- Rear	23000	23000	23000
Axle Capacity, lbs - Front	13200	13200	13200
- Rear	23000	23000	23000
Wheelbase, in	270	284	270
Engine Displacement, l.	*	8.3T-I6/ 10.4T-V8	8.3T-I6/ 10.4T-V8
SAE Gross Horsepower	*	210/210	210/215
SAE Gross Torque, lb-ft	*	605/600	605/600
Transmission, Automatic**	MT643	MT643	MT643
Brake Lining, in - Front	16.5 x 5	16.5 x 5	16.5 x 6.0
- Rear	16.5 x 7	16.5 x 7	16.5 x 8.6
Truck Steel Belt Radial Tires Size & Load Range	Tubeless 11R/22.5H	11R2.5H	11R22.5H
Wheels - Rear	Dual	Dual	Dual
Wheels, Rim Size, in	8.25	8.25	8.25

\*See minimum power requirements in Par. F.4.1.3.

\*\*Direct in fourth gear.

Engines listed on this page are approved to meet or exceed power requirements under normal operating conditions. Other engines must be submitted for approval by the School Bus Committee (see Par. F.4.1.3.).

## G. WHEELCHAIR LIFT SPECIFICATION

### FLOOR-MOUNTED WHEELCHAIR LIFT, ELECTRIC (HYDRAULIC OR MECHANICAL)

- G.1. GENERAL REQUIREMENTS** - When so specified in the Invitation for bids (see Options 34, 35, and 36), the 15-through 77-passenger school buses shall be equipped with a wheelchair lift meeting the following requirements. All parts which are not specifically mentioned, that are necessary for the unit to be complete and ready for operation, or which are normally furnished as standard equipment, shall be furnished by the successful bidder. All parts shall conform in strength, quality, and workmanship to industry standards.
- 1.1. GENERAL DESIGN** - The lift furnished for these options (see Options 34, 35, and 36) shall be a floor-mounted, 12 VDC electric-hydraulic or electric-mechanical operated wheelchair lift with a minimum 800 pounds lifting capacity. The vertical lift (platform travel) shall be a minimum of 30 inches. The unit shall be self-contained and mounted directly to the existing school bus body floor.
- 1.2. FRAME AND RELATED COMPONENTS** -
- 1.2.1. Frame** - Frame of lift shall be constructed of heavy-duty steel and designed to support the platform extension, toe board, and other parts necessary for proper operation, plus a minimum of 800 pounds of additional weight. (An aluminum frame may be substituted for steel provided the wheelchair lift warranty is upgraded (see Par. A.10.4.9.).)
- 1.2.2. Platform, Automatic Folding type** -
- 1.2.2.1. Design** - The platform shall be of sturdy construction and covered with minimum 0.125 inch safety plate steel or 0.125 inch expanded metal (open grate) with maximum 0.75 inch openings. Minimum dimensions of platform shall be 29 inches in width and 43 inches long. Any portion of platform in the folded (travel) position which obstructs window vision shall be covered with expanded metal.
- 1.2.2.2. Lift Action** - Action of the lift must be power-up and controlled descent with slow (gentle) movement. Design of the platform shall be such that it will be level at all times during the raising and lowering action. A load switch shall be installed on the platform to prevent accidental folding while loading wheelchair passengers.
- 1.2.2.3. Safety Rails** - The platform shall be equipped with safety rails on both sides of minimum 0.125-inch steel and one inch high. The front of the lift shall have a folding type safety rail not less than 3 inches in height. Safety rail folding action may be either manual or automatic.
- 1.2.2.4. Toe Board** - A toe board shall be furnished that is angled at approximately 8 degrees below the horizontal.
- 1.3. SPECIAL SERVICE DOORS** - One or two special side doors with windows in each door shall be provided as follows:
- 1.3.1. Design** - The special service door(s) may be the standard double swingout doors or sliding door (with glass) furnished by the chassis manufacturer on vehicles used for converted van buses or the special service doors shall be constructed of zinc-coated steel (G-60) with a minimum thickness of 0.396 inches meeting ASTM A-525. Doors may be either standard widths or as required for the lift furnished. The doors shall extend from the window header to the bottom of the floor line. Doors shall be water- and weather-tight when closed and the lift is in the travel position.
- 1.3.2. Installation** - Doors constructed by the body manufacturer shall be installed using piano or butt type hinges and attached to body by means of rivets or bolts, nuts, and lock washers. Neither metal screws nor self-tapping bolts are acceptable except for alignment purposes; when used for this purpose these types of fasteners shall be tack-welded at the head.
- 1.3.3. Rub Rails** - Exterior side(s) of special service doors shall have two rub rails with end caps installed at approximately the same level as the side rub rails. Rub rail installation shall be in accordance with the requirements outlined in Paragraphs C.2.4. and E.2.4.
- 1.3.4. Door Operation** - The opening and closing operation of the door(s) may be manual, vacuum, pneumatic, or electrical. Controls for doors other than those manually operated shall be located in the driver's compartment and designed for easy manual opening in case of an emergency. (See Par. G.1.6. for lift operating controls.)
- 1.3.5. Drip Rails** - Full length drip rails shall be furnished over the special service doors to direct water away from the doors.

