SPECIFICATIONS

STATE OF TEXAS

SCHOOL BUSES

NO. 070 - B - 85

1985

EFFECTIVE

JANUARY 1, 1985

PREPARED JOINTLY

BY

STATE PURCHASING AND GENERAL SERVICES COMMISSION

TEXAS EDUCATION AGENCY

DEPARTMENT OF PUBLIC SAFETY

INDEX TO STATE OF TEXAS SCHOOL BUS SPECIFICATIONS

NO. 070-B-85, 1985

INDEX

EFFECTIVE DATE
January 1, 1985

TEXAS SPECIFICATION NO.
070-B-85
(Supersedes No. 070-B-01)

TEXAS SCHOOL BUSES

A. GENERAL INFORMATION, REQUIREMENTS, AND CONDITIONS

A.1. SCOPE

1.1. This school bus specification includes the minimum requirements for ten sizes of school buses to be used by Texas schools participating in the Foundation School Program. This specification covers the purchase of bus bodies and chassis separately and the purchase of complete school buses. The bus sizes shall be designated in terms of passenger capacity, exclusive of the driver, as listed below:

15 Passenger	24 Passenger	47 Passenger	59 Passenger	71 Passenger (Short Wheelbase)
19 Passenger	35 Passenger	53 Passenger	65 Passenger	71 Passenger (Long Wheelbase)
				83 Passenger

1.2. The 15-passenger bus may be of the van conversion type and shall have a seating arrangement for 15 passengers.

1.3. The 19-passenger bus may be of the conventional school bus body design or a conventional and/or van conversion type which will provide space for 19 passengers.

1.4. The 24 through 71-passenger bus shall be of the conventional school bus design and shall provide space for passengers in the 24 through 71 range as specified in A.1.1. above.

NOTE: A semi-forward control chassis has been approved as equal for 59, 65, and 71 passenger capacities.

1.5. The 83-passenger bus shall be of the forward control or rear engine transit design and shall provide space for 83 passengers.

A.2. DEFINITIONS

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

2.2. ANSI means American National Standards Institute.

2.3. ASTM means American Society for Testing and Materials.

2.4. BCI means Battery Council International.

2.5. Commission and SPGSC mean Texas State Purchasing and General Services Commission.

2.6. Department of Public Safety and DPS mean Texas Department of Public Safety.

2.7. Education Agency and TEA mean Texas Education Agency.

2.8. EPA means United States Environmental Protection Agency.

2.9. FMVSS means Federal Motor Vehicle Safety Standards.

2.10. Federal Standard No. 17 means Federal Highway Safety Program Standard Number 17.

2.11. Manufacturer means a fabricator of school buses, bodies, chassis, or components.

2.12. SAE means Society of Automotive Engineers.

2.13. SBMI means School Bus Manufacturer's Institute.

2.14. Vendor means a manufacturer's representative or dealer authorized to make sales and supply parts and services in Texas.

2.15. VESC means Vehicle Equipment Safety Commission.

A.3. APPLICABLE SPECIFICATIONS AND STANDARDS

3.1. School bus bodies and chassis shall meet or exceed the minimum requirements of this specification and shall also meet all applicable requirements of **Federal Motor Vehicle Safety Standards (FMVSS)** and **Highway Safety Program Standard No. 17.** All requirements of this specification must be met unless they are in conflict with the FMVSS, as they apply to school buses.

3.2. School bus bodies and chassis shall also meet or exceed the current **National Minimum Standards for School Buses except** when those requirements are in conflict with the requirements of this specification. In such cases, the requirements specified herein shall prevail.

3.3. References to specifications, standards, and test methods shall be to those in effect on the date of the Invitation for Bids. The following publications form a part of this specification to the extent specified here:

3.3.1. Federal Specifications - Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

(1) TT-C-490B - **Cleaning Methods and Pretreatment of Ferrous Surfaces For Organic Coatings**

(2) TT-C-520B - **Coating Compound, Bituminous, Solvent Type, Underbody, (For Motor Vehicles)**

(3) TT-E-489 - **Enamel, Alkyd, Gloss (For Exterior and Interior Surfaces)**

(4) V-T-295D - **Thread, Nylon**

(5) ZZ-M-71D - **Matting, Rubber and Vinyl**

3.3.2. Federal Standards - Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

(1) No. 595a - **Colors**

3.3.3. FMVSS - Federal Motor Vehicle Safety Standards (Public Law 89-563) - Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

(1) No. 103 - **Windsbield Defrosting and Defogging Systems**

(2) No. 105-75 - **Brakes, Hydraulic Service, Emergency and Parking**

(3) No. 108 - **Lamps, Reflective Devices, and Associated Equipment**

(4) No. 111 - **Rearview Mirrors - Passenger Cars and Multipurpose Passenger Vebicles**

(5) No. 121 - **Air Brake Systems - Buses and Trailers**

(6) No. 125 - **Warning Devices**

(7) No. 208 - **Occupant Crash Protection**

(8) No. 209 - **Seat Belt Assemblies - Passenger Cars, Multipurpose Passenger Vehicles, Trucks and Buses**

(9) No. 210 - **Seat Belt Assembly Anchorages**

(10) No. 217 - **Bus Window Retention and Release**

(11) No. 220 - **School Bus Rollover Protection**

(12) No. 221 - **School Bus Body Joint Strength**

(13) No. 222 - **School Bus Seating and Crash Protection**

(14) No. 301-75 - **Fuel System Integrity**

(15) No. 302 - **Flammability of Interior Materials - Passenger Cars, Multipurpose Passenger Vehicles, Trucks, and Buses**

3.3.4. Federal Highway Safety Program Standard No. 17, Pupil Transportation Safety - Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

3.3.5. National Minimum Standards for School Buses, 1980 Revised Edition, National Standards Conference (May, 1980), National Safety Council, 425 North Michigan Avenue, Chicago, Illinois 60611.

3.3.6. ANSI - American National Standards Institute, Inc., 1430 Broadway, New York, New York 10018.

(1) Z26.1-1966 - **Safety Glazing Materials for Glazing Motor Vehicles Operating on Land Highways, Safety Code for,** including Supplement Z26.1a-1969

3.3.7. ASHRAE - American Society of Heating, Refrigeration and Air Conditioning Engineers, Inc., Circulation Department, 345 East 47th Street, New York, New York 10017.

(1) ASHRAE 16-69 - **Methods of Testing for Rating of Room Air Conditioners**

3.3.8. ASTM - American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103.

(1) A 446-76 - Specification for **Sheet Steel, Zinc Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality**

(2) A 525-81 - General Requirements for **Steel Sheet, Zinc Coated (Galvanized) by the Hot-Dip Process**

(3) D 3574-77e, Standard Test Method for **Testing Cellular Materials - Slab Bonded and Molded Urethane Foam**

3.3.9. EPA - United States Environmental Protection Agency, Waterside Mall, 401 M Street, S.W., Washington, D.C. 20460.

(1) Noise Emission Standards

3.3.10. SAE - Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, Pennsylvania 15096.

(1) SAE J20e - **Coolant System Hoses**

(2) SAE J377 - **Performance of Vehicle Traffic Horns**

(3) SAE J383 - **Motor Vehicle Seat Belt Anchorages**

(4) SAE J514j - **Hydraulic Tube Fittings**

(5) SAE J516b - **Hydraulic Hose Fittings**

(6) SAE J517d - **Hydraulic Hose**

(7) SAE J561b - **Electrical Terminals - Eyelet and Spade Type**

(8) SAE 588e - **Turn Signal Lamps**

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

(10) SAE J887a - **School Bus Red Signal Lamps**

3.3.11. U.S. Product Standard PS 1-83 - American Plywood Association, P.O. Box 11700, Tacoma, Washington 98411.

3.3.12. School Bus Manufacturers' Institute, Engineering Committee, P.O. Box 70409, Washington, D.C. 20088-0409.

(1) SBMI Standard Number 001, **Standard Code for Testing and Rating Automotive Bus Hot Water Heating and Ventilating Equipment**

3.3.13. Vehicle Equipment Safety Commission, Suite 908, 1030 15th Street, N.W., Washington, D.C. 20005

(1) Regulation VESC - 6

(2) Regulation VESC - 10

A.4. GENERAL INFORMATION AND REQUIREMENTS

4.1. Each bus body and bus chassis furnished under this specification shall be new 1985 or 1986 models 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 here.

4.2. All bus bodies, chassis, or complete school bus units shall be completely assembled, adjusted, and all equipment installed. All parts not specifically mentioned herein which are necessary to provide a complete school bus, bus body, or chassis shall be furnished by the successful bidder and said parts shall conform in strength, quality of materials, and workmanship to recognized industry engineering practices.

4.3. The requirements for gross vehicle weight ratings, gross axle weight ratings (front and rear), and tire size, and load range for each size chassis are specified in **TABLE NOS. 3, 4** and **8-17**, pages 38-39, and 73-82, and are **minimum** requirements.

4.4. These requirements are for a van type school bus (15 and 19 passenger), conventional type school bus (24-71 passenger), and a transit type school bus (83 passenger) with standard equipment. **The added weights of optional equipment such as air conditioning, luggage racks, lifts for the physically impaired and other heavy accessories were not considered in establishing the capacity ratings to be certified for the chassis.**

4.5. 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.

4.6. Paragraphs **A.4.3.**, **A.4.4.**, and **A.4.5.** are not applicable for chassis only which are to be used by the State of Texas for remounting of bus bodies.

A.5. CERTIFICATION AND COMPLIANCE

5.1. **By signing his bid,** the bidder certifies that the equipment being offered meets or exceeds all requirements and conditions of this specification. Failure on the part of the bidder to comply with all the requirements and conditions of this specification will subject his bid to rejection.

5.2. Requirements and accessories, either standard or optional, under this specification shall be installed by body, chassis or product manufacturer except air conditioners, tachographs, tachometers and wheelchair lifts may be installed by authorized service representatives. Installation of such items shall conform in strength, quality, and workmanship to the accepted standards of the industry.

