

# **STATE OF TEXAS**

## **1997 MODEL SCHOOL BUSES**

**Texas Specification No.  
070-SB-97**

**General Services Commission  
Central Procurement Services  
1711 San Jacinto Street  
P. O. Box 13047  
Austin, TX 78701-3047**

**GENERAL SERVICES COMMISSION  
1997 BUS REQUISITION SCHEDULE**

<b><u>REQUISITION DUE DATE</u></b>	<b><u>BID ADVERTISED</u></b>	<b><u>SCHEDULED DELIVERY*</u></b>
12-20-96	1-15-97	7-31-97
1-30-97	2-18-97	8-31-97
2-28-97	3-18-97	9-30-97
3-28-97	4-16-97	10-31-97
4-30-97	5-21-97	11-30-97
5-30-97	6-18-97	12-31-97
6-27-97	7-16-97	1-31-98
7-31-97	8-20-97	2-28-98
8-28-97	9-17-97	3-31-98
9-26-97	10-15-97	4-30-98
10-31-97	11-19-97	5-31-98
11-26-97	12-17-97	6-30-98
12-30-97	1-21-98	7-31-98

\*If a delivery date falls on a Saturday or Sunday, the actual delivery date shall be the first business day after the scheduled delivery date. If you have special requirements or need to bid a bus outside of this schedule, contact Purchaser "U" at 512-463-3369.

**1998 BUS REQUISITION SCHEDULE**

<b><u>REQUISITION DUE DATE</u></b>	<b><u>BID ADVERTISED</u></b>	<b><u>SCHEDULED DELIVERY*</u></b>
1-29-98	2-18-98	8-31-98
2-27-98	3-18-98	9-30-98
3-27-98	4-15-98	10-31-98
4-30-98	5-20-98	11-30-98
5-29-98	6-17-98	12-31-98
6-26-98	7-15-98	1-31-99
7-31-98	8-19-98	2-28-99
8-28-98	9-16-98	3-31-99
9-30-98	10-21-98	4-30-99
10-30-98	11-18-98	5-31-99
11-26-99	12-16-98	6-30-99
12-31-98	1-20-99	7-31-99

## TABLE OF CONTENTS

LIST OF TABLES/FIGURES .....	iii
SECTION A - GENERAL INFORMATION, REQUIREMENTS AND CONDITIONS .....	1
SECTION B - ORDERING INFORMATION .....	15
SECTION C - 15 - 20 PASSENGER BODY REQUIREMENTS .....	26
SECTION D - 15 - 20 PASSENGER CHASSIS REQUIREMENTS .....	54
SECTION E - 24 - 83 PASSENGER BODY REQUIREMENTS .....	70
SECTION F - 24 - 83 PASSENGER CHASSIS REQUIREMENTS .....	107
SECTION G - WHEELCHAIR LIFT SPECIFICATIONS .....	150
SECTION H - AIR CONDITIONING SPECIFICATIONS .....	157
SECTION I - AVAILABILITY OF SPECIFICATIONS .....	162
FORM FOR ASSISTANCE .....	163
THREE-MONTH TEST OF NEW SCHOOL BUS ENGINES .....	164
SCHOOL BUS REQUISITION .....	167
APPROVED PRODUCTS LIST -- SCHOOL BUS ENGINES .....	169
APPROVED PRODUCTS LIST -- SCHOOL BUS BODIES .....	171
GENERAL INDEX .....	172

## LIST OF TABLES AND FIGURES

### TABLES AND FIGURES

<u>Table No.</u>	<u>Title</u>	<u>Page No.</u>
1	Physical Requirements, 15-20 Passenger Buses	26
2	Comparison of 15-24 Passenger Buses	52
3	15-passenger School Bus Table	63
4	16-passenger School Bus Table	65
5	18-passenger School Bus Table	66
6	19-passenger School Bus Table	68
7	20-passenger School Bus Table	69
8	Physical Requirements, 24-83 Passenger Buses	70
9	Steel Requirements for School Bus Bodies	80
10	One-Piece Seat Cushion Physical Properties	93
11	Two-piece Seat Cushion Physical Properties	93
12	24-passenger School Bus Table	117
13	35-passenger Conventional School Bus Table	119
14	47-passenger Conventional School Bus Table	121
15	47-passenger Forward Control School Bus Table	123
16	53-passenger Conventional School Bus Table	125
17	53-passenger Forward Control School Bus Table	127
18	59-passenger Conventional School Bus Table	129
19	59-passenger Forward Control School Bus Table	131
20	65-passenger Conventional School Bus Table	133
21	65-passenger Forward Control Diesel School Bus Table	135
22	71-passenger Short Wheelbase Conventional School Bus Table	137
23	71-passenger Long Wheelbase Conventional School Bus Table	139
24	71-passenger Forward Control Diesel School Bus Table	141
25	77-passenger Conventional School Bus Table	143
26	77-passenger Forward Control Diesel School Bus Table	145
27	83-passenger Forward Control Diesel (front engine) School Bus Table	147
28	83-passenger Forward Control Diesel (rear engine) School Bus Table	147
29	Air Conditioning Minimum Requirements Table	158

<u>Figure No.</u>	<u>Title</u>	<u>Page No.</u>
1	Chassis Types, small buses	61
2	Seat Cushion Assembly	92
3	Required Service Facility Zones	161

## SPECIFICATION FOR TEXAS SCHOOL BUSES

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

#### **A.1. SCOPE:**

- 1.1. BUS SIZES:** This school bus specification includes the minimum requirements for fourteen (14) 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 are designated in terms of passenger capacity exclusive of the driver, as listed below for regular seating. Capacity is based upon National Height and Weight Percentile Averages as specified in Federal Highway Safety Program Guideline No. 17. [See Paragraph B.1.2.]

15* Passenger	16* Passenger	18* Passenger	19* Passenger	20* Passenger
24* Passenger	35* Passenger	47* Passenger	53* Passenger	59* Passenger
65* Passenger	71S* Passenger (Short Wheelbase)	71L* Passenger (Long Wheelbase)	77* Passenger	83* Passenger
* Seating capacity will be reduced from the above whenever wheelchair positions and/or maximum seat spacing are specified for a given size bus (See Paragraphs A.1.3. and B.1.)				

#### **1.2. BUS TYPES:**

- 1.2.1. TYPE A (I & II):** The "Type A" school bus is a conversion or body constructed upon a van-type or cutaway front-section vehicle with a left side driver's door, designed for carrying more than ten (10) persons. This definition shall include two (2) classifications: "Type A-I", with a gross vehicle weight rating (GVWR) over ten-thousand pounds (10,000 lbs.); and "Type A-II", with a gross vehicle weight rating (GVWR) of ten-thousand pounds (10,000 lbs.) and under.
- 1.2.2. TYPE B:** A "Type B" school bus is a conversion or body constructed and installed upon a van or front section vehicle chassis, or stripped chassis, with a gross vehicle weight rating of more than ten-thousand pounds (10,000 lbs.), designed for carrying more than ten (10) persons. Part of the engine is beneath and/or behind the windshield and beside the driver's seat. The entrance door is behind the front wheels.
- 1.2.3. TYPE C:** A "Type C" school bus is a body installed upon a flat back cowl chassis with a gross vehicle weight rating of more than ten-thousand pounds (10,000 lbs.), designed for carrying more than ten (10) persons. All of the engine is in front of the windshield and the entrance door is behind the front wheels.

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

**1.3. SPECIAL EDUCATION BUSES:** Special education buses for impaired passengers may contain less than fifteen (15) passenger and wheelchair positions combined, but not less than ten (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 ten (10) passenger positions are classified as Multipurpose Passenger Vehicles (MPV's) by the Federal government. They will be designated by the State of Texas as "school buses" for the purposes of this specification. The State of Texas requires that MPV's used as school buses shall meet the same standards they would meet if built to accommodate ten (10) or more passengers even though they must be certified as Multipurpose Passenger Vehicles.

## **A.2. DEFINITIONS AND ABBREVIATIONS:**

**2.1. ASHRAE:** American Society of Heating, Refrigeration and Air Conditioning Engineers.

**2.2. ANSI:** American National Standards Institute.

**2.3. ASTM:** American Society for Testing and Materials.

**2.4. BCI:** Battery Council International.

**2.5. Commission and GSC:** General Services Commission.

**2.6. Conventional Bus:** A school buss with all of the engine in front of the windshield and the service or entrance door behind the front wheels.

**2.7. Department of Public Safety and DPS:** Texas Department of Public Safety.

**2.8. Education Agency and TEA:** Texas Education Agency.

**2.9. EPA:** United States Environmental Protection Agency.

**2.10. FMVSS:** Federal Motor Vehicle Safety Standards.

**2.11. Federal Guideline No. 17:** Federal Highway Safety Program Guideline Number 17.

**2.12. Forward Control Bus:** 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. GAWR:** Gross Axle Weight Rating.

- 2.14. **GVWR:** Gross Vehicle Weight Rating.
- 2.15. **Invitation for Bids and IFB:** Invitation for Bids.
- 2.16. **Knee Space:** 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 four inches (4") above the seat cushion.
- 2.17. **Manufacturer:** A fabricator of school buses, bodies, chassis, or components.
- 2.17. **MPV:** Multipurpose passenger vehicle accommodating ten (10) or less people.
- 2.18. **NSSB:** National Standards for School Buses (formerly National Minimum Standards).
- 2.19. **SAE:** Society of Automotive Engineers.
- 2.20. **SBMI:** School Bus Manufacturer's Institute.
- 2.21. **SCAAN:** Computer analysis of engine performance.
- 2.22. **Semi-forward Control Bus:** A bus in which part of the engine is beneath and/or behind the windshield and beside the driver's seat.
- 2.23. **Vendor:** Manufacturer's representative or dealer authorized to make sales and supply parts and services in Texas.
- 2.24. **VESC:** Vehicle Equipment Safety Commission.

### **A.3. APPLICABLE SPECIFICATIONS AND STANDARDS:**

- 3.1. **FEDERAL HIGHWAY SAFETY PROGRAM GUIDELINES:** 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 Guidelines No. 17. All requirements of this specification must be met unless they are in conflict with Program Guidelines No. 17 as it applies to school buses.
  - 3.1.1. **Federal Highway Safety Program Guidelines No. 17, Pupil Transportation Safety:** Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.
- 3.2. **FEDERAL MOTOR VEHICLE SAFETY STANDARDS (FMVSS):** School bus bodies and chassis shall meet or exceed the minimum requirements of this specification and shall also meet all applicable requirements of the FMVSS and those which are finally adopted. 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, DC 20402:
    - 3.2.1.1. **FMVSS No. 103 –** Windshield Defrosting and Defogging Systems.
    - 3.2.1.2. **FMVSS No. 105 –** Brakes, Hydraulic Service, Emergency and Parking.

- 3.2.1.3. FMVSS No. 108** -- Lamps, Reflective Devices, and Associated Equipment.
- 3.2.1.4. FMVSS No. 111** -- Rearview Mirrors - Passenger Cars and Multipurpose Passenger Vehicles.
- 3.2.1.5 FMVSS No. 121** -- Air Brake Systems - Buses and Trailers.
- 3.2.1.6. FMVSS No. 125** -- Warning Devices.
- 3.2.1.7. FMVSS No. 131** -- School Bus Pedestrian Safety Devices.
- 3.2.1.8. FMVSS No. 205** -- Glazing Materials.
- 3.2.1.9. FMVSS No. 208** -- Occupant Crash Protection.
- 3.2.1.10. FMVSS No. 209** -- Seat Belt Assemblies - Passenger Cars, Multipurpose Passenger Vehicles, Trucks and Buses.
- 3.2.1.11. FMVSS No. 210** -- Seat Belt Assembly Anchorages.
- 3.2.1.12. FMVSS No. 217** -- Bus Emergency Exits and Window Retention and Release.
- 3.2.1.13. FMVSS No. 220** -- School Bus Roll-over Protection.
- 3.2.1.14. FMVSS No. 221** -- School Bus Body Joint Strength.
- 3.2.1.15. FMVSS No. 222** -- School Bus Seating and Crash Protection.
- 3.2.1.16. FMVSS No. 301** -- Fuel System Integrity.
- 3.2.1.17. FMVSS No. 302** -- Flammability of Interior Materials - Passenger Cars, Multipurpose Passenger Vehicles, Trucks, and Buses.
- 3.2.1.18. FMVSS No. 303** -- Fuel System Integrity, Alternative Fuels.
- 3.2.1.19. FMVSS No. 304** -- Compressed Natural Gas Fuel Container Integrity.

**3.3. NATIONAL STANDARDS FOR SCHOOL BUSES (NSSB):** School bus bodies and chassis shall also meet or exceed the current NSSB (formerly National Minimum Standards) 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 Standards for School Buses, 1995 Revised Edition, National Standards Conference (May, 1995), National Safety Council, 425 North Michigan Avenue, Chicago, IL 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 Bid. The following publications form a part of this specification to the extent specified herein:

**3.4.1. AMERICAN NATIONAL STANDARDS INSTITUTE, INC. (ANSI), 1430 Broadway, New York, NY 10018:**



- 3.4.1.1. ANSI Z26.1** -- Safety Glazing Materials for Glazing Motor Vehicles Operating on Land Highways, Safety Code for, including Supplement Z26.1a, 1969.
- 3.4.2 AMERICAN PLYWOOD ASSOCIATION**, P.O. Box 11700, Tacoma, WA 98411:
- 3.4.2.1. U.S. Plywood Standard PS 1-83.**
- 3.4.3. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)**, 1916 Race Street, Philadelphia, PA 19103:
- 3.4.3.1. ASTM A 446** -- Standard Specification for Sheet Steel, Zinc Coated (Galvanized) by the Hot Dip Process, Structural (Physical) Quality.
- 3.4.3.2. ASTM A 525** -- Standard Specification for General Requirements for Steel Sheet, Zinc Coated (Galvanized) by the Hot-Dip Process.
- 3.4.3.3. ASTM D 3574** -- Standard Specification for Standard Test Method for Testing Cellular Materials - Slab Bonded and Molded Urethane Foam.
- 3.4.3.4. ASTM B 117** -- Standard Specification for Method of Salt Spray (Fog) Testing.
- 3.4.4. AMERICAN SOCIETY OF HEATING, REFRIGERATION AND AIR CONDITIONING ENGINEERS, INC. (ASHRAE)**, Circulation Department, 345 East 47th Street, New York, NY 10017:
- 3.4.4.1. ASHRAE 16-69** -- Methods of Testing for Rating of Room Air Conditioners.
- 3.4.5. FEDERAL HIGHWAY ADMINISTRATION**, United States Department of Transportation, Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402:
- 3.4.5.1. Federal Highway Administration FP-85** - Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects.
- 3.4.6. FEDERAL STANDARDS:** Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402:
- 3.4.6.1. Federal Standard No. 595a** -- Colors.
- 3.4.7. FEDERAL SPECIFICATIONS:** Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402:
- 3.4.7.1. Federal Specification No. TT-C-490B** -- Cleaning Methods and Pretreatment of Ferrous Surfaces For Organic Coating.
- 3.4.7.2. Federal Specification No. TT-C-520B** -- Coatings Compound, Bituminous, Solvent Type Underbody, (For Motor Vehicles).
- 3.4.7.3. Federal Specification No. TT-E-489** -- Enamel, Alkyd, Gloss (For Exterior and Interior Surfaces).
- 3.4.7.4. Federal Specification No. V -T-295D** -- Thread, Nylon.

**3.4.7.5. Federal Specification No. ZZ-M- 71D -- Matting, Rubber and Vinyl.**

**3.4.8. SCHOOL BUS MANUFACTURERS' INSTITUTE (SBMI),** Engineering Committee, 7508 Ben Avon Road, Bethesda, MA 20817:

**3.4.8.1. SBMI Standard No. 001 --** Standard Code for Testing and Rating Automotive Bus Hot Water Heating and Ventilating Equipment.

**3.4.9. SOCIETY OF AUTOMOTIVE ENGINEERS, INC. (SAE),** 400 Commonwealth Drive, Warrendale, PA 15096:

**3.4.9.1. SAE J20e --** Coolant System Hoses.

**3.4.9.2. SAE J377 --** Performance of Vehicle Traffic Horns.

**3.4.9.3. SAE J383 --** Motor Vehicle Seat Belt Anchorages - Design Recommendations.

**3.4.9.4. SAE J514 --** Hydraulic Tube Fittings.

**3.4.9.5. SAE J516 --** Hydraulic Hose Fittings.

**3.4.9.6. SAE J517 --** Hydraulic Hose.

**3.4.9.7. SAE J561 --** Electrical Terminals - Eyelet and Spade Type.

**3.4.9.8. SAE J588 --** Turn Signal Lamps for use on motor vehicles less than 2032 millimeter in overall width.

**3.4.9.9. SAE J639 --** Safety Practices for Mechanical Vapor Compression Refrigeration Equipment or Systems Used to Cool Passenger Compartments of Motor Vehicles.

**3.4.9.10. SAE J887 --** School Bus Warning Lamps.

**3.4.9.11. SAE J994b --** Alarm - Backup - Electric - Performance, Test, and Application.

**3.4.9.12. SAE J1128 --** Low Tension Primary Cable.

**3.4.9.13. SAE J1133 --** School Bus Stop Arm.

**3.4.10. STATE OF CALIFORNIA:**

**3.4.10.1. DEPARTMENT OF CONSUMER AFFAIRS,** 3485 Orange Grove Ave., North Highlands, CA 95660.

**3.4.10.1.1. California Technical Bulletin 117, Section A, Part I, Seat Cushion Compression Test.**

**3.4.11. STATE OF TEXAS:**

**3.4.11.1. RAILROAD COMMISSION OF TEXAS (RRC),** Liquefied Petroleum Gas Division, P.O. Box 12967, Austin, TX 78711-2967:

**3.4.11.1.1. Regulations for Compressed Natural Gas (Current Edition).**

**3.4.11.1.2. Safety Rules** – Liquefied Petroleum Gas Division (Current Edition).

**3.4.11.3. TEXAS NATURAL RESOURCE CONSERVATION COMMISSION (TNRCC)**,  
12100 Park 35 Circle, Austin, TX 78753:

**3.4.11.3.1. Regulation IV (31 TAC CHAPTER 114)**, Control of Pollution from Motor Vehicles (Current Edition).

**3.4.12. UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (EPA)**, Waterside Mall,  
401 M Street, S.W., Washington, DC 20460:

**3.4.12.1. EPA** – Noise Emission Standards.

**3.4.13. VEHICLE EQUIPMENT SAFETY COMMISSION (VESC)**, Suite 908, 1030 15th Street,  
N.W., Washington, DC 20005:

**3.4.13.1. VESC** – Regulation 6.

**3.4.13.2. VESC** – Regulation 10.

#### **A.4. GENERAL INFORMATION AND REQUIREMENTS:**

**4.1. EQUIPMENT INSTALLATION:** Requirements and accessories, either standard or optional, furnished 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.

**4.2. NEW MODELS:** Each bus body and bus chassis furnished under this specification shall be new school buses 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.

**4.3. 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. Completion of the Mileage Statement Portion of the Manufacturer's Statement of Origin will satisfy this requirement.

**4.4. 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.

**4.5. VENDOR GROSS VEHICLE WEIGHT RATINGS SELECTION<sup>1</sup>:** The requirements for

---

<sup>1</sup> Paragraph A.4.5 is not applicable for chassis only which are used by the State of Texas for remounting of bus bodies.

gross vehicle weight ratings (GVWR), gross axle weight ratings (GAWR) (front and rear), and tire size and load range for each size chassis are specified in Table No.'s Three through Seven (3 through 7) and Table No.'s Twelve through Twenty-eight (12 through 28), and are minimum requirements. These requirements are for small type school bus (15- through 20-passenger), conventional, and semi-forward control type school buses (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 alternative fuel storage tanks, air conditioning, 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.

**A.5. BID 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.

**5.1. PRICE PROTECTION:** The requisitioning school district, at the districts option, reserves the right to review all bids received prior to award to determine funds availability [See Paragraph B.2.1.5]. Vendors shall provide price protection for sixty (60) days from the date of the bid opening.

**A.6. CERTIFICATION AND COMPLIANCE:**

**6.1. 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 (1) copy of the work order must accompany the bus to its final destination.

**6.2. CERTIFICATION, ALL BIDDERS:** 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.

**6.3. CERTIFICATION, SUCCESSFUL BIDDER:** 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.

**6.4. CHASSIS PRODUCTION ORDER:**

**6.4.1. Attachment:** One (1) copy of the production order or "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 Paragraph A.6.4.2.]. The production order shall be a printed form and not machine coded.

**6.4.2. Alternative Plate:** In lieu of the production order, the information required above may be stamped on a metal plate, either on the vehicle 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.

**6.4.3. Removal/Obliteration:** The production order or chassis 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 vehicle 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.

**6.5. LITERATURE AND DRAWINGS: Each bidder shall furnish the following:**

**6.5.1. Isometric 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: 1.) the item number, 2.) the type of steel, and 3.) the decimal thickness of steel used in the construction. [See Table No. Nine (9)].

**6.5.2. Number of Drawings:** On construction items, one (1) 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.

**6.5.3. Literature:** The bidder shall have on file with the Commission, the latest pamphlets, brochures, and printed literature on the equipment the bidder proposes to furnish to this specification.

**6.5.4. Metal Certification:** The bidder shall have on file with the Commission, a statement certifying that the metal used in Texas School Buses conforms to the NSSB. NSSB requires galvanized steel to meet the requirements of the one-thousand (1,000) hour salt spray test in accordance with ASTM Standard B 117 and shall not lose more than ten percent (10%) of material by weight.

**6.6. MANUFACTURER'S STATEMENT OF ORIGIN:** The vendor, successful bidder, shall furnish the Commission with the Manufacturer's Statement of Origin which shall include the mileage accrued at the time of delivery to the school district. The Certificate of Title will not meet this requirement. The manufacturer's New Vehicle Warranty and major component parts warranties [See Paragraph A.10.4.] shall be furnished to the receiving school district. [See Paragraph. A.7.6.].

**6.7. TEMPORARY LICENSE TAGS:** Red temporary license tags shall be issued by the vendor for use with each new bus delivered [See Paragraph B.4.2.].

## **A.7. DELIVERY:**

- 7.1. 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<sup>2</sup>. 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 (6) months after delivery to any district, 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.
- 7.2. DELIVERY ON SCHEDULE:** Delivery on schedule is critical. The ability to deliver as specified in the Invitation for Bid will be a factor in making awards. A vendor who fails to make delivery in accordance with the terms of the purchase order shall be liable for actual damage suffered by the State. The amount of such damages shall be determined by the Commission.
- 7.3. DELIVERY TIME:** 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 written consent and approval of the receiving school district. The person delivering the bus shall present a delivery receipt to the responsible school personnel and obtain that school official's signature before delivery is considered complete. [See Paragraph A.7.6.]
- 7.4. LATE DELIVERIES:** Failure by the vendor to deliver buses, caused directly by natural disaster, war, civil disturbance, Federal Law and regulations, or labor disputes, which are beyond control of the contractor, will not cause the damages described in Paragraph A.7.2. to be assessed, but will not prohibit the district from canceling the order.
- 7.5. LATE DELIVERY NOTIFICATION:** The vendor shall notify the Commission and the district, in writing, at least twenty (20) days in advance of the scheduled delivery date. The notice shall indicate the anticipated delivery date and the specific cause of this delay. Failure to notify the Commission shall be cause to disqualify the bid.

In addition, a vendor who has orders for buses which have not been delivered in accordance with the terms of the purchase order shall submit a monthly report to "Purchaser U", Central Procurement Services, General Services Commission by the fifteenth (15th) day of each month. The report shall contain the following information: (1) purchase order number; (2) school district name; (3) reason for the late delivery; (4) current status; and (5) expected delivery date.

- 7.6. PRE-DELIVERY SERVICE:** The vendor or the vendor's representative 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:

**7.6.1.** Chassis lubrication, complete.

---

<sup>2</sup> Under no circumstances shall a bus be used as a towing vehicle prior to or during delivery to its destination. A private passenger vehicle may be towed behind the bus to be used by the delivery person to use to return to their place of origin.