## G. WHEELCHAIR LIFT SPECIFICATIONS

- 1.3.6. Door Holding Device - A means (device) shall be provided to hold the swing-out type door(s) in the fully opened position.
- 1.4. **HYDRAULIC SYSTEM AND RELATED COMPONENTS** - Electric-hydraulic wheelchair lifts shall be furnished with a hydraulic system for lift operation. The components shall include, but not be limited to, the following:
  - 1.4.1. Hydraulic Cylinders - Hydraulic cylinders shall be installed for lift operations. Piston rod diameter of each cylinder shall be not less than 0.75 inch. Cylinders shall have a minimum of 34 inches of extension action and shall be capable of lifting a minimum of 800 pounds in addition to the weight of the lift.
  - 1.4.2. Hydraulic Valves - The system shall provide valves for the following actions:
    - 1.4.2.1. Speed - Adjustable valves shall be provided to control the raising and lowering speed of the lift.
    - 1.4.2.2. Power Failure - The system shall also be equipped with either a relief valve or other mechanical means for raising or lowering the wheelchair platform in case of power failure.
    - 1.4.2.3. Override Action - A bypass valve (or other means) shall be provided to prevent the lifting of the bus by over extending the hydraulic cylinders.
  - 1.4.3. Hydraulic Fluid Reservoir - A reservoir for hydraulic fluid shall be furnished and installed in an accessible location to allow easy checking of the fluid level and filling as necessary. Fluid capacity and type shall be as recommended by the lift manufacturer.
  - 1.4.4. Hoses and Fittings - Hose, hose fittings, and hydraulic fittings shall meet the requirements of SAE J517, J516, and J514, respectively, for nominal size(s) furnished.
  - 1.4.5. Weather/Dust Protection - Exposed hydraulic cylinders, pumps, and any other parts requiring protection from the weather, or dust, or any other foreign objects for proper durable operation shall be properly sealed.
- 1.5. **ELECTRO-MECHANICAL SYSTEMS** - Electro-mechanical hydraulic lift systems shall be furnished with worm screw or similar device for lift action.
- 1.6. **OPERATING CONTROLS AND SAFETY DEVICES** -
  - 1.6.1. Operating Switches - Controls for each movement of the lift shall be through a remote pendant-type control (or equivalent) which has automatic return-to-off switches. Electrical cables shall be good quality copper, covered by heavy-duty rubberized sheath and of sufficient length to allow operation of the lift from inside and outside of bus.
  - 1.6.2. Warning and Safety Devices -
    - 1.6.2.1. Safety Switch - A safety switch shall be installed at or near the service door to prevent operation of the lift except when all special service doors are substantially open.
    - 1.6.2.2. Warning Light - A flashing amber signal light, mounted near the other dashboard instruments, shall warn the driver when the ignition switch is activated and the special service doors are open or ajar, i.e., not completely closed.
- 1.7. **ELECTRICAL SYSTEM** - All wiring and wiring connectors used in the construction of the wheelchair lift shall meet the requirements of SAE j561:
  - 1.7.1. Motor - The motor shall be a heavy-duty, 12 VDC type, equipped with shaft bearings.
  - 1.7.2. Alternator - Wheelchair lift-equipped buses shall be provided with alternators with the following performance for the following sizes of school buses:
    - 1.7.2.1. 15- Through 20-passenger Buses - A minimum output rating of 100 amperes and at least 50 amperes at the engine manufacturer's recommended idle speed (RPM).
    - 1.7.2.2. 24- Through 77-passenger Buses - A minimum output rating of 105 amperes and at least 50 amperes at the engine manufacturer's recommended idle speed (RPM).
  - 1.7.3. Electrical Insulation - Any component such as the motor, electric wiring, switches, and any connections or parts likely to pose a safety hazard, shall be enclosed in insulated housing(s) to protect passengers and equipment.

## G. WHEELCHAIR LIFT SPECIFICATIONS

1.8. MOUNTING AND INSTALLATION - Installation shall be such that vibrations will be minimal. The wheelchair lift shall be installed by the bus body manufacturer or authorized dealer of lift manufacturers.

1.8.1. Mounting - The lift shall be mounted on the front right (curb) side (see Option No. 35) or front or rear (see Option 34) of the school bus body floor and securely bolted in place (see Note below). Floor frame shall be reinforced as required to support the lift and load. Lift shall be positioned approximately 36 inches behind the main entrance door for the 18- and 24- through 77-passenger buses leaving sufficient space for one regular bus seat or one wheelchair. If the body is designed so space specified above is not available, the lift shall be mounted as far forward as practical to minimize floor space loss. (Tail pipe may be routed anywhere between the frame rails to provide sufficient clearance for the lift.)

**NOTE:** School District may specify rear curb side mounting of lift and wheelchair positions for the 18- and 24- through the 77-passenger buses only and mounted as above (see Option 36) in order to place the required minimum 30-inch wide aisle in the rear portion of the bus. This will increase the seating capacity for regular passengers in the front section since a narrower aisle (minimum 12 inches) may be used in this area. This option is recommended only for those buses which will have a regular attendant in addition to the driver.

1.8.2. Level Test - The sides of any bus provided with a wheelchair lift shall be within + 2 inches of each other when measured from comparable points on each side to the ground with the bus empty and parked on a level hard surface (such as concrete). Chassis springs and suspension shall be adjusted as necessary to provide a level bus when the additional weight of a wheelchair lift is installed (see Paragraphs A.4.4., D.1.1., and E.1.1.).

1.8.3. Fuel Access Port (see Par. E.3.1.) - A fuel access port is required on all 35- through 83-passenger buses except front wheelchair equipped buses.

## G.2. PASSENGER SAFETY AND WHEELCHAIR RETENTION DEVICES -

### 2.1. WHEELCHAIR LOCKS AND RETAINERS -

2.1.1. Steel Wheelchair Locks - Standard wheelchair locks shall be made from heavy-duty steel and designed to permit quick locking and/or release of chair wheels. The lock(s) may be designed to lock each chair wheel individually or both wheels simultaneously by means of a lever control or other device located between the two wheel locks. The devices shall meet the following requirements:

2.1.1.1. Opening Force - Each wheelchair lock combination shall be capable of withstanding a minimum force of 5000 pounds.