5.3. **The vendor must certify on the face of his invoice** that the equipment delivered meets or exceeds the requirements and conditions of this specification and that the equipment was manufactured in accordance with this specification. The burden of proof for compliance with this specification shall be the responsibility of the vendor, manufacturer, or both.

5.4. **Each bidder shall furnish the following:**

5.4.1. The bidder shall have on file with both the State Purchasing and General Services Commission and the Education Agency the latest pamphlets, brochures, and printed literature on the equipment he proposes to furnish to this specification.

5.4.2. The bidder shall have on file with the Commission detailed **isometric** drawings of the bus body showing floor panels, side posts, roof bows, bow-frames, strainers, longitudinal frame members, exterior panels, and front and rear end framing. Each component shall be identified in block form showing (first) the item number, (second) the type of steel, and (third) the decimal thickness of steel used in the construction. (Refer to **TABLE NO. 6**, Page 53 for steel requirements on 24 passenger and larger capacities.)

5.4.3. On construction items, one drawing will suffice; however, drawings must be furnished on special items and changes or deviations from common construction when such change affects any one size bus. All drawings submitted will be treated as confidential information. Drawings must be approved by the Commission.

A.6. AWARDS

The Commission reserves the right to accept or reject any and all bids, in whole or in part, and to waive all technicalities when these actions are determined by the Commission to be in the best interests of Texas. Failure to receive a satisfactory chassis or body bid shall not prohibit the awarding of contracts to others by the Commission, when in the best interest of the State.

A.7. PRODUCTION ORDER - CHASSIS

7.1. One copy of the production order (line setting ticket) listing both standard and optional equipment installed on the chassis must accompany the chassis to which it pertains upon delivery of the chassis to the bus body manufacturer and to the final destination (receiving School District).

7.2. 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. The production order shall be a printed form and not machine coded.

7.3. In lieu of the production order, the information required above may be stamped on a metal plate, either an additional plate or on the truck identification plate regularly furnished. 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.

7.4. The production order (line setting ticket) or truck identification plate referred to above shall not be removed from the chassis by the body manufacturer since it is for the information of the school which is to receive the bus. The truck identification plate shall not be obliterated when undercoating or paint is applied to the area where the plate is mounted. The plate shall not be mutilated or covered when installing equipment such as the heater, heater hose and electrical cables.

A.8. WORK ORDER - BUS BODY

8.1. 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.

8.2. One copy of the work order must accompany the bus to its final destination.

A.9. NOTIFICATION

Successful, complete unit bidders shall submit to this Commission:

9.1. Within 10 days from the Commission's purchase order date, a copy of the vendor's chassis order indicating the date **each** chassis will be delivered to the body plant.

9.2. Within 10 days after receipt by the vendor, notice that chassis are in possession, for specific orders.

9.3. At least 20 days in advance of the final delivery date, when a known delay precludes delivery of a unit on time, written notice shall be made to the Commission.

A.10. INSPECTION

Inspection shall be by and at the discretion of this Commission or its designated agent and may be performed either at the place of manufacture or at the final destination, or both. The authorized State Inspector shall have access to the manufacturer's plant during all normal working hours in order to make all necessary inspections during the process of manufacture and assembly. This does not preclude the school districts' personnel from making inspections during manufacture or after acceptance of delivery. The school districts' 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 his distributor.

A.11. PREDELIVERY SERVICE

11.1. The following service on the chassis and body shall be performed before the bus is delivered to the receiving school district:

11.1.1. Predelivery inspection and service on chassis

11.1.2. Complete chassis lubrication

11.1.3. Oil levels checked and maintained with the proper grade and weight of oil

11.1.4. Interior and exterior of bus shall be cleaned and washed

11.2. The vendor or his representative who is responsible for the final delivery shall attach a signed certificate to the bus stating that the above service was performed and that inspection indicates the bus is in good condition and ready for delivery.

A.12. DELIVERY

12.1. The delivery of a bus to any specified destination may be made by any normal delivery procedure which the manufacturer or distributor is utilizing. (See **NOTE** below.) The bus body distributor must guarantee the equipment to be free from damage as a result of his type of delivery. If any damage is caused by or during delivery that can be established within six months after delivery to any school, then the school must be compensated for such damage by the contractor. It shall be the obligation and responsibility of the body manufacturer to check and inspect each chassis delivered to his plant to ascertain that the chassis is free from any damage which might have occurred as a result of the type of delivery.

NOTE: Under no circumstances shall a bus be used as a towing vehicle prior to or during delivery to its destination.

12.2. Buses may be delivered to the receiving school districts **only** between the hours of 8:00 a.m. and 4:00 p.m. Monday through Friday, excluding holidays. Deliveries at other times are **not** to be made without at least 24 **hours notice** and **only** then with the **expressed consent and approval** of the receiving school district. The person delivering the bus shall present the Inspection Report Forms to the responsible school personnel **and** obtain that school official's signature **before delivery is considered complete.** (See **A.11.2.**)

12.3. Delivery on schedule is critical. The ability to deliver as specified in the Invitation for Bids may be a factor in making awards.

12.4. A vendor who fails to make delivery in accordance with terms of the purchase order may be liable to the State for actual damage suffered by the State. The amount of such damages shall be determined by the Commission.

12.5. Failure by the successful bidder to deliver buses, caused as a direct result of Acts of God, War, Civil Disturbance, Federal Law and Regulations, or Labor Disputes, which is beyond control of the contractor, will not cause the damages described in Paragraph **A.12.4.** above to be assessed.

A.13. WARRANTY AND SERVICE

13.1. The successful bidder shall furnish the Commission with the Manufacturer's Certificate of Origin (**Certificate of Title will not meet this requirement**). The Manufacturer's New Vehicle Warranty and major component parts warranties (See **A.13.5.**) shall be furnished to the receiving school district at the time of delivery. (See Paragraph **A.11.** for Predelivery Service requirements).

13.2. 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 his agent performs the warranty work on school buses. (See **A.13.3.**)

13.3. 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 at his own expense make such repairs as required. If there is a question of whether it is the responsibility of the body or the chassis manufacturer to repair a given defect, then it shall automatically become the prime contractor's and/or successful bidder's responsibility to see that the repair(s) is made to the satisfaction of the receiving school district and this Commission. Upon refusal of the prime contractor and/or successful bidder to make satisfactory adjustment(s), the Commission reserves the right to claim and recover from said prime contractor and/or successful bidder by due process of law, such sums as may be sufficient to correct the error or make good the defect in material and/or workmanship.

13.4. **NOTE TO SCHOOL DISTRICTS:**

The Commission 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 from defects in materials and workmanship. In addition, the bus body and chassis are warranted from 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.

For warranty work on the bus body, contact the vendor (identified on the school bus purchase order issued by the Commission).

For warranty service and repairs on the bus chassis:

(1) First, contact the chassis dealer (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,

(2) Call the Zone Service Manager, Representative, or Engineer listed below for assistance (the dealer Principal may be asked to assist in this contact):

CHEVROLET

DALLAS ZONE	**HOUSTON ZONE**
Customer Service Manager 214 - 659-5441	Customer Service Manager 713 - 460-7301

FORD

DALLAS ZONE	**HOUSTON ZONE**
Jack Wagner Heavy Truck Service Engineer 214 - 242-6611	Bernie Lenhart/Ron Canal Heavy Truck Service Engineers 713 - 680-4267

GMC	**IHC**
Robert Elliott Zone Service Manager 214 - 659-5154 214 - 659-5156	Ray T. Barton Regional Service Manager 214 - 258-3545

(3) If the problems are still not satisfactorily resolved, notify the vendor by letter with a copy to:

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

13.5. The following are **general** terms of the warranties; **however, for specific coverage of any item on a school bus refer to the warranty literature provided at time of vehicle delivery.**

13.5.1. **Bus Body** - A minimum of 12 months beginning on the date of delivery to the user. (For service contact the vendor).

13.5.2. **Bus Chassis** - 12 months or 12,000 miles, whichever first occurs, beginning on the date of delivery. (For service contact the local chassis dealer). (See **NOTE** below.)

NOTE: In case the bus is delivered during the summer months and is not to be placed in service or used at all until the start of the fall term, the school district should contact the local chassis dealer for a delayed starting date for warranty service, i.e., start of school or date bus placed in service.

Your local dealer will verify the chassis mileage and record the starting date for bus use. However, if the bus is used before the starting date, then the delayed warranty date is voided and the warranty date automatically becomes the delivery date.

Application for the delayed warranty is the responsibility of the school district and must be done within 15 working days after the date the bus is placed in service or the warranty starts at time of delivery.

Any questions should be addressed to your local chassis dealer or to the Specification Section, State Purchasing and General Services Commission.

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

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

(A) Detroit Diesel Allison transmissions are warranted for 50,000 miles or 12 months at 100% cost of parts and labor; 50,001 miles to 62,500 miles or 15 months at 80% cost of parts and labor; 62,501 to 75,000 miles or 18 months at 60%; 75,001 to 87,500 miles or 21 months at 40%; and 87,501 to 100,000 miles or 24 months at 20%. An extended warranty is available at extra cost.

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

13.5.6. **Mid-Range Diesel Engines** (47-83 passenger) - 5 years or 50,000 miles, whichever first occurs. (For service contact the chassis dealer.)

13.5.7. **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.

13.5.8. **Wheelchair Lifts** - All component parts are warranted for 12 months and are specifically defined in the manufacturer's pamphlet included with the vehicle delivery.

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

A.14. TERMS, INVOICING, AND PAYMENT

14.1. A warrant (check) will be issued within four to six days after the Accounting Office of the Commission has received the following:

14.1.1. Five copies of the vendor's invoice for all buses delivered at the same time to a school district on a single purchase order. This invoice must certify that the buses delivered meet or exceed the requirements and conditions of this specification. (See **A.5.3.**)

14.1.2. Certificate of Origin (**not** Certificate of Title) from the vendor.

14.1.3. Inspection Report from the School District indicating the buses were delivered.

14.1.4. Check for payment of the bus or buses from the school district.

NOTE: A warrant (check) will not be issued until all four of the above are received by the Accounting Office at the following address:

Accounting Office
State Purchasing and General Services Commission
P.O. Box 13047, Capitol Station
Austin, Texas 78711-3047
Telephone: 512 - 475-3052

14.2. Payments shall be made by the Commission from the School Bus Revolving Fund as reappropriated by H.B. 133, 55th Legislature, Regular Session, **after the school's check has been received and deposited into this account.**

A.15. TEMPORARY LICENSE TAGS AND EXEMPT LICENSE PLATES

15.1. Temporary (Red) License Tags shall be issued by the vendor for use with each new bus delivered. These tags are legal to use for a period of 20 days only.