7.6.2. Check all fluid levels and maintain proper grade and types of fluids.

7.6.3. Clean and wash interior and exterior of bus.

7.6.4. Pre-delivery inspection and service on chassis.

**A.8. INSPECTION:** Inspection shall be by and at the discretion of the 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, before 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.9. TERMS, INVOICING AND PAYMENT:**

**9.1. INVOICE, VENDOR'S:**

**9.1.1. School District's Copies:** The vendor shall submit the invoice to the school district at the address shown on the purchase order. The invoice must certify that the buses delivered meet or exceed the requirements and conditions of this specification. [See Paragraph A.6.3.].

**9.1.2. PAYMENTS, DISPUTED:** 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 twenty-first (21st) day after the date on which the invoice is received. A copy of the notice to the vendor shall be forwarded to "Purchaser U", Central Procurement Services, General Services Commission.

**A.10. WARRANTY AND SERVICE<sup>3</sup>:**

**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 Paragraph 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 the 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 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

---

<sup>3</sup> Warranty registrations must be completed and mailed to initiate warranty.

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.

**10.4.1. Air Conditioner:** Basic coverage for chassis and body parts is for twelve (12) months as specified in manufacturer's warranty document. The air conditioning manufacturer shall have service facilities available in each of the five (5) zones within the State of Texas [See Figure No. Three (3)]. For service on units provided by chassis manufacturer, contact local chassis dealer; for service on other makes, contact the vendor.

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

**10.4.2.1.** Allison Transmission Division (ATD) transmissions are warranted for thirty-six (36) months, unlimited mileage, at one-hundred percent (100%) cost of parts and labor. An extended warranty for forty-eight (48) months or sixty (60) months is available at extra cost.

**10.4.3. Batteries:** Twelve (12) months or twelve-thousand (12,000) miles, whichever occurs first. Battery warranties are included with the chassis warranty. For service contact the local dealer as specified in the battery warranty document.

**10.4.4. Bus Body:** A minimum of twelve (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.

**10.4.5. Bus Chassis:** Twelve (12) months or twelve-thousand (12,000) miles, whichever occurs first, beginning on the date of delivery [See delayed chassis warranty, Paragraph A.10.4.6.]. For warranty service and repairs on the bus chassis:

**10.4.5.1. 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.

**10.4.5.2. 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**  
Light-Duty Fleet Service Manager  
214-541-5447

**DALLAS ZONE**

**<- FORD ->**

**HOUSTON ZONE**

Jerold Sheets  
Heavy Truck Service Engineer  
214-417-6254

Ron Canal  
Heavy Truck Service Engineer  
713-320-7605

**GMC**

Rick Deets  
Medium-Duty Fleet Zone Service Mgr.  
810-745-7101  
214-541-5150  
1-800-322-7181 Woodfiel

**NIC**

Ray T. Barton  
Regional Service Manager  
214-450-3100

**10.4.5.3. Third:** If the problems are still not satisfactorily resolved, notify the vendor by letter with a copy to:

**Purchaser "U"**  
**Central Procurement Services**  
**General Services Commission**  
**P. O. Box 13047**  
**Austin, Texas 78711-3047**

**10.4.5.4. Last:** If the above action does not resolve the problem, you may use the form provided in the appendix of this specification to contact the Commission.

**10.4.6. 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:

**10.4.6.1.** Making application for the delayed warranty through the following steps, is the responsibility of the school district and must be done within fifteen (15) working days after the date the bus is delivered or the warranty starts at time of delivery :

**10.4.6.2.** Contacting the local chassis dealer for a delayed starting date for warranty service (i.e., start of school or date bus placed in service). The 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, the delayed warranty date is voided and the warranty date automatically becomes the delivery date.

Any questions should be addressed to the local chassis dealer or to the Commission.

**10.4.7. Diesel Engines, Mid-Range (35-83 passenger):** Five (5) years or fifty-thousand (50,000) miles, whichever occurs first. Extended warranties are available at extra cost. 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 twelve (12) months and are specifically defined in the manufacturer's literature included with the vehicle delivery. Warranty on wheelchair lifts with frames manufactured of aluminum shall be a minimum of twenty-four (24) months on frame rails and a minimum of eighteen (18) months on gear box and motor; all other components shall be warranted for twelve (12) months [See Paragraph G.1.5.1.].

## **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 Guidelines Standard No. 17. Approximately thirteen inches (13") per pupil has been established for designating bus body passenger capacities.
- 1.2. **REDUCED PASSENGER CAPACITY:** The thirteen inch (13") figure must be considered when ordering school buses since passenger capacity may be reduced when junior high, high school, or adult passengers are primary passengers. As an example, for larger students in which only two (2) students can be accommodated per seat, then a 71-passenger school bus may only seat about forty-eight (48) students. Other capacity buses will likewise seat fewer than the stated capacity. If there is a question about seating capacity in regular or wheelchair-equipped school buses, please consult with school bus body vendors or manufacturers before ordering.

- B.2. ORDERING:** Complete school buses, school bus bodies, or school bus chassis shall be requisitioned using the Requisition Form (or a copy) furnished within this document. Please refer to the facsimile requisition form on the pages following the options. More than one (1) bus may be requisitioned on one (1) 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 district 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 selected and checked (vendor's choice otherwise). State quantity and the size (capacity) of buses desired and specify the type (e.g., either Conventional or Forward Control) being ordered. PLEASE NOTE THAT THE REQUISITION FORM IS VALID UNTIL MODIFIED.
- 2.1.2. **SELECT REGULAR OPTIONS:** Select from the list of regular options for the size bus being ordered, the desired option (s) by making a check mark or an "X" next to the number.
- 2.1.3. **BID REVIEW:** School districts have the right to examine bids received prior to award in order to determine funds availability [See Paragraph A.5.1.]. School districts shall indicate in the appropriate section on the requisition their desire to initiate this review. Vendors are required to provide price protection for sixty (60) days from the bid opening. After this review, school districts must notify the Commission of their desire to award to the lowest bidder meeting specifications before the sixty (60) day price protection time constraint expires.
- 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 listed special optional equipment required by item number. First, check to see if the item is listed in the above Regular Options; if so use that list for ordering. This second sheet should be dated and identified with the School District Requisition Number.

**2.3. MAILING ADDRESS:** Mail the Requisition and the Certification Form to:

**Purchaser "U"**  
**Central Procurement Services**  
**General Services Commission**  
**P. O. Box 13047**  
**Austin, Texas 78711-3047**

**For further information, call: (512) 463-3369**

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

**ALLISON TRANSMISSIONS**

Stewart & Stevenson  
P.O. Box 1637  
Houston, TX 77251

**CHEVROLET MOTOR DIVISION**

General Motors Corporation  
130 East Carpenter  
Irving, TX 75063

**DODGE DIVISION**

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

**FORD MOTOR COMPANY**

Helm, Inc.  
P.O. Box 07150  
Detroit, MI 48207  
1-800-782-4356

**GMC TRUCK & COACH DIVISION**

Dysart, Service Department  
31 Judson  
Pontiac, MI 48058

**NAVISTAR INTERNATIONAL**

P. O. Box 655334  
Dallas, TX 75265

**FOR SHOP MANUALS AND/OR INFORMATION ON SCHOOL BUS BODY OPTIONS, ETC.,  
CONTACT:**

**BLUE BIRD/COLLINS**

Bridges-Hemphill  
Enterprises, Inc.  
1501 N Elm  
Denton, TX 76201  
1-800-633-8513

**CARPENTER**

Statewide Bus Sales  
1440 S Loop 12  
Irving, TX 75060  
1-800-460-2877

**THOMAS**

Longhorn Bus Sales  
6921 Homestead Rd.  
Houston, TX 77208  
1-800-392-5356

**AmTRAN and GENESIS**

Texas School Bus Ctr, Inc.  
4800 E. Seventh St.  
Austin, TX 78702  
1-800-382-8390

**MID-BUS/VAN-CON-WHEELED VEHICLES**

Conwell Smith Sales  
P. O. Box 1551  
Austin, TX 78767  
1-800-769-8621

Texas Bus Sales  
1605 W 34th St.  
Houston, TX 77206-0213  
1-800-34-BUSES

Lasseter Bus & Mobility  
4455 Alpha Rd., Suite. 102  
Dallas, TX 75244  
1-800-880-5620

**FREIGHTLINER**

Custom Chassis Corporation  
552 Hyatt Street  
Gaffney, SC 29341  
1-864-488-8607

**B4. TEMPORARY LICENSE TAGS AND EXEMPT LICENSE PLATES:**

- 4.1. EXEMPT LICENSE PLATES:** The following forms are required to obtain exempt license plates at the address shown:

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

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

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

Exempt license plates must be obtained from:

**Texas Department of Transportation (TxDOT)  
Division of Motor Vehicles  
ATTN.: Special Plates Section  
P.O. Box 26480  
Chimney Corners Station  
Austin, Texas 78755-0480**

- 4.2. TEMPORARY LICENSE TAGS:** The vendor shall issue with each bus delivered, temporary, red, license tags [See Paragraph A.6.7.]. **TEMPORARY LICENSE TAGS ARE LEGAL ONLY FOR A PERIOD OF TWENTY (20) DAYS.**

## B.5. REGULAR OPTIONS

### 15- THROUGH 20-PASSENGER BUSES

#### REGULAR OPTION NO.

#### DESCRIPTION

1. **Air Conditioning<sup>4</sup>**, Standard Cooling [See Paragraph H].
2. **Air conditioning**, extra cooling [See Paragraph H.1.5].
4. **Alternator**, one-hundred ampere (100 amp) minimum for "Type A" buses and minimum of one-hundred-thirty ampere (130 amp) for "Type B" buses [Required with Option No.'s 1 or 35. See Paragraph D.4.1.3.].
8. **Diesel Engine** [See Tables Three (3) through Seven (7)].
10. **Door, Powered Service**, manufacturer's standard (Not available on Sedan type doors) [See Paragraph C.2.14.3.].
11. **Door, Service**, Automotive Sedan Type (for 18- and 19-passenger buses only; [See Figure Number One (No. 1) and Tables Five and Six (5-6)].
12. **Fuel Tank, Increased Capacity**, conventional fuels (30-gallon minimum capacity; [See Paragraph D.3.3.2.].
13. **Glazing, Dark Tint, Passenger Side Windows**, minimum Light Transmittance of thirty percent (30%) and maximum Light Transmittance of forty percent (40%) [See Paragraph C.2.19.3.].
14. **Heater, Rear**, auxiliary [See Paragraph C.3.4.].
15. **Knee Spacing** (maximum allowed by FMVSS No. 222; requires deleting one (1) row of seats (five (5) positions) which will reduce seating capacity. (Not available on 16- and 19-passenger buses.

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

16. **Laminated Safety Plate Glass**, AS-2 or better [See Paragraph C.2.19.2.2.].
19. **Reflective material**: [See Paragraph C.3.7.].
20. **School Name Lettering**, both sides of bus [See Paragraph C.1.4.9.].
23. **Security System Lock, All Doors** (with ignition disconnect on emergency door).
24. **Sound Abatement Insulation** (shall reduce interior noise by four (4) decibels, minimum).

<sup>4</sup> Special Requirements: Option No. One (1) requires a minimum one-hundred ampere (100 amp) alternator and five-eighths inch (5/8") nominal thickness plywood installed over the steel floor.

- 25. **Student Safety Crossing Gate** [See Paragraph C.3.10.].
- 26. **Strobe Light, Roof-mounted** [See Paragraph C.3.8.].
- 27. **Tachograph**, zero to eighty miles per hour (0-80 mph), twelve (12) volt (with seven (7) day four-and-seven-eighths inch (4-7/8") disc chart and electronic clock/speedometer/recorder; [See Paragraph D.5.6.].
- 30. **Tool Compartment** [See Paragraph C.3.11.].
- 31. **Wheel, Spare**, unmounted (without carrier, tire, or tube; See Paragraph D.2.6.2.].
- 35. **Wheelchair Lift, Folding Platform Type, Right Curb Side Mounted (15-20 passenger buses only; with \_\_\_\_\_ wheelchair positions. Will reduce seating capacity**<sup>5</sup>
- 36. **Wheelchair Restraints, Webbed-belt Type** (for unusual wheelchairs which cannot otherwise be restrained; [See Paragraph G.3.].
- 37. **White Roof** [See Paragraph C.1.4.2.].
- 38. **Windows, push-out**, additional (for emergency exit), (indicate quantity per side) \_\_\_\_\_ [See Paragraph C.2.4.2.].
- 39. **Passenger Seats**, specialized with integral child restraint system. Integral means "a built-in feature," systems not built into the seat do not qualify.
- 40. **Engine Hour Meter.**

For Option No. 35 the school district must specify the number of wheelchair positions required on bus.

## REGULAR OPTIONS

### 24- THROUGH 77-PASSENGER BUSES

REGULAR OPTION NO.	DESCRIPTION
1.	<b>Air Conditioning<sup>6</sup></b> , Standard Cooling [See Paragraph H].
2.	<b>Air Conditioning, extra cooling</b> (Not available on 77-passenger buses) [See Paragraph H.1.5.].
3.	<b>Alternative Fuel Engines</b> (Availability selective. Select from 3A or 3B): The power units (engines) furnished for the respective size and style bus shall be operable on alternative fuels, as determined by the Texas Natural Resources Conservation Commission (TNRCC). The power unit shall be the chassis manufacturer's standard or optional engine for the vehicle type, which meets or exceeds the power requirements specified herein, at the engine manufacturer's rated operating speed. The engine may be of a standard production design or retrofitted for alternative fuels only by the engine Original Equipment Manufacturer (OEM) or any duly certified and/or approved manufacturer designated by the OEM, and certified/ licensed by the Texas Railroad Commission (RRC), as applicable. The engine shall be of such design and construction that it will give an even flow of power at all engine speeds without undue vibration, strain, or overheating of engine components. The fuel system shall meet all applicable FMVSS and The Railroad Commission of Texas certification and/or licensing requirements. These vehicles shall be fully operational at delivery to the district without any additional modification or adjustments [See Paragraph D.5.3.3.]. Alternatively fueled engines shall be OEM warranted for a period of not less than five (5) years/fifty-thousand (50,000) miles, and shall include all engine and emission parts and fuel system components. The engine manufacturer or approved designate, may upgrade engines in the field to improve durability, reliability, or emissions with the approval of the ordering agency.
3A.	<b>Compressed Natural Gas (CNG):</b> The engine shall be capable of operating on compressed natural gas, as defined herein, in a mono- or bi-fuel mode, as specified in the Invitation for Bid. The engine, fuel system, and all components shall meet all applicable FMVSS requirements. The fuel tank (s) shall be constructed of appropriate material for a fuel storage system for compressed natural gas and be enclosed in a cage meeting the same requirements as required for traditional fuels. (Internal check valves may be furnished in lieu of cages.) Minimum mileage range shall be seventy-five (75) miles or as specified in the Invitation for Bid.
3B.	<b>Liquefied Petroleum Gas (LPG):</b> The engine shall be capable of operating on liquefied petroleum gas, as defined herein. The engine, fuel system, and all components shall meet all applicable FMVSS requirements. The fuel tank (s) shall be constructed of appropriate material for a fuel storage system for liquefied petroleum gas. Minimum mileage range shall be seventy-five (75) miles or as specified in the Invitation for Bid.

Special Requirements: Option No. One (1) requires a minimum one-hundred-thirty ampere (130 amp) alternator and five-eighths inch (5/8") nominal thickness plywood installed over the steel floor.



4. **Alternator**, One-hundred-thirty ampere (130 amp) minimum (required with Option No.'s 1, 35 or 36; [See Paragraph F.4.1.2.].
5. **Axle, Rear, Two-speed** (Not available with automatic transmission).
6. **Brakes, Hydraulic** (for 59-, 65-, 71-, and 77-passenger buses only).
7. **Chassis, Long Wheelbase** (Requires minimum two-hundred-four inch (274") wheelbase for 71-passenger conventional bus only; or one-hundred-fifty-seven inch (157") wheelbase for 24-passenger bus only).
8. **Diesel Engine** (For 24- through 77-passenger buses; [See conventional buses in Tables 12 through 28.].
9. **Differential, No-spin.**
10. **Door, Powered Service**, manufacturer's standard [See Paragraph E.2.15.5.].
12. **Fuel Tank, Increased Capacity**, conventional fuel (for 24-passenger buses only; See Paragraph F.3.3.2.].
13. **Glazing, Dark Tint, Passenger Side Windows**, minimum Light Transmittance of thirty percent (30%) and maximum Light Transmittance of forty percent (40%) [See Paragraph E.2.19.3.1.].
14. **Heater, Rear**, auxiliary [See Paragraph E.3.6.].
15. **Knee Spacing** (Maximum allowed by FMVSS No. 222; requires deleting one (1) row (six (6) positions) of 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	27.75	27.75	27.75

16. **Laminated Safety Plate Glass**, AS-2 or better [See Paragraph E.2.19.2.2.].
17. **Low profile tires.**
18. **Mud Flaps, with Brackets, Mounted** [See Paragraph E.3.10.]. There shall be no advertisement on mud flaps.
19. **Reflective material** [See Paragraph E.3.9.]]
20. **School Name Lettering**, both sides of bus [See Paragraph E.1.4.9.].
21. **Seat Backs, Increased Height** [See Paragraph E.2.13.1.].
22. **Seat Belts** (For each passenger seating position; See Paragraph E.3.13.].
23. **Security System Lock, All Doors** (With ignition disconnect on emergency door).

- 24. **Sound Abatement Insulation** (shall reduce interior noise by four (4) decibels, minimum).
- 25. **Student Safety Crossing Gate** [See Paragraph E.3.16.].
- 26. **Strobe Light, Roof-mounted** [See Paragraph E.3.12.].
- 27. **Tachograph**, Zero to eighty miles per hour (0-80 mph), twelve (12) volt (with seven (7) day four-and-seven-eighths inch (4-7/8") disc chart and electronic clock/speedometer/recorder; [See Paragraph F.5.9.].
- 28. **Tachometer** (To indicate engine RPM).
- 29. **Tires, Mud and Snow Tread** (For Rear Wheels only).
- 30. **Tool Compartment** [See Paragraph E.3.17.].
- 31. **Wheel, Spare, Unmounted** (Without carrier, tire, or tube; See Paragraph F.2.6.2.2.].
- 32. **Wheel, Spare, Mounted** (with carrier but not tire and tube; carrier not available on 24-passenger bus; [See Paragraph F.2.6.2.1.].
- 33. **Wheelchair Lift, Folding Platform Type, Front Curb Side Mounted** (For 24-through 71-passenger bus only; [See Paragraph G.].<sup>7</sup>.
- 34. **Wheelchair Lift, Folding Platform Type, Rear Curb Side Mounted.** Same as Option No. 35 (for 15-20 passenger buses) except floor-mounted on rear curb side of bus [See Paragraph G.].<sup>6</sup>. This option is recommended only for buses which will have a regular attendant in addition to the driver.
- 36. **Wheelchair Restraints, Webbed-belt Type** (For unusual wheelchairs which cannot otherwise be restrained; [See Paragraph G.3.].
- 37. **White Roof** [See Paragraph E.1.4.1.].
- 38. **Windows, push-out, additional** (for emergency exit), (indicate quantity per side) \_\_\_\_\_ [See Paragraph E.2.19.1.5.].
- 39. **Passenger seats**, specialized with integral child restraint system. Integral means "a built-in feature," systems not built into the seat do not qualify.

---

<sup>7</sup>

For Option Nos. 33 and 34, the school district must specify the number of wheelchair positions required on bus.

## REGULAR OPTIONS

### 83-PASSENGER BUSES

REGULAR OPTION NO.	DESCRIPTION
1.	<b>Air Conditioning<sup>8</sup></b> , Standard Cooling [See Paragraph H].
2.	<b>Air Conditioning, extra cooling</b> [See Paragraph H.1.5.].
3.	<b>Alternative Fuel Engines</b> (Availability selective. Select from 3A or 3B): The power units (engines) furnished for the respective size and style bus shall be operable on alternative fuels, as determined by the Texas Natural Resources Conservation Commission (TNRCC). The power unit shall be the chassis manufacturer's standard or optional engine for the vehicle type, which meets or exceeds the power requirements specified herein, at the engine manufacturer's rated operating speed. The engine may be of a standard production design or retrofitted for alternative fuels only by the engine Original Equipment Manufacturer (OEM) or any duly certified and/or approved manufacturer designated by the OEM, and certified/licensed by the Texas Railroad Commission (RRC), as applicable. The engine shall be of such design and construction that it will give an even flow of power at all engine speeds without undue vibration, strain, or overheating of engine components. The fuel system shall meet all applicable FMVSS and The Railroad Commission of Texas certification and/or licensing requirements. These vehicles shall be fully operational at delivery to the district without any additional modification or adjustments [See Paragraph D.5.3.3.]. Alternatively fueled engines shall be OEM warranted for a period of not less than five (5) years/fifty-thousand (50,000) miles, and shall include all engine and emission parts and fuel system components. The engine manufacturer or approved designate, may upgrade engines in the field to improve durability, reliability, or emissions with the approval of the ordering agency.
3A.	<b>Compressed Natural Gas (CNG)</b> : The engine shall be capable of operating on compressed natural gas, as defined herein, in a mono- or bi-fuel mode, as specified in the Invitation for Bid. The engine, fuel system, and all components shall meet all applicable FMVSS requirements. The fuel tank (s) shall be constructed of appropriate material for a fuel storage system for compressed natural gas and be enclosed in a cage meeting the same requirements as required for traditional fuels. (Internal check valves may be furnished in lieu of cages.) Minimum mileage range shall be seventy-five (75) miles or as specified in the Invitation for Bid.
3B.	<b>Liquefied Petroleum Gas (LPG)</b> : The engine shall be capable of operating on liquefied petroleum gas, as defined herein. The engine, fuel system and all components shall meet all applicable FMVSS requirements. The fuel tank (s) shall be constructed of appropriate material for a fuel storage system for liquefied petroleum gas. Minimum mileage range shall be seventy-five (75) miles or as specified in the Invitation for Bid.

Special Requirements: Option No. One (1) requires a minimum one-hundred-thirty ampere (130 amp) alternator and five-eighths inch (5/8") nominal thickness plywood installed over the steel floor.

4. **Alternator**, One-hundred-thirty ampere (130 amp) minimum (Required with Option No.'s 1, 35 or 36; [See Paragraph F.4.1.2.]  
  
**Note:** Regular Option Numbers Five through Eight (5--8) are not applicable on the 24-passenger through 77-passenger buses.
9. **Differential, No-spin.**
10. **Door, Powered Service, manufacturer's standard** [See Paragraph E.2.15.5.].
12. **Fuel Tank, Increased Capacity**, Conventional fuel (ninety (90) gallon minimum capacity; [See Paragraph F.3.3.2.].
13. **Glazing, Dark Tint Passenger Side Windows**, Minimum Light Transmittance of thirty percent (30%) and maximum Light Transmittance of forty percent (40%) [See Paragraph E.2.19.3.1.].
14. **Heater, Rear**, auxiliary [See Paragraph E.3.6.].
15. **Knee spacing** (Maximum allowed by FMVSS No. 222; requires deleting one (1) row (six (6) positions) of seats which will reduce seating capacity).

Regular Seating Capacity	83
Rows of Seats	13
Minimum Knee Space, inches	27

16. **Laminated Safety Plate Glass**, AS-2 or better [See Paragraph E.2.19.2.2.].
17. **Low Profile Tires.**
18. **Mud Flaps, with Brackets, Mounted** [See Paragraph E.3.10.]. There shall be no advertisement on the mud flaps.
19. **Reflective material:** [See Paragraph E.3.9.].
20. **School Name Lettering**, both sides of bus [See Paragraph E.1.4.9.].
21. **Seat Backs, Increased Height** [See Paragraph E.2.13.1.].
22. **Seat Belts** (For each passenger seating position; [See Paragraph E.3.13.].
23. **Security System Lock, All Doors** (With ignition disconnect on emergency door).
24. **Sound Abatement Insulation** (Shall reduce interior noise by four (4) decibels, minimum).
25. **Student Safety Crossing Gate.** [See Paragraph E.3.16.].
26. **Strobe Light, Roof-mounted** [See Paragraph E.3.12.].