2.1.1.2. Adjustable Width - Wheelchair locks shall be the adjustable type to lock wheelchair wheels with widths ranging from 13 inches to 30 inches.

2.1.1.3. Placement - Wheelchair locks shall be positioned in the various size buses so as to provide an aisle width sufficient for moving large wheelchairs from their locking locations to the wheelchair lift and to the emergency door. In no case shall the aisle width in this area be less than 30 inches. The locks shall be positioned as shown below:

- (i) Front Section - Preferred placement of wheelchair lock(s), which may provide for side facing wheelchairs, is in the front section of bus body, securely mounted to the side of the body.
- (ii) Rear Section - When so specified in the Invitation for Bids, the wheelchair locks (as well as the wheelchair lift) shall be placed in the rear section of the bus (see Option Nos. 34 and 36).
- (iii) Other Sections - Wheelchair lock(s) placed in other than the front section of the bus shall be as recommended by the body manufacturer to provide the number of wheelchair spaces which are specified in the Invitation for Bids. Conventional seat widths may be as follows to provide the 30-inch aisle width:
  - (a) 30 Inch Seats - In buses which have an interior width of at least 90 inches, 30-inch minimum width seats may be used on either or both sides where necessary to provide the required 30-inch aisle.
  - (aa) 26 Inch Seats - For buses with less than 90-inch interior widths, 26-inch minimum width seats may be used where necessary to provide the required 30-inch minimum aisle if this cannot be done with 30-inch minimum width seats.

**G. WHEELCHAIR LIFT SPECIFICATIONS**

2.1.2. **Webbed Belts Tie-downs** - When so specified in the Invitation for Bids (see Option 37), wheelchair retention devices shall be the webbed-belt type to accommodate those wheelchairs which cannot be locked in conventional (steel) restraining devices because of unusual sizes and types of wheels, etc. These belt type wheelchair tie-downs shall meet the above strength requirements and shall be Aeroquip Series E/A FF865, Q'Straint 5000, or approved equal.

2.2. **SEAT BELTS** - Seat belts shall be provided for each wheelchair position. The number shall be the same as the number of wheelchair positions specified in the Invitation for Bids. The seat belt assemblies shall conform to FMVSS No. 209 for school buses. The assemblies furnished shall be equipped with reel-type retractors incorporated as a part of each mounting bracket.

**G.3. OTHER REQUIREMENTS** - Wheelchair lift-equipped school buses shall also be provided with the following:

3.1. **FLOOR COVERING** - The floor in the wheelchair area and the area in the lift entryway shall be smooth and free of projections. Aisle floor covering shall be the same as required in Par. E.2.13.

3.2. **INTERIOR LAMP, LIFT COMPARTMENT** - The lift compartment shall have one interior lamp installed in the roof panel above the center of the lift compartment; or one lamp shall be installed in the roof panels on each side of the lift door to illuminate the platform entryway area. The lamp(s) shall be minimum 15 candlepower each and shall be one of the approved lamps listed in Par. E.1.4.4.2.

3.3. **PAINTING** - The interior and exterior of the special service doors lifts shall be primed and painted in accordance with the painting requirements in Par. E.1.8. as follows:

3.3.1. **Interior** - The interior of the special service door(s) of wheelchair lifts shall be painted to match the manufacturer's standard interior color of the bus on which it is installed.

3.3.2. **Exterior** - The exterior of special service doors shall be primed and painted in accordance with painting requirements in Par. E.1.8.

3.4. **UNIVERSAL HANDICAP SYMBOLS** - School buses with wheelchair lifts shall display the universal handicapped symbols on the front of one side and the rear of the other side below the window line of the bus. These emblems shall be white on blue, shall not exceed 12 inches in size, and may be reflectorized.

3.5. **LITERATURE** - Repair manual, parts list, and instructions for adjustment of hydraulic valves, mechanical parts, and electrical equipment shall be furnished with each lift.

**H. AIR CONDITIONING SPECIFICATIONS**

**H.1. SPECIAL REQUIREMENTS** - Any school buses ordered with air conditioning (see Options 1 and 2) shall be furnished with the following:

- 1.1. **ALTERNATOR** - Each 15- through 20-passenger bus and each 24- through 83-passenger bus equipped with an air conditioning system shall be furnished with alternators (see below) having a minimum output rating of 100 and 130 amperes, respectively. All air-conditioned buses shall have alternators with a minimum charging rate of 50 amperes (15- through 20-passenger) or 58 amperes (24- through 83-passenger) at the chassis manufacturer's recommended engine idle speed, except self-contained air conditioning units. These self-contained units shall have sufficient electrical generating capacity to operate all air conditioning controls including the blowers.
- 1.2. **INSULATION** - Minimum 5/8-inch nominal thickness plywood shall be installed over the existing or manufacturer's standard steel floor for insulation (see Par. C.2.12. for plywood requirements including installation requirements). Air-conditioned buses shall have the equivalent of 1.5 inches of fiberglass or other insulation in the ceilings and walls including the interior of hat-shaped bows. The insulation shall have a minimum R-factor value of 5.77.
- 1.3. **TINTING** - The windshield and all windows of air-conditioned school buses shall be tinted to reduce the heat load of the system. (See Option No. 10 for dark tinting.)