15.2. Exempt license plates may be obtained from the Regional offices of Texas Department of Highways and Public Transportation (TDHPT). You may make application by phone or in person. The following is required:

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

15.2.2. Form 130, "Application for Title"

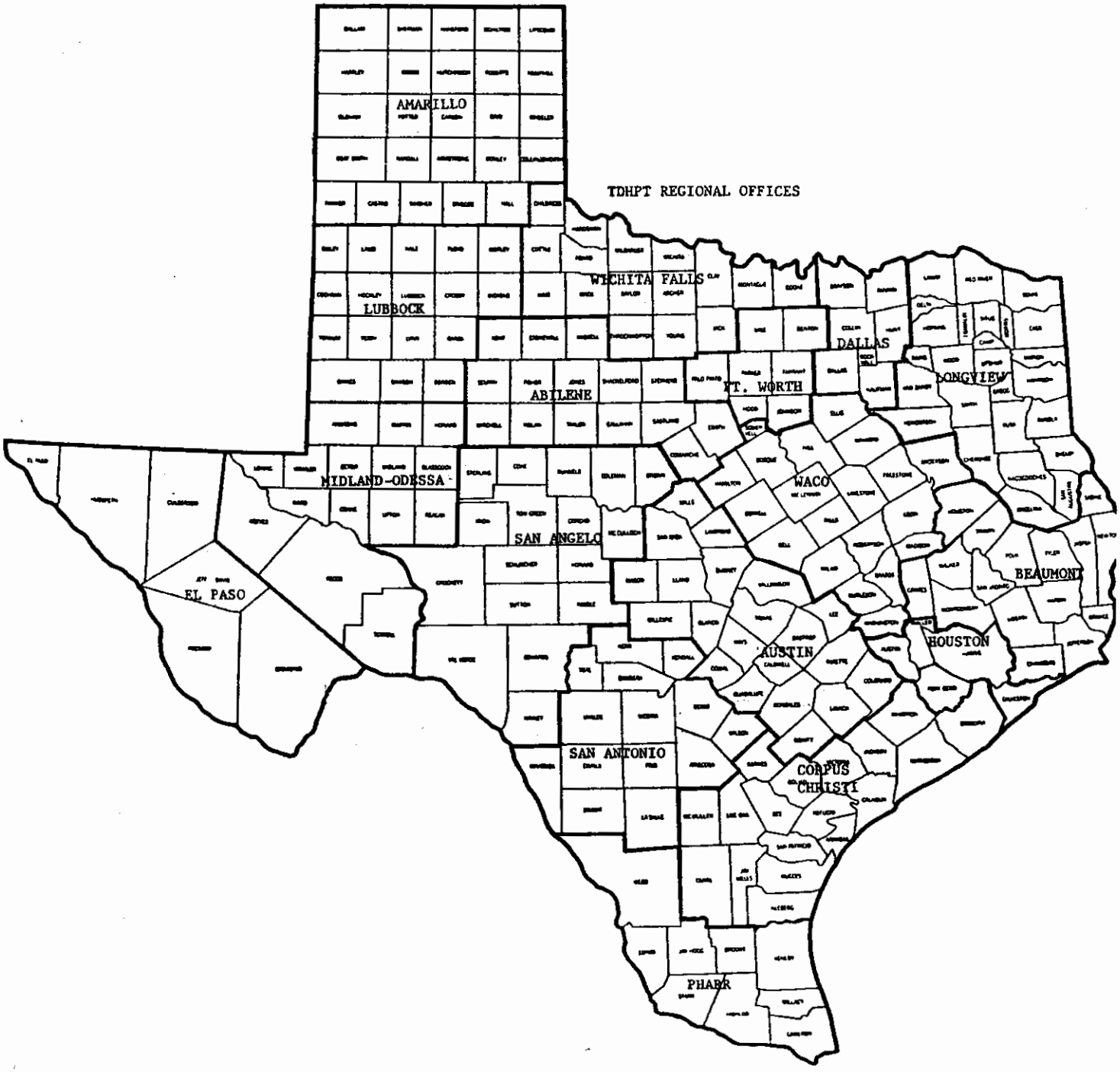
15.2.3. Form 62A, "Application for Exempt Plates"

The forms are available from the Regional Offices. (See list on page 10)

TDHPT REGIONAL OFFICES

LOCATION	ADDRESS	PHONE
Abilene	3385 N. Third Suite 14 79603	(915) 673-4506
Amarillo	421 S. Bowie (2nd Floor) 79106	(806) 372-3277
Austin	8868 Research Blvd. (Corporate Center) Suite 108 78758	(512) 465-7445
Beaumont	4245 Cardinal Drive 77705	(409) 842-5875
Corpus Christi	1245 S. Port Avenue 78405	(512) 884-4891
Dallas - Carrollton	1932 North I-35 Carrollton, TX 75006	(214) 446-1313
El Paso	202 N. Clark 79905	(915) 779-5405
Fort Worth - Arlington	910 N. Watson Road (Hwy 360) Arlington, TX 76011	(817) 277-8226
Houston	5611 Hoover Street 77092	(713) 681-6637
Longview	200 N. High Street Suite 126 75601	(214) 758-2706
Lubbock	2504-A 82nd Street 79433	(806) 745-8888
Midland - Odessa	840 Central Odessa, Texas 79761	(915) 337-4434
Pharr	611 N. Cage 78577	(512) 781-3291
San Angelo	100 Paint Rock Road 76903	(915) 655-7326
San Antonio	4243 Piedras Drive East Suite 155 78228	(512) 733-3937
Waco	1227 N. Valley Mills Drive 76710	(817) 776-3284
Wichita Falls	1601 Southwest Parkway 76302	(817) 767-4339

A map of the State of Texas with the counties served by these 17 Regional Offices is included for convenience. (See page 11)


TDHPT REGIONAL OFFICES
AMARILLO
LUBBOCK
WICHITA FALLS
DALLAS
LONGVIEW
FT. WORTH
ABILENE
MIDLAND-ODESSA
WACO
SAN ANGELO
EL PASO
BEAUMONT
HOUSTON
AUSTIN
SAN ANTONIO
CORPUS CHRISTI
PHARR

B. ORDERING INFORMATION

B.1. GENERAL

1.1. Passenger capacity definition, as used in this specification, has reference to seat (width) space allotted for each pupil. Based on national height and weight percentile averages specified in Federal Highway Safety Standard No. 17, approximately 13 inches per pupil has been established for designating bus body passenger capacities by manufacturers.

1.2. The 13-inch figure must be considered when ordering school buses since passenger capacity may be reduced when junior high, high school or adult students are primary passengers.

B.2. SERVICE OR SHOP MANUALS

School districts desiring chassis service or shop manuals may obtain them, separately from school buses ordered, by corresponding directly with the following manufacturers:

(Allison Transmissions)
Stewart & Stevenson
P.O. Box 1637
Houston, Texas 77001

Chevrolet Motors Division
P.O. Box 40911
Houston, Texas 77040

Dodge Division
Chrysler Motor Corporation
P.O. Box 551
Dallas, Texas 75234

Ford Motor Company
Service Publications
7388 North End Station
Detroit, Michigan 48202

GMC Truck and Coach Division
P.O. Box 22013
Dallas, Texas 75222

International Harvester Company
P.O. Box 225334
Dallas, Texas 75265

(Blue Bird)
Bolain Equipment, Inc.
Route 1, Box 476
Denton, Texas 76201

Thomas Built Buses
P.O. Box 2450
Highpoint, North Carolina 27262

B.3. ORDERING

3.1. When ordering school buses to this specification, the requisitioning agency must specify the following pertinent data:

3.1.1. The quantity and the size of bus (or buses) or chassis desired;

3.1.2. If the school district does not specify front or rear engine on an 83 passenger bus, the vendor may provide either of these.

3.1.3. Options desired. (See B.5.)

3.2. Complete school buses, school bus bodies, or school bus chassis shall be requisitioned using the Texas Education Agency School Bus Requisition Form furnished by TEA. Please refer to the sample requisition on page 18.

B.4. PREPARATION OF THE REQUISITION

4.1. All of the information requested in the upper portion of the requisition form should be completed by the ordering school with the exception of the space provided for the State Purchasing and General Services Commission Requisition Number. This space is for Commission use only.

4.2. The requisition should be prepared in quadruplicate; mail the original and one copy to the Transportation Section of the Education Agency. The remaining two copies are for the school.

4.3. More than one bus may be requisitioned on one form provided they are all the same size. "Chassis or Bodies only" should be on separate requisitions from complete school buses.

4.4. Optional Equipment: Please refer to the list of optional equipment in Paragraph **B.5.** Select the options desired by number and enter a brief description of the option(s) in the corresponding space provided on the requisition form.

EXAMPLE: The Austin Independent School District desires to purchase two 71 passenger complete school buses equipped with options. (Refer to the list of optional equipment and the sample requisition form for the correct procedure in completing this request.)

4.5. Should any optional equipment be desired that does not appear on the list of options, it should be entered on the requisition in the space entitled "Others". If additional space is required, please attach a school letterhead to the requisition listing the additional options. The second sheet should be dated and identified with your school requisition number.

4.6. The certification and approval on the lower portion of the requisition form shall be completed before submitting to TEA.

B.5. OPTIONAL EQUIPMENT

The ordering agency or school shall list on the requisition a brief description opposite the item number for options required. (See page 18 for sample requisition.)

15 AND 19 PASSENGER BUSES

Do not list options more than once. Do not modify regular options. A modified regular option must be listed under special options in section designated as "Other".