- 27. **Tachograph**, Zero to eighty miles per hour (0-80 mph), twelve (12) volt (with seven (7) day four-and-seven-eighths inch (4-7/8") disc chart and electronic clock/ speedometer/recorder; [See Paragraph F.5.9.].
- 28. **Tachometer** (To indicate engine RPM).
- 29. **Tires, Mud and Snow Tread** (For Rear Wheels only).
- 30. **Tool Compartment** [See Paragraph E.3.17.].
- 32. **Wheel, Spare, Mounted** (With carrier but not tire and tube; [See Paragraph F.2.6.2.2.].
- 38. **White Roof** [See Paragraph E.1.4.1.].
- 39. **Windows, push-out**, Additional (for emergency exit), (indicate quantity per side) [See Paragraph E.2.19.1.5.].
- 40. **Passenger seats**, Specialized with integral child restraint system. Integral means "a built-in feature," systems not built into the seat do not qualify.

## 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 Table No. One (1). [See Option No. 15 and Paragraph A.1.3.]:

**TABLE NO. ONE (1)  
PHYSICAL REQUIREMENTS**

Column (1) MINIMUM SIZE	Column (2) OVERALL BODY WIDTH	Column (3) KNEE SPACINGS <sup>1</sup>	Column (4) SEAT WIDTH LEFT <sup>2</sup> RIGHT	Column (5) CENTER AISLE WIDTH	Column (6) FLOOR-TO-CEILING HEIGHT <sup>3</sup>
Number of Passengers	Inches, Maximum	Inches, Minimum	Inches, Minimum	Inches, Minimum	Inches, Minimum
15	96	24	30* -- 30**	12	6
16	96	25	30* -- 30	12	72
18	96	24	30 -- 30**	12	63
19	96	25	39* -- 26	12	62
20	96	25	39 -- 26	12	72
<sup>1</sup> Column No. 3: <u>Knee space</u> 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 four inches (4") above the seat cushion.					
<sup>2</sup> Column No. 4: *Left rear seat shall have minimum width of twenty-six inches (26"). **Twenty-six inches (26") is permitted if twenty-six and/or thirty-nine inches (26"/39") combination is provided.					
<sup>3</sup> Column No. 6: <u>Floor-to-ceiling height</u> shall be measured in the center of the body between the Number Two pillar and the last side body pillar ahead of the rear roof slope.					

- 1.1.1. **Interior Width:** Fifteen passenger (15-) through 20-passenger school buses shall have a minimum interior width of seventy inches (70") at the shoulder level of a seated ninety percentile (90%) male passenger [See Table No.'s Three through Seven (3-7)].
- 1.2. **BUMPERS, REAR:** 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 the 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 three-sixteenths inch (3/16") thick by eight inches (8") high and shall wrap around the body, extending forward for at least twelve inches (12") 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 No. One (1) and Paragraph C.2.8.].
- 1.4. **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. Exit signs and Lettering shall be in compliance with FMVSS No. 217.

- 1.4.1. **Bumpers:** Bumpers for "Type A" school buses shall be the manufacturer's standard color; bumpers for "Type B" school buses shall be finished in black (Color No. 17038).
- 1.4.2. **Body 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 Bid (See Option No. 38), the school bus roof shall be painted white. The white 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 white paint shall be the same quality as the paint on the remainder of the school bus.
- 1.4.3. **Body Interior:** Unless otherwise specified in the Invitation for Bid, 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 Paragraph C.2.8.].
- 1.4.4. **Emergency Exit Lettering:** The emergency exits shall be marked "EMERGENCY DOOR" or "EMERGENCY EXIT," both on the outside and/or on the inside in compliance with FMVSS No. 217. All applicable requirements of FMVSS No. 217 relating to instructions, outlining, and markings shall be met.
- 1.4.5. **Exterior Mirror Backs:** The metal backs of all exterior mirrors, if painted, shall be finished in lusterless black (Color No. 37038; [See Paragraphs C.3.5.3 and C.3.5.5.].
- 1.4.6. **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).
- 1.4.7. **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 Commission, may be placed on the exterior bus body.
- 1.4.8. **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.
- 1.4.9. **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 eight inches (8") high and shall have one inch (1") 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). Body shall bear words "SCHOOL BUS" in black letters at least eight inches (8") high on both front

and rear of body or on signs attached thereto. Lettering shall be placed as high as possible without impairment of its visibility. Letter shall conform to "Series B" of Standard Alphabets for signs. "SCHOOL BUS" lettering shall have a reflective background, or as an option, may be illuminated by backlighting. Required lettering and numbering shall include:

District or company name or owner of the bus shall be displayed in the beltline.

Bus identification number shall be displayed on the sides, on the rear, and on the front.

**1.4.10. School Name Lettering:** When so specified in the Invitation for Bid [See Option No. 20], 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 five (5") inches high with minimum five-eighths inch (5/8") 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 Paragraph C.1.4. Maximum number of characters in one (1) line of the name is limited to thirty (30). The school district should list in the space provided on the School Bus Requisition Form [See sample form on Page 168], the name to be placed on the bus. Characters should be typed or printed plainly on this form to ensure accurate spelling.

**1.4.11. Wheels:** Both sides of all wheels, including the spare, shall be finished in the chassis manufacturer's standard color.

**1.4.12. Wheel Covers:** Wheel covers may be bright metal.

**1.5. INSULATION, NOISE:** Each school bus shall be constructed so that the noise level measured at the ear of the occupant nearest the primary vehicle noise source shall not exceed eighty-five (85) decibels, when tested in accordance with the procedure given in the Noise Test Procedure of NSSB. [See Option No. 24].

**1.6. INSULATION, THERMAL:** The ceilings and sidewalls shall be thermally insulated with a fire-resistant material approved by Underwriters Laboratories, Inc. to adequately reduce the noise level and to minimize vibrations. Buses shall have the equivalent of one-and-one-half inches (1-1/2") 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.

**1.7. LAMPS, SIGNALS, AND WARNING DEVICES:** Each bus shall be furnished with the lamps listed below [See SBMI Standard No. 001]:

**1.7.1. Alternately Flashing Signal Lamps:** Each school bus shall be equipped with eight (8) warning signal lamps, four (4) red and four (4) amber, working in an automatic or -sequential integrated system. The signal lamps shall conform to the design, installation, location and operating requirements in Paragraph S4.1.4. of FMVSS No. 108:

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

*". . . (b) Four (4) red signal lamps designed to conform to SAE Standard J887, "School Bus Red Signal Lamps," July 1964, and four (4) amber signal lamps designed to conform to that standard, except for their color, and except that their candlepower shall be at least two-and-one-half (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; an*

*"(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.

**1.7.1.1. Band:** Each set of amber and red lamps shall have a minimum three inch (3") black band around the set and a three inch (3") band between the lamps in each set. The color of this band shall be black enamel (Color No. 17038, Black Enamel of Federal Standard 595a). If it is not possible to provide a three inch (3") 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 SBMI Standard No. 001].

**1.7.1.2. 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 three-sixteenths inch (3/16"). 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

**1.7.1.3. Operating Instructions:** Complete instructions for the detailed operation of the warning signal lamp system shall be furnished with each school bus.

**1.7.2. Backup Lamps:** The color, requirements, and mounting of backup lamps shall be in accordance with FMVSS No. 108, except two (2) backup lamps are required by Texas Specifications.

**1.7.3. Identification Lamps:** Each bus with an overall width of eighty or more inches (80+") shall be furnished with identification lamps installed on the front and rear, three (3) amber lamps in the front and three (3) 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 (6") or more than twelve inches (12") 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 No.'s 45012 and 45013, or K-D 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].

Example of an approved equal: Peterson Model - PM 122.

- 1.7.4. Interior and Stepwell Lamps:** A minimum of two (2) 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.
- 1.7.5. License Plate Lamp:** The color, requirements, and mounting of the license plate lamp shall be in accordance with FMVSS No. 108.
- 1.7.6. 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.
- 1.7.7. Tail and Stop Lamps:** The quantities, colors, requirements, and mounting of tail and stop lamps shall be in accordance with FMVSS No. 108.
- 1.7.8. 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.
- 1.7.9. Warning Devices:** Each school bus shall be equipped with three (3) triangular warning devices meeting the requirements of FMVSS No. 125. The devices shall be packed three (3) per metal or heavy-duty plastic box, or they may be individually packed in metal or heavy-duty plastic boxes with the three (3) boxes contained within a carrier. Warning devices shall be securely mounted in the driver's compartment. Triangular warning devices furnished shall be approved by the Texas Department of Public Safety.
- 1.8. 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.
- 1.9. 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.
- 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. 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 one-eighth inch (1/8") 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 chassis identification plate [See Paragraph A.6.4.3.].
- 1.10.2. 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 twenty (20) mils.

**1.11. WIRING:** All wiring shall conform to the current standards of the SAE. Wiring shall be arranged as required with each circuit protected by a fuse or circuit breaker. Wiring as arranged in the circuits to manufacturer's specifications are acceptable; however, the addition of another circuit for the alternatively flashing signal lamps shall be provided.

**1.11.1. 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 (8) light warning system and hazard warning lights.

**1.11.2. Color and Number Coding:** A system of color and number coding shall be used and an appropriate identifying diagram shall be provided together with the wiring diagram provided by the chassis manufacturer.

The following body interconnecting circuits shall be color coded as noted:

FUNCTION	COLOR
Left Rear Directional Signal	Yellow
Right Rear Directional Signal	Dark Green
Stoplights	Red
Backup Lights	Blue
Taillights	Brown
Ground	White
Ignition Feed, Primary Feed	Black

The color of the cables shall conform to SAE J1128.

**1.11.3. Fusing:** Each circuit, except starting and ignition, shall be fused separately or shall have an adequate circuit breaker. Two (2) extra fuses for each size of fuse installed on the bus by the body manufacturers, shall be conveniently mounted on the bus body.

**1.11.4. Main Circuits:** The electrical system wiring shall have at least nine (9) main circuits:

- (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.

## C.2. CONSTRUCTION:

- 2.1. GENERAL REQUIREMENTS:** All Texas school buses, including those with ten-thousand pounds (10,000 lbs.) gross vehicle weight rating (GVWR) or less, shall conform to the performance requirement of FMVSS No. 221, "School Bus Body Joint Strength," and restraining barriers conforming to FMVSS No. 222, "School Bus Passenger Seating - Crash Protection," Sections S.5.2 and S.5.3.

### 2.1.1. Body-Chassis Attachment:

**2.1.1.1. 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.

**2.1.1.2. 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) **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.
- (ii) **U-bolts<sup>9</sup>:** A minimum of two (2) U-bolts shall also be used on each frame rail to attach the body to the chassis frame. The four (4) 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 one-half inch (1/2") past the nuts. Minimum diameter of the U-bolt threads shall be seven-sixteenths inch (7/16").

**2.1.2. 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 heater or 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.

**2.1.3. 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.

**2.1.4. Fasteners, 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.

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 (4) U-bolts. Two (2) installed on each frame rail.

- 2.1.5. Fasteners, Other:** Sheet metal screws or self-tapping bolts of any type shall not be used in the construction of bodies except:
- 2.1.5.1.** Alignment<sup>10</sup> of doors or in conjunction with rivets, welds, or bolts for compliance with FMVSS No. 221, as applicable, or;
  - 2.1.5.2.** Attachment of exterior mirrors in certain cases [See Paragraph C.3.5.3.], or;
  - 2.1.5.3.** Electrical wire moldings and light fixtures, or;
  - 2.1.5.4.** Installation of header pads over the doors, or;
  - 2.1.5.5.** 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.** Interior panels which must be removed to give accessibility to other interior or concealed components, or;
  - 2.1.5.7.** Seat construction [See Paragraph C.2.12.4.2.], or;
  - 2.1.5.8.** Window frames when applied with the metal adhesive.
- 2.1.6. 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:
- 2.1.6.1. 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.
  - 2.1.6.2. Grille:** A sufficiently reinforced grille assembly.
  - 2.1.6.3. Hood:** Hood cover with latching mechanism providing access to the forward part of the engine.
  - 2.1.6.4. Lamps:** Headlamps and parking/turn-signal lamps as required by FMVSS No. 108.
- 2.1.7. Steering Wheel Placement:** There shall be at least a two inch (2") clearance between the steering wheel and the cowl, instrument panel, or any other surface.
- 2.2. 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.

<sup>10</sup> 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.

## **2.3. BODY FRAME:**

**2.3.1. Longitudinal Frame Members:** The body frame shall contain, as a minimum, the following longitudinal frame members at the locations shown:

**2.3.1.1. Rear Corner:** 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.

**2.3.1.2. Roof:** Two (2) 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, 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.

**2.3.1.3. Shoulder Level:** There shall be one (1) 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 flat) strip of metal.

**2.3.1.4. Window/Seat Frame Area:** There shall be one (1) 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 wheel housing. 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.

**2.4. EMERGENCY EXITS:** Texas school buses shall be provided with emergency exits which comply with FMVSS No. 217 and those requirements as listed below:

**2.4.1. Emergency Doors:** Buses furnished to this specification shall be equipped with emergency doors meeting the description below. Fifteen passenger (15-) and 18-passenger buses shall be equipped with emergency doors meeting the requirements of either "Style I" (two-door type) or "Style II" (single door type). Sixteen passenger (16-), 19-passenger, and 20-passenger buses shall be furnished with Style II 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 Paragraph C.2.19.2. and Paragraph C.1.4.4.]. No seat or other object shall be

placed in the body that restricts the passageway to the emergency door to less than twelve inches (12"). There shall be no steps leading to the emergency door.

**2.4.1.1. Design, "Style I" Emergency Door (Two (2) Door Type for 15- and 18-passenger buses only):** Both of the rear doors shall be for emergency exit use and provided with the following:

**2.4.1.1.1. Door Holding Device:** A means (device) shall be provided to hold the swing-out type door (s) in the fully opened position.

**2.4.1.1.2. Fastening:** The two (2) 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.

**2.4.1.1.3. 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, three inches (3") wide and one inch (1") thick, extending the full width of the emergency door to prevent injury when accidentally impacted.

**2.4.1.1.4. 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.

**2.4.1.1.5. 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.

**2.4.1.2. Design, "Style II" Emergency Door (Single Door Type):**

**2.4.1.2.1. 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.

**2.4.1.2.2. Design:** The emergency door shall be located in the center rear of the body and shall have a minimum horizontal opening of thirty inches (30") and a minimum vertical opening of forty-eight inches (48") measured from the floor level. It shall be properly sealed against moisture and dust.

**2.4.1.2.3. Door Holding Device:** A means (device) shall be provided to hold the swing-out type door (s) in the fully opened position.

**2.4.1.2.4. 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, three inches (3") wide and one inch (1") thick, extending the full width of the emergency door to prevent injury when accidentally impacted.

**2.4.1.2.5. Latch:** The emergency door shall be equipped with a slide bar rack and pinion (cam) operated latch. The slide bar shall be approximately one-and-one-fourth inches (1-1/4") wide and three-eighths inch (3/8") thick and shall have a minimum stroke of one-and-one-eighth inches (1-1/8"). The slide bar shall be spring loaded so as to retain the bar in the closed position and have a minimum of one inch (1") of horizontal bearing surface beyond the edge of the door frame when the door lock is in a latched position.

**2.4.1.2.6. 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.

**2.4.1.2.7. 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.

**2.4.2. Emergency Exit Requirements:** "Type A", "Type B", "Type C", and "Type D" vehicles shall be equipped with a total number of emergency exits as follows for



the indicated capacities of vehicles. Exits required by FMVSS No. 217 may be included to comprise the total number of exits specified.

Zero to 42-Passenger = One (1) emergency exit per side and one (1) roof hatch.

43- to 78-Passenger = Two (2) emergency exits per side and two (2) roof hatches.

79- to 90-Passenger = Three (3) emergency exits per side and two (2) roof hatches.

Each emergency exit above shall comply with FMVSS No. 217. These emergency exits are in addition to the rear emergency door or exit.

In addition to the audible warning required on emergency doors by FMVSS No. 217 additional emergency exits may also be equipped with an audible warning device.

- 2.5. FLOORS:** 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:

**2.5.1. 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.

**2.5.2. Material:** The floor shall be covered with plywood securely attached to the existing steel floor. The plywood shall be five-eighths inch (5/8") 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.

- 2.6. FLOOR COVERING:**

**2.6.1. 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 three-sixteenths inch (3/16") measured from tops of ribs. Rubber aisle floor covering shall meet Federal Specification ZZ-M-71D.

**2.6.2. Installation:** Floor covering must be permanently bonded to floor and must not crack when subjected to sudden changes in temperature. Bonding or adhesive material shall be waterproof and shall be type recommended by the manufacturer of floor-covering material. All seams must be sealed with waterproof sealer.

**2.6.3. 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 one-eighth inch (1/8").

- 2.7. PANELS, EXTERIOR:** Exterior panels shall be steel; however, front door farings and front and rear end-caps only may be fiberglass or heavy-duty plastic.

**2.7.1. 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.

**2.7.2. Joints:** Joints shall meet the requirements of FMVSS No. 221.

**2.8. PANELS, INTERIOR:** 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 A 446. 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- and 18- passenger buses only.

**2.8.1. Attachment:** All interior panels shall be attached to the frame structure by bolts, rivets, or by any well-designed method utilizing self-locking panels, or locking panel strips. Regardless of the method used, the panels shall be attached so that vibration, rumbling, and popping shall be at a minimum.

**2.8.2. Design:** Front and rear panels shall be formed to present a smooth, pleasing appearance. 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.

**2.9. RUB RAILS:** Two (2) separate, one-piece (1-piece) continuous rub rails of the type, grade, and thickness of steel specified in Table No. Nine (9) or approved equal, shall be installed on the body as described below. The minimum finished width of all rub rails shall be four inches (4"):

**2.9.1. 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 (1") 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.

**2.9.2. 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 (1) of the following drainage methods shall be used:

**2.9.2.1. Slots:** The bottom flange of the rub rail shall have a minimum of one inch (1") by 0.032 inch formed slots spaced on not more than twelve inch (12") centers, or;

**2.9.2.2. Slots or Holes:** One (1), one-fourth inch (1/4") 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.

- 2.9.3. 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 Paragraph C.2.1.5.5]. Provisions for one-piece (1-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.

- 2.9.4. Location:** One (1) 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.

- 2.9.5. Sealing:** The top joint of the rub rail shall be sealed with a caulking compound or adhesive as specified in Paragraph C.2.1.2.

- 2.10. SEAT BARRIERS:** Barriers shall be furnished and installed in accordance with FMVSS No. 222. Barriers shall also be provided with the following:

- 2.10.1. 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. The outside surface of this handle shall be stainless steel, polished aluminum, or chrome-plated steel. The design shall provide a smooth installation which would eliminate the possibility of clothing or other articles becoming caught upon ingress or egress from the vehicle.

- 2.10.2. Knee Space:** Knee space between these barriers and the front of each front passenger seat shall be at least twenty-four inches (24") for 15- and 18-passenger and twenty-five inches (25") for 16-, 19-, and 20-passenger buses when measured from the modesty panel to the front of the seat back at the center of the seat approximately four inches (4") above the seat cushion.

- 2.10.3. Upholstery:** Barriers shall be covered with upholstery meeting the requirements of Paragraph C.2.12.5.

- 2.11. SEATING REQUIREMENTS, DRIVER:**

- 2.11.1. 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 four inches (4") "Fore and Aft." The back of the driver's seat shall be heavily padded and form-fitted ("Type B" and "Type C" only). Driver's seat supplied by the body company shall be high back suspension seat with a minimum seat back adjustment of fifteen degrees (15°), not requiring the use of tools, and with a head restraint to accommodate a 95th percentile adult male, as defined in FMVSS No. 208. The driver's seat shall be secured with nuts, bolts, and washers or flanged-headed nuts.

**2.11.2. Driver's High Back Seat, Optional:** When so specified in the Invitation for Bid (or when a GMC/Chevrolet chassis is furnished) a high back driver's seat shall be provided with a minimum seat back adjustment of fifteen degrees (15°) and with a head restraint to accommodate a 95th percentile adult male, as defined in FMVSS No. 208, and shall meet all of the applicable requirements of Paragraph C.2.11.1. ("Type B" and "Type C" only).

**2.11.3. 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. Driver seat positioning and range of adjustments shall be designed to accommodate comfortable actuation of the foot control pedals by ninety-five percent (95%) of the male/female adult population.

**2.11.4. Seat Belts and Seat Belt Assembly:** Three (3) point, "Type II" seat belt assembly conforming to FMVSS No. 209 shall be provided for the driver. The belt assembly shall be equipped with an emergency locking retractor (ELR) for the continuous belt 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 II" 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.

**2.12. SEATING REQUIREMENTS, PASSENGER:** 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:

**2.12.1. Seat Belts, Passenger:** Seat belts conforming to FMVSS No.'s 209 and 210 shall be provided for each passenger position on 15- through 20-passenger school buses, including those with a GVWR of more than ten-thousand pounds (10,000 lbs.). The seat belts shall meet the following requirements:

**2.12.1.1. 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 (2) position seats shall use two (2) colors; three (3) position seats may use two or three (2 or 3) colors.

**2.12.1.2. Design:** Seat belts shall have a buckle end and an attaching end which are adjustable to fit passenger sizes as required by FMVSS No.'s 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.

**2.12.2. Seat Cushions:** All seat cushion units thirty inches (30") wide or less shall be designed to adequately support two (2) passengers of one-hundred-twenty pounds (120 lbs.) each. All seat cushions over thirty inches (30") wide shall be designed to adequately support three (3) passengers of one-hundred-twenty pounds (120 lbs.) each. The seat cushion shall consist of a base, foam cushion, and upholstery meeting the following requirements:

- 2.12.2.1. Base:** The base shall be nominal one-half inch (1/2") 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.

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

**2.12.3. Seat Frames:**

- 2.12.3.1. 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. Flip seats meeting the requirements of FMVSS No. 217 may be utilized at a location to accommodate side emergency exits as required by FMVSS No. 217. Seat frame legs shall be two, four, or six (2, 4, or 6) 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.

- 2.12.3.2. 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 [See Paragraph C.1.4.3].

**2.12.4. Seat Installation:**

- 2.12.4.1. Aisle Width:** The minimum aisle width between rows of seats shall be twelve inches (12"), except a thirty inch (30") aisle is required if regular seating is provided between the rear emergency door and wheelchair position on wheelchair equipped buses [See Paragraph G.1.7.3].

- 2.12.4.2. Attachment:** Each leg shall be attached to the floor with at least two (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.

- 2.12.4.3. Knee Spacing:** The seats shall provide knee spacing as normally furnished by the manufacturer for this seating capacity but not less than twenty-four inches (24") for the 15- and 18-passenger buses. [See Paragraph A.2.13.: Definition of knee space.] Knee spacing for the 16- through 20-passenger bus shall be not less than twenty-four inches (24") [See Table No. One and Option No. 15].

**2.12.4.4. Track Seating:** Seats may be track mounted in conformance with FMVSS No. 222. If track seating is installed, the manufacturer shall supply minimum and maximum seat spacing dimensions applicable to the bus, which comply with FMVSS No. 222. This information shall be on a label permanently affixed to the bus.

**2.12.5. Upholstery:** The seat cushion and back units shall be covered on top and four (4) sides with a vinyl resin-coated upholstering material as follows:

**2.12.5.1. Material:** These materials shall be fire-resistant and shall meet or exceed the Boston Fire Block Test in the National School Bus Standards. They shall be artificial leather.

**2.12.5.2. 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.

**2.12.5.3. Welting:** There shall be welting on exposed seams of the seat back and cushion.

**2.13. SERVICE ENTRYWAY:** The entrance door steps shall be designed so that the first step shall not be more than ten to fourteen inches (10 -- 14") from the ground when the bus is unloaded. Step risers shall not exceed a height of ten inches (10"). When plywood is used on a steel floor or step, the riser height may be increased by the thickness of the plywood. 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 Paragraph C.2.10.1.: Handrail Installation Requirements] A suitable device (s) shall be designed and installed to prevent injury or fatality of passengers from being dragged. At least one such device shall assist passengers during entry or egress, and be of such design to eliminate entanglement.

**2.14. SERVICE OR ENTRANCE DOORS:** Fifteen (15)- through 20-passenger buses shall be equipped with a 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.

**NOTE:** Fifteen (15)-passenger buses may have either a "Style I" or a "Style II" service door at the manufacturer's option. Sixteen (16)-passenger buses shall have a "Style II" (tall) service door (no option). Eighteen (18)- and 19-passenger buses shall have a "Style II" (tall) service door unless Option No. 11 a for sedan type door is designated by the ordering school district. Twenty (20)-passenger buses shall have a "Style II" (tall) service door (no option). [See Table No. Two (2): Comparison of small buses.] This door shall have a positive latching mechanism to eliminate the possibility of an inadvertent door opening during a frontal crash or roll-over.