**H.2. GENERAL AND PERFORMANCE REQUIREMENTS** - Air-conditioning systems furnished to meet the requirements of this specification shall be the mechanical vapor compression refrigeration type. Each air conditioning system shall have sufficient power for simultaneous cooling, circulating, cleaning, and dehumidifying the air. The refrigerant for the system must be nontoxic, nonflammable, and nonexplosive. The air conditioning system shall be manufactured to conform to the requirements of SAE J639. Air conditioning units furnished under this specification shall be of the current year's production. Details not specifically defined herein shall be in accordance with the manufacturer's standard commercial practice for products of this type. This following describes the components, type of system, and the performance requirements for the efficient air conditioning of school buses:

- 2.1. **PERFORMANCE REQUIREMENTS, SMALL BUSES** - Small buses (i.e., 15- through 20-passenger) equipped with either Option 1 (standard cooling) or Option 2 (extra cooling) shall have the following values of air flow rate and cooling capacity with values either approximate (standard cooling) or minimum values (for extra cooling) as indicated. Air conditioners installed on small buses to meet Option 1 (standard cooling) shall meet the performance requirements of Par. H.2. below and shall have the approximate flow rates and cooling capacities as shown below. Air conditioners installed on small buses to meet Option 2 (extra cooling) shall meet or exceed the minimum air flow rate and cooling capacities listed below in Table 29:

TABLE 29

AIR CONDITIONING REQUIREMENTS FOR SMALL BUSES

PASSENGER CAPACITY	STANDARD COOLING*		EXTRA COOLING**	
	COOLING CAPACITY Btu/hr	AIR FLOW RATE CFM	COOLING CAPACITY Btu/hr	AIR FLOW RATE CFM
15	19,245	450	33,500	900
16-20	25,660	900	40,000	1200

\*Approximate values (Option 1)

\*\*Minimum values (Option 2)

The approximate volumes are 614 cubic feet for the 15-passenger bus and about 790 cubic feet for the other small buses.

- 2.2. **PERFORMANCE REQUIREMENTS, LARGE BUSES** - Table No. 30 lists the approximate air flow rates (in CFM) and cooling capacities (in Btu/hr) required for each of the large (i.e., 24- through 83-passenger school buses). Note that these values are not the minimum required values but are approximate and are included only for use by the ordering school district. The vendor or manufacturer shall provide an air conditioning system meeting the performance requirements listed below and the approximate values listed in Table No. 30. The air conditioning system furnished for any large size school bus under Option 1 shall be capable of cooling the interior to 80°F when measured at the center of the bus under the following conditions:

2.2.1. Outside Ambient Temperature - Minimum of 100°F.

2.2.2. Relative Humidity - Minimum of 50%.

2.2.3. Cooling Time - Maximum of 30 minutes.

2.2.4. Engine Speed - 1000 rpm.



H. AIR CONDITIONING SPECIFICATIONS

TABLE 30  
AIR CONDITIONERS with SKIRT-MOUNTED CONDENSERS

MANUFACTURER	ITEM	PASSENGER CAPACITY				
		24	35	47	53	59
MINIMUM REQUIREMENTS	Btu/hr	35000	43000	48000	52000	58000
	Air flow, CFM	900	1000	1100	1200	1350
AC Industries	Model	AC552*	AC552*	AC552*	663	663
	Btu/hr	48000	48000	48000	60000	60000
	Air Flow, CFM	1330	1330	1330	1985	1985
Bergstrom Manufacturing	Model	SBAC*	72102	72102	72102	72018
	Btu/hr	36000	52000	52000	52000	58500
	Air flow, CFM	1650	1200	1200	1200	2400
Scott Air	Model	BE420*	BE480*	BE480*	624	624
	Btu/hr	42000	48000	48000	60000	60000
	Air Flow, CFM	1200	1650	1650	2000 (Diesel)	2000 (Diesel)
Thermo King	Model	B3*	D3*	E2*	None	None
	Btu/hr	40000	45000	49400		
	Air flow, CFM	1750	1500	1400		
Trans Aire	Model	TA73RCD*	TA73RCD*	TA73RCD*	TA94D4	TA94D4
	Btu/hr	45000	53000	53000	72000	72000
	Air Flow, CFM	1050	1600	1600	1740	1740

TABLE 30 (cont'd)

MANUFACTURER	ITEM	PASSENGER CAPACITY				
		65	71-S	71-L	77	83
MINIMUM REQUIREMENTS	Btu/hr	69000	74000	74800	74800	90000
	Air flow, CFM	1450	1500	1550	1550	2000
AC Industries	Model	862	863	863	863	1072
	Btu/hr	72000	80000	80000	80000	96000
	Air Flow, CFM	1985	1985	1985	1985	2660
Bergstrom Manufacturing	Model	72000	72301	72301	72301	72115
	Btu/hr	69255	74880	74880	74880	90000
	Air flow, CFM	1500	3000	3000	3000	2400
Scott Air	Model	723	ECA-75	ECA-75	ECA-75	None
	Btu/hr	72000	75000	75000	75000	
	Air Flow, CFM	2000 (Diesel)	2500	2500	2500	
Thermo King	Model	None	None	None	None	None
	Btu/hr					
	Air flow, CFM					
Trans Aire	Model	TA94D4	TA97D4	TA97D4	TA97D4	TA97DH
	Btu/hr	72000	85000	85000	85000	106000
	Air Flow, CFM	1740	3200	3200	3200	3200

\*Powered by vehicle engine.

NOTE: LISTING ON THIS TABLE NOTWITHSTANDING, ALL AIR CONDITIONERS ON TEXAS SCHOOL BUSES SHALL REDUCE AN AMBIENT TEMPERATURE OF 100 DEGREES F TO AT LEAST 80 DEGREES F INSIDE THE LOADED BUS WITHIN 30 MINUTES WHEN TESTED AT 1000 RPM AND A RELATIVE HUMIDITY OF 50% MINIMUM. The temperature shall be measured in the center of the bus.

G

## H. AIR CONDITIONING SPECIFICATIONS

2.3. **CONTROLS** - A control box or panel, which shall be located in the driver's compartment, shall be permanently installed to house inside temperature and fan speed(s) controls.

### 2.4. INSTALLATION -

2.4.1. **Installing Dealer** - Installation of the air conditioning system(s) shall be by the bus body company or by an authorized factory air conditioning dealer who normally stocks, sells, installs, and services a unit of the type being furnished.