Regular Option No. — **Description**

(1) Air Conditioning, **Standard** Cooling (see pages 86-88).

(2) Air Conditioning, **Extra** Cooling (see pages 86-88).

NOTE: Special Requirements - Options (1) and (2) require that windshield and all windows be tinted (to approximately 70% - light transmittance), 5/8 inch nominal thickness plywood be installed over existing steel floor, and a minimum 100 amp alternator be provided.

(3) Alternator - 100 ampere minimum. (Required as standard with options (1), (2), and (28).

(7) Diesel engine (See **TABLE**, pages 38-39).

(9) Fuel Tank (30-gallon minimum capacity).

(10) *Glazing Material, deep tint - AS-3 grade window glass for passenger side windows. Reduces light transmittance to approximately 10%. Available in 15- and 19-passenger buses, including air conditioned buses. Recommended for transporting some impaired passengers.

(11) Heater, Auxiliary (See page 32).

(16) Knee Spacing - Maximum allowed by FMVSS No. 222.
Maximum knee space requires deleting some seats which will reduce seating capacity.

Passenger Capacity	15	19
Rows of Seats	3	3
Minimum Knee Space-inches	27	28

(18) Tachograph - 0-80 mph, 12 volt, with 7-day 4-7/8 inch disc chart and electronic clock/speedometer/recorder. Shall be installed on dashboard. Tachograph shall be Argo Model 1310-6, or Veeder-Root Model AB-1407 or approved equal.

(22) Tool Compartment - A metal container of adequate strength and capacity (for storage of tire chains, tow chains, and such tools as may be necessary for minor emergency repairs while bus is enroute) shall be provided. Such storage container may be located either inside or outside passenger compartment but, if inside, it shall have cover (seat cushion shall not serve this purpose) capable of being securely latched and be fastened to floor in right rear or right front of bus.

(26) Wheel, Spare without carrier (less tire and tube)

(28) Wheelchair Lift, (Folding Platform Type) - Floor mounted on **curb side** of bus in front of or behind the rear wheelwell. Requires 100 ampere minimum alternator (See pages 83-85).

NOTE: For option (28), the school district must specify number of wheelchair positions required on bus.

*NOTE: Regular tinting (70% light transmittance) is permitted in all windows. Dark tinting (30% light transmittance) and, Deep tinting (10% light transmittance) is not permitted in the windshield or any other window used for driving purposes. All these safety glazing materials are required to be approved by the Texas Department of Public Safety.

B. ORDERING INFORMATION

24 THROUGH 71 PASSENGER BUSES

Do not list options more than once. Do not modify regular options. A modified regular option must be listed under special options in the section designated as "Other".

Regular Option No. — **Description**

(3) Alternator - 100 ampere minimum, required with air conditioning and wheelchair lifts (See page 71).

(4) Axle, Rear, Two-Speed.

(5) Brakes, Hydraulic (For 59, 65, and 71 passenger buses only)

(6) Chassis, Long Wheelbase (71 passenger bus only), requires long cowl, and minimum 274 inch wheelbase.

(7) Diesel Engine (See page 69). On 35 through 71 passenger buses, this option (7) requires the installation of an audible (which also may be a visual) warning device that will activate within eight seconds to prevent damage to the engine when either the engine oil pressure is below the safe level, or when the engine temperature is above the safe level, or both. A manual engine shut-down device is preferred.

(8) Differential, No-Spin.

(9) Fuel Tank, Increased Capacity - 30 gallon minimum for 24 passenger; 60 gallon minimum for 47-71 passenger. Not applicable to 35 passenger bus (See page 67).

(11) Heater, Rear (See page 63).

(12) Luggage Rack - Mounted on top of the bus (See page 63).

(13) Moisture Ejectors, Automatic (59 through 71 passenger buses with air brakes only) (See page 68).

(14) Mud Flaps, with Brackets - Mounted (advertisement on mud flaps is prohibited). (See page 64).

(15) Mud Flap Brackets only - Mounted (See page 64).

(16) Knee Spacing - Maximum allowed by FMVSS No. 222.
Maximum knee space requires deleting some seats which will reduce seating capacity.

Passenger Capacity	24	35	47	53	59	65	71-S	71-L
Rows of Seats	4	5	7	8	9	10	11	11
Minimum Knee Space-inches	27	28	28	27 3/4	28	27 3/4	27 1/2	27 3/4

(17) Slack Adjusters, Automatic - Two at front and two at rear wheels. (59 through 71 passenger buses with air brakes only) (See page 68).

(18) Tachograph - 0-80 mph, 12 volt with 7-day, 4-7/8 inch disc chart and electronic clock/speedometer/recorder shall be installed on dashboard. Shall be Argo Model 1310-6 or Veeder-Root Model AB-1407 or approved equal.

(19) Tachometer (to indicate engine RPM).

(20) Tires, Steel Belted Radial, Tubeless.

(21) Tires, Mud and Snow Tread - Rear Wheels (See bus **TABLES** for required sizes).

(22) Tool Compartment - A metal container of adequate strength and capacity (for storage of tire chains, tow chains and such tools as may be necessary for minor emergency repairs while bus is enroute) shall be provided. Such storage container may be located either inside or outside passenger compartment but, if inside, it shall have cover (seat cushion shall not serve this purpose) capable of being securely latched and be fastened to floor in right rear or right front of bus.

(23) Transmission, Automatic (See page 71).

(24) Wheels, Disc: (Front Only)

(25) Wheels, Disc: (All Wheels)

(27) Wheel, Spare with Carrier (Less Tire and Tube) - Mounted (See page 69).

NOTE: Carrier is not available on 24 passenger bus.

(29) Wheelchair Lift (Folding Platform Type) - Floor mounted on **front curb** side of bus. Requires 100 ampere minimum alternator (See pages 83-85).

(30) Wheelchair Lift (Folding Platform Type) - Same as above except floor mounted on **rear** curb side of bus: Requires 100 ampere minimum alternator and mounting of wheelchair position locks and seat belts in the rear of the bus in order to restrict the 30 inch minimum aisle requirement to the back portion of the bus. This will increase the seating for regular passengers in the front where a 12 inch minimum aisle shall be constructed. **This option is only recommended for buses which will have a regular attendant in addition to the driver.**

NOTE: For options (29) and (30), the school district must specify number of wheelchair positions required on bus.

B. ORDERING INFORMATION

83 PASSENGER BUSES

Do not list options more than once. Do not modify regular options. A modified regular option must be listed under special options in section designated as "Other".

Regular Option No.	Description
(8)	Differential, No-Spin.
(9)	Fuel Tank (Increased Capacity) - Minimum 90 gallons (See page 67).
(11)	Heater, Rear (See page 63 for size and installation).
(12)	Luggage Rack (Mounted on top of bus) (See page 63.)
(14)	Mud Flaps, with Brackets - Mounted (See page 64). **There shall be no advertisement on the mud flaps.**
(15)	Mud Flap Brackets **only** - Mounted (See page 64).
(16)	Knee spacing - Maximum allowed by FMVSS No. 222. Maximum knee space requires deleting some seats which will reduce seating capacity. Rows of seats - 13, minimum knee space - 27 inches.
(17)	Slack Adjusters, Automatic - Four (See page 68).
(18)	Tachograph - 0.80 mph, 12 volt, with 7-day 4-7/8 inch disc chart and electronic clock/speedometer/recorder shall be installed on dashboard. Tachograph shall be Argo Model 1310-6 or Veeder-Root Model AB-1407 or approved equal.
(21)	Tires, Mud and Snow Tread - Rear Wheels (See **TABLE NOS. 16** and **17** for size required on each chassis).
(22)	Tool Compartment - A metal container of adequate strength and capacity (for storage of tire chains, tow chains, and such tools as may be necessary for minor emergency repairs) shall be provided. Such storage container may be located either inside or outside passenger compartment but, if inside, it shall have a cover (seat cushion shall not serve this purpose) capable of being securely latched and be fastened to the floor in the right rear or right front of bus.
(27)	Wheel, Spare, with Carrier (less tire and tube) - Mounted (See page 69).

Austin Independent School District
District Name

TEXAS EDUCATION AGENCY
Transportation Division

227-901-1
County District No.

Purchase Requisition for School Buses

Travis
County Name

Contact Person Telephone

6100 North Guadalupe, Austin, Texas 78752
Mailing Address City State Zip

Bus Delivery Address if Different From Above

School Requisition No.

January 7, 1985
Date of Requisition

2 Quantity 71 Size —Passenger—School Bus Complete

For use of State Purchasing and General Services Commission Only

Reference No.

Bid Opening Date

State Requisition No.

Refer to options and sample requisition form found in current Texas School Bus Specifications and list options desired on corresponding line below:

1.		16.	
2.		17.	
3.	Alternator - 100 AMP Min.	18.	
4.		19.	
5.		20.	
6.		21.	
7.		22.	
8.		23.	Transmission, Automatic
9.		24.	
10.		25.	
11.		26.	
12.		27.	
13.		28.	
14.		29.	
15.		30.	

Others:

This is to certify that there will be sufficient money on hand unencumbered to pay for the equipment covered by this requisition when invoice is presented.

Typed Name of District or County Superintendent	Date	Telephone
	January 7, 1985	

Signature

MAIL ORIGINAL AND ONE COPY TO:
Texas Education Agency
Transportation Division
201 East Eleventh Street
Austin, Texas 78701

TEA Approval

ADM-040R84

TEXAS EDUCATION AGENCY
Transportation Division

Purchase Requisition for School Buses

District Name _____ County District No. _____

Contact Person _____ Telephone _____ County Name _____

Mailing Address _____ City _____ State _____ Zip _____

Bus Delivery Address if Different From Above _____

School Requisition No. _____

Date of Requisition _____

Quantity _____ Size _____ —Passenger—School Bus Complete

For use of State Purchasing and General Services Commission Only

Reference No. _____

Bid Opening Date _____

State Requisition No. _____

Refer to options and sample requisition form found in current Texas School Bus Specifications and list options desired on corresponding line below:

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____
15. _____
16. _____
17. _____
18. _____
19. _____
20. _____
21. _____
22. _____
23. _____
24. _____
25. _____
26. _____
27. _____
28. _____
29. _____
30. _____

Others: _____

This is to certify that there will be sufficient money on hand unencumbered to pay for the equipment covered by this requisition when invoice is presented.