**2.14.1. Attachment:** "Style I" doors shall be attached by the chassis manufacturer's standard method. The hinges for "Style II" 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 "Style II" doors while installing rivets. Self-tapping bolts may be used for alignment if the bolt heads are tack-welded to the hinges [See Paragraph C.2.1.5.1.].

- 2.14.2. Design, "Style I" (Sedan Type) Service Door:** This service or entrance door shall be of one-piece (1-piece) and shall have a minimum horizontal opening of approximately twenty-eight inches (28") and a minimum vertical opening of approximately fifty-three inches (53"). 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 Bid [See Option No. 11], 18- and 19-passenger buses shall be furnished with sedan type "Style I" service doors.
- 2.14.3. Design, "Style II" (Tall) Service Door<sup>11</sup>:** This service or entrance door shall be the two-piece (2-piece) or folding type and shall have a minimum horizontal opening of approximately twenty-four inches (24") and a minimum vertical opening of approximately sixty-eight inches (68"). The doors shall be operated from controls at or near the bus driver's seated position. The doors shall be either operated manually or when so specified in the Invitation for Bid [See Option No. 10], 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 one-hundred-twenty-five pound (125 lb.) 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.
- 2.14.4. Driver's Visibility:** Service or entrance doors shall have lower and upper glass panels [See Paragraph C.2.14.5.], or, if a sedan-type door, a system of mirrors and glass panels to provide the driver a clear view of entering passengers as well as the passenger landing area. Whichever style of door is used, provision shall be made using either glass panels or mirrors to give the seated driver a view of at least the upper seven-and-one-half inches (7-1/2") of a thirty inch (30") 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.
- 2.14.5. Glass Panels:** "Style II" service or entrance doors shall have glass panels of approved safety glass [See Paragraph C.2.19.2.: Installation Requirements]. Bottom of each lower glass panel shall be not more than ten inches (10") from the top surface of the bottom step. The top of each upper glass panel shall be not more than six inches (6") from the top of the door. "Type A" buses shall have upper glass panels (window) of safety glass with a minimum area of three-hundred-fifty square inches (350 sq. ins.).
- 2.14.6. 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, three inches (3") high and one inch (1") thick, extending the full width of the opening, to prevent injury when accidentally impacted.

<sup>11</sup> Powered Service Doors shall be clearly and concisely marked with operating instructions in case of power failure.

**2.15. SIDE DOORS OF CONVERTED VANS:** The side doors of converted van shall be made inoperable by one of the following:

**2.15.1. 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.

**2.15.2. Side Reinforced:** 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.

**2.16. 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.

**2.17. 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.

**2.18. WHEELHOUSING:** The wheelhousing shall be the manufacturer's standard design. [See Paragraph C.1.10.: Undercoating Requirements.)

**2.19. WINDSHIELD AND WINDOWS:**

**2.19.1. General Design:**

**2.19.1.1. Side Windows, Passenger, Standard:** There shall be either a standard or a push-out type window for each passenger seat except where it is not possible because of the installation of side emergency exits [See Paragraphs C.2.4.2 and C.2.19.1.2]. Standard side 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 (6") from the top. The passenger side windows shall provide an unobstructed opening twenty-two inches (22") wide and between nine and ten inches (9 -- 10") high. These windows shall include a metal stop pin, bar, or similar device to ensure that the windows can be lowered only within the mandatory limit. These latches and related mechanism (excluding the thumb regulator) shall be manufactured of metal. When in a closed position, all windows shall be weather-tight.

**2.19.1.2. Side Windows, Passenger, Push-out Type<sup>12</sup>:** At the manufacturer's option, 15- through 20-passenger buses may be provided with one (1) push-out side window in lieu of an emergency exit on each side [See Paragraphs C.2.4.1 and C.2.4.2 and Option No. 39]. These windows shall be hinged at the top and shall be positioned for ease of egress.

<sup>12</sup> Push-out windows shall be equipped with an electrical switch connected to an audible signal automatically operated and located in the driver's compartment which shall indicate when the window is pushed out in excess of one-half inch (1/2"). 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.



These push-out windows shall be the body manufacturer's standard push-out passenger windows meeting or exceeding Federal Standards.

- 2.19.1.3. Service Door and Emergency Door Windows:** The windows of either style emergency door and "Style II" service doors [See Paragraph C.2.4.1.] shall be furnished with upper glass panels permanently closed and set in rubber or sealed in rubber.
- 2.19.1.4. Windshield:** The maximum width of the windshield center post shall not exceed two-and-one-half inches (2-1/2"). There shall be at least a two inch (2") clearance between the steering wheel and the windshield, cowl, instrument panel, or any other surface.
- 2.19.2. 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:
  - 2.19.2.1. Rear and Other Windows:** The glass in the rear (side) windows, and all other windows including the driver's side windows and the emergency door windows, shall be a minimum of one-eighth inch (1/8") safety plate glass and shall be AS-2 or AS-3 grade or better as specified in ANSI Safety Code Z26.1.
  - 2.19.2.2. Safety Plate Glass:** When so specified in the Invitation for Bid [See Option No. 16], all windows shall be AS-2 grade or better safety plate glass.
  - 2.19.2.3. Side Windows, Passenger:** The glass in all passenger side windows (including push-out type emergency exit windows) shall be a minimum of one-eighth inch (1/8") safety plate glass and shall be AS-2 grade or better, as specified in ANSI Safety Code Z26.1.
  - 2.19.2.4. Windshield:** The windshield shall be minimum seven-thirty-seconds inch (7/32") thick safety plate glass and shall be heat-absorbent, laminated AS-1 safety glass meeting NSI Standard Z26.1, as amended.
- 2.19.3. Tinting<sup>13</sup>:**
  - 2.19.3.1. Side Windows, Passenger:** When so specified in the Invitation for Bid [See Option No. 13], passenger side windows and push-out type emergency windows only shall be tinted to minimum thirty percent (30%), maximum forty percent (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.
  - 2.19.3.2. Windshield:** The windshield shall have a horizontal gradient band (tinted) starting slightly above the driver's line of vision with

<sup>13</sup>

All safety glazing materials shall be approved by the Department of Public Safety.

approximately ninety percent (90%) light transmittance and gradually decreasing to a minimum of seventy percent (70%) light transmittance at the top of the windshield, or the entire windshield shall be tinted to meet the requirements of FMVSS No. 205.

### C.3. ACCESSORIES, REQUIRED AND OPTIONAL:

- 3.1. **BACKUP ALARM:** An automatic, audible backup warning alarm meeting the requirements of Type C, 97 d (A), SAE J994b (except for twelve (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. **EMERGENCY EQUIPMENT:** Fifteen passenger (15-) through 20-passenger school buses shall be equipped with the following emergency equipment:
- 3.3.1. **Body Fluid Cleanup Kit:** Each bus shall be provided with a removable and moisture-proof body fluid cleanup kit. It shall be properly mounted and identified as a Body Fluid Cleanup Kit. This kit shall contain as a minimum, the following items mounted in a removable metal or hard plastic kit:
- 1 -- 15 oz. chlorine-type absorbent deodorant material (or equal)
  - 1 -- 12 oz. germicidal spray disinfectant
  - 2 -- pair disposable latex gloves
  - 4 -- 18" x 18" absorbent towels
  - 1 -- plastic pick-up spatula
  - 1 -- plastic hand broom
  - 1 -- plastic dust pan
  - 2 -- 14" x 19" disposal bags and ties (waterproof)
  - 2 -- adhesive "BIO-HAZARD" labels
  - 1 -- 12 oz. deodorant spray
  - 4 -- individually wrapped, cold sterilization wipes in foil-lined pouches
  - 2 -- paper respiratory masks
  - 1 -- metal or hard plastic container identified as "BIO-HAZARD" with black symbol and lettering on orange mountable case.
- 3.3.2. **Fire Extinguishers:** School buses shall be equipped with a fire extinguisher, as listed below:
- 3.3.2.1. **Standard Fire Extinguisher:** Each bus shall be equipped with at least one (1) refillable stored pressure Multipurpose Dry Chemical type (or approved equal) fire extinguisher of minimum five pounds (5 lbs.) 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.
- 3.3.3. **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
- 8 -- 2 in. bandage compress
- 10 -- 3 in. bandage compress
- 2 -- 2 in. x 6 yds. sterile gauze roller bandages
- 2 -- non-sterile 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
- 1 -- pair latex gloves
- 1 -- mouth-to-mouth airway

### 3.4. HEATERS AND RELATED COMPONENTS:

- 3.4.1. **Heater, Standard:** 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.
- 3.4.2. **Heater, Auxiliary:** When so specified in the Invitation for Bid [See Option No. 14], an auxiliary hot water type heater shall be furnished and installed in the rear of the passenger compartment of the bus. Heated conduits inside the bus shall be insulated or shielded to prevent injury to the driver or passengers.
- 3.4.3. **Bleeder Valves:** Any heater (s) installed by the body manufacturer shall have accessible air bleeder valves installed in the return lines.
- 3.4.4. **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.

### 3.5. MIRRORS, EXTERIOR: 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:

- 3.5.1. **Mirror System, Crossover:** The crossview mirror system shall provide the driver with indirect vision of an area at ground level from the front bumper forward and the entire width of the bus to a point where the driver can see by direct vision. The crossview system shall also provide the driver with indirect vision of the area at ground level around the left and right front corners of the bus to include the tires and service entrance on all types of buses to a point where it overlaps with the rear vision mirror system.
- 3.5.2. **Mirror System, Rearview:** The rearview mirror system shall be capable of providing a view along the left and right sides of the bus which will provide the driver with a view of the rear tires at ground level, a minimum of two-hundred feet (200 ft.) to the rear of the bus and at least twelve feet (12 ft.) perpendicular to the side of the bus at a distance of thirty-two feet (32 ft.) back from the front bumper.
- 3.5.3. **Mounting and Mounting Brackets, Standard:** Mirror mounting and backing shall be of steel or a high-impact plastic such as a polycarbonate/polyethylene terephthalate blend, or approved equal. Mounting of all 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. This system of mirrors shall be easily adjustable but be rigidly braced so as to reduce vibration. Each exterior rear vision mirror shall be mounted in the brackets and assemblies shown on Texas General Services Commission Drawings numbered 040-35(1), 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.

**3.5.4. Mirror Backing and Mounting, Stainless Steel, Optional:** When so specified in the Invitation for Bid, exterior rearview mirror backs and mounting brackets shall meet or exceed all of the applicable requirements of Paragraph C.3.5.3; above except the mirror backing and mounting shall be made of stainless steel.

**3.5.5. Painting:** 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).

**3.6. MIRRORS, INTERIOR:** A clear-vision interior rearview mirror conforming to FMVSS No. 111, with at least six inch by sixteen inch (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.

**3.7. REFLECTIVE MATERIAL<sup>14</sup>:** When so specified in the Invitation for Bid [See Option No. 19], buses shall be equipped with reflective material meeting the following requirements. The material shall be automotive engineering grade or better, shall meet the initial reflectance values in DOT FHWA FP-85 and shall retain at least fifty percent (50%) of those values for a minimum of six (6) years. Reflective materials and markings shall be installed in the following location:

**3.7.1.** Front and/or rear bumper may be marked diagonally forty-five degrees (45°) down to centerline of pavement with two inch (2") plus or minus one-fourth inch ( $\pm 1/4$ ") wide strips of non-contrasting reflective material.

**3.7.2.** Rear of bus body shall be marked with a strip of reflective National School Bus Yellow (NSBY) material to outline the perimeter of the back of the bus using material which conforms with the requirements of FMVSS 571.131 Table One (1). The perimeter marking of rear emergency exits per FMVSS No. 217 and/or the use of reflective "school bus" signs per Paragraph 3.7.3 below partially accomplish the objective of this requirement. To complete the perimeter marking the back of the bus, strips of at least one-and-three-fourths inch (1-3/4") reflective NSBY material shall be applied horizontally above the rear windows and above the rear bumper extending from the rear emergency exit perimeter marking

---

<sup>14</sup> Reflectivity of stop signal arm is to be addressed under Stop Signal Arm Section. Signs, if used, placed on the rear of the bus relating to school bus flashing signal lamps or railroad stop procedure may be of reflective material as specified.

outward to the left and right rear corners of the bus; and vertical strips shall be applied at the corners connecting these horizontal strips.

**3.7.3.** "SCHOOL BUS" signs, if not lighted design, shall be marked with reflective National School Bus Yellow material comprising background for lettering of the front and/or rear "SCHOOL BUS" signs.

**3.7.4.** Sides of bus body shall be marked with reflective National School Bus Yellow material at least one-and-three-fourths inch (1-3/4") in width, extending the length of the bus body and located (vertically) between the floor line and the beltline.

**3.8. STROBE LIGHT, Flashing:** When so specified on Invitation for Bid [See Option No. 26], 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 flashing three-hundred-and-sixty degrees (360°) around a vertical axis. The light source shall be minimum of fifty (50) candlepower and flash eighty to one-hundred-and-twenty (80 --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 six-and-one-half inches (6-1/2").

**3.9. STOP ARM:** 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. It shall have a minimum one-half inch (1/2") wide white border and the word "STOP" in white letters at least six inches (6") high against a red background on both sides. The letters, border and background shall be of reflective materials meeting DOT FHWA FP-85. Double-faced red, alternately flashing lamps, or LED Stop Sign, flashing both sides, 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.

**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. STUDENT SAFETY CROSSING ARM:** When so specified in the Invitation for Bid [See Option No. 25], each bus shall be equipped with a student safety crossing arm which shall meet or exceed SAE Standard J 1133. It shall be extended and retracted simultaneously with stop arm by means of the stop arm control. It shall be mounted to the right side of the front bumper by means of a four (4) point mounting assembly. All components and connections shall be weatherproofed. The unit shall be easily removable for the purpose of towing of the bus. The unit shall be constructed of nonferrous material or treated as per the body sheet metal standard and shall contain no sharp edges or projections that

could cause hazard or injury to students. The crossing arm shall extend seventy-two inches (72") from the front bumper and shall not open more than ninety degrees (90°) when in the "extended" position. The mechanism may be activated by air pressure, electricity, or be vacuum.

- 3.11. **SUN VISOR:** An adjustable sun visor with a minimum size of five inches by sixteen inches (5" x 16") 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.
- 3.12. **TOOL COMPARTMENT:** When so specified in the Invitation for Bid [See Option No. 30], 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 and shall be capable of being securely latched. However, if it is located inside the passenger compartment, it shall be provided with a separate cover, and shall be fastened to the floor in the right front or the right rear of the bus. A seat cushion shall not be used as this cover.
- 3.13. **WINDSHIELD WASHERS AND WIPERS:**
  - 3.13.1. **Washers:** A vacuum- or electrical-operated windshield washer shall be furnished and installed. The washer shall have a minimum reservoir capacity of one (1) 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.
  - 3.13.2. **Wipers:** A windshield wiping system, two (2) speed or variable speed, with an intermittent feature, shall be provided. The wipers shall be operated by one (1) or more air or electric motors of sufficient power to operate wipers. If one (1) motor is used the wipers shall work in tandem to give full sweep of windshield.

**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 in the order indicated:

- 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-94.
  - 4.1.2. **Literature and drawings:** See Paragraph A.6.5.
- 4.2. **REVIEW OF REQUEST:** The Commission 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 that the bus body meets or exceeds the requirements of this specification, the vendor or manufacturer shall arrange for the school bus to be brought to Austin, Texas for inspection and evaluation by the Commission and the Texas School Bus Committee.
- 4.3. **INSPECTION AND EVALUATION<sup>15</sup>:**

<sup>15</sup> 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 inspected and evaluated prior to approval. The vendor or manufacturer shall request by letter that these other body lengths/models be

**4.3.1.** The bus body shall be inspected using the current School Bus Inspection Check List.

**4.3.2.** The bus body will be evaluated and if found suitable for the intended purpose, the Commission will issue a letter to the manufacturer listing the model as approved for the capacities requested. If found not suitable, the Commission will issue a letter to the vendor or manufacturer giving the reason (s) for disapproval.

**C.5. COMPARISON OF SMALL BUS BODIES:** Table Number Two (2) lists the features of the various body configurations for 15- through 20-passenger school buses. The 24-passenger bus body configurations are included in this Table for reference. [See Figure No. One (1) for the various chassis types available for some of these school bus bodies.]

**TABLE NUMBER TWO (2)  
COMPARISON OF SMALL SCHOOL BUS BODIES**

Passenger Capacity	Service Door	Emergency Door	Rear Wheels	Min. Body Width <sup>1</sup>	Body Sides	Min. Interior Height	Chassis Type	Body Mfg. & Model/Name/No.
15	Sedan	Dual	Single	70"	Sloping	62"	Van	Econo, Reddi-Bus, Van-Con
15	Tall	Dual or Single	Single	75"	Straight or Sloping	64"	Van or Cutaway	Bantam, Super Bantam, Guide DW
15	Tall	Dual	Dual	90"	Sloping	72"	Cutaway	Micro-Bird, Minotaur SRW, Guide DW
15	Tall	Single	Dual	87"	Straight	62"	Cutaway	VSS
16	Tall	Single	Dual	90"	Straight	72"	Cutaway	Chaperone, ClassMate, Micro-Bird, VSS, Bussette, Spr. Btm, MB-20 Guide DW
18	Tall	Dual	Single	70"	Sloping	64"	Van or Cutaway	
18	Tall	Dual or Single	Single	75"	Straight	64"	Van or Cutaway	Bantam, Super Bantam, Guide SW
18 (w/ Option No. 15)	Sedan	Dual	Single	70"	Sloping	63-1/2"	Van or Cutaway	Bantam, Super Bantam, Van Con
19	Tall	Single	Dual	87"	Straight	72"	Cutaway	Chaperone, ClassMate, Micro-Bird, Minotaur, VSS, Spr. Btm., MB-20, Guide DW, Grand Bantam
19 (w/ Option No. 11)	Sedan	Single	Dual	87"	Straight	62"	Cutaway	Vanguard
20	Tall	Single	Dual	78"	Straight	72"	Cutaway or Stripped Cadet	Spr. Btm., MB-20, Guide DW, Minotaur G.P., Mini-Bird Cadet, Grand Bantam
<sup>1</sup> Minimum interior width at shoulder line for the models listed.								

approved.



<b>Note:</b>	Bantam	= Collins	Econo	= Collins	MB-20	= Blue Bird
	Guide SW	= MidBus	Micro-Bird	= Blue Bird	Super Bantam	= Collins
	Guide DW	= MidBus				
	Cadet	= Carpenter	Mighty-Mite	= Thomas	VSS	= Ward
			Mini-Bird	= Blue Bird	Van Con	= Van Con
	ClassMate	= Carpenter	Minotaur	= Thomas	Grand Bantam	= Collins
	ClassMate	= Carpenter				

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

### **D.1. GENERAL REQUIREMENTS:**

- 1.1. GENERAL SPECIFICATIONS:** The requirements for gross vehicle weight ratings (GVWR), gross axle weight ratings front and rear (GAWR) and tire sizes and load ranges, as specified in Table No.'s Three through Seven (3 -- 7) for each size chassis are minimum requirements [See Paragraph A.4.5.]. The requirements are for school buses with standard equipment. The added weights of optional equipment such as alternative fuel storage tanks, 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 shall be painted black (Color 17038); cowl, fenders, and hood shall be painted school bus yellow (Color 13432); and bumpers and wheels shall be painted the chassis manufacturer's standard color.

### **D.2. AXLES, SUSPENSION, AND RELATED COMPONENTS:**

- 2.1. AXLE CAPACITIES:** Axle capacities and gross axle weight ratings (GAWRs) shall be as specified in Table No.'s Three through Seven (3 -- 7) 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.4.5., D.1.1, and G.1.7.2.].
- 2.2. 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 fifty-five miles per hour (55 mph) minimum [See Paragraph D.5.3.3.].
- 2.3. BRAKES AND RELATED COMPONENTS:**
  - 2.3.1. Service Brakes:** Service brakes shall be manufacturer's standard hydraulic front power disc brakes and rear disc or drum brakes meeting FMVSS No. 105 as applicable to school buses.
  - 2.3.2. Warning, Low Fluid:** Hydraulic assist-boosters shall audibly and visually warn of fluid or power loss.
  - 2.3.3.** The hydraulic braking system shall include the service brake, an emergency brake that is a part of the service brake system and controlled by the service brake control, and a parking brake.
- 2.4. HUBODOMETERS:** Each chassis shall be equipped with one (1) 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:
  - 2.4.1. Accu-Trak,** Standard Car Truck, Park Ridge, IL 60068.
  - 2.4.2. Engler Instruments,** 250 Culver Ave., Jersey City, NJ 07305.

**2.4.3. Veeder-Root 79, Hartford, CT 06102.**

**2.5. SHOCK ABSORBERS:** Two (2) front and two (2) rear heavy-duty, double-acting shock absorbers shall be installed.

**2.6. SPRINGS:** The ground ratings for the front and rear springs shall be as specified in Table No.'s Three through Seven (3 -- 7) for each make of vehicle [See Paragraphs A.4.5, D.1.1, and G.1.7.2.].

**2.7. TIRES AND WHEELS:**

**2.7.1. 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 No.'s Three through Seven (3 -- 7).

**2.7.2. Wheel, Spare:** When so specified in the Invitation for Bid [See Option No. 31], the bus shall have a spare wheel; however carrier and tire/tube for spare wheel will not be provided under this option.

### **D.3. CHASSIS FRAME AND RELATED COMPONENTS:**

**3.1. 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.

**3.2. CHASSIS FRAME SIDE MEMBERS:** Each frame side member shall be of one-piece (1-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.

**3.3. FUEL TANKS, CONVENTIONAL Fuel:** Standard and auxiliary fuel tanks shall meet FMVSS No. 301 as applicable to school buses and shall meet the current design objectives of the SBMI. Fuel tanks installed on Texas school buses shall have a minimum "draw" of eighty-three percent (83%) of capacity.

**3.3.1. Fuel Tanks, Standard:** The standard fuel tank shall have a minimum capacity of twenty-one (21) gallons. The tank shall be mounted, filled, and vented entirely outside the body [See Paragraph D.5.4.3.].

**3.3.2. Fuel Tank (s), Auxiliary:** When so specified in the Invitation for Bid, [See Option No. 12], the bus shall be furnished with a minimum capacity thirty (30) gallon fuel tank or tanks furnished and installed by the chassis manufacturer.

**3.4. 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.4. ELECTRICAL SYSTEM AND RELATED COMPONENTS:**

**4.1. ALTERNATORS:** The twelve (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 speed. These alternators shall be ventilated and voltage controlled and, if necessary, current-controlled. Alternators shall be provided as follows:

**4.1.1. Alternator, Standard:** "Type A" buses and "Type B" buses shall be furnished with a standard alternator with a minimum electrical output of seventy-five (75) amperes with gasoline or alternative fuel engines (sixty-five amperes (65 amps) with diesel) and one-hundred amperes (100 amps), respectively.

**4.1.2. Alternators, Other:** School buses equipped with the following equipment shall have alternators as follows:

**4.1.2.1. Air-Conditioned Buses:** "Type A" buses and "Type B" buses equipped with air conditioning shall have alternators with a minimum electrical output of one-hundred amperes and one-hundred-thirty amperes (100 and 130 amps), respectively.

**4.1.2.2. Wheelchair Lift-Equipped Buses:** "Type A" buses and "Type B" buses equipped with wheelchair lifts shall have alternators with a minimum electrical output of one-hundred and one-hundred-thirty amperes (100 and 130 amps), respectively.

**4.1.2.3. Air-Conditioned and Wheelchair-Equipped Buses:** "Type A" buses and "Type B" buses equipped with both air conditioning and wheelchair lifts shall have alternators with a minimum electrical output of one-hundred-thirty and one-hundred-sixty amperes (130 and 160 amps), respectively.

**4.1.3. Alternator, Optional:** When so specified in the Invitation for Bid [See Option No. 4], "Type A" buses shall have an alternator with a minimum electrical output of one-hundred amperes (100 amps) and "Type B" and "Type C" buses shall have an alternator with a minimum electrical output of one-hundred-thirty amperes (130 amps), respectively.

**4.2. 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 for 15- through 20-passenger school buses shall have a potential of twelve (12) volts and meet the following:

**4.2.1. Battery, Diesel Engines:** The batteries furnished with diesel engines shall be as specified by the chassis manufacturer. When two (2) batteries are provided, they shall both be installed under the hood or one (1) 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.