2.4.2. **Workmanship - Poor, shoddy installation will be grounds for immediate rejection of the complete bus.**

H.3. **COMPONENTS** - The following is a list of the components required for these air conditioning systems (see Par. H.2. above). Any parts or components not specifically mentioned below, but which are required to provide a complete operating unit, or which are standard for the model bid, shall be included:

3.1. **BLOWER UNIT** - The blower unit shall be of heavy-duty design and shall circulate air over the evaporator to cool the passenger compartment. Fans may be of the centrifugal or axial type and quiet in operation. Fan motor(s) shall have bearings of the permanent lubrication type and designed to operate on the 12 VDC system of the school bus.

3.2. **COMPRESSOR** - The compressor for the 15- through the 20-passenger may be the chassis engine mount type and compatible with the engine RPM. Compressors for all sizes of buses shall be of the air conditioning or chassis manufacturer's standard design. Lubrication of all moving parts shall be accomplished automatically. An automatic (electric) clutch shall be provided on the compressor. The compressor size shall be as required to meet the performance requirements above or the minimum values listed for the extra cooling air conditioner for the small bus.

Compressors for the 24-passenger through 83-passenger school bus may be installed in an independent skirt mounted unit or they may be driven by the vehicle engine. If the engine driven unit requires more than one compressor to meet the performance requirements, then the installer shall use a double strength serpentine belt to drive both compressors or furnish a copy of a written authorization from the chassis manufacturer to use dual belts on the compressors. No installation of any air conditioning units or systems shall void the chassis manufacturer's engine warranty under any circumstances.

3.3. **CONDENSER** - The condenser shall be as recommended by the manufacturer of the unit but shall be skirt mounted on the 24-passenger and larger buses. (A condenser constructed of nonferrous metal tubes and metal fins, securely bonded to the condenser tubing with brazed fittings and joints, is preferred.) However, air conditioning manufacturers shall use their standard condenser and fabrication and installation practices.

3.4. **EVAPORATOR (COOLING COIL)** - Air conditioning manufacturers shall use their standard cooling coil and fabrication and installation practices. (However, an evaporator of the copper-tube, metal-fin type with the fins securely bonded to the tubes with brazed or welded fittings and joints, is preferred.)

3.5. **DASH OUTLETS** - Air conditioners on 15- through 19-passenger school buses shall have in-dash air outlets; other size buses may be provided with in-dash outlets at the option of the manufacturer.

3.6. **REFRIGERANT DRYER** - An adequate dryer shall be installed in the refrigerating circuit.

### H.4. OTHER REQUIREMENTS -

4.1. **AVAILABILITY OF SERVICE AND REPAIR PARTS** - An adequate supply of repair parts must be carried in stock within the State of Texas. Bidder shall include with each bid, or have on file with the Purchasing Division of this Commission, a list of companies or individuals, and their addresses, who stock repair parts and who can perform service on the products furnished.

4.2. **LABELING** - Each air conditioning unit shall have affixed a legible and durable nameplate with the following information:

4.2.1. Name and address of the manufacturer.

4.2.2. Cooling Capacity of the installed unit (in Btu/hr) based on the smallest rating of any component in the system.

4.2.3. Recirculation and ventilation of air quantity (in CFM).

4.3. **INSTRUCTION BOOKS** - The supplier shall furnish one copy of complete installation, maintenance, and operating instructions for each different model, size, and type of equipment furnished to each shipping destination. The instructions shall accompany the equipment when shipped. If a parts list is required by the ordering agency, the agency should contact the vendor supplying the equipment.

**AVAILABILITY OF SPECIFICATIONS**

Copies of this specification may be obtained from:

**SPECIFICATION SECTION**

State Purchasing and General Services Commission  
P. O. Box 13047  
Austin, Texas 78711-3047  
Phone (512) 463-3411



LETTERHEAD

THREE-MONTH TEST OF NEW SCHOOL BUS BODIES

Note to School District: It would be helpful in our deliberation on approval of school bus bodies if the attached form could be completed at the end of the test period on the school bus body you have agreed to test and evaluate. Please add any information that you think may be significant. In this test we believe that different drivers should be allowed to drive the bus and give their opinions of its suitability for school bus use.

NEW SCHOOL BUS BODY EVALUATION
(Please check or complete appropriate item)

Size \_\_\_ passengers Manufacturer: \_\_\_ Blue Bird \_\_\_ Carpenter \_\_\_ Collins \_\_\_ Lewis \_\_\_ Thomas \_\_\_ Van-Con \_\_\_ Ward \_\_\_ Wayne \_\_\_ (Other, please list name):
Design: \_\_\_ Forward Control or \_\_\_ Conventional or \_\_\_ Semi-forward Control Body Number \_\_\_\_\_