Typed Name of District or County Superintendent	Date	Telephone	Signature

MAIL ORIGINAL AND ONE COPY TO:
Texas Education Agency
Transportation Division
201 East Eleventh Street
Austin, Texas 78701

TEA Approval

ADM-040R84

C. BODY SPECIFICATIONS - 15 & 19 PASSENGER

C.1. GENERAL REQUIREMENTS

1.1. BODY SIZES

1.1.1. Body Physical Requirements - The physical requirements for 15 and 19 passenger school bus bodies shall conform to the following **TABLE:** (Exception-See option No. 16)

TABLE NO. 1

Physical Requirements

(1) Minimum Size Number of Passengers	(2) Overall Body Width Inches Maximum	(3) Knee Spacings Inches Minimum	(4) Seat Width Left-Right Inches Minimum	(5) Center Aisle Width Inches Minimum	(6) Floor to Ceiling Height Inches Minimum
15	96	24	29 - 29	12	60
19	96	25	39 - 26*	12	60

NOTES: Column (3) - **Knee space** is defined as the horizontal distance from the front center of a seat back to the rear center of the seat back (or barrier) immediately ahead, measured at approximately 4 inches above the seat cushion.

Column (4) - *Left rear seats may be 26 inches wide also.

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

1.2. BUMPER, REAR

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

1.3. CEILING

The ceiling shall be free of all projections likely to cause injury to passengers. (See Physical Requirements above for ceiling height requirements and Paragraph C.2.9. for other ceiling requirements.)

1.4. LAMPS, SIGNALS, AND WARNING DEVICES

Each bus shall be furnished with the lamps listed below:

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

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

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

(i) Each amber signal 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 keys without affecting operation of the alternately flashing eight warning signal lamps.

1.4.1.1. Each set of amber and red lamps shall have a black* 3-inch minimum band around the set and 3-inch band between the lamps in each set. If it is not possible to provide a 3-inch band between the lamps in the set, the manufacturer will then provide a band as wide as possible. Any visor or hood used to shade the lights and improve visibility shall not interfere with the intensity and photometric performance of the warning lights.

*Federal Standard No. 595a, Black Enamel, Color No. 17038.

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

1.4.1.3. Complete instructions for the detailed operation of the warning signal lamp system shall be furnished with each school bus.

1.4.2. Backup Lamps - The color, requirement, and mounting of backup lamps shall be in accordance with FMVSS No. 108, **except two are required by Texas Specifications.**

1.4.3. Identification Lamps - Each bus, with an overall width of 80 or more inches, will have identification lamps installed on the front and rear - three amber lamps in the front and three red lamps in the rear. The lamps will be as close as practicable to the top and vertical centerline, with lamp centers spaced not less than six inches or more than twelve inches apart. Each lamp shall be the armored flush mounting type for protection of 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 such as Grote Manufacturing Company, Madison, Indiana 47250, Model Numbers 45012 and 45013, or KD Lamp Company, 1910 Elm Street, Cincinnati, Ohio 45210, Model Numbers 38469-901 and 40268-301. Example of an approved equal: Peterson Model - PM122.

1.4.4. Interior Lamps - A minimum of two interior dome lamps shall be installed to properly and adequately illuminate the entire aisle and emergency passageway. The step-well shall be illuminated with a separate lamp which will be activated by opening the service door.

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

1.4.6. Operating Units and Flashers - The operating units and flashers for turn-signals and vehicular hazard warning signals shall meet the requirements of FMVSS No. 108.

1.4.7. Tail and Stop Lamps - The quantities, colors, requirements, and mounting of tail and stop lamps shall be in accordance with FMVSS No. 108.

1.4.8. Turn-Signal/Hazard Warning Lamps - The quantities, colors, requirements, and mountings of turn-signal/hazard warning lamps shall be in accordance with FMVSS No. 108.

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

1.5. WIRING

1.5.1. All wiring shall conform to the current standards of the SAE.

1.5.2. Wiring as arranged in the circuits to manufacturer specifications are acceptable; however, the addition of another circuit for the alternately flashing signal lamps shall be provided.

1.6. LICENSE PLATE HOLDER

A license plate holder shall be mounted on the rear of the bus body. The holder shall be so designed that the license plate will receive illumination from the clear lens on the underneath side of the tail light, or by a separate lamp.

1.7. OPENINGS

All openings in the floorboard or fire wall between chassis and passenger carrying compartment, such as for gearshift lever, steering column and auxiliary brake lever, **shall be sealed.** All openings between chassis and passenger carrying compartment made due to alterations by the body manufacturer **must be sealed.**

1.8. COLORS

1.8.1. Interior - The interior of the complete bus body shall be finished in the manufacturer's standard color.

1.8.2. Exterior - The exterior of the complete bus except for rub rails shall be finished in Color No. 13432, School Bus Yellow, of Federal Standard No. 595a.

1.8.3. Lettering - The school bus bodies shall have the words "SCHOOL BUS" painted in neat, clearly defined block letters on the front, rear, and on both sides of the bus body Color No. 17038, Black, of Federal Standard No. 595a. The letters shall be 8 inches high and shall have 1-inch wide strokes. The use of pressure sensitive tape or decals (except decals used for instructional purposes such as emergency door instructions, etc.), are not acceptable for trim and/or lettering (i.e., emergency door, emergency exit signs). **No logo, trademark, insignia or lettering 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 reasonably sized logo which has been approved by Specification Section may be placed on the exterior bus body.

1.8.4. Bumpers - Bumpers shall be finished in Color No. 17038, Black, of Federal Standard No. 595a.

1.8.5. 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 rail shall be painted either Black (Color No. 17038) or School Bus Yellow (Color No. 13432) at the option of the manufacturer.

1.8.6. Wheels - Both sides of all wheels, including the spare, shall be finished in Color No. 17038, Black, of Federal Standard No. 595a.

1.8.7. Wheel Covers - Wheel covers may be bright metal.

1.8.8. Grilles - Grilles may be painted either the same color as the exterior of the bus body or they may be a bright finish (chrome or annodized aluminum).

1.9. UNDERCOATING

1.9.1. The requirement for the coating material in the section on Wheel Housing (C.2.4.), is to provide for insulation, sound deadening, protection from road minerals, and rust prevention, as applicable. The material shall be applied as specified in the section and as described below.

1.9.2. The entire underside of the bus body, including floor members, side panels below the floor level and all metal fenders or fenders with metal liners shall be coated with 1/8 inch thick material as specified below. The undercoating shall be applied in accordance with the undercoating manufacturer's instructions. Do not cover up or obliterate the truck identification plate. (See A.7.4.)

1.9.3. Insulating and undercoating materials shall be an asphalt base underbody coating conforming to Federal Specification TT-C-520B or shall be Lion Nokorode Emulsion 331 as manufactured by Lion Oil Company, El Dorado, Arkansas 71730 or an approved equal. An example of an approved equal is Tectyl MC121B, manufactured by Ashland Petroleum Company, Box 391, Ashland, Kentucky 41101, applied to a dry film thickness greater than 20 mils.

1.10. INSULATION

The ceilings and sidewalls shall be thermally insulated with a fire-resistant material approved by the Underwriters Laboratories Inc. to adequately reduce the noise level and to minimize vibrations. Air conditioned buses shall have the equivalent of 1 1/2 inches of fiberglass insulation in the ceilings and walls including the interior of hat shaped bows. Any insulation used shall have a minimum R factor value of 6.3.

C.2. CONSTRUCTION

2.1. GENERAL REQUIREMENTS

2.1.1. 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 reasonably dustproof and watertight unit.

2.1.2. 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.

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

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

2.1.3.2. For electrical wire moldings and light fixtures, or

2.1.3.3. Seat back construction (See Paragraph C.2.14), or

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

2.1.3.5. In certain cases, for attachment of exterior mirrors (See Paragraph C.3.5.).

2.1.3.6. In the installation of rub rails or emergency door handles and latches where it is impossible to use rivets or bolts, nuts, and lock washers and then only when these fasteners are used in conjunction with the manufacturer's standard metal adhesive which is used to meet joint strength requirements.

2.1.3.7. In window-frames when applied with the metal adhesive.

2.1.3.8. In the installation of header pads over the doors.

*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.

2.1.4. A flexible, tenacious, high quality caulking compound or adhesive must 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 of the heater or the drain openings at the bottom of the rub rails. The compound shall be applied to the required areas in a neat and workmanlike manner **without voids or skips.**

2.9. INTERIOR PANELS

2.9.1. All interior panels shall be made of steel and shall be the bus body manufacturer's standard design. Front and rear panels shall be formed to present a smooth, pleasing appearance. Roof panels shall be continuous from header to header. If the ceiling is constructed so as to contain lapped joints, the forward panel shall be lapped by the rear panel and all exposed edges shall be beaded, hemmed, flanged, or otherwise treated to minimize sharp edges.

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

2.9.3. Lower interior panels under passenger windows shall be clear coated galvanized steel or galvalume embossed steel, ASTM designation A446-76.

2.10. DOORS

2.10.1. Service Door

2.10.1.1. General - All 15 and 19 passenger buses shall be equipped with either a Style 1 or a Style 2 service or entrance door which shall be located on the right side near the front of the bus in direct view of the driver. These doors are described in the following paragraphs and shall have lower and upper glass panels or a system of mirrors to provide the driver an unobstructed view of entering passengers as well as the passenger landing area. The glass panels shall be set in rubber and shall be at least 1/8 inch thick safety glass, ANSI Safety Code Z26.1, AS-2 or better grade. The glass panels or mirrors shall give the seated driver a view of at least the upper 7 1/2 inches of a 30 inch rod placed upright on the ground at any point along a line one foot outboard from the service door entrance, between the front and rear of the service door. A long stainless steel clad grab handle (hand rail) shall be installed in the left side doorway (See Paragraph C.2.13.).