**4.2.2. Battery, Gasoline Engines:** The minimum performance level shall be a BCI cold cranking capacity of no less than three-hundred-sixty amperes (360 amps) at zero degrees (0°F) with a minimum one-hundred (100) minute reserve capacity.

- 4.2.3. Battery (s), Alternative Fueled Vehicles:** Dedicated alternative fueled vehicles shall have batteries meeting or exceeding those required for a gasoline engine school bus with comparable horsepower. Batteries for dual fueled buses shall have batteries specified by the conventional fuel used.
- 4.3. HORNS:** Each bus shall be equipped with horn or horns of standard make. Each horn shall be capable of producing audible sounds in the frequency range from two-hundred-fifty to two-thousand (250 to 2,000) hertz and at an intensity of between eighty-two (82) and one-hundred-two (102) decibels. The sound level measurements shall be made at a distance of fifty (50) feet directly in front of the vehicle in accordance with SAE J377.
- 4.4. INSTRUMENTS AND INSTRUMENT PANEL:** The bus shall be equipped with the following non-glare illuminated instruments controlled by an independent rheostat<sup>16</sup> 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:
- 4.4.1.** Ammeter (or Voltmeter) with graduated charge and discharge indications.
  - 4.4.2.** Fuel Gauge.
  - 4.4.3.** Glow Plug Indicator Light (for diesel buses with glow plugs only).
  - 4.4.4.** Odometer (Six (6) digits, e.g., register to 99,999.9 miles).
  - 4.4.5.** Oil Pressure Gauge and/or Warning Light.
  - 4.4.6.** Speedometer.
  - 4.4.7.** Vehicle manufacturer's standard Keyed Ignition Switch.
  - 4.4.8.** Water Temperature Gauge and/or Warning Light.
- 4.5. LAMPS:** Each bus shall be equipped with at least two (2) clear 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.
- 4.6. 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.1.7 and C.1.11.].
- 4.7. WIRING:** The chassis manufacturer shall provide a readily accessible terminal strip or plug on the body side of the cowl, or at an accessible location within the engine compartment, with the following minimum terminals for the body connections:
- 4.7.1.** Backup lamps.

<sup>16</sup> 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.

- 4.7.2.** Instrument panel lights (rheostat controlled by head lamp switch).
- 4.7.3.** Left turn signals.
- 4.7.4.** Right turn signals.
- 4.7.5.** Stop lamps.
- 4.7.6.** Tail lamps.

## **D.5. ENGINE AND RELATED COMPONENTS:**

- 5.1. AIR CLEANER:** Each chassis shall be equipped with a factory-installed maximum capacity, replaceable dry element type air cleaner. The intake air system for diesel engines shall have an air cleaner restriction indicator properly installed by the chassis manufacturer to meet manufacturer's engine specifications.
- 5.2. COOLING SYSTEM:** The cooling system shall have the manufacturer's largest heavy-duty radiator available for the series and 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.
- 5.3. 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.
- 5.3.1. Diesel Engines:** When so specified in the Invitation for Bid [See Option No. 8], the 15-, 16-, 18-, 19-, or 20-passenger school bus chassis shall be furnished with a 4-cycle diesel engine.
- 5.3.2. Gasoline Engines:** Engines for the 15- through 20-passenger buses shall be of the gasoline type unless otherwise specified in the Invitation for Bid. Approved engines are listed in Tables No.'s Three through Seven (3 -- 7) and in the Class 070-SB-APL.
- 5.3.3. Power Requirements:** Each bus shall be furnished with an engine that meets or exceeds the following minimum criteria [See Paragraph D.5.3.4.7.], when tested at or above the gross vehicle weight rating (GVWR) required for a given bus capacity and with all accessories except air conditioning compressor on and operating:
- 5.3.3.1.** Acceleration from zero to fifty miles per hour (0--50 mph) in sixty (60) seconds or less.
- 5.3.3.2.** Gradeability of one-and-one-half percent (1.5%) minimum at fifty miles per hour (50 mph).
- 5.3.3.3.** Gradeability of five percent (5.0%) minimum at twenty-five miles per hour (25 mph).
- 5.3.3.4.** Startability of twenty percent (20%) minimum.
- 5.3.3.5.** Top speed of fifty-five miles per hour (55 mph) minimum at the manufacturer's rated rpm for the governed engine.
- 5.3.4. Approval of New Engines:** Procedures for approving new school bus engines for 15- through 20-passenger school buses shall be as follows:

- 5.3.4.1.** Submit to the Commission, a letter certifying that the proposed engine meets or exceeds each requirement of Paragraph D.5.3.3 when installed in the largest size bus for which approval is requested.
- 5.3.4.2.** The Commission 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.
- 5.3.4.3.** If this review verifies that the engine meets the requirements of this specification, and is so stated in the above letter, the vendor or manufacturer shall contact the GSC Purchaser to arrange for 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.
- 5.3.4.4.** 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 GSC on the form provided. [See "Three Month Test of New School Bus Engines," Form in Attachment C].
- 5.3.4.5.** The vendor or manufacturer shall then contact the GSC Purchaser and the TEA Director of Programs, School Transportation about ordering the school bus with the subject engine.
- 5.3.4.6.** The bus shall be tested for a period of not less than three (3) months during the regular nine (9) months school term, preferably on a variety of routes on activity trips.
- 5.3.4.7.** Upon receipt of the school district's report, the Commission will make a determination that the engine be accepted or rejected, and advise the vendor of that determination. The School Bus Committee will be advised of this action and the engine will be added to the Class 070-SB-APL, if acceptable.

**NOTE:** Once an engine is approved in one (1) horsepower and torque version, other power versions of this same engine, with greater horsepower and torque need not be tested in a school bus prior to approval. For approval, the vendor or manufacturer shall follow Paragraph D.5.3.5.1, and, in addition, state the rear axle 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 gross horsepower and torque as well as the rear axle 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 (5) requirements listed in Paragraph F.5.3.4. There are additional requirements for engines, either implied or specified, separate from the above performance requirements.

#### **5.4. EXHAUST SYSTEM:**



- 5.4.1 **Component Placement:** The exhaust pipe, muffler, and tailpipe shall be mounted under the bus and attached to the chassis frame.
- 5.4.2 **Noise Level:** The noise level shall neither exceed EPA "Noise Emission Standards" nor eighty-five (85) decibels at the ear of the occupant in the bus nearest the noise source.
- 5.4.3 **Tailpipe Exit:** The tailpipe of a gasoline-powered bus shall not exit the side of the bus anywhere within twelve inches (12") 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.
- 5.5. **OIL FILTER:** Each chassis shall be equipped with a factory-installed, minimum one (1) quart capacity oil filter with a replaceable filter element.
- 5.6. **TACHOGRAPH:** When so specified in the Invitation for Bid [See Option No. 27], a tachograph containing a combination clock/speedometer/recorder shall be installed on the dashboard. The tachograph shall be Argo Model (s) 1310-6, Veeder-Root Model 1407, or approved equal.
- 5.7. **THROTTLE:** The force required to operate the throttle shall not exceed sixteen pounds (16 lbs.) throughout the full range of accelerator pedal travel.

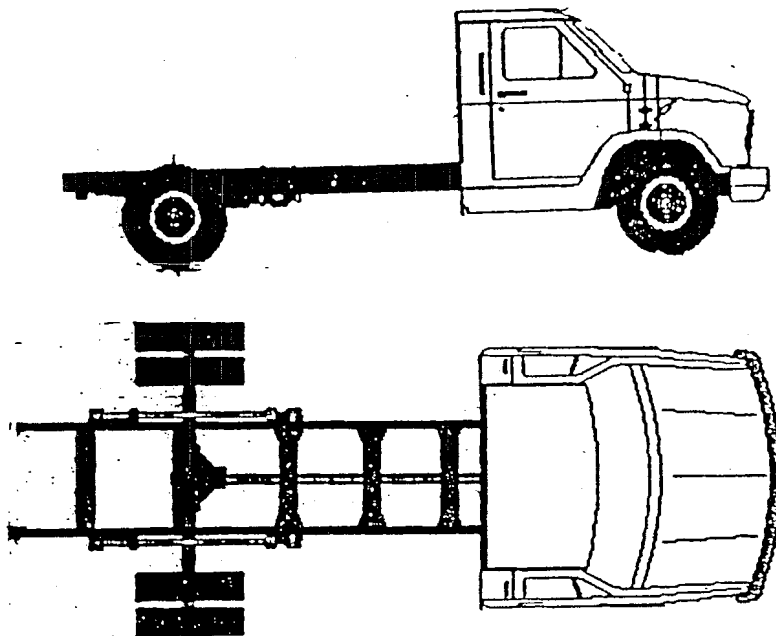
**D.6. TRANSMISSION AND RELATED COMPONENTS:**

- 6.1. **AUTOMATIC TRANSMISSION, STANDARD:** The standard automatic transmission shall be the three- or four-forward (3- or 4-) speed automatic type. An electronic control or similar device may be installed to ensure that automatic transmissions cannot accidentally be moved out of the neutral or park gear position while the driver is not in the driver's seat, and shall be one of the following:
  - 6.1.1. Chrysler Motor Corporation's "A727 LoadFlite" ;
  - 6.1.2. Ford Motor Company's Standard automatic, or;
  - 6.1.3. General Motors Corporation's "Turbo Hydramatic" .
- 6.2. **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.

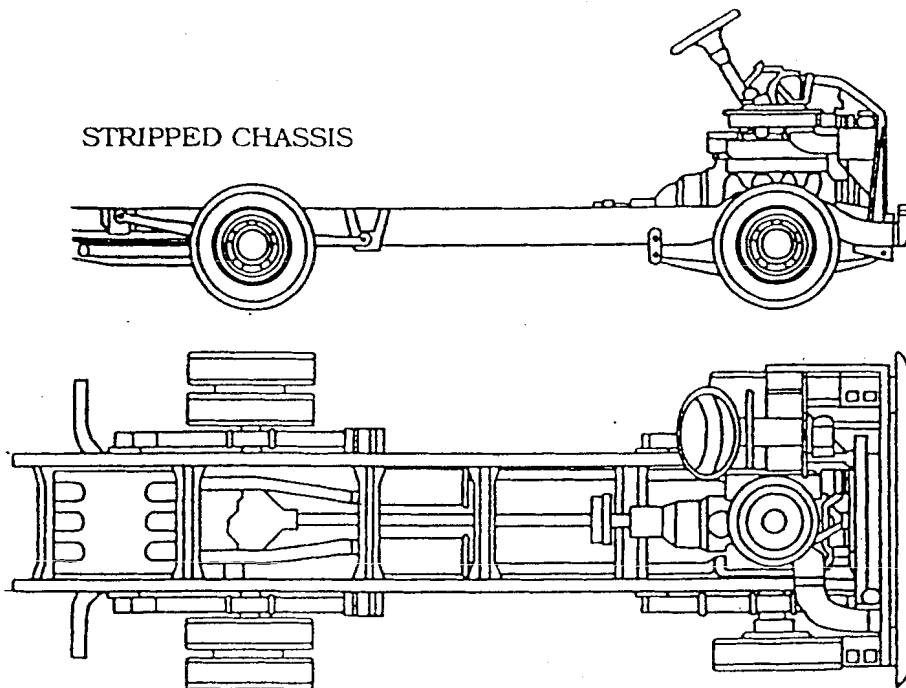
**D.7. CHASSIS TYPES:** Figure No. One (1) shows the types of chassis available for small school buses.

**FIGURE No. ONE (1)**

CUTAWAY



STRIPPED CHASSIS



**TABLE NO. THREE (3)**  
**15-Passenger Bus Chassis**  
**[SEE PARAGRAPH B.1.2.: REDUCED PASSENGER CAPACITY]**  
Refer to General Requirements, Page 7

15-Passenger ITEM	1997 Min. Rqmts.	Chevrolet/GMC G31305	Chevrolet/GMC G31705	Ford Van E350*1	Ford Cutaway E350*1
GVWR, lbs.	9500	9500/10000D	9500	9500	9600
GAWR, lbs. Front	4050	4100/4100D	4300	4050	4050
GAWR, lbs. Rear	6084	6084/7500D	6084	6084	6084
Axle Capacity, lbs. Front	4300	4300/4300	4300	4600	4600
Axle Capacity, lbs. Rear	6084	6084/7500D	6084	6340	6340
Wheelbase, in.	135	135	155	138	158
Chassis Length, in.	As Required	241	239	237.4	237.4
Track, in. Front	68.4	N/A	N/A	69.4	68.4
Track, in. Rear	67.0	N/A	N/A	67.0	71.6
Gasoline Engine, L.	**2	5.7L-V8	5.7L-V8	*1	*1
SAE Gross Horsepower	**2	250	250	*1	*1
SAE Gross Torque, lb-ft.	**2	330	330	*1	*1
Transmission: Automatic	A3	A4OD	A4OD	A4OD	E4OD
Tires, Steel Belted Radial		LT245/75R16E	LT245/75R16E	LT245/75R16E	LT245/75R16E
Size & Load Range					
Wheels: Rear	As Shown	Dual	Single	Single	Single
Alternator, amperes	100	124	100	130	130
*1Furnished with diesel engine only [See Option No. 8].					
**2See minimum power requirements in Paragraph D.5.3.4.					

**DIESEL ENGINE [Option No. 8]**

15-Passenger ITEM	1997 Min. Rqmts.	Chevrolet/GMC 631305/631303/631605	Ford E 350
Engine Displacement, L.	*1	6.5L-V8	7.3T-V8
SAE Gross Horsepower	*1	190	210
SAE Gross Torque, lb-ft.	*1	385	425
Alternator, amperes	100	100	130
*1See minimum power requirements in Paragraph D.5.3.4.			

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 Paragraph D.5.3.4.].

### 15-Passenger Bodies

15-Passenger ITEM S.W.	1997 Min. Rqmts.	Blue Bird Mircor-Bird	Collins Bantam	Van-Con Bus	MidBus Guide SW/DW	Thomas SRW Minotaur	AmTram Vanguard	Carpenter Classmate SW	US Bus Universe
Interior Headroom, in.	65	74	65 75	65	72	73	74	68	75
Interior Width: Floor Line, in.	72	90.5	78	72	79	84	91	76	82
Interior Width: Shoulder Line, in.	70	91	78	70	77	84	91	76	81
Service Door Type	As Shown	Tall	Tall	Sedan	Tall	Tall	Tall	Tall	Tall
Rear Wheels	As Shown	Dual/Single	Single	Single	Single	Single	Dual	Single	Single
Chassis Type	As Shown	Cutaway	Cutaway	Cutaway	Cutaway	Cutaway	Cutaway	Cutaway	Cutaway

**TABLE NO. FOUR (4)**  
**16-Passenger Bus Chassis**  
**[SEE PARAGRAPH B.1.2.: REDUCED PASSENGER CAPACITY]**  
Refer to General Requirements, Page 7

16-Passenger ITEM	1997 Min. Rqmts.	Chevrolet/GMC G31503	Chevrolet/GMC P30862	Ford E350 *
GVWR, lbs.	10000	10000	14500	10000
GAWR, lbs. Front	4050	4100	5000	4050
GAWR, lbs. Rear	7200	7500	11000	7200
Axle Capacity, lbs, Front	4300	4300	5000	4600
Axle Capacity, lbs, Rear	7500	7500	11000	78000
Wheelbase, in.	125	135	125	138
Chassis Length, in.	As Required	241	221	237.4
Track, in. Front	65.2	N/A	65.2	69.4
Track, in. Rear	66.7	N/A	66.7	73.2
Gasoline Engine, L.	**1	5.7L-V8	5.7L-V8	*1
SAE Gross Horsepower	**2	250	180	*1
SAE Gross Torque, lb-ft.	**2	330	295	*1
Transmission: Automatic	A4	A4 OD	4L80-E	E4 OD
Tires, Steel Belted Radial	Tubeless	LT225/75R16D	8.00R19.5D	LT225/75R16D
Size & Load Range				
Wheels, Rear	Dual	Dual	Dual	Dual
Alternator, amperes	100	100	105	130
***See minimum power requirements in Paragraph D.5.3.4.				

**DIESEL ENGINE [Option No. 8]**

16-Passenger ITEM	1997 Min. Rqmts.	Ford E350	Chevrolet/GMC
Engine Displacement, L.	*1	7.3T-V8	6.5L-V8
SAE Gross Horsepower	*1	210	190
SAE Gross Torque, lb-ft	*1	325	385
Alternator, amperes	100	130	100
*See minimum power requirements in Paragraph D.5.3.4.			

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 Paragraph D.5.3.4.].

**16-PASSENGER BODIES**

[Wide Body, Straight side, "Style II" Service Door]

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

16-Passenger ITEM	1997 Min. Rqmts.	AmTran	Blue-Bird Micro-Bird	Carpenter Classmate	Collins Spr.	Collins Grnd.	MidBus Guide/DW	Thomas Minotaur	US Bus SturdiBus
Interior Headroom, in.	72	74	74.0/77.0	74	75	75	73	72	75
Interior Width, in.	90	90	90.5	90	90.5	90.5	90	90	90

**TABLE NO. FIVE (5)**  
**18-Passenger Bus Chassis**  
**[SEE PARAGRAPH B.1.2.: REDUCED PASSENGER CAPACITY]**  
Refer to General Requirements, Page 7

18-Passenger ITEM	1997 Min. Rqmts.	Ford E 350 Cutaway	Chevrolet/GMC G31503 Cutaway
GVWR, lbs.	9500	9600	9500
GAWR, lbs. Front	4050	4050	4100
GAWR, lbs. Rear	6084	6084	6084
Axle Capacity, lbs. Front	4100	4600	4100
Axle Capacity, lbs. Rear	6084	6340	6084
Wheelbase, in.	138	138	155
Chassis Length, in.	--	--	241
Gasoline Engine, L.	*1	**2	5.7L-V8
SAE Gross Horsepower	*1	**2	250
SAE Gross Torque, lb-ft.	*1	**2	330
Transmission: Automatic	A4	E4OD	A4OD
Tires, Steel Belted Radial	Tubeless	LT245/75R16E	LT245/75R16E
Size & Load Range	As Shown		
Wheels, Rear	Single	Single	Single
Alternator, amperes	100	100	124
*See minimum power requirements in Paragraph D.53.4.			
**Furnished with diesel engine only [See Option No. 8].			

**DIESEL ENGINE [Option No. 8]**

18-Passenger ITEM	1997 Min. Rqmts.	Ford E350	Chevrolet/GMC 631303
Engine Displacement, L.	*1	7.3T-V8	6.5L-V8
SAE Gross Horsepower	*1	210	190
SAE Gross Torque, lb-ft	*1	425	385
Alternator, amperes	100	130	100
*See minimum power requirements in Paragraph D.5.3.4.			

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 Paragraph D.5.3.4.].

# **18-PASSENGER BODIES (With Dual (or Single) Rear Emergency Door)**

The following bodies are available on van conversion chassis:

<b>18-Passenger ITEM</b>	<b>1997 Min. Rqmts.</b>	<b>Collins Bantam</b>	<b>MidBus Guide SW or DW</b>	<b>Van-Con 18 Passenger</b>	<b>Carpenter Classmate SW</b>	<b>US Bus Sturdi Bus</b>
Overall Length	220	220/246.8	228.0	236/220	243.0	225.0
Interior Height	65	65/75	72.0	65.0	68.0	68.0
Interior Width	72	78	79	72	76	74
Entrance Door Height <sup>1</sup>	64	70/80	72	72	70	64
Passenger Seats (26"-39" Benches:						
Left Side, rows	4 or 5	4	4	4/5	5	
Curb Side, rows	4 or 5	4	4	5	5	
Knee Space, in.	24	24	25	24	24	
Aisle Width, in.	12	13	12	15	13.25	
<sup>1</sup> *Option 11 allows automotive type ("Style I") service doors.						

**TABLE NO. SIX (6)**  
**19-Passenger Bus Chassis**  
**[SEE PARAGRAPH B.1.2.: REDUCED PASSENGER CAPACITY]**

Refer to General Requirements, Page 7

19-Passenger ITEM	1997 Min. Rqmts.	Chevrolet/GMC	Chevrolet/GMC P30862	Ford E 350 Cutaway
GVWR, lbs.	10000	10000	14500	11500
GAWR, lbs. Front	4050	4100	5000	4050
GAWR, lbs. Rear	7500	7500	11000	7500
Axle Capacity, lbs, Front	4300	4300	5000	4600
Axle Capacity, lbs, Rear	7500	7500	11000	7800
Wheelbase, in.	125	155	125	138
Chassis Length, in.	As Required	241	221	232.4
Track, Front, in.	65.2	N/A	65.2	69.4
Track, Rear, in.	66.7	N/A	66.7	73.2
Gasoline Engine, L.	*1	5.7L-V8	5.7L-V8	**2
SAE Gross Horsepower	*	250	180	**2
SAE Gross Torque, lb-ft.	*	330	295	**2
Transmission: Automatic	A4	A4OD	4L80-E	E4OD
Tires, Steel Belted Radial	Tubeless	LT225/75R16D	8.00R19.5D	LT225/75R16D
Size & Load Range	As Shown			
Wheels, Rear	Dual	Dual	Dual	Dual
Alternator, amperes	100	100	105	130
*1See minimum power requirements in Paragraph D.5.3.4.				
**Furnished with diesel engine only [See Option No. 8].				

**DIESEL ENGINE [Option No. 8]**

19-Passenger ITEM	1997 Min. Rqmts.	Ford E350	Chevrolet/GMC 631303
Engine Displacement, L.	*1	7.3T-V8	6.5L-V8
SAE Gross Horsepower	*1	210	190
SAE Gross Torque, lb-ft	*1	425	385
Alternator, amperes	100	130	100
*1See minimum power requirements in Paragraph D.5.3.4.			

**19-PASSENGER BUS BODIES**

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

19-Passenger ITEM	1997 Min. Rqmts.	AmTran Vanguard VSS19	Blue Bird Micro-Bird MB-20	Carpenter Classmate	Collins Spr. Bantam	Collins Grand. Bantam	Thomas Minotaur	MidBus Guide DW	US Bus Super Sturdi
Interior Headroom, in.	72	74	74/77	74	75	75	72	73/79	75
Interior Width, in.	90	90.5	90.5	90	90.5	90.5	90	90	91
Service Door <sup>1</sup>	As Shown	Tall	Tall	Tall	Tall	Tall	Tall	Sedan/ Tall	Tall
<sup>1</sup> Available only with Option 11, Sedan-type Service Door.									



**TABLE NO. SEVEN (7)**  
**20-Passenger Bus Chassis**  
**[SEE PARAGRAPH B.1.2.: REDUCED PASSENGER CAPACITY]**  
Refer to General Requirements, Page 7

20-Passenger ITEM	1997 Min. Rqmts.	Chevrolet/GMC P30842	Chevrolet/GMC P30862	Ford Super Duty Cutaway
GVWR, lbs.	11500	11500	11500	14050
GAWR, lbs. Front	4400	4400	5000	4600
GAWR, lbs. Rear	7900	7900	7900	9450
Axle Capacity, lbs, Front	5000	5000	5000	4600
Axle Capacity, lbs, Rear	7900	7900	7900	9450
Wheelbase, in.	125	125	125	158
Chassis Length, in.	As Required	214.8	222.1	257.4
Track, Front, in.	65.2	65.2	65.2	69.4
Track, Rear, in.	66.7	66.7	66.7	77.7
Gasoline Engine, L.	*1	5.7L-V8	5.7L-V8	**2
SAE Gross Horsepower	*1	180	180	**
SAE Gross Torque, lb-ft.	*1	295	295	**
Transmission: Automatic	A4OD	4L80-E/A40D	A4OD	E4OD
Tires, Steel Belted Radial	Tubeless	8.00R19.5E/D	8.00R19.5E	LT225/75R16E
Size & Load Range	As Shown			
Wheels, Rear	Dual	Dual	Dual	Dual
Alternator, amperes	105	105	105	130
*1See minimum power requirements in Paragraph D5.3.4.				
**Furnished with diesel engine only [See Option No. 8].				

**DIESEL ENGINE [Option No. 8]**

20-Passenger ITEM	1997 Min. Rqmts.	Ford Super Duty	Chevrolet/GMC 631303
Engine Displacement, L.	*1	7.3T-V8	6.5L-V8
SAE Gross Horsepower	*1	210	190
SAE Gross Torque, lb-ft	*1	425	385
Alternator, amperes	100	130	100
*1See minimum power requirements in Paragraph D.5.3.4.			