INTERIOR

Aisle Width: \_\_\_ Sufficient \_\_\_ Too Narrow.
Aisle and Underseat Areas: Projections likely to cause injury? \_\_\_ Yes \_\_\_ No.
Side Windows: Operate \_\_\_ Smoothly \_\_\_ with difficulty
- Glass \_\_\_ loose \_\_\_ O.K. - Latching Mechanism \_\_\_ Uneven \_\_\_ O.K.
- Provide unobstructed opening from 9 to 10 inches high and min of 22 inches wide? \_\_\_ Yes \_\_\_ No.
Interior Panels: Forward Panels lap Rear Panels? \_\_\_ Yes \_\_\_ No
- Secured by Screws \_\_\_ Yes \_\_\_ No - Rivets on \_\_\_ inch centers
Headroom: \_\_\_ Sufficient \_\_\_ Too Low
Entrance Stepwell: Height above Ground (unloaded) \_\_\_ inches
Service/Entrance Doors: Easily Operated? \_\_\_ Yes \_\_\_ No
- Easy access from outside? \_\_\_ Yes \_\_\_ No - Easy to exit thru? \_\_\_ Yes \_\_\_ No
Floor: Projections/Sharp Edges? \_\_\_ Yes \_\_\_ No
Passenger Seats: Seams Welting? \_\_\_ Yes \_\_\_ No
Driver's Compartment: Easy Access to? \_\_\_ Yes \_\_\_ No
Entrance Door: Operates Easily \_\_\_ Yes \_\_\_ No
- Closes Securely \_\_\_ Yes \_\_\_ No. - Min. Horizontal Width \_\_\_ inches
- Min. Vertical Clearance \_\_\_ inches
Wheelwells: Smooth Curvatures \_\_\_ Yes \_\_\_ No
Defrosters: Working? \_\_\_ o.k. \_\_\_ not satisfactory
Auxiliary Heater: Mounting Location: \_\_\_\_\_
Any Other Comments on Interior: \_\_\_\_\_

EXTERIOR

Battery Compartment (under Floor): Easy Access for Servicing? \_\_\_ Yes \_\_\_ No
- Battery Cables long enough? \_\_\_ Yes \_\_\_ No.
Body-Cowl Attachment: Joint Sealed Securely and Evenly? \_\_\_ Yes \_\_\_ No.
Emergency Door: Operate Easily from Outside? \_\_\_ Yes \_\_\_ No
Fuel Filler Opening: Centered approx. around Fuel Filler Neck? \_\_\_ Yes \_\_\_ No
- Easy Access for Refueling? \_\_\_ Yes \_\_\_ No
Panels: Upper Panels Lap Lower (Unless Panels Run Across Bus)? \_\_\_ Yes \_\_\_ No
- Riveted or Bolted to Vertical Posts every \_\_\_ inches
- Riveted or Bolted every \_\_\_ inches between Vertical Posts.
Skirt Reinforcements Braced on 30-inch centers or less? \_\_\_ Yes \_\_\_ No
Stirrup Steps: Provide Easy Access to Windshield? \_\_\_ Yes \_\_\_ No
Undercoating: Wheelwells? \_\_\_ Yes \_\_\_ No - Under Floor? \_\_\_ Yes \_\_\_ No
- Side Panels Below Floor? \_\_\_ Yes \_\_\_ No
Other Comments on Exterior: \_\_\_\_\_
Does this Bus Body Meet your needs and requirements? \_\_\_ Yes \_\_\_ No
Do you recommend that it be approved for use in Texas? \_\_\_ Yes \_\_\_ No
General Comments on this bus body \_\_\_\_\_



### THREE MONTH TEST OF NEW SCHOOL BUS ENGINES

**Note to School District:** It would be helpful in our deliberation on approval of school bus engines if the attached form could be completed at the end of the test period on the bus engine you have agreed to test and evaluate. Please add any information that you think may be significant. In this test we believe that different drivers should be allowed to drive the bus and give their opinions of its suitability for school bus use.

#### New Engine Evaluation

(Please check or complete appropriate item)

#### Description

Engine size: \_\_\_\_\_ CID \_\_\_\_\_ Liters, \_\_\_\_\_ Rear Axle Ratio, \_\_\_\_\_ Gas \_\_\_\_\_ Diesel  
 Manufacturer \_\_\_\_\_, \_\_\_\_\_ Turbocharged \_\_\_\_\_ Naturally Aspirated  
 Dodge, Ford, GMC, NIC

\_\_\_\_\_ Automatic \_\_\_\_\_ Manual Transmission, \_\_\_\_\_ Air conditioner, \_\_\_\_\_ Wheelchair lift  
 \_\_\_\_\_ Air or \_\_\_\_\_ Hydraulic Brakes, \_\_\_\_\_ Tire Size, Luggage Rack \_\_\_\_\_ Top \_\_\_\_\_ Bottom

Installed in \_\_\_\_\_ passenger \_\_\_\_\_ bus body  
 Blue Bird, Carpenter, Thomas, Ward, Wayne

BEGIN DATE \_\_\_\_\_ DISTRICT \_\_\_\_\_ END DATE \_\_\_\_\_

#### Tests

Loaded with approximately 125 pounds for each passenger space with an approximate 150-pound driver, please conduct the following five tests if possible:

(We will need to know if criteria different from that recommended are used.)

1. Acceleration - 0 to 50 MPH in 60 seconds or less: From a standing start on a level stretch of asphalt or concrete highway, record with a stop watch the time required to reach 50 MPH. \_\_\_\_\_ Time in seconds rounded to the nearest 0.1 second.
  2. \* Grade of 1.5% minimum @ 50 MPH: From a running start, drive the bus at 50 MPH up a grade of approximately 1.5%. Most federal highways have maximum grades of 3.0% except overpasses which are steeper. Record the speed at the summit \_\_\_\_\_ Miles per hour.
  3. \* Grade of 5.0% minimum - @ 25 MPH: From a running start, drive the bus at 25 MPH up a grade of approximately 5.0%. Most state highways have maximum grades of 7.0%. Record the speed at the summit \_\_\_\_\_ Miles per hour.
  4. Startability - 20.0%: If possible locate a grade of approximately 20.0 degrees. (Your local Highway Department engineering may be able to help you locate grades.) Park the bus on the foot of the hill facing upward then start the engine and drive up the hill. If no 20.0% grade is available, use the steepest hill in the district. Est. grade \_\_\_\_\_ %.
- \* Grades of 1.5% and 5.0% rise 1.5 and 5.0 feet, respectively, in a 100 foot distance.
5. Speed - 55 MPH: With the engine speed governor connected and operating, determine if the bus will reach a minimum of 55 MPH on a level stretch of asphalt or concrete highway.  
 Complies: \_\_\_\_\_ Yes \_\_\_\_\_ No