2.10.1.2. Service Door, Style 1 - This service or entrance door shall be of one piece and shall have a minimum horizontal opening of approximately 28 inches and a minimum vertical opening of approximately 54 inches. The door shall be manually operated. The door control must be the hand lever type, driver-operated, and shall be designed to afford easy release and to prevent accidental opening.

2.10.1.3. Service Door, Style 2 - This service or entrance door shall be the two-piece or folding type and shall have a minimum horizontal opening of approximately 24 inches and a minimum vertical opening of approximately 68 inches. The door shall be operated from controls at or near the bus driver's seated position. The doors may be air actuated (pressure or vacuum), electrically actuated, or manually operated, and shall be designed to allow manual opening in case of an emergency. To prevent accidental opening while the bus is in motion, the door opening system shall require at least a 125 pound force applied to its center in order to manually open the door. Both vertical closing edges of the door shall be equipped with rubber or rubberized materials to protect passenger's fingers.

2.10.1.4. The inside top of the service or entrance door, head impact area, shall be protected by an energy absorbing padded header board of sufficient size (width, depth, and length) to prevent injury when accidentally impacted.

2.10.2. Side Doors

2.10.2.1. The cargo doors on the side of converted vans shall be removed and the area reinforced and covered with riveted-on exterior paneling.

2.10.2.2. At the option of the manufacturer, the doors need not be removed but shall be reinforced and made permanently inoperable by means other than the rub rails on the outside of the body.

2.10.3. Emergency Door - 15 passenger buses furnished to this specification shall be equipped with emergency doors meeting the requirements of either Style 1 (two door type) or Style 2 (single door type). We prefer a single emergency door when available from the chassis manufacturer. 19 passenger buses shall be furnished with Style 2 door only. **19 passenger buses with double rear emergency doors will not be accepted.** Either door style shall be furnished with upper glass panels, permanently closed, set in rubber or sealed against rubber. The glass shall be AS-2 grade or better as specified in ANSI Safety Code Z26.1.

2.10.3.1. Emergency Door Style 1 (two door type - for 15 passenger buses only).

2.10.3.1.1. Lettering: Both of the rear doors shall be for emergency exit use. This rear emergency door exit shall be marked "EMERGENCY DOOR" or "EMERGENCY EXIT", both on the outside and on the inside, with at least two inch high lettering painted on top of, or directly above the exit.

2.10.3.1.2. 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.

2.10.3.1.3. Fastening: The two-door emergency exit, located at the rear of the bus, shall be equipped with a fastening device on each door that will secure the 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 on the second-opened door shall permit opening of the door from the inside of the bus only. **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.

2.10.3.1.4. 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. The switch shall be enclosed to prevent tampering and the wires leading from the switch shall be concealed in the body. No cut-off switch shall be installed in the circuit.

2.10.3.2. Emergency Door Style 2 (single door type):

2.10.3.2.1. Dimensions: The emergency door shall be located in the center rear of the body and shall have a minimum horizontal opening of 30 inches and a minimum vertical opening of 48 inches measured from the floor level.

2.10.3.2.2. Lettering: The emergency door shall be marked "EMERGENCY DOOR" or "EMERGENCY EXIT" on the inside and outside with at least 2 inch high lettering painted on top of, or directly above the door.

2.10.3.2.3. Latch: The emergency door shall be equipped with a slidebar rack and pinion (cam) operated latch. The slidebar shall be approximately 1.25 inches wide and 0.375 inch thick and shall have a minimum stroke of 1.125 inches. The slidebar shall be spring loaded so as to retain the bar in the closed position and have a minimum of one inch of horizontal bearing surface beyond the edge of the door frame when the door lock is in a latched position.

2.10.3.2.4. Fastening: The movement of the lock handle through its full arc of operation shall not be obstructed by, or extend into the area behind the rear seats at the emergency door. The handle, when in the closed position, shall meet requirements of FMVSS No. 217. The design of the lock 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 in order that the door can be closed securely for positive fastening. Provisions for opening from the outside shall consist of a handle (device) of such design as to prevent "hitching" but to permit opening when necessary. The outside handle, when in the closed position, shall extend vertically downward from its pivot center.

2.10.3.2.5. Hinges: The 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. No steps shall lead to the emergency door. No seat or other object shall be so placed in the body as to restrict the passage to the emergency door to less than 12 inches.

2.10.3.2.6. Switch: The emergency door latch shall be equipped with a heavy duty electric plunger-type switch connected to a warning buzzer located in driver's compartment. The switch shall be enclosed in a metal case, and wires leading from switch shall be concealed in bus body. 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.

2.11. WINDSHIELD AND WINDOWS

2.11.1. The windshield shall be a minimum of 0.21875 inch thick safety plate and shall be heat absorbent, laminated AS-1 safety glass to meet ANSI Standard Z26.1 as amended. The windshield shall have a horizontal gradient band (tinted) starting slightly above line of driver's vision and gradually decreasing in light transmittance by 20 percent or less at top of windshield. The windshield shall be slanted back at the top not less than 2 inches. The maximum width of the windshield center post shall not exceed 2.5 inches.

2.11.2. There shall be one vertical opening side window for each passenger seat. These windows shall open from the top only and shall operate freely. All side windows except the driver's and the service door window, shall be the split sash type with positive latch. **Side windows that can be latched in an uneven position are not acceptable.** They shall be furnished with a latching mechanism which will allow each window to be latched in a position not more than six inches from the top.

2.11.3. The passenger side windows shall provide an unobstructed opening 22 inches wide and between 9 and 10 inches high.

2.11.4. The glass in all side windows shall be AS-2 grade or better, as specified in ANSI Safety Code Z26.1. Window glass shall be installed with rubber channel gasket material or approved equivalent material. All exposed edges of glass shall be banded. Tinted AS-3 grade glass is acceptable as an option for passenger side windows with deep tinted glazing. (See Option No. 10, page 13.)

2.12. VENTILATION

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

2.13. BARRIERS AND PANELS

Barriers or a system of padded guard rails, stanchions, and modesty panels or a **combination padded stanchion-guard rail with padded modesty panel** shall be installed in front of each front passenger seat. The barrier or the modesty panel on the right front shall have a hand rail installed on its front side to assist passengers entering or exiting the bus. The requirements of these barriers and modesty panels are as follows:

2.13.1. Buses with GVWR of 10,000 pounds or less shall have **either** a restraining barrier similar to that required by FMVSS No. 222 **or** a padded stanchion, a padded guard rail, and a padded modesty panel **or a combination padded stanchion-guard rail with padded modesty panel.**

2.13.1.1. Stanchion(s) **or combination stanchions and guard rails** shall be installed at the rear of the entrance step-well **and** at the right rear of the driver's seat. The placement of stanchions shall neither restrict the entrance passageway at any level to **less** than 24 inches nor aisle width to less than 12 inches.

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

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

2.13.1.4. A padded modesty panel shall be installed beneath each of the two guard rails and shall extend down from each guard rail to within two inches or less of the bus floor and from approximately one inch of the outside wall to within approximately one inch of the stanchion or vertical portion of the guard rail-stanchion. If the right-hand modesty panel extends over or into the entrance step-well opening, it must be flanged at the floor line so as to close any opening between this panel and the floor. These modesty panels shall be securely attached to the guard rails and other supports in a manner so that rattles and loosening will not occur. The right-hand modesty panel shall not restrict the entrance passageway to less than 24 inches. The left-hand modesty panel shall not interfere with the rearward travel of the driver's seat. Knee space between these modesty panels and the front of each front passenger seat shall be at least 24 inches for 15 passenger and 25 inches for 19 passenger buses when measured from the modesty panel to front of seat back at the center of the seat approximately 4 inches above the seat cushion. The modesty panels shall be padded on both sides.

2.13.2. Buses with GVWR of more than 10,000 pounds shall have restraining barriers installed in front of each front passenger seat in accordance with the requirements of FMVSS No. 222.

2.14. SEATS

2.14.1. The bus passenger seats shall conform to the following requirements and shall meet requirements of FMVSS No. 222.

2.14.2. The seat frames shall be constructed of steel. Type, size, and gauge shall be as required to meet FMVSS No. 222, seat load deflection requirements.

2.14.3. Seat frames shall be two, four or six pedestal type and shall be mounted with bolts, flat washers, lock washers, and nuts, or approved equal. Where it is impossible to use bolts and nuts at certain floor points due to main cross members or floor sill interference, thread forming or cutting bolts and **lock washers** may be used.

2.14.4. Knee spacing for the 15 passenger bus shall be as normally furnished for seating capacity but in no case less than a minimum of 24 inches. Seat spacing for the 19 passenger bus shall be in no case less than 25 inches. (See also **TABLE NO.1** and Option No. 16). Knee space is defined as the distance from the front of the seat back center to the seat back (or barrier) immediately ahead, measured in a horizontal plane approximately 4 inches above the center of the seat cushion.

2.14.5. The minimum aisle width between rows of seats shall be 12 inches (See Section G.2.3.3, Wheelchair Lift Buses, for aisle width requirements). The entire seat frames, except that section of the seat back frame which is padded and upholstered, shall be thoroughly cleaned, primed and painted. The paint shall have adhesive qualities which will not permit the removal of the paint by means of the thumbnail-scratch method without first chipping a starting place.

2.14.6. All seat cushion units 30 inches wide or less shall be designed to adequately support two passengers of 125 pounds each. All seat cushions over 30 inches wide shall be designed to adequately support three passengers of 125 pounds each. The seat cushion shall consist of a base, urethane foam cushion material, and upholstery as follows:

2.14.6.1. **Base** - The base shall be 1/2 inch nominal thickness interior grade C-D plywood with exterior grade glue, identification index 32/16, manufactured in conformance with U.S. Product Standard PS 1-83 for Construction and Industrial Plywood, and identified as to veneer grade and glue bond type by the trademarks of an approved testing agency or made of "Donnite" material, manufactured by the Donnite Corporation, Flora & Harrison, Plymouth, Indiana 46563, of equal or better strength and thickness. **Plywood with blue stain in sapwood is not acceptable.**

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

2.14.6.3. **Upholstery** - The seat cushion unit shall be covered on top and four sides with a vinyl resin coated upholstering material. This material shall have a regular fire-resistant treatment and shall be artificial leather equal to coated fabrics as follows:

TABLE NO. 2

Manufacturer	Fabric	oz./yd.^{2}	oz./lin.yd.	Backing
Naugahyde	1037R	28.0	42.0	1.06 broken twill
Athol	1042FR	28.0	42.0	polyester cotton knit
Masland-Dura	6042 MXP-076	25.5	38.0	polyester cotton twill
*General Tire	2.73	24.0	38.0	polyester drill
*Uniroyal	E 7097-1	25.5	38.0	polyester knit
*Athol	536FR	25.5	38.0	polyester twill

*approved equal

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.