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 Paragraph D.5.3.4.).

The following bodies are available on stripped chassis:

**20-PASSENGER BUS BODIES** (Straight Side, "Style II" Service Door)

20-Passenger ITEM	1997 Min. Rqmts.	Blue Bird Mini-Bird MB-20	Carpenter Cadet	Collins Grand Bantam <sup>1</sup>
Interior Headroom, in.	74	74/77	77	75
Interior Width, in.	90	90.5	90	90
Service Door <sup>2</sup>	As Shown	Tall	Tall	Tall
<sup>1</sup> Body available on cutaway chassis.				
<sup>2</sup> 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. 15 and Paragraph A.1.3]:

**TABLE NO. EIGHT (8)  
PHYSICAL REQUIREMENTS**

(1)	(2)	(3)	(4) <sup>1</sup>	(5) <sup>2</sup>	(5)	(6) <sup>3</sup>	(7)
Minimum Size Number of Passengers:	Overall Body Width Inches, Max.	Rows Of Seats Each	Knee Spacing Inches, Min.	Seat Width Left Inches, Min.	Seat Width Right Inches, Min.	Center Aisle Width Inches, Min.	Floor-to-Ceiling Height Inches, Min.
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
<sup>1</sup> 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.							
<sup>2</sup> Column (5): Left rear seat shall have minimum width of 26 inches.							
<sup>3</sup> Column (6): Floor-to-ceiling height shall be measured in the center of the body between the Number Two (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 forty (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 twelve inches (12") on each side. The bumper shall be of pressed steel channel at least three-sixteenths inch (3/16") thick by eight inches (8") 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 One (1) and Paragraph E.2.9.].

- 1.4. 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. Exit signs and lettering shall be in compliance with FMVSS No. 217.

- 1.4.1. **Body Exterior:** The exterior of the complete bus except for bumpers, rub rails, and wheels 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 Bid [See Option No. 38], 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.
- 1.4.2. **Body Interior:** Unless otherwise specified in the Invitation for Bid, the interior of the complete bus body shall be finished in the manufacturer's standard color except where clear-coat galvanized steel is required [See Paragraph E.2.9].
- 1.4.3. **Chassis Components:** Unless otherwise specified in the Invitation for Bid, chassis components such as grilles, frame rails, and wheel covers shall be painted the chassis manufacturer's standard color.
- 1.4.4. **Emergency Exit Lettering:** The emergency exits shall be marked "EMERGENCY DOOR" or "EMERGENCY EXIT," both on the outside and/or on the inside in compliance with FMVSS No. 217. All applicable requirements of FMVSS No. 217 relating to instructions, outlining, and markings shall be met.
- 1.4.5. **Exterior Mirror Backs and Brackets:** The metal backs of all exterior mirrors, if painted, and all exterior mirror brackets shall be finished in lusterless black (Color No. 37038). [See Paragraphs E.3.8.2 and E.3.8.4.].
- 1.4.6. **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 Commission, may be placed on the exterior bus body.
- 1.4.7. **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.
- 1.4.8. **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 with black paint (Color No. 17038 of Federal Standard No. 595a). The letters shall be eight inches (8") high and shall have one inch (1") 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). Body shall bear words "SCHOOL BUS" in black letters at least eight inches (8") high on both front and rear of body or on signs attached thereto. Lettering shall be placed as high as possible without impairment of its visibility. Letter shall conform to "Series B" of Standard Alphabets for signs. "SCHOOL BUS" lettering shall have a reflective background, or as an option, may be illuminated by backlighting. Required lettering and numbering shall include:

District or company name or owner of the bus shall be displayed in the beltline.

Bus identification number shall be displayed on the sides, on the rear, and on the front.

**1.4.9. School Name Lettering:** When so specified in the Invitation for Bid (See Option No. 20), the school district name shall be provided in black letters on both sides of the bus near the belt line. Lettering shall be minimum five inches (5") high with minimum five-eighths inch (5/8") 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 Paragraph E.1.4. Maximum number of characters in one (1) 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 168*), the name to be placed on the bus. Characters should be typed or printed plainly on this form to ensure accurate spelling.

**1.4.10. Wheels:** The wheels shall be painted the chassis manufacturer's standard color.

**1.5. INSULATION, NOISE:** Each school bus shall be constructed so that the noise level measured at the ear of the occupant nearest the primary vehicle noise source shall not exceed eighty-five (85) decibels, when tested in accordance with the procedure given in the Noise Test Procedure of NSSB. [See Option No. 24].

**1.6. INSULATION, THERMAL:** The ceilings and sidewalls shall be thermally insulated with a fire-resistant material approved by Underwriters Laboratories, Inc. to adequately reduce the noise level and to minimize vibrations. Buses shall have the equivalent of one-and-one-half inches (1-1/2") 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.

**1.7. LAMPS, SIGNALS, AND WARNING DEVICES:** Each bus shall be furnished with the lamps listed below [See SMI Standard No. 001]:

**1.7.1. Alternately Flashing Signal Lamps:** Each school bus shall be equipped with eight (8) warning signal lamps, four (4) red and four (4) 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 (4) red signal lamps designed to conform to SAE Standard J887, "School Bus Red Signal Lamps," July 1964, and four (4) amber signal lamps designed to conform to that standard, except for their color, and except that their candlepower shall be at least two-and-one-half (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.

- 1.7.1.1. Band:** Each set of amber and red lamps shall have a minimum three inch (3") black band around the set and a three inch (3") band between the lamps in each set. The color of this band shall be black enamel (Color No. 17038, Black Enamel of Federal Standard 595a). If it is not possible to provide a three inch (3") 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 SBI Standard No. 001].
- 1.7.1.2. 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 three-sixteenths inch (3/16"). 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.
- 1.7.1.3. Operating Instructions:** Complete instructions for the detailed operation of the warning signal lamp system shall be furnished with each school bus.
- 1.7.2. Backup Lamps:** The color, requirements, and mounting of backup lamps shall be in accordance with FMVSS No. 108, except two (2) backup lamps are required by Texas Specifications.
- 1.7.3. 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 No.'s 45012 and 45013, or K-D Lamp Company, 1910 Elm Street, Cincinnati, Ohio 45210, Model Nos. 38469-901 and 40268-301, or Weldon Model No. 5050, or approved equal. [See SBI Standard No. 001 and FMVSS No. 108 Types and proper location of Lamps.]

Example of an approved equal: Peterson Model - PM122.

**1.7.3.1. Clearance Lamps.**

**1.7.3.2. Identification Lamps.**

**1.7.3.3. Intermediate Side Marker Lamps** (not required on buses less than 30 feet long).

#### 1.7.3.4. Side Marker Lamps.

**1.7.4. 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 designated for a twelve (12) volt electrical system and shall have installed a minimum fifteen (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.

**1.7.4.1. 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

**1.7.4.2.** Stepwell and interior lamps approved are as follows:

#### MANUFACTURER

#### CATALOG NUMBER

	<u>Dome Lamps</u>	<u>Stepwell Lamps</u>
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	

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

**1.7.6. 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 (1) amber intermediate 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.

**1.7.7. 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 seven inches (7") in diameter and mounted at approximately the belt line level of the bus. A set of minimum four inch (4") tail/stop lamps shall be installed below the seven inch (7") 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 toll to remove the lens. The lamps shall be Grote 78002

or 78102 taillight, K-D Lamp Company Models 258-2601 or 258-2605, or approved equal.

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

- 1.7.8. 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 seven inches (7") 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. The operating units and flasher for turn-signals and vehicular hazard warning signals shall meet the requirements of FMVSS No. 108.

**1.7.8.1. 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 three-sixteenths inch (3/16"). 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.

**1.7.8.2. Wiring:** The exposed wiring to the signal lamps shall be enclosed in a one-piece (1-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 six inches (6") until it enters the bus body.

- 1.7.9. Warning Devices:** Each school bus shall be equipped with three (3) triangular warning devices meeting the requirements of FMVSS No. 125. The devices shall be packed three (3) per metal or heavy-duty plastic box, or they may be individually packed in metal or heavy-duty plastic boxes with the three (3) boxes contained within a carrier. Warning devices shall be securely mounted in the driver's compartment. Triangular warning devices furnished shall be approved by the Texas Department of Public Safety.

- 1.8. 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 three-eighths inch (3/8") 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.

- 1.9. 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.

**1.10. PAINTING:**

**1.10.1 Preparation and Cleaning:**

**1.10.1.1. 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.

**1.10.1.2. 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.

**1.10.2. Primer Coat<sup>17</sup>:** 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.

**1.10.3. Finish Coat<sup>18</sup>:** 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 two (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.

**1.11. UNDERCOATING:** Undercoating is required to provide for insulation, sound deadening, protection from road minerals, and rust prevention, as applicable, and shall meet the following:

**1.11.1. 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 one-eighth inch (1/8") thick material as specified below. The undercoating shall be applied in accordance with the undercoating manufacturer's instructions. Do not cover up or obliterate the chassis identification plate [See Paragraph A.6.4.3].

<sup>17</sup> 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 Paragraph E.2.9].

<sup>18</sup> Alternate methods for preparing metal surfaces and painting procedures will be considered on an individual basis. Manufacturers shall submit their procedural data to the Commission for approval where methods are used that differ from those specified above.



1.11.2. **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 twenty (20) mils.

1.12. **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 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 interval of twenty-four inches (24") or less.

1.12.1. **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 (8) light warning system and hazard warning lights.

1.12.2. **Color and Number Coding:** A system of color and number coding shall be used and an appropriate identifying diagram shall be provided together with the wiring diagram provided by the chassis manufacturer.

The following body interconnecting circuits shall be color coded as noted:

FUNCTION	COLOR
Left Rear Directional Signal	Yellow
Right Rear Directional Signal	Dark Green
Stoplights	Red
Backup Lights	Blue
Taillights	Brown
Ground	White
Ignition Feed, Primary Feed	Black

The color of the cables shall conform to SAE J1128.

1.12.3. **Fusing:** Each circuit, except starting and ignition, shall be fused separately or shall have an adequate circuit breaker. Two (2) extra fuses for each size of fuse installed on the bus by the body manufacturers, shall be conveniently mounted on the bus body.

1.12.4. **Main Circuits:** The electrical system wiring shall have at least nine (9) main circuits:

- (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.

## **E.2. CONSTRUCTION:**

**2.1. GENERAL REQUIREMENTS:** Twenty-four passenger (24-) through 83-passenger school buses shall meet or exceed the bus body joint strength requirements of FMVSS No. 221. The bodies shall be reasonably dustproof and watertight. The main steel components are listed below and their requirements are listed in Table No. Nine (9). They shall be constructed of Type I 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 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.

**2.1.1.3. The Floor System:** Floor panels, main cross members, auxiliary cross members, wheelhousing, steps, and stepwell bracing.

**2.1.1.4. The Interior Paneling:** Side and ceiling panels.

**2.1.2. Body-Chassis Attachment:** The body shall be attached to the chassis frame by means of U-bolts with seven-sixteenths inch (7/16") diameter threads and a minimum ten-thousand pounds (10,000 lbs.) tensile pull strength per arm, and the manufacturer's standard 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 one-half inch (1/2") past the nuts. Each bus shall be furnished with the following as indicated:

**2.1.2.1. 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.

**2.1.2.2. Other Fastening Devices:** All other main cross members (not attached by U-bolts) 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 Commission, may be used in addition to U-bolts and standard clips to eliminate slippage.

**2.1.2.3. U-Bolt:** Bus bodies shall be attached to the chassis with U-bolts. The number used and their placement shall be as follows:

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

**TABLE NO. NINE (9)**  
**STEEL REQUIREMENTS**  
**NOMINAL METAL THICKNESSES AND ZINC COATING DESIGNATIONS<sup>19</sup>**

Item Number	Components	Thickness, In.	Metal Zinc Coating Designation
1	Bows, Frames	.0635	G 60
2	Bows, Roof	.0635	G 60
3	Cowl, Front	.0635	G 60
4	Doors, Emergency and Service:		G 60
4a	Exterior Panel	.0396	G 60
4b	Interior Panel	.0336	G 60
5	Door Posts:		
5a	Emergency Door	.0785	G 60
6	Floor Panels	.0785	G 60
7	Longitudinal Frame Members:		
7a	Floor Line	.0635	G 60
7b	Seat Line	.0635	G 60
7c	Belt Line	.0635	G 60
7d	Window Header Line	.0635	G 60
8	Panels, Exterior:		
8a	Front	.0396	G 60
8b	Rear	.0396	G 60
8c	Roof	.0396	G 60 or A 60
8d	Side	.0396	G 60 or A 60
8e	Skirts	.0396	G 60
9	Panels, Interior:		
9a	Headlining	.0336	G 60 or A 60
9b	Front Lap	.0336	G 60 or A 60
9c	Rear Lap	.0336	G 60 or A 60
9d	Lower (below windows)	.0336	G 60 or A 60* <sup>1</sup>
10	Posts, Side	.0635	G 60
11	Rub Rails:		
11a	Skirt Line	.0635	G 60
11b	Floor Line	.0635	G 60
11c	Seat Line	.0635	G 60
11d	Window Line	.0396	G 60
12	Wheel Housing	.0635	G 60
13	Window Sills	.0396	G 60**
<sup>1</sup> 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.			

<sup>19</sup> It is mandatory that all components listed in Table No. Nine (9) 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. Nine (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 ANCI tolerances allowed for metal thickness requirements.

- 2.1.3. 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 nine (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.
- 2.1.4. 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 six inches (6").
- 2.1.5. 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 heater or 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.
- 2.1.6. 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 Paragraph F.3.1. 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.
- 2.1.7. 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 Paragraph F.5.5]. The tail pipe shall not extend beyond the rear bumper.
- 2.1.8. Fasteners, 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.
- 2.1.9. Fasteners, Other:** Sheet metal screws or self-tapping bolts of any type shall not be used in the construction of bodies except:

- 2.1.9.1. Alignment<sup>20</sup> of doors or in conjunction with rivets, welds, or bolts for compliance with FMVSS No. 221, as applicable, or;
  - 2.1.9.2. Attachment of exterior mirrors in certain cases [See Paragraph E.3.8.5], or;
  - 2.1.9.3. Electrical wire moldings and light fixtures
  - 2.1.9.4. Installation of header pads over the doors, or;
  - 2.1.9.5. 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;
  - 2.1.9.6. Interior panels which must be removed to give accessibility to other interior or concealed components, or;
  - 2.1.9.7. Seat construction [See Paragraph E.2.13.5.2], or;
  - 2.1.9.8. Window frames when applied with the metal adhesive.
- 2.1.10. **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:
- 2.1.10.1 **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.
  - 2.1.10.2 **Grille:** A sufficiently reinforced grille assembly.
  - 2.1.10.3 **Hood:** Hood cover with latching mechanism providing access to the forward part of the engine.
  - 2.1.10.4. **Lamps:** Headlamps and parking/turn-signal lamps as required by FMVSS No. 108.
- 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 Paragraph E.2.10.3.1].
- 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 Paragraph A.6.4.2].

---

<sup>20</sup> 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.

**2.1.13. Steering Wheel Placement:** There shall be at least a two inch (2") clearance between the steering wheel and the cowl, instrument panel, or any other surface.

**2.1.14. 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. 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.

**2.3. 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 Paragraph F.4.2.4]. 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.

**2.4. 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.

**2.4.1. Design:** The frame shall have a formed shape with a minimum cross sectional depth of one-and-one-eighth inches (1-1/8"). 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 than thirty inch (30") centers, except that one (1) side post and bow or one bow frame may be set on a maximum of thirty-eight-and-three-fourth inch (38-3/4") center, or three (3) bow frame sections not exceeding thirty-six-and-one-half inches (36-1/2") may be used in any one (1) body (up to four (4) thirty-eight-and-three-fourth inch (38-3/4") body frame sections may be used for Forward Control Rear Engine buses ONLY). 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.

**2.4.2. 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 not cause undue strain [See Paragraph E.2.4.1].

**2.4.3. Longitudinal Frame Members:** The body frame shall have not less than four (4) 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 (1) 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, i.e., an extra rub rail in the belt line area. This rub rail shall meet requirements specified under RUB RAILS, Paragraph E.2.10.

**2.4.4 Material:** The body frame system [See Paragraph E.2.1.1] shall be of the type, grade, and thickness of steel specified in Table No. Nine (9) or approved equal, and shall meet the requirements of FMVSS No. 220.

**2.4.5. Rear Frame Section:** The rear frame shall consist of a formed sill, two (2) posts (one (1) 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.

**2.5. EMERGENCY EXITS:** Texas school buses shall be provided with emergency exits which comply with FMVSS No. 217 and those requirements as listed below:

**2.5.1. EMERGENCY DOORS:** The emergency door shall be of the type, grade, and thickness of steel specified in Table No. Nine (9) 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 Paragraphs E.2.19.2. and E.1.4.4.] No seat or other object shall be placed in the body that restricts the passageway to the emergency door to less than twelve inches (12"). There shall be no steps leading to the emergency door.

**2.5.1.1. 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 bolt heads are tack-welded to the hinges [See Paragraph E.2.1.9.1.].

**2.5.1.2. Design:** The emergency door on all except rear-engine buses<sup>21</sup> shall be located in the center of the rear of the body and shall have a minimum horizontal opening of thirty inches (30") and a minimum vertical opening of forty-eight inches (48") 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.

**2.5.1.3. Door Holding Device:** A means (device) shall be provided to hold the swing-out type door (s) in the fully opened position (ninety degree (90°) minimum).

**2.5.1.4. Glass Panels:** The glass in the emergency door shall have an area of not less than two-hundred-ninety-nine square inches (299 sq. in.) and shall be set solid in a waterproof manner [See Paragraph E.2.19.1.1.]. The installation of glass in the lower portion of the door is required and

---

<sup>21</sup> A left rear emergency door meeting the requirements of FMVSS No. 217, shall be provided on rear engine buses.



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.

**2.5.1.5. 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, three inches (3") wide and one inch (1") thick, extending the full width of the emergency door to prevent injury when accidentally impacted.

**2.5.1.6. Latch:** The emergency door shall be equipped with a slide bar rack and pinion (cam) operated latch. The slide bar shall be approximately one-and-one-fourth inches (1-1/4") wide and three-eighths inch (3/8") thick and shall have a minimum stroke of one-and-one-eighth inches (1-1/8"). The slide bar shall be spring loaded so as to retain the bar in the closed position and have a minimum of one inch (1") of horizontal bearing surface beyond the edge of the door frame when the door lock is in a latched position.

**2.5.1.7. 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.

**2.5.1.8. 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.

**2.5.2. Emergency Exit Requirements:**

"Type A", "Type B", "Type C", and "Type D" vehicles shall be equipped with a total number of emergency exits as follows for the indicated capacities of vehicles. Exits required by FMVSS No. 217 may be included to comprise the total number of exits specified:

Zero to 42 Passenger = One (1) emergency exit per side and one (1) roof hatch.

43 to 78 Passenger = Two (2) emergency exits per side and two (2) roof hatches.

79 to 90 Passenger = Three (3) emergency exits per side and two (2) roof hatches.

Each emergency exit above shall comply with FMVSS No. 217. These emergency exits are in addition to the rear emergency door or exit.

In addition to the audible warning required on emergency doors by FMVSS No. 217 additional emergency exits may also be equipped with an audible warning device.

**2.6. FLOORS:** The floor system [See Paragraph E.2.1.1.3.] shall be of the type, grade, and thickness of steel specified in Table No. Nine (9) or approved equal (See Paragraph E.3.1.).

**2.6.1. 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.

**2.6.2. Cross Members:** The cross members shall be spaced not more than ten inches (10") 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 under structure 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 one-eighth inch (1/8") thick conforming to that specified in Paragraph E.1.11.

**2.6.3. Insulation:** When air conditioning is ordered [See Option No. One (1) and Paragraph H.1.2.] the floor shall be covered with five-eighths inch (5/8") 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 Paragraph C.2.5.1.].

**2.7. FLOOR COVERING:**

**2.7.1. 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 three-sixteenths inches (3/16") when measured from tops of the ribs. Rubber aisle floor covering shall meet Federal Specification ZZ-M-71D.

**2.7.2. Installation:** Floor covering must be permanently bonded to floor and must not crack when subjected to sudden changes in temperature. Bonding or adhesive material shall be waterproof and shall be a type recommended by the manufacturer of floor-covering material. All seams must be sealed with waterproof sealer.

**2.7.3. Trim:** Seams shall be covered with extruded aluminum metal strips of a minimum three-sixteenths inches (3/16") high and one inch (1") 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 (3) 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 nine inches (9") 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 three-fourths inches (3/4") from each end. Screws may be placed nine-and-one-half inches (9-1/2") apart only to avoid interference with floor sill members.

**2.7.4 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 one-eighth inches (1/8"). Floor covering on toeboard shall be held in place by trim strip or molding.

## **2.8. PANELS, EXTERIOR:**

**2.8.1. 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. The exterior side panels shall be installed either vertically or longitudinally. Vertical panels shall be one-piece (1-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.

**2.8.2. 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 (3) pieces welded or riveted together to form a continuous piece over the front and rear frame.

**2.8.3. Joints:** Joints shall meet the requirements of FMVSS No. 221.

**2.8.4. Material:** All exterior panels [See Paragraph E.2.1.1.2.] shall be of the type, grade, and thickness of steel specified in Table No. Nine (9) or approved equal.

**2.8.5. Undercoating:** All exterior panels shall be completely sprayed on the inside of the main exposed surfaces, and shall feather edge to the edge of the attaching members, with one-sixteenth inch (1/16") thick material conforming to that specified in Paragraph E.1.11. The spraying shall be done after the panels are installed.

**2.9. PANELS, INTERIOR:** 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 A 446. 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.

**2.9.1. Attachment:** All interior panels shall be attached to the frame structure by bolts, rivets, or by any well-designed method utilizing self-locking panels, or locking panel strips. Regardless of the method used, the panels shall be attached so that vibration, rumbling, and popping will be at a minimum.

**2.9.2 Design:** Front and rear panels shall be formed to present a smooth, pleasing appearance. 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.

**2.10. RUB RAILS:** Four (4) separate, one-piece (1-piece), continuous rub rails of the type, grade, and thickness of steel specified in Table No. Nine (9) (or approved equal), shall be installed on the body as described below. The minimum finished width of all rub rails shall be four inches (4"):

**2.10.1. 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 (1") 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.

**2.10.2. 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 (1) of the following drainage methods shall be used:

**2.10.2.1. Slots:** The bottom flange of the rub rail shall have a minimum of one inch by 0.32 inch (1" x 0.32") formed slots spaced on not more than twelve inch (12") centers, or;

**2.10.2.2. Slots or Holes:** One (1), one-fourth inch (1/4") diameter slot or hole 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.

**2.10.3. 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 Paragraph E.2.1.9.5.]. Provisions for one-piece (1-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:

**2.10.3.1. 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 wheel housings) 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 (1) 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 Paragraph E.2.1.11.

**2.10.3.2. 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 (2-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 (1") 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.

**2.10.3.3. 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 wheel house, by lapping the full width of the supporting part of the post.

**2.10.4. Location:** One (1) rub rail shall be installed at the skirt level, one (1) at or near the floor, one (1) at or near the seat level, and one (1) near the window line. One (1) additional rub rail may be furnished in lieu of one longitudinal frame member [See Paragraph E.2.4.3.].

**2.10.5. Sealing:** The top joint of the rub rail shall be sealed with a caulking compound or adhesive as specified in Paragraph E.2.1.5.

**2.11. 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.

**2.11.1. 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. The outside surface of this handle shall be stainless steel, polished aluminum, or chrome-plated steel. [See Paragraph C.2.14.4.].

**2.11.2. Knee Space:** Knee space between these barriers and the front of each front passenger seat shall be at least twenty-four inches (24") for 24-passenger bus, at least twenty-four-and-three-fourths inches (24-3/4") for the 71S- and 83-passenger buses, and at least twenty-five inches (25") for all other 35- through 77-passenger buses when measured from the modesty panel to the front of the seat back at the center of the seat approximately four inches (4") above the seat cushion.