#### Documentation

6. Record the hubodometer reading at the beginning and end of a 2- or 3-month period and the amount of fuel used. Calculate the overall fuel consumption \_\_\_\_\_ Miles per gallon.
7. Document any warranty work or other repairs required on the test bus. \_\_\_\_\_
8. Note regular maintenance performed and any unusual problems such as excessive oil consumption or fluid leaks. \_\_\_\_\_

**Operation on a Regular Route**

Average daily mileage: \_\_\_\_\_ Miles Starting: \_\_\_\_\_ O.K. \_\_\_\_\_ Hard to start  
Acceleration: \_\_\_\_\_ Adequate \_\_\_\_\_ Poor, Comments: \_\_\_\_\_  
Temperature: Runs \_\_\_\_\_ O.K. \_\_\_\_\_ Hot Adequate power fully loaded? \_\_\_\_\_ Yes \_\_\_\_\_ No  
Oil Consumption: \_\_\_\_\_ Miles/qt. Regular Route Fuel Consumption: \_\_\_\_\_ Miles/gal.

**Operation on an Activity Trip**

Maintain 50 mph Loaded? \_\_\_\_\_ Yes \_\_\_\_\_ No Comments: \_\_\_\_\_  
Oil Consumption: \_\_\_\_\_ Miles/qt. Activity Trip Fuel Consumption: \_\_\_\_\_ Miles/gal.  
Maximum Lawful Speed up Steepest Hill: \_\_\_\_\_ MPH Power: \_\_\_\_\_ O.K. \_\_\_\_\_ Need more  
List any problems or comments concerning operation on an Activity Trip: \_\_\_\_\_

Is this engine suitable for transportation needs in your District? \_\_\_\_\_ Yes \_\_\_\_\_ No

Signatures \_\_\_\_\_ Superintendent \_\_\_\_\_ Transportation Director Date \_\_\_\_\_

We thank you for your cooperation and assistance in providing written results of this engine test and the recommendations of your Administration, Drivers and Mechanics.

Jack Edwards  
TEA

Pat Martin  
SPGSC

Buddy Means  
DPS

TEXAS SCHOOL BUS COMMITTEE  
April 9, 1987

ADDITIONAL REMARKS:  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Return To: **Specification/Inspection Section  
State Purchasing and General Services Commission  
P.O. Box 13047  
Austin, TX 78711-3047**

MAJOR COMPONENTS CHART - SMALL BUS

MAJOR COMPONENTS CHART - 1990 MODEL YEAR

SMALL SCHOOL BUSES

MAJOR COMPONENTS	PASSENGER CAPACITY					PAGE NO.
	15	16	18	19	20	
<b>ALTERNATOR:</b>						
Amps, Min - Std	75	75	75	75	75	37
- Opt	100	100	100	100	100	37, 91
- w WC Lift	100	100	100	100	100	37, 91
- w A/C	100	100	100	100	100	37, 91
<b>BATTERY:</b>						
Diesel Engine -						
CCA, Amp, Min	MS	MS	MS	MS	MS	38
Reserve. Minutes, Min	MS	MS	MS	MS	MS	38
Gasoline Engine -						
CCA, Amp, Min	360	360	360	360	360	37
Reserve, Minutes, Min	100	100	100	100	100	37
<b>BRAKES:</b>						
Standard	Hyd	Hyd	Hyd	Hyd	Hyd	35
Optional	NA	NA	NA	NA	NA	--
<b>ENGINES:</b>						
Diesel	Opt	Opt	Opt	Opt	Opt	36
Gasoline	Std	Std	Std	Std	Std	36
<b>EMERGENCY DOOR GLASS, LOWER</b>						
	N/A	N/A	N/A	N/A	N/A	--
<b>FUEL TANK, Gal, Min - Std</b>						
	21	21	21	21	21	35
- Opt	30	30	30	30	30	35
<b>HEATER, Btu/hr - Std</b>						
	MS	MS	MS	MS	MS	31
- Opt Aux.	MS	MS	MS	MS	MS	31
<b>KNEE SPACING, Min - Std</b>						
	24	25	26	25	25	17
- Opt	27	27	27	28	28	17
<b>TILT HOOD</b>						
	N/A	N/A	N/A	N/A	N/A	--
<b>TIRES:</b>						
Truck Steel Belt Radial -						
Tubeless	MS	MS	MS	MS	MS	35
Size	MS	MS	MS	MS	8R19.5E	35
Tube Type	NA	NA	NA	NA	NA	--
Size	NA	NA	NA	NA	NA	--
Bias Belt -						
Tubeless	NA	NA	NA	NA	NA	--
Size	NA	NA	NA	NA	NA	--
Tube Type	NA	NA	NA	NA	NA	--
Size	NA	NA	NA	NA	NA	--
<b>TRANSMISSIONS/CLUTCHES:</b>						
Automatic -	Std	Std	Std	Std	Std	37
Model	MS	MS	MS	MS	MS	37
Standard -						
Fwd. Gears	NA	NA	NA	NA	NA	--
Clutch Size, in, Min	NA	NA	NA	NA	NA	--
<b>U-BOLTS, NO., Min</b>						
	NA	NA	NA	NA	4	22
<b>WHEELS:</b>						
Steel Disc	Std	Std	Std	Std	Std	35
Cast Spoke	NA	NA	NA	NA	NA	35

LEGEND: AC = Air Conditioning; Amp = Amperes; Aux. = Auxiliary; CCA = Cold Cranking Amperes; Fwd. = Forward; Gal = Gallon; Hyd = Hydraulic; in = inches; M4/M5 = Manual 4-spd/5-spd Transmission; Min = Minimum; MS = Manufacturer's Standard; NA = Not Available/Not Applicable; Opt = Optional; Std = Standard; WC = Wheelchair