2.14.7. The seat backs shall slope backward to provide a comfortable seating angle. **Seat backs that are set in a vertical plane or tilt forward are not acceptable.**

2.14.8. The base of the driver's seat shall be of the adjustable pedestal type or the platform type giving approximately 4 inches "Fore and Aft". The back of the driver's seat shall be heavily padded and formfitted. 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.

2.14.9. A seat belt assembly conforming with FMVSS No. 209 shall be provided for the driver. The belt assembly furnished shall be equipped with reel-type retractors incorporated as part of each seat belt mounting bracket. The location of the seat belt anchorage shall conform to SAE Standard J383 with the driver's seat adjusted to its rearmost position. When a Type II Seat Belt with a standard shoulder harness is provided for the driver of a small school bus, a reel-type retractor is not required at the stationary fastening bracket but this mounting bracket must be within easy reach of the seated driver.

2.14.10. Seat belts and assemblies for each passenger seating position shall be provided on all 15 and 19 passenger buses.

C.3. ACCESSORIES - REQUIRED AND OPTIONAL

3.1. DEFROSTERS

Defrosting equipment shall keep the windshield, the window to the left of the driver, and 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.

3.2. FIRE EXTINGUISHERS

3.2.1. Each bus shall be equipped with at least one refillable stored pressure dry-chemical type (monoammonium phosphate or potassium bicarbonate base) fire extinguisher of at least 5 pound capacity, mounted in extinguisher manufacturer's bracket of automotive type, and located in driver's compartment in full view of and readily accessible to driver. Fire extinguisher shall bear Listing Mark of Underwriters Laboratories Inc., showing rating of not less than 2A10-B:C.

3.2.2. Fire extinguishers shall be furnished with a pressure gauge. Fire extinguishers with nylon heads are acceptable provided they have been approved by the Specification Section, State Purchasing and General Services Commission. Example of acceptable nylon head fire extinguisher: Kidde Model 2 A 40B:C, 2A 40-B:C Rating.

Example of an approved equal fire extinguisher:

American Safety Products (ASP) Model 13000, 2A 40-B:C Rating. For those who prefer this type, this fire extinguisher is available with a 13 pound charge of combined halon gas. It is not permissable to transport these units after refilling, therefore the manufacturer offers a 5 year warranty and replacement of discharged units with a new unit at half price.

3.3. FIRST AID KIT

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

2 single units - 1 in. x 2 1/2 yds. adhesive tape
2 single units - sterile gauze pads 3 in. x 3 in. (12 per unit)
1 single unit - 3/4 in. x 3 in. adhesive bandages (100 per unit)
1 single unit - 2 in. bandage compress (12 per unit)
1 single unit - 3 in. bandage compress (12 per unit)
2 single units - 2 in. x 6 yds. sterile gauze roller bandage
2 single units - nonsterile triangular bandage approximately 40 in. x 36 in. x 54 in., with 2 safety pins
3 single units - sterile gauze 36 in. x 36 in. (U.S.P. 24 x 28 count)
3 single units - sterile eye pads (1 per unit)
1 pair - scissors

3.4. HEATER

3.4.1. 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. When so specified in the Invitation for Bids, an auxiliary hot water type heater shall be furnished and installed in the passenger compartment of the bus (Option 11, page 13). Heated conduits inside the bus shall be insulated or shielded to prevent injury to the driver or passengers.

3.5. MIRRORS

Mounting of exterior mirrors to the bus body shall be by means of bolts, nuts, and lock washers, where possible; otherwise No. 10 hexagon head sheet metal bolts with star lock washers or No. 10 hexagon head sheet metal screws with serrated surface shall be used. Exterior mirrors shall conform to the requirements of FMVSS No. 111.

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 Color No. 37038, Lusterless Black of Federal Standard No. 595a.

3.5.1. Crossover - An exterior wide angle (crossview) mirror (minimum 40 square inches of surface area) shall be installed on the left front of the bus and shall comply with the requirements of Section IV B.1.e of Federal Safety Standard No. 17, or as amended. This mirror shall have a tripod bracket assembly.

3.5.2. Exterior Rearview

3.5.2.1. 15 Passenger Bus (Below Eye-Level Mirrors)

Mirror: Two metal-backed exterior clear-vision below eye-level rearview mirrors with unit magnification and not less than fifty square inches of reflective surface shall be mounted outside, one to the left and one to the right of the driver. The right side rearview mirror shall be the split view (dual view) type made up of a minimum 50 square inches flat mirror and a convex mirror. The convex mirror shall have an approximate minimum of nineteen square inches reflective surface.

Bracket: Each mirror shall be mounted on a tripod type mounting bracket, such as K-D Lamp Company, Model 112-7308. An approved equal is General Motors bracket number D-44 with 3 point mounting instead of tripod mounting.

3.5.2.2. 19 Passenger Bus

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

Bracket: Each exterior mirror is to be mounted in the brackets and assemblies shown on Texas State Purchasing and General Services Commission Drawings Numbered 040-35(1), 040-35(2), 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.

NOTE: Care must be exercised to guard against reducing exterior mirror sizes below minimums. The required field of view shall not be impaired. An approved equal is General Motors bracket number D-44 with 3 point mounting instead of tripod mounting.

EXCEPTION: **Where the body of the 19 passenger bus extends laterally beyond the bus cab, these fifty square inch minimum flat mirrors and nineteen square inch minimum convex mirrors in dual view fabrication shall be mounted on both sides of the bus.**

At the option of the manufacturer, these below eye-level mirrors which are required on 15 passenger buses may also be used on 19 passenger buses whose bodies do not extend laterally beyond the cab.

3.5.2.3. A minimum 40 square inch convex mirror shall be installed on the right front of each bus to provide localized vision.

3.5.3. Interior Rearview - A clear-vision interior rearview mirror, conforming to FMVSS No. 111, with at least 32 square inches of clear 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.

3.6. SUN VISOR

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

3.7. WINDSHIELD WIPERS AND WASHERS

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

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

D. CHASSIS SPECIFICATIONS - 15 AND 19 PASSENGER

D.1. GENERAL

1.1. GENERAL REQUIREMENTS

The requirements for gross vehicle weight ratings, gross axle weight ratings (front and rear) and tire sizes and load ranges, as specified in **TABLE NOS.** 3 and 4, pages 38 and 39, for each size chassis are **minimum** requirements. **The requirements are for a school bus with standard equipment. The added weights of optional equipment, such as air conditioning, luggage racks, lifts for the physically impaired and other heavy accessories were not considered in establishing the capacity ratings to be certified for the chassis.** If additional optional equipment is ordered which necessitates increased capacity ratings of either axles, springs or tires, it is the responsibility of the vendor to furnish them so that proper certification can be made on the vehicle.

1.2. COLOR

The chassis, including bumpers and wheels, shall be painted Black*; cowl, fenders, and hood shall be painted School Bus Yellow**.

*Federal Standard No. 595a, Color 17038.
**Federal Standard No. 595a, Color 13432.

D.2. CHASSIS FRAME AND RELATED COMPONENTS

2.1. CHASSIS FRAME SIDE MEMBERS

Each frame side member shall be of one-piece construction. If the frame side members are extended, such extension shall be designed, furnished, and guaranteed by the installing manufacturer. The installation shall be made by either the chassis or body manufacturer. Extensions of frame lengths are permissible only when such alterations are welded on behind the hanger of the rear spring. This specification does not permit wheelbase extensions.

2.2. BUMPERS, FRONT AND REAR

Front and rear bumpers shall be chassis manufacturer's standard (except, see below) and shall be painted Black, Color No. 17038 of Federal Standard No. 595a.

NOTE: If rear bumper is furnished by body manufacturer, bumper shall be of the size and type and attached to frame as described in Paragraph **C.1.2.**

2.3. FUEL TANK

2.3.1. The fuel tank shall have a minimum capacity of 21 gallons. The tank shall be mounted, filled and vented entirely outside the body. (See Section D.4.4.1.)

2.3.2. **When so specified in the Invitation for Bids,** the bus shall be furnished with a fuel tank having a minimum capacity of 30 gallons, as furnished and installed by the chassis manufacturer. (See Option 9, page 13.)

2.3.3. Fuel tanks shall meet FMVSS No. 301-75 as applicable to school buses.

2.4. STEERING, POWER

The bus shall be furnished with manufacturer's standard power steering, which will provide safe and accurate performance at maximum load and speed.

D.3. AXLES, SUSPENSION AND RELATED COMPONENTS

3.1. AXLES

Axle capacities and gross axle weight ratings shall be as specified in **TABLE NOS.** 3 and 4 for each make of vehicle. However, note that a larger capacity may be required by additional components. (See Paragraph **A.4.4.**).

3.2. BRAKES

3.2.1. Service brakes shall be manufacturer's standard front power disc brakes and rear disc or drum brakes.

3.2.2. Hydraulic brakes shall meet FMVSS No. 105-75 as applicable to school buses.

3.3. SHOCK ABSORBERS

Two front and two rear heavy-duty, double-acting shock absorbers shall be provided.

3.4. SPRINGS

The ground ratings for the front and rear springs shall be as specified in **TABLE NOS. 3** and **4** for each make of vehicle. (See Paragraph **A.4.4.**).

3.5. TIRES AND WHEELS

3.5.1. Sizes of tires to be furnished shall be as specified in **TABLE NOS. 3** and **4** for each make of vehicle. All tires shall be new and the tread style furnished shall be the tire manufacturer's standard design **unless otherwise specified in the Invitation for Bids.** All tires shall be of the quality known as "Original Equipment Line".