**2.11.3. Upholstery:** Barriers shall be covered with upholstery meeting the requirements of Paragraph C.2.12.3.6.

**2.12. SEATING REQUIREMENTS, DRIVER:**

**2.12.1. 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 four inches (4") "Fore and Aft," and a separate minimum one inch (1") vertical adjustment. The back of the driver's seat shall be heavily padded and form-fitted. Driver's seat supplied by the body company shall be a high back suspension seat with a

minimum seat back adjustment of fifteen degrees (15°), not requiring the use of tools, and with a head restraint to accommodate a 95th percentile adult male, as defined in FMVSS No. 208. The driver's seat shall be secured with nuts, bolts, and washers or flanged-headed nuts.

**2.12.2. 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 six inches (6").

**2.12.3. 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.

**2.12.4. Seat Belts and Seat Belt Assembly:** A three-point (3-point), "Type II" 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 emergency locking retractor (ELR) for the continuous belt assembly. 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 eight inch (8") semi-rigid 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.

**2.13. SEATING REQUIREMENTS, PASSENGER:** 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:

**2.13.1. Seat Back Heights:** When so specified in the Invitation for Bid [See Option No. 21<sup>22</sup>], seat back heights shall be increased four inches (4") over the seat back heights required by FMVSS No. 222.

**2.13.2. Seat Belts, Passenger, Optional:** [See Paragraph E.3.13.].

**2.13.3. Seat Cushions:** All twenty-six inch (26") and all thirty-nine inch (39") seat cushions shall be designed to adequately support, respectively, two or three (2 or 3) passengers of one-hundred-twenty pounds (120 lbs.) each. All seat cushion materials shall meet or exceed the requirements of FMVSS No. 302 and/or California Technical Bulletin 117. The seat cushion shall be either of one-piece (1-piece) construction or may be constructed of more than one-piece (1-piece) at the manufacturer's option. The seat cushion unit shall consist of a base, a one- or two-piece (1- or 2-piece) polyurethane foam cushion, and upholstery, meeting the following requirements:

**2.13.3.1. Base:** The base shall be nominal one-half inch (1/2") thick, interior grade, C-D plywood with exterior grade glue, identification index 32/16,

---

<sup>22</sup> Seat backs with this option will have heights of approximately twenty-eight inches (28").

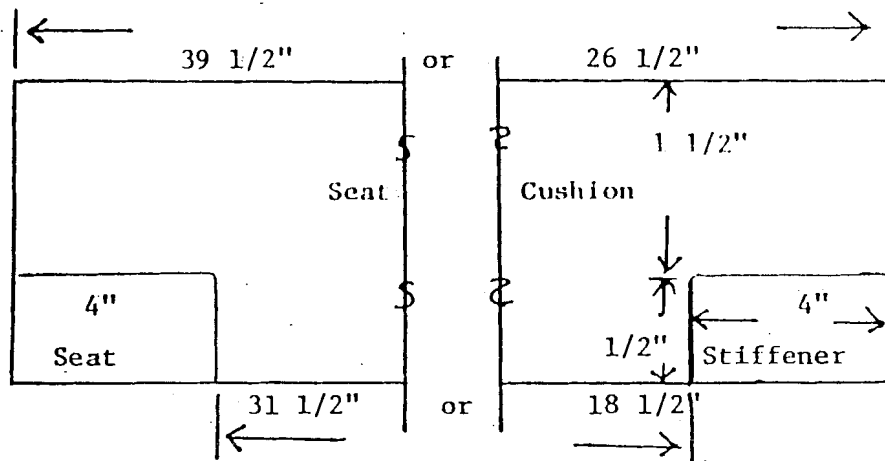
manufactured in conformance with U.S. Product Standard PS 1-83 and identified as to veneer grade and glue bond type by the trademarks of an approved testing agency. Plywood with blue stain in sapwood is not acceptable.

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.

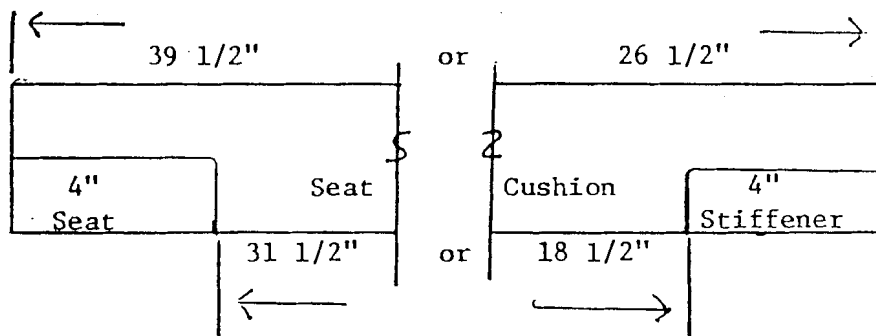
**2.13.3.2. Foam Cushion Assembly, One-Piece Polyurethane Foam:**

- (i) **Construction:** The seat cushion dimensions shall be in accordance with the nominal dimensional requirements as shown in Figure No. Two (2).
- (ii) **Design:** The one-piece (1-piece) foam cushion shall be solid polyurethane foam conforming to the physical requirements in Table No. Ten (10) (rebonded or molded polyurethane foams are not acceptable for seat cushion).

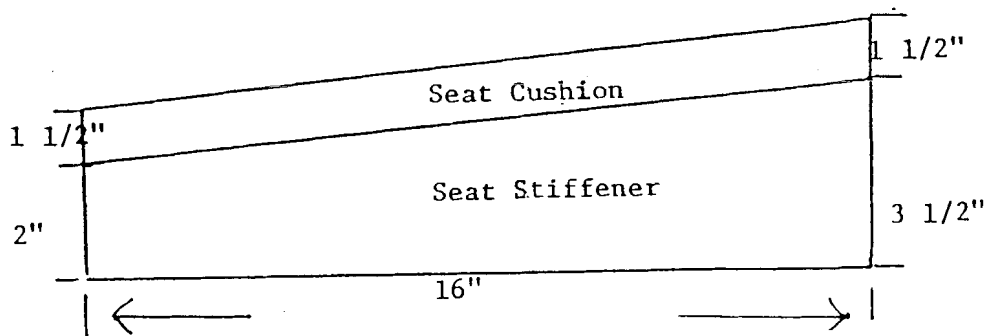
**FIGURE 2**  
**SEAT CUSHION ASSEMBLY**



**FRONT VIEW**



**REAR VIEW**



**SIDE VIEW**



**TABLE NO. TEN (10)**  
**ONE-PIECE CUSHION**  
**PHYSICAL PROPERTIES**  
**(ASTM D 3574)**

Item	One-Piece Seat Cushion
Density, lbs/cubic foot, Min.	1.8
Load Deflection, 4" thick @ 25% Indentation, Min.	90
Indentation Load, ratio, 65%/25%, Min.	2
Compression Set, 50% Deflection (22 hrs @ 158° F), Max.	2.0
Tensile Strength, lbs/square inch, Min.	10
Tensile Elongation, %, Min.	150
Tear Resistance, labs/inch, Min.	1.5

**2.13.3.3. Foam Cushion Assembly, Two-piece Polyurethane:**

- (i) **Construction:** The seat cushion assembly shall be fabricated in accordance with the nominal dimensional requirements as shown in Figure No. Two (2). In the two-piece (2-piece) assembly, the top one-and-one-half inches (1-1/2") of the cushion shall be of one (1) 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 Figure No. Two (2).
- (ii) **Design:** The two-piece (2-piece) foam cushion assembly shall be constructed of unfilled polyurethane foam conforming to the physical requirements in Table No. Eleven (11) (rebonded polyurethane foams are not acceptable for seat cushion or seat stiffeners):

**TABLE NO. ELEVEN (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.	52 ± 5	80
Indentation Load, ratio, 65%/25%, Min.	2	3
Compression Set, 50% Deflection (22 hrs @ 158° F), Max.	10	20
Tensile Strength, lbs/square inch, Min.	10	12
Tensile Elongation, %, Min.	150	75
Tear Resistance, labs/inch, Min.	2	2

**2.13.4. Seat Frames:**

**2.13.4.1. 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. Flip seats meeting the requirements of FMVSS No. 217 may be utilized at a location to accommodate side emergency exits as required by FMVSS No. 217. Seat frames legs shall be two, four, or six (2, 4, or 6) 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.

**2.13.4.2. 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 [See also Paragraph E.1.10.].

**2.13.5. Seat Installation:**

**2.13.5.1. Aisle Width:** The minimum aisle width between rows of seats shall be twelve inches (12") except a thirty inch (30") aisle is required if regular seating is provided between the rear emergency door and any wheelchair positions on wheelchair-equipped buses [See Paragraph G.1.7.3.].

**2.13.5.2. Attachment:** Each leg shall be attached to the floor with at least two (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.

**2.13.5.3. Knee Spacing:** Allowing for manufacturing tolerances, Texas requires the maximum allowable knee space on buses consistent with the overall standard body lengths [See Paragraph A.2.13. and Option No. 15]. These minimums are generally not less than the following [See Table No. Eight (8)]:

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

**2.13.5.4. Track Seating:** Seats may be track mounted in conformance with FMVSS No. 222. If track seating is installed, the manufacturer shall supply minimum and maximum seating spacing dimensions applicable to the bus, which comply with FMVSS No. 222. This information shall be on a label permanently affixed to the bus.

**2.13.6. Upholstery:** The seat cushion and back units shall be covered on top and four (4) sides with a vinyl resin-coated upholstering material as follows:

- 2.13.6.1. Material:** These materials shall be fire-resistant and shall meet or exceed the Boston Fire Block Test in the National School Bus Standards. They shall be artificial leather.
- 2.13.6.2. 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.
- 2.13.6.3. Welting:** There shall be welting on exposed seams of the seat back and cushion.

## **2.14. SERVICE ENTRYWAY:**

- 2.14.1. Design of Steps:** The entrance door steps shall be designed so that the first step shall be not less than ten inches (10") and not more than fourteen inches (14") for "Type A", "Type B", and "Type C" buses and a range between eleven inches (11") and not more than sixteen inches (16") for "Type D" buses, from the ground when the bus is unloaded. Service door entrance may be equipped with two- or three-step (2- or 3-step) entrance. Risers in each case shall not exceed a height of ten inches (10"). When plywood is used on a steel floor or step, the riser height may be increased by the thickness of the plywood. [See Paragraph E.2.6.3.]. The stepwell shall not protrude beyond the side body line and shall be fully enclosed to prevent accumulation of ice, snow, and dust. A suitable device (or devices) shall be designed and installed to prevent injury or fatality of passengers from being dragged. At least one (1) such device shall assist passengers during entry or egress, and be designed to eliminate entanglement.
- 2.14.2. Entryway Access:** There shall be a minimum of twelve inches (12") of unrestricted access from the service door to the center aisle.
- 2.14.3. Floor Material:** All steps and the floor line platform area shall be covered with three-sixteenths inches (3/16") rubber metal-backed treads with at least one-and-one-half inch (1-1/2") white nosing as an integral piece without any joint. A three inch (3") white rubber step edge with metal back may be substituted in the floor line platform area. Step tread minimum overall thickness shall be three-sixteenths inch (3/16") ribbed design similar to the ribbed design of the aisle rubber. Metal back of tread, minimum twenty-four (24) gauge cold rolled steel, shall be permanently bonded to ribbed rubber. Grooved design shall be such that said grooves run at ninety degree (90°) angle to long dimension of step tread. The rubber portion of the step trends shall have the following characteristics:
- 2.14.3.1.** Show a Durometer or equivalent hardness of eighty-five to ninety-five (85 to 95).
- 2.14.3.2.** Special compounding for good abrasion resistance and high coefficient of friction.
- 2.14.3.3.** Sufficient flexibility so that it can be bent around a one-half inch (1/2") mandrel both at one-hundred-thirty degrees (130°F) and twenty degrees (20°F) without breaking, cracking, or crazing.

**2.14.4. Handrails:** A grab handle not less than twenty inches (20") 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 [See Paragraph C.2.11.1.]. The design shall provide a smooth installation which would eliminate the possibility of clothing or other articles becoming caught upon ingress or egress from the vehicle.

**2.15. SERVICE or ENTRANCE DOORS:** The service door shall be of the type, grade, and thickness of steel specified in Table No. Nine (9) or approved equal:

**2.15.1. 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 Paragraph E.2.1.9.1.].

**2.15.2. Design:** The service doors may be the two-piece (2-piece) type (i.e., open in the middle) or the folding (or jackknife) type. These doors shall have a minimum horizontal opening of approximately twenty-four inches (24") and a minimum vertical opening of about sixty-eight inches (68"). The service door shall have upper and lower glass panels [See Paragraph E.2.15.3.] 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. This door shall have a positive latching mechanism to eliminate the possibility of an inadvertent door opening during a frontal collision or roll-over.

**2.15.3. Glass Panels:** Service or entrance doors shall have glass panels of approved safety glass [See Paragraph E.2.19.2.]. Bottom of each lower glass panel shall be not more than ten inches (10") from the top surface of the bottom step. The top of each upper glass panel shall be not more than six inches (6") from the top of the door.

**2.15.4. 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, three inches (3") high and one inch (1") thick, extending the full width of the opening, to prevent injury when accidentally impacted.

**2.15.5. Location and Operation:**

**2.15.5.1. Conventional Bus Doors:** The entrance doors for conventional buses shall be operated manually, or when so specified in the Invitation for Bid [See Option No. 10], actuated electrically, or by air pressure or vacuum and shall allow manual opening in case of an emergency. 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 (2-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.

**2.15.5.2. Forward Control Bus Doors:** The doors on forward control buses shall be operated either manually or actuated electrically or by air pressure or vacuum, and shall allow manual opening in case of an

emergency. 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 (2/3) of its opening width shall be ahead of the point opposite the back of the driver's seat. When so specified in the Invitation for Bid [See Option 10], doors shall be operated by means of electric, air pressure or vacuum, at the manufacturer's option.

**2.15.5.3. Semi-forward Control Bus Doors<sup>23</sup>:** On semi-forward control buses, the entrance doors 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 one-hundred-twenty-five pound (125 lb.) force applied to its center in order to manually open the door. When so specified in the Invitation for Bid [See Option No. 10], doors shall be operated by means of electric, air pressure or vacuum, at the manufacturer's option.

- 2.16. SKIRT REINFORCEMENTS:** Side skirts shall be gusseted or braced on not more than thirty inch (30") centers and wherever required for rigidity and to prevent vibration. If the body sections are authorized to be longer than thirty inches (30"), no more than three sections of skirt reinforcement shall be on centers up to a maximum of thirty-six inches (36"), or no more than one (1) section shall be on centers up to a maximum of thirty-eight-and-three-fourth inches (38-3/4").
- 2.17. 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. A static-type, non-closeable exhaust ventilator shall be installed in the low-pressure area of roof.
- 2.18. WHEELHOUSING:** The wheelhousing shall be of the type, grade, and thickness of steel specified in Table No. Nine (9) 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 Paragraph E.1.11.].
- 2.19. WINDSHIELD AND WINDOWS:**

**2.19.1. General Design:**

<sup>23</sup> Powered Service Doors shall be clearly and concisely marked with operating instructions in case of a power failure.

**2.19.1.1. Emergency Door Windows:** The emergency door shall be furnished with an upper and lower glass panels [See Paragraph E.2.5.1.4.] permanently closed, and set in rubber or sealed against rubber.

**2.19.1.2. Rear Window:** Rear windows (not emergency door windows)<sup>24</sup> shall be installed on each side of the rear emergency door. Each rear window glass shall have a minimum area of one-hundred-forty square inches (140" sq.) and shall be set solid in a waterproof manner. These windows shall be installed securely to prevent removal by hand.

**2.19.1.3. Side Window, Driver's:** The driver's window shall be a two-piece (2-piece) window of either of the following types:

- (i) Two-piece (2-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.

**2.19.1.4. Side Windows, Passenger, Standard<sup>25</sup>:** There shall be either a standard or a push-out type window for each passenger seat except where it is not possible because of the installation of side emergency exits [See Paragraphs E.2.5.2. and E.2.19.1.5.]. Standard side 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 (6") from the top. The passenger side windows shall provide an unobstructed opening twenty-two inches (22") wide and between nine and ten inches (9" and 10") high. These windows shall include a metal stop pin, bar, or similar device to ensure that the windows can be lowered only within the mandatory limit. These latches and related mechanism (excluding the thumb regulator) shall be manufactured of metal. When in a closed position, all windows shall be weather-tight.

---

<sup>24</sup> A rear "push-out" window, meeting the requirements of FMVSS No. 217, shall be provided on the rearward window on rear engine buses.

<sup>25</sup> Seventy-seven-passenger (77-) and 83-passenger rear-engine buses may have one less set of passenger windows than rows of seats.

**2.19.1.5. Side Windows, Passenger, Push-out Type<sup>26</sup>:** At the manufacturer's option, 24-passenger buses may be provided with one push-out side window in lieu of an emergency exit on each side and 35- through 83-passenger buses may be provided with two push-out side windows in lieu of two (2) emergency exits on each side [See Paragraphs E.2.5.1. and E.2.5.2. and Option No. 39]. These windows shall be hinged at the top and shall be positioned for ease of egress. These push-out windows shall be the body manufacturer's standard push-out passenger windows meeting or exceeding Federal Standards.

**2.19.1.6. Windshield:** The maximum width of the windshield center post shall not exceed two-and-one-half inches (2-1/2"). There shall be at least two inches (2") of clearance between the steering wheel and the windshield, cowl, instrument panel, or any other surface.

**2.19.2. 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:

**2.19.2.1. Rear and 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 one-eighth inch (1/8") safety plate glass and shall be AS-2 grade or better as specified in ANSI Safety Code Z26.1.

**2.19.2.2. Safety Plate Glass:** When so specified in the Invitation for Bid [See Option No. 16], all windows shall have AS-2 grade or better grade laminated safety plate glass.

**2.19.2.3. Side Windows, Passenger:** The glass in all passenger side windows, including push-out type emergency exit windows, shall be a minimum of one-eighth inch (1/8") safety plate glass and shall be AS-2 grade or better, as specified in ANSI Safety Code Z26.1.

**2.19.2.4. Windshield:** The windshield shall be minimum seven-thirty-seconds inch (7/32") thick safety plate glass and shall be heat-absorbent, laminated AS-1 safety glass meeting ANSI Standard Z26.1, as amended.

**2.19.3. Tinting<sup>27</sup>:**

<sup>26</sup> Push-out windows shall be equipped with an electrical switch connected to an audible signal automatically operated and located in the driver's compartment which shall indicate when the window is pushed out in excess of one-half inch (1/2"). 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.

<sup>27</sup> All safety glazing materials shall be approved by the Department of Public Safety.

**2.19.3.1. Side Windows, Passenger:** When so specified in the (See Option No. 16), passenger side windows only shall be tinted to minimum twenty-eight percent (28%), maximum forty percent (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.

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

### **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 Paragraph G.1.7.3.].

**3.2. BACKUP ALARM:** An automatic, audible backup warning alarm meeting the requirements of Type C, 97 decibels, SAE J994b (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. EMERGENCY EQUIPMENT:** Twenty-four-passenger (24-) through 83-passenger school buses shall be equipped with the following emergency equipment:

**3.4.1. Body Fluid Cleanup Kit:** Each bus shall be provided with a removable and moisture-proof body fluid cleanup kit. It shall be properly mounted and identified as a Body Fluid Cleanup Kit. This kit shall contain as a minimum, the following items mounted in a removable metal or hard plastic kit:

- 1 -- 15 oz. chlorine-type absorbent deodorant material (or equal)
- 1 -- 12 oz. germicidal spray disinfectant
- 2 -- pair disposable latex gloves
- 4 -- 18" x 18" absorbent towels
- 1 -- plastic pick-up spatula
- 1 -- plastic hand broom
- 1 -- plastic dust pan
- 2 -- 14" x 19" disposal bags and ties (waterproof)
- 2 -- adhesive "BIO-HAZARD" labels
- 1 -- 12 oz. deodorant spray
- 4 -- individually wrapped, cold sterilization wipes in foil-lined pouches
- 2 -- paper respiratory masks



- 1 -- metal or hard plastic container identified as "BIO-HAZARD" with black symbol and lettering on orange mountable case

**3.4.2. Fire Extinguishers:** School buses shall be equipped with a fire extinguisher, as listed below:

**3.4.2.1. 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 five pound (5 lb.) 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.

**3.4.3 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
- 8 -- 2 in bandage compress
- 10 -- 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
- 1 -- pair latex gloves
- 1 -- mouth-to-mouth airway

**3.5. HEATERS AND RELATED COMPONENTS:**

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

**3.5.2. Heater, Standard:** 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:

**3.5.2.1. Twenty-four-passenger (24-) and 35-passenger Buses:** 45,000 Btu/hr.

**3.5.2.2. Forty-seven-passenger (47-) and Larger Buses:** 80,000 Btu/hr.

**3.5.3. Heater, Auxiliary<sup>28</sup>:** When so specified in the Invitation for Bid [See Option No. 14], 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 Paragraph E.2.13.5.2. The Btu/hr. rating shall

<sup>28</sup> Auxiliary heaters on diesel-powered buses shall be furnished with a water circulating pump.

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:

**3.5.3.1. Twenty-four-passenger (24-) and 35-passenger Buses:** 40,000 Btu/hr.

**3.5.3.2. Forty-seven-passenger (47-) and Larger Buses:** 60,000 Btu/hr.

**3.5.4. 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 (2) 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:

**3.5.4.1.** One (1) between the heater hose connection and the water pump outlet, and,

**3.5.4.2.** One (1) between the heater hose connection and the engine block.

**3.5.5. 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.

**3.6. MUD FLAPS:** When so specified in the Invitation for Bid [See Option No. 18], 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 eight inches (8") 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.

**3.7. MIRRORS, EXTERIOR:** 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:

**3.7.1. Mirror System, Crossover:** The crossview mirror system shall provide the driver with indirect vision of an area at ground level from the front bumper forward and the entire width of the bus to a point where the driver can see by direct vision. The crossview system shall also provide the driver with indirect vision of the area at ground level around the left and right front corners of the bus to include the

tires and service entrance on all types of buses to a point where it overlaps with the rear vision mirror system.

- 3.7.2. Mounting and Mounting Brackets, Standard:** Mirror mounting and backing shall be of steel or a high-impact plastic such as a polycarbonate/polyethylene terephthalate blend, or approved equal. Mounting of all 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. This system of mirrors shall be easily adjustable but be rigidly braced so as to reduce vibration. Each exterior rear vision mirror shall be mounted in the brackets and assemblies shown on Texas General Services Commission Drawings Numbered 040-35(1), 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.
- 3.7.3. Mirror Backing and Mounting, Stainless Steel, Optional:** When so specified in the Invitation for Bid, exterior rearview mirror backs and mounting brackets shall meet or exceed all of the applicable requirements of Paragraph E.3.8.2 above except the mirror backing and mounting shall be made of stainless steel.
- 3.7.4. Painting:** 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 Type 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).
- 3.7.5. Rearview Mirror System:** The rearview mirror system shall be capable of providing a view along the left and right sides of the bus which will provide the driver with a view of the rear tires at ground level, a minimum of two-hundred feet (200') to the rear of the bus and at least twelve feet (12') perpendicular to the side of the bus at a distance of thirty-two feet (32') back from the front bumper.
- 3.8. MIRRORS, INTERIOR:** A clear-vision, interior rearview mirror conforming to FMVSS No. 111, with at least six inches by thirty inches (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.
- 3.9. REFLECTIVE MATERIAL<sup>29</sup>:** When so specified in the Invitation for Bid [See Option No. 19], buses shall be equipped with reflective material meeting the following requirements. The material shall be automotive engineering grade or better, shall meet the initial reflectance values in DOT FHWA FP-85 and shall retain at least fifty percent (50%) of those values for a minimum of six (6) years. Reflective materials and markings shall be installed in the following locations:

<sup>29</sup> Reflectivity of the stop signal arm is addressed under the Stop Signal Arm Section. If used, signs placed on the rear of the bus relating to school bus flashing signal lamps or railroad stop procedure may be reflective material as specified.