MAJOR COMPONENTS CHART - LARGE BUS

MAJOR COMPONENTS CHART

LARGE SCHOOL BUSES

MAJOR COMPONENTS	PASSENGER CAPACITY									PAGE
	24	35	47	53	59	65	71	77	83	
<b>ALTERNATOR: Amps, Min - Std</b>	90	90	90	90	90	90	90	90	100	73
- Opt	100	100	100	100	100	100	100	100	---	73, 91
- w WC Lift	105	105	105	105	105	105	105	105	105	73, 91
- w AC* 130	130	130	130	130	130	130	130	130	130	73, 91
<hr/>										
<b>BATTERY: Diesel Engine -</b>										
CCA, Amp, Min	450	450	450	450	450	450	450	450	450	74
Reserve, Minutes, Min	130	130	130	130	130	130	130	130	130	74
<b>Gasoline Engine -</b>										
CCA, Amp, Min	360	360	360	360	360	360	360	360	NA	74
Reserve, Minutes, Min	100	100	100	100	100	100	100	100	NA	74
<hr/>										
<b>BRAKES: Standard</b>	Hyd	Hyd	Hyd	Hyd	Air	Air	Air	Air	Air	70
Optional	NA	NA	NA	NA	Hyd	Hyd	Hyd	Hyd	NA	70
<hr/>										
<b>ENGINES: Diesel</b>	Opt	Opt	Opt**	Opt**	Opt**	Opt**	Opt**	Opt**	Std	71
Gasoline	Std	Std	Std	Std	Std	Std	Std	Std	NA	71
<hr/>										
<b>EMERGENCY DOOR GLASS, LOWER</b>	Std	Std	Std	Std	Std	Std	Std	Std	Std	57
<hr/>										
<b>FUEL TANK, Gal, Min - Std</b>	30	45	60	60	60	60	60	60	60	69
- Opt	30	NA	NA	NA	NA	NA	NA	NA	90	69
<hr/>										
<b>HEATER, Btu/hr - Std</b>	45,000	45,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	64
- Opt Aux.	40,000	40,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	64
<hr/>										
<b>KNEE SPACING, Min - Std</b>	24	25	25	25	25	25	24.75 <sup>a</sup>	25	24.75	44
- Opt	27	28	28	27.75	28	27.75	27.50 <sup>b</sup>	27.75	27.75	44
<hr/>										
<b>TILT HOOD, CONV. CHASIS:</b>	NA	Std	Std	Std	Std	Std	Std	Std	NA	69
<hr/>										
<b>TIRES: Steel Belt Radial -</b>										
Tubeless	NA	Std	Std	Std	Std	Std	Std	Std	Std	70
Size	NA	9R	9R	9R	10R	10R	11R	11R	11R	
		22.5F	22.5F	22.5F	22.5F	22.5F	22.5G	22.5G	22.5H	70
Tube Type	NA	Opt	Opt	Opt	Opt	Opt	Opt	Opt	Opt	70
Size	NA	8.25R	8.25R	8.25R	9.00R	9.00R	10.00R	10.00R	10.00R	
		20F	20F	20F	20F	20F	20G	20G	20H	70
<hr/>										
<b>Bias Belt -</b>										
Tubeless	Std	Opt	Opt	Opt	Opt	Opt	Opt	Opt	Opt	70
Size	8-	7.50-	8.25-	8.25-	9.00-	9.00-	10.00-	10.00-	10.00-	
	19.5E	20E	20E	20E	20F	20F	20F	20F	20G	70
Tube Type	Opt	Opt	Opt	Opt	Opt	Opt	Opt	Opt	Opt	70
Size	8.00x	7.50x	8.25x	8.25x	9.00x	9.00x	10.00x	10.00x	10.00x	
	19.5E	20E	20E	20E	20F	20F	20F	20F	20G	70
<hr/>										
<b>TRANSMISSIONS/CLUTCHES:</b>										
Automatic -	Opt	Opt	Opt	Opt	Opt	Opt	Opt	Opt	Std	73
Model	MS	AT-545	AT-545	AT-545	AT-545	AT-545	AT-545	AT-545 <sup>c</sup>	MT-643	
Standard -										
Fwd. Gears	M4	M4	M4	M4	M5	M5	M5	M5	NA	73
Clutch Size, in, Min	12	12	12	12	12	13	13	13	NA	73
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<b>U-BOLTS, NO., Min</b>	4	6	6	6	6	8	8	8	8	51
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<b>WHEELS: Steel Disc</b>	Std	Std	Std	Std	Std	Std	Std	Std	Std	70
Cast Spoke	NA	Opt	Opt	Opt	Opt	Opt	Opt	Opt	NA	70

LEGEND: AC = Air Conditioning; Amp = Amperes; Aux. = Auxiliary; CCA = Cold Cranking Amperes; Fwd. = Forward Hyd = Hydraulic; M4/M5 = Manual 4-spd/5-spd Transmission; Min = Minimum; MS = Manufacturer's Standard; NA = Not Available/Not Applicable; Opt = Optional; Std = Standard; WC = Wheelchair

NOTES: <sup>a</sup> = 25.00" on 71-passenger Long Wheelbase School Bus; <sup>b</sup> = 27.75" on 71-passenger Long Wheelbase School Bus; <sup>c</sup> = MT 643 on 77-passenger Forward-control School Bus or where required to match engine torque.

TILT HOODS NOT APPLICABLE TO FORWARD CONTROL BUSES.

\*See Par. H for Self-contained Air Conditioning Units.

\*\*Diesel Engine Required on 53- to 71-passenger Forward Control Buses.