- 3.9.1.** Front and/or rear bumper may be marked diagonally forty-five degrees (45°) down to centerline of pavement with two inch (2") plus or minus one-fourth inch ( $\pm 1/4$ ") wide strips of non-contrasting reflective material.
- 3.9.2.** Rear of bus body shall be marked with strips of reflective National School Bus Yellow (NSBY) material to outline the perimeter of the back of the bus using material which conforms with the requirements of FMVSS 571.131 Table One (1). The perimeter marking of rear emergency exits per FMVSS No. 217 and/or the use of reflective "school bus" signs per Paragraph 3.9.3 below partially accomplish the objective of this requirement. To complete the perimeter marking of the back of the bus, strips of at least one-and-three-fourths inch (1-3/4") reflective NSBY material shall be applied horizontally above the rear windows and above the rear bumper extending from the rear emergency exit perimeter marking outward to the left and right rear corners of the bus; and vertical strips shall be applied at the corners connecting these horizontal strips.
- 3.9.3.** "SCHOOL BUS" signs, if not lighted design, shall be marked with reflective National School Bus Yellow material comprising background for lettering of the front and/or rear "SCHOOL BUS" signs.
- 3.9.4.** Side of bus body shall be marked with reflective National School Bus Yellow Material at least one-and-three-fourths inches (1-3/4") in width, extending the length of the bus body and located (vertically) between the floor line and the beltline
- 3.10. STROBE LIGHT, Flashing:** When so specified on Invitation for Bid [See Option No. 26], an optional white flashing strobe light meeting the following requirements shall be provided:
- 3.10.1. Design:** The lamp shall have a single clear lens emitting light revolving three-hundred-sixty degrees (360°) around a vertical axis. The light source shall be minimum of fifty (50) candlepower and flash eighty to one-hundred-and-twenty (80-120) 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.
- 3.10.2. Mounting:** The strobe light shall be permanently installed near the centerline on the school bus roof not more than one-third (1/3) of the body length forward from the rear edge of the bus roof. It shall not extend above the roof more than approximately six-and-one-half inches (6-1/2").
- 3.11. SEAT BELTS, PASSENGER:** When so specified in the Invitation for Bid [See Option No. 22], seat belts conforming to FMVSS No.'s 209 and 210 shall be provided for each passenger position. The seat belts shall meet the following requirements:
- 3.11.1. 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 (2) position seats shall use two (2) colors; three (3) position seats may use two or three (2 or 3) colors.
- 3.11.2. Design:** Seat belts shall have a buckle end and an attaching end which are adjustable to fit passenger sizes as required by FMVSS No.s' 208 and 209 (except lights and buzzers are not required). 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. 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.
- 3.13. STOP ARM:** A school bus stop arm meeting SAE J1133 and the following requirements shall be provided:
- 3.13.1. Design:** The sign shall be octagon-shaped, constructed of zinc-coated steel or aluminum. It shall have a minimum one-half inch (1/2") wide white border and the word "STOP" in white letters at least six inches (6") high against a red background on both sides. The letters, border and background shall be of reflective materials meeting DOT FHWA FP-85. Double-faced red, alternately flashing lamps, one (1) 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.
- 3.13.2. Mounting:** The stop arm shall be installed on the left side of the school bus near the front cowl section.
- 3.14. STUDENT SAFETY CROSSING ARM:** When so specified in the Invitation for Bid (See Option No. 25), each bus shall be equipped with a student safety crossing arm which shall meet or exceed SAE Standard J 1133. It shall be extended and retracted simultaneously with stop arm by means of the stop arm control. It shall be mounted to the right side of the front bumper by means of a four-point (4-point) mounting assembly. All components and connections shall be weatherproofed. The unit shall be easily removable for the purpose of towing of the bus. The unit shall be constructed of nonferrous material or treated as per the body sheet metal standard and shall contain no sharp edges or projections that could cause hazard or injury to students. The crossing arm shall extend seventy-two inches (72") from the front bumper and shall not open more than ninety degrees (90°) when in the "extended" position. The mechanism may be activated by air pressure, electricity, or be vacuum.
- 3.15. SUN VISOR:** A two-post (2-post), adjustable sun visor with a minimum size of six inches by thirty inches (6" x 30") and a minimum thickness of one-eighth inch (1/8") and constructed of tinted Plexiglas 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 Bid [See Option No. 30], 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 and shall be capable of being securely latched. However, if it is located inside the passenger compartment, it shall be provided with a separate cover, and shall be fastened to the floor in the right front or the right rear of the bus. A seat cushion shall not be used as this cover.

### **3.17. WINDSHIELD WASHERS AND WIPERS:**

**3.17.1. 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 (1 qt.) 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.

**3.17.2. Wipers:** A windshield wiping system, two (2) speed or variable speed, with an intermittent feature, shall be provided.

The wipers shall be operated by one (1) or more air or electric motors of sufficient power to operate wipers. If one (1) motor is used, the wipers shall work in tandem to give full sweep of windshield.

### **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 in the order indicated:

**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-96.

**4.1.2. Literature and drawings:** See Paragraph A.6.5.

**4.2. REVIEW OF REQUEST:** The Commission 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 that the bus body meets or exceeds the requirements of this specification, the vendor or manufacturer shall arrange for the school bus to be brought to Austin, Texas for inspection and evaluation by the Commission and the Texas School Bus Committee.

### **4.3. INSPECTION AND EVALUATION:**

**4.3.1.** The bus body shall be inspected using the current School Bus Inspection Check List.

**4.3.2.** The bus body will be evaluated and if found suitable for the intended purpose, the Commission will issue a letter to the manufacturer listing the model as approved for the capacities requested<sup>30</sup>. If found not suitable, the Commission will issue a letter to the vendor or manufacturer giving the reason (s) for disapproval.

<sup>30</sup>

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 inspected and evaluated prior to approval. The vendor or manufacturer shall request by letter that these other body lengths/models be approved.

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

### **F.1. GENERAL REQUIREMENTS:**

- 1.1. **GENERAL SPECIFICATIONS:** The requirements for gross vehicle weight ratings (gross vehicle weight rating (GVWR), gross axle weight ratings (front and rear) (GAWRs) and tire sizes and load ranges, as specified in Table No.'s Twelve through Twenty-eight (12 -- 28) for each size chassis are minimum requirements [See Paragraph A.4.5]. The requirements are for school buses with standard equipment. The added weights of optional equipment such as alternative fuel storage tanks, 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. AXLES, SUSPENSION, AND RELATED COMPONENTS:**

#### **2.1. AXLES:**

- 2.1.1. **Axle Capacities:** Axle capacities and gross axle weight ratings (GAWRs) shall be as specified in Table No.s' Twelve through Twenty-eight (12 --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.4.5, F.1.1, and G.1.7.2.].
- 2.1.2. **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 fifty-five miles per hour (55 mph) minimum [See Paragraph F.5.3.4.].

#### **2.2. BRAKES AND RELATED COMPONENTS:**

- 2.2.1. **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:
  - 2.2.1.1. **Air Compressor:** The air compressor on 83-passenger buses shall have a minimum twelve cubic feet (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.
  - 2.2.1.2. **Air Tanks:** The air tank (s) for 83-passenger buses shall be equipped with automatic valves to drain condensation from the tanks.
  - 2.2.1.3. **Automatic Moisture Ejectors:** Automatic moisture ejectors shall be furnished and installed.

**2.2.1.4. Automatic Slack Adjusters:** Four automatic slack adjusters shall be furnished and installed, two (2) at the front and two (2) at the rear.

**2.2.1.5. Visual Brake Stroke Adjustment Indicators:** Visual Brake Stroke Adjustment Indicators shall be furnished at each brake location.

**2.2.2. 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 Bid [See Option No. 6], the 59-, 65-, 71-, and 77-passenger school buses shall be equipped with hydraulic brakes.

**2.2.2.1.** The hydraulic braking system shall include the service brake, an emergency brake that is a part of the service brake system and controlled by the service brake control, and a parking brake.

**2.3. HUBODOMETERS:** Each chassis shall be equipped with one (1) 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:

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

**2.3.2.** Engler Instruments, 250 Culver Ave., Jersey City, NJ 07305.

**2.3.3.** Veeder-Root, Hartford, CT 06102.

**2.4. SHOCK ABSORBERS:** Two (2) front heavy-duty, double-acting shock absorbers shall be installed.

**2.5. 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 No.'s Twelve through Twenty-eight (12 -- 28). Rear springs shall be of the progressive type. If leaf type front springs are used, stationary eyes shall be protected by a full wrapper leaf in addition to the main leaf.

**2.6. TIRES AND WHEELS:**

**2.6.1. 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. All tires shall be "Original Equipment Line Quality." Schools may order Mud and Snow tread design tires [See Option No. 29]. For tire size and load range for each size chassis, see Table No.'s Twelve through Twenty-eight (12 -- 28).

**2.6.2. Wheels:** Each chassis shall be equipped with six (6) standard steel disc type wheels. When so specified in the Invitation for Bid [See Option No.'s 31 and 32], the following optional wheels and carrier shall be furnished on the chassis as indicated:



2.6.2.1. Wheel, Spare, Mounted with Carrier but not tire (or tube); For 35-through 83-passenger only; See Option No. 32<sup>31</sup>.

2.6.2.2. Wheel, Spare, Unmounted without Carrier, Tire, or Tube); For 24-through 77-passenger buses; See Option No. 31.

### F.3 CHASSIS FRAME AND RELATED COMPONENTS:

- 3.1. **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 shall be heavy duty transit type, not less than three-sixteenth inches by nine-and-one-half inch (3/16" x 9-1/2") steel (nine-and-three-fourth inches (9-3/4") for the 83-passenger bus). It must be of sufficient strength to permit pushing a vehicle of equal gross weight without permanent distortion to the bumper, chassis, or body. The bumper shall be painted black (Color No. 17038).
- 3.2. **CHASSIS FRAME SIDE MEMBERS:** Each frame side member shall be of one-piece (1-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.
- 3.3. **FUEL TANKS, CONVENTIONAL FUEL:** 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. Fuel tanks installed on Texas school buses shall have a minimum "draw" of eighty-three percent (83%) of capacity.
- 3.3.1. **Fuel Tank (s), Standard:** The standard fuel tank for 47- through 83-passenger school buses shall have a minimum capacity of sixty (60) gallons, except the 47- and 53-passenger forward control bus may have a minimum capacity of thirty-five (35) gallons. The 24- and the 35-passenger buses shall have fuel tanks with minimum capacities of twenty (20) and thirty (30) gallons, respectively. The tank (s) shall be mounted, filled, and vented entirely outside the body [See Paragraph F.5.5.3.].
- 3.3.2. **Fuel Tank (s), Auxiliary:** When so specified in the Invitation for Bid [See Option No. 12], the 24- and the 83-passenger buses shall be furnished with minimum capacity fuel tank or tanks of thirty (30) and ninety (90) gallons, respectively. The auxiliary fuel tank for the 24-passenger bus shall be furnished and installed by the chassis manufacturer. Thirty-five (35-) through 77- passenger buses do not have auxiliary fuel tanks available. Seventy-one (71-) and 77-passenger buses shall have one-hundred (100) gallon capacity auxiliary fuel tanks.
- 3.3.3. **Material:** Each tank (including auxiliary fuel tanks) shall be constructed of sixteen (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.
- 3.4. **FUEL TANKS, ALTERNATIVE FUEL:** Fuel tank (s) for alternative fuels [See Option No. 3] shall meet or exceed all of the rules and regulations of the Texas Railroad Commission

---

<sup>31</sup> Carrier not available for 24-passenger bus; spare wheel only is available on this option.

(RRC), the requirements of FMVSS No. 304 and others, as applicable. Capacity shall be that required to meet the range requirements of the Option or as specified in the Invitation for Bids.

- 3.5. **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).
- 3.6. **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.4. ELECTRICAL SYSTEM AND RELATED COMPONENTS:

- 4.1. **ALTERNATORS:** The twelve (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 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:
  - 4.1.1. **Alternator, Standard:** The 24- through 83-passenger buses shall have a standard alternator with a minimum electrical output of one-hundred amperes (100 amps).
  - 4.1.2. **Alternator, Optional:** When so specified in the Invitation for Bid [See Option No. Four (4)], the 24- through 83-passenger chassis shall have an alternator with a minimum electrical output of one-hundred-thirty amperes (130 amps).
  - 4.1.3. **Alternators, Other:** School buses equipped with the following equipment shall have alternators meeting the following requirements:
    - 4.1.3.1. **Air-Conditioned Buses:** Buses equipped with air conditioning shall have alternators with a minimum electrical output of one-hundred-thirty amperes (130 amps).
    - 4.1.3.2. **Wheelchair Lift-Equipped Buses:** Buses equipped with wheelchair lifts shall have alternators with a minimum electrical output of one-hundred-thirty amperes (130 amps).
    - 4.1.3.3. **Air-Conditioned and Wheelchair-Equipped Buses:** Buses equipped with both air conditioning and wheelchair lifts shall have alternators with a minimum electrical output of one-hundred-sixty amperes (160 amps).
- 4.2. **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 six or twelve (6 or 12) volts and meet the following:
  - 4.2.1. **Battery, Diesel Engines:** Batteries shall be single or dual twelve (12) volt or dual six (6) volt as specified by the chassis manufacturer. The minimum performance level shall be a BCI cold cranking capacity (CCA) of not less than

four-hundred-fifty amperes (450 amps) at zero degrees (0°F) with a minimum one-hundred-thirty (130) minute reserve capacity except for the 24-passenger bus which shall have a minimum three-hundred-sixty (360) cold cranking capacity (CCA) and one-hundred (100) minute reserve capacity.

**4.2.2. Battery, Gasoline Engines:** Batteries shall be twelve (12) volts with a minimum performance level of BCI cold cranking capacity (CCA) of not less than three-hundred-sixty amperes (360 amps) at zero degrees (0°F) with a minimum one-hundred (100) minute reserve capacity.

**4.2.3. Battery (s), Alternative Fueled Vehicles:** Dedicated alternative fueled vehicles shall have batteries meeting or exceeding those required for a gasoline engine school bus with comparable horsepower.

**4.2.4. Battery 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.

**4.2.5. 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 Paragraph E.2.3.].

**4.3. HORNS:** Each bus shall be equipped with horn or horns of standard make. Each horn shall be capable of producing audible sounds in the frequency range from two-hundred-fifty to two-thousand (250 to 2,000) hertz and at an intensity between eighty-two and one-hundred-two (82 and 102) decibels. The sound level measurements shall be made at a distance of fifty feet (50') directly in front of the vehicle in accordance with SAE J377.

**4.4. INSTRUMENTS AND INSTRUMENT PANEL:** The bus shall be equipped with the following nonglare illuminated instruments (controlled by an independent rheostat<sup>32</sup>), 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.

**4.4.1.** Air Pressure Gauge (air brake equipped).

**4.4.2.** Ammeter (or Voltmeter) with graduated charge and discharge indications.

**4.4.3.** Fuel Gauge.

**4.4.4.** Glow Plug Indicator Light (for diesel buses with glow plugs only).

**4.4.5.** High Beam Headlamp Indicator.

**4.4.6.** Odometer (Six (6) digits, i.e., register to 99,999.9 miles).

**4.4.7.** Oil Pressure Gauge.

**4.4.8.** Speedometer.

---

<sup>32</sup> 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.

**4.4.9.** Vehicle manufacturer's standard keyed ignition switch.

**4.4.10.** Water temperature gauge.

**4.5. LAMPS:** Each bus shall be equipped with at least two clear 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.

**4.6. WIRING:** The chassis manufacturer shall provide a readily accessible terminal strip or plug on the body side of the cowl, or at an accessible location within the engine compartment, with the following minimum terminals for the body connections:

**4.6.1.** Backup Lamps.

**4.6.2.** Instrument Panel Lights (rheostat controlled by head lamp switch).

**4.6.3.** Left Turn signals.

**4.6.4.** Right turn signals.

**4.6.5.** Stop lamps.

**4.6.6.** Tail lamps.

#### **F.5. ENGINE AND RELATED COMPONENTS:**

**5.1. AIR CLEANER:** Each chassis shall be equipped with a factory-installed maximum capacity, heavy-duty replaceable dry element type air cleaner. The intake air system for diesel engines shall have an air cleaner restriction indicator properly installed by the chassis manufacturer to meet manufacturer's engine specifications.

**5.2. 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.

**5.3. 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.

**5.3.1. Diesel Engines:** When so specified in the Invitation for Bid [See Option No. Eight (8)], a bus chassis having a gasoline engine listed as standard, shall be furnished with a four (4) cycle diesel engine. Diesel engines are standard for 47-through 77-passenger and the 83-passenger forward control buses.

**5.3.2. 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 Table No.'s Twelve through Twenty-eight (12 -- 28) and in the Class 070-SB APL.

**5.3.3. Alternative Fuel Engines:** When so specified in the Invitation for Bid [See Option No. Three (3)], the 24- through 83 passenger buses shall be equipped by the chassis manufacturer (or approved designate) with engines capable of operating on alternative fuels.

**5.3.4. Power Requirements:** Each bus shall be furnished with an engine that meets or exceeds the following minimum criteria See Paragraph F.5.3.5.7. Notes], when tested at or above the gross vehicle weight rating (GVWR) required for a given bus capacity and with all accessories except air conditioning compressor on and operating:

**5.3.4.1.** Acceleration from zero to fifty miles per hour (0--50 mph) in sixty (60) seconds or less.

**5.3.4.2.** Gradeability of one-and-one-half percent (1.5%) minimum at fifty miles per hour (50 mph).

**5.3.4.3.** Gradeability of five percent (5%) minimum at twenty-five miles per hour (25 mph).

**5.3.4.4.** Startability of twenty percent (20%) minimum.

**5.3.4.5** Top speed of fifty-five miles per hour (55 mph) minimum at the manufacturer's rated rpm for the governed engine.

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

**5.3.5.1.** Submit to the Commission, a recent original computer SCAAN showing that the proposed engine meets or exceeds each requirement of Paragraph F.5.3.4 under the following conditions:

- (i) Air resistance coefficient = 0.550 or relative drag coefficient of 88-whichever the manufacturer uses.
- (ii) All engine accessories on and operating including fan clutch, alternator, power steering pump, air compressor, and any other powered accessory except air conditioning compressors.
- (iii) Gross vehicle weight rating (GVWR) equal to or greater than that of the largest bus for which approval is requested.
- (iv) Minimal frontal area of seventy-five square feet (75 sq. ft.), or actual frontal area, if different.
- (v) Other parameters shall be of the manufacturer's standard values for the coefficient of friction on smooth concrete, driveline efficiency, etc.
- (vi) Radial tires of the size specified in the table for the particular bus capacity.

(vii) Transmission, chassis manufacturer's standard automatic, or AT-545, MT-643 transmission, as applicable [See Paragraph F.6].

- 5.3.5.2. The Commission will review the SCAAN and advise the vendor or manufacturer by letter of the results of this review. Copies will be furnished to the School Bus Committee.
- 5.3.5.3. If this review verifies that the engine meets the requirements of this specification, and is so stated in the above letter, the vendor or manufacturer shall contact the GSC Purchaser to arrange for 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 participant.
- 5.3.5.4. 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 GSC on the form provided (See copy of the form entitled, "Three-Month Test of New School Bus Engines," on Page 165.
- 5.3.5.5. The vendor or manufacturer shall then contact the GSC Purchaser and TEA School Bus Committee Representative about ordering the school bus with the subject engine.
- 5.3.5.6. The bus shall be tested for a period of not less than three (3) months during the regular nine (9) months school term, preferably on a variety of routes and on activity trips.
- 5.3.5.7. Upon receipt of the school district's report, the Commission will make a determination that the engine be accepted or rejected, and advise the vendor of that determination. The School Bus Committee will be advised of this action and the engine will be added to the Class 070-SB-APL, if acceptable.

**NOTES:** Once an engine is approved in one horsepower and torque version, other greater 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 Paragraph F.5.3.5.1, and, in addition, state the rear axle 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 SAE net horsepower and SAE net torque as well as the rear axle 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 24- THROUGH 83-PASSENGER SCHOOL BUSES IN THE STATE OF TEXAS ARE THE FIVE REQUIREMENTS LISTED IN PARAGRAPH F.5.3.4. There are additional requirements for engines, either implied or specified, separate from the above performance requirements.

- 5.4. 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 signals (which may be also be visual) 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 eight (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.
- 5.5. EXHAUST SYSTEM:**
- 5.5.1. Component Placement:** The exhaust pipe, muffler, and tailpipe shall be mounted under the bus and attached to the chassis frame.
- 5.5.2. Noise Level:** The noise level shall neither exceed EPA "Noise Emission Standards" nor eighty-five (85) decibels at the ear of the occupant in the bus nearest to the noise source in the bus. When so specified in the Invitation for Bid [See Option No. 24], the bus shall be furnished with sufficient sound insulation to reduce the noise level to less than eight-six (86) decibels measured at the same place.
- 5.5.3. Tailpipe:** The tailpipe shall be constructed of seamless or electrically welded tubing of sixteen (16) gauge steel or equivalent, and shall extend at least five inches (5") beyond the chassis frame. The size of the tailpipe shall not be reduced after it leaves the muffler.
- 5.5.4. Tailpipe Exit:** The tailpipe of a gasoline-powered bus shall not exit the side of the bus anywhere within twelve inches (12") 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.
- 5.6. FUEL FILTER:** Each diesel engine shall be equipped with a fuel filter of the full-flow design, installed between the fuel tank and the injector pumps.
- 5.7. GOVERNOR:** A governor set to the manufacturer's recommended maximum engine speed (RPM) shall be installed by the engine manufacturer. When engine is remotely located from driver, the governor shall be set to limit engine speed to maximum revolutions per minute recommended by engine manufacturer, and a tachometer shall be installed so the engine speed may be known to the driver.
- 5.8. OIL FILTER:** Each chassis shall be equipped with a factory-installed, minimum one quart (1 qt.) 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.
- 5.9. TACHOGRAPH:** When so specified in the Invitation for Bid [See Option No. 27], a tachograph containing a combination clock/speedometer/recorder shall be installed on the dashboard. The tachograph shall be Argo Model (s) 1310-6, Veeder-Root Model AB-1407, or approved equal.
- 5.10. THROTTLE:** The force required to operate the throttle shall not exceed sixteen pounds (16 lbs.) throughout the full range of accelerator pedal travel.
- F.6. 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. **Note:** An electronic control or similar device may be

installed to ensure that automatic transmissions cannot accidentally be moved out of the neutral or park gear position while the driver is not in the driver's seat.

- 6.1. **AUTOMATIC TRANSMISSION, CHASSIS MANUFACTURER'S:** Unless otherwise specified in the Invitation for Bid, the 24-passenger bus shall be furnished with a minimum three (3) forward speed automatic transmission which shall be the chassis manufacturer's standard automatic transmission for this type of chassis.
- 6.2. **AUTOMATIC TRANSMISSION (ATD MODEL AT 545):** Unless otherwise specified in the Invitation for Bid, the 35- through 71-passenger and the 77-passenger conventional buses shall be furnished with a minimum four (4) forward speed automatic transmission. The transmission shall be the ATD Model AT 545, or approved equal [See Paragraph F.6.], unless an ATD Model MT-643 is required to match engine torque. The application will conform to the manufacturer's recommended capacity limits of 30,000 gross vehicle weight rating (GVWR) and/or four-hundred-forty-five pounds per foot (445 lb.-ft.) maximum torque rating for AT-545 transmissions.
- 6.3. **AUTOMATIC TRANSMISSION (ATD MODEL MT-643):** Unless otherwise specified in the Invitation for Bid, the 77- and 83-passenger forward control buses (and others, as required by increased torque rating of optional or standard engines), shall be furnished with a minimum four (4) forward speed automatic transmission. The transmission shall be the ATD Model MT-643, or approved equal.
- 6.4. **DRIVE SHAFT GUARD<sup>33</sup>:** 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.
- 6.5. **MANUAL TRANSMISSIONS:** Unless otherwise specified in the Invitation for Bid, the manual type transmission shall be furnished on all 24- through 77-passenger buses (but not the 83-passenger bus, which require 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 ten percent (10%) above the maximum net torque developed by the engine. Its design shall provide for four forward and one reverse speeds for the 24-passenger chassis, and five (5) forward (direct in fifth) and one (1) reverse speed for 35-, 47-, 53-, 59-, 65-, 71-, and 77-passenger chassis.
- 6.6. **MANUAL TRANSMISSION CLUTCH:** The clutch in buses equipped with manual transmissions shall have a torque capacity not less than ten percent (10%) 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:
  - 6.6.1. **Twelve inch (12") Clutch:** All chassis for the 24-, 35-, 47-, 53-, and 59-passenger buses with manual transmissions shall be equipped with a minimum twelve inch (12") diameter clutch.

---

<sup>33</sup> Drive shaft guard is not required on rear engine, rear-drive bus.