3.5.2. **When so specified in the Invitation for Bids,** the bus shall have a spare wheel. (See Option 26, page 13.)

NOTE: Carrier for spare wheel will not be provided under this option.

3.6. HUBODOMETERS

3.6.1. Each chassis shall be equipped with one hubodometer, such as Engler Instruments, 250 Culver Ave., Jersey City, New Jersey 07305, or Veeder-Root, Hartford, Connecticut 06102. Hubodometers shall be calibrated in miles and installed by the manufacturer with standard mounting bracket (preferably on the right) at the rear axle drive wheel.

D.4. ENGINE AND RELATED COMPONENTS

4.1. ENGINE

4.1.1. The engine shall be the gasoline type. Engine displacement shall be as specified in **TABLE NOS. 3** and **4** for each make of vehicle. SAE net horsepower is calculated with required accessories (including the fan) installed and operating.

4.1.2. **When so specified in the Invitation for Bids,** the 15- and 19-passenger bus chassis shall be furnished with a 4-cycle diesel engine (See Option 7, page 13).

4.2. AIR CLEANER

The bus shall be equipped with an adequate oil bath, dry element, or equivalent type factory installed air cleaner.

4.3. COOLING SYSTEM

The cooling system fan shall be heavy-duty reinforced type. The cooling system radiator shall be of sufficient capacity to cool the motor at all speeds in all gears.

4.4. EXHAUST SYSTEM

4.4.1. The exhaust pipe, muffler, and tailpipe shall be mounted under the bus and attached to the chassis frame. Tailpipe shall not extend directly under the fuel filler tube and cap. Any tailpipe which extends to within 12 inches of the vertical plane under the fuel filler opening shall be protected with a metal shield to divert spilled fuel away from the tailpipe. The vendor shall be responsible for meeting these requirements.

4.4.2. The noise level shall meet the current EPA "Noise Emission Standards".

4.5. OIL FILTER

An oil filter with replaceable element or cartridge type shall be provided and shall be connected by flexible oil lines if it is not of built-in or engine-mount design. Oil filter shall have an oil capacity of at least one quart.

4.6. TACHOGRAPH

A tachograph containing a combination clock/speedometer/recorder shall be installed, **when so specified in the Invitation for Bids.** (See Option 18, page 13.)

D.5. TRANSMISSION AND RELATED COMPONENTS

5.1. DRIVE SHAFT GUARD

Each drive shaft 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.

5.2. TRANSMISSION, AUTOMATIC

5.2.1. Transmission shall be the three forward speed automatic type.

5.2.2. The automatic transmission shall be one of the following: Chrysler Motor Corporation's "A727 LoadFlite", General Motors Corporation's "Turbo Hydramatic" or Ford Motor Company's "SelectShift".

D.6. ELECTRICAL SYSTEM AND RELATED COMPONENTS

6.1. ALTERNATOR

Requirements for the electrical output (amperes) of the alternator shall be as specified in **TABLE NOS.** 3 and 4 (except a minimum 100 ampere alternator is required with air conditioning or wheelchair lift).

6.2. BATTERY

6.2.1. The storage battery furnished with each chassis shall be of sufficient capacity for adequate operation of the engine starter, lights, signals, heater, and all other electrical equipment required by this specification.

6.2.2. The batteries furnished with gasoline engines shall have a potential of 12 volts and shall have a minimum performance level as follows: Cold cranking capacity of not less than 360 amperes @ 0°F with a minimum 100 ampere reserve capacity (BCI Rating).

6.2.3. The batteries furnished with diesel engines shall be as specified by the chassis manufacturer. When two batteries are provided, they shall both be installed under the hood or one shall be installed under the hood and the other shall be installed in a battery box. Single batteries shall be installed under the hood.

6.3. HORNS

6.3.1. Each bus shall be equipped with a horn or horns of standard make. Each horn shall be capable of producing audible sounds in a range between 82 and 102 decibels.

6.3.2. The sound level measurements shall be made at a distance of 50 feet directly in front of the vehicle in accordance with SAEJ377, performance of vehicle traffic horns.

6.4. INSTRUMENTS AND INSTRUMENT PANEL

The bus shall be equipped with the following nonglare illuminated instruments and gauges mounted for easy maintenance and repair and in such a manner that each is clearly visible to the seated driver. Indicator warning lights in lieu of gauges are permissible as shown below:

(1) Speedometer

(2) Odometer

(3) Fuel Gauge

(4) Oil Pressure Gauge and/or Warning Light

(5) Water Temperature Gauge and/or Warning Light

(6) Ammeter or Voltmeter with graduated charge and discharge indications

(7) Vehicle manufacturer's standard Keyed Ignition Switch shall be provided

6.5. LAMPS

6.5.1. Each school bus shall be equipped with at least two white headlamps meeting requirements of FMVSS No. 108. These lamps shall be furnished with a dimmer switch located at the far left of the steering column.

6.5.2. Each school bus shall be equipped with adequate parking lamps operated by a switch in common with the headlamps.

6.6. TURN-SIGNAL AND VEHICULAR WARNING SIGNAL OPERATING UNITS AND FLASHERS

The operating units and flashers for turn-signals and vehicular hazard warning signals shall meet the requirements of FMVSS No. 108. (See Paragraph C.1.4.)

D. CHASSIS SPECIFICATIONS - 15 AND 19 PASSENGER

TABLE NO. 3

15 PASSENGER

Refer to General Requirements, Page 3

Item	1985 Min. Rqmts.	Chevrolet CG31305	Dodge B350ZWC	Ford E 350	GMC TG31305
GVWR, lbs	8510	8600	8510	8900	8600
Front Axle Capacity, lbs	3600	3900	3600	4200	3900
Rear Axle Capacity, lbs	5500	5700	5500	6340	5700
Front GAWR, lbs	2950	3900	3170	2950	3900
Rear GAWR, lbs	5340	5360	5340	6340	5360
F. Spg. Gnd. Rating, lbs	as req'd	1950	1585	1700	1950
R. Spg. Gnd. Rating, lbs	as req'd	2700	2670	3287	2700
Wheelbase, in.	125	125.0	127.6	138	125.0
Front Track, in.	66.9	68.61	67.8	66.9	68.61
Rear Track, in.	64.0	67.38	64.0	64.0	67.38
Length, in.	202.0	202.2	222.9	226.3	202.2
Engine CID	**	350-V8	360-V8	351-V8	350-V8
SAE Net Horsepower	**	160	170	160	160
SAE Net Torque, lb-ft	**	250	260	280	250
Transmission	Auto	Auto	Auto	Auto	Auto
Tire Size - Load Range*	Truck Type	8.75R-16.5E	8.75R-16.5E	LT235/85R16E	8.75R-16.5E
Alternator - Amperes	60	66	60	60	66

*Tires shall be tubeless type steel belted radial.

DIESEL ENGINE (Optional)

15 Passenger	1985 Min. Rqmts.	Chevrolet	Ford	GMC
Engine Displacement-Liters	**	6.2N	6.9N	6.2N
SAE Net Horsepower	**	135	165	135
SAE Net Torque, lb-ft	**	240	317	240
Transmission	Auto	Auto	Auto	Auto

**See minimum power requirements in Section F.4.1.3., page 69.

Engines listed here are approved to meet or exceed power requirements under normal operating conditions. Other engines must be submitted for approval by the Commission.

D. CHASSIS SPECIFICATIONS - 15 AND 19 PASSENGER

TABLE NO. 4

19 PASSENGER

Item	1985 Min. Rqmts.		Chevrolet CP30842	Chevrolet CG31303	Ford E350	GMC TP30842	GMC TG31303
GVWR, lbs	10000		11500	10000	10000	11500	10000
Front Axle Capacity, lbs	4200	3900	5000	3900	4200	5000	3900
Rear Axle Capacity, lbs	7400		7900	7500	7400	7900	7500
Front GAWR, lbs	2950		3880	3900	2950	3880	3900
Rear GAWR, lbs	7300	7200	7900	7200	7300	7900	7200
F. Spg. Gnd. Rating, lbs	as req'd		2200	1950	1700	2200	1950
R. Spg. Gnd. Rating, lbs	as req'd		4000	3600	3650	4000	3600
Wheelbase, in.	125.0		125.0		138	125.0	
Front Track, in.	65.22	68.44	65.22	69.34	68.44	65.22	69.34
Rear Track, in.	62.81	73.22	62.81	74.10	73.22	62.81	74.10
Length, in.	214.8	197.6	214.8	197.6	218.1	214.8	197.6
Engine CID	***		350-V8		351-V8	350-V8	
SAE Net Horsepower	***		160		160	160	
SAE Net Torque, lb-ft	***		250		280	250	
Transmission	Auto		Auto		Auto	Auto	
Tire Size-Load Range*	Dual Rear**		LT215/85R16D 800.16.5D		LT215/85R16D	LT215/85R16D 800.16.5D	
Alternator-Amperes	60		66		60	66	

*Tires shall be tubeless type and of polyester cord body construction or steel belted radial.

**A bus with rear curb-side wheel chair lift may be provided with single rear wheels. Larger tires are required.

DIESEL ENGINE (Optional)

19 Passenger	1985 Min. Rqmts.	Chevrolet	Ford	GMC
Engine Displacement-Liters	***	6.2N	6.9N	6.2
SAE Net Horsepower	***	135	165	135
SAE Net Torque, lb-ft	***	240	317	240
Transmission	Auto	Auto	Auto	Auto

***See minimum power requirements in Section F.4.1.3., page 69.

Engines listed here are approved to meet or exceed power requirements under normal operating conditions. Other engines must be submitted for approval by the Commission.

E. BODY SPECIFICATIONS - 24 THROUGH 83 PASSENGER

E.1. GENERAL REQUIREMENTS

1.1. BODY SIZES

1.1.1. Physical requirements for the 24 through 83 passenger school buses shall conform to the the following **TABLE:** (Exception - See Option No. 16.)

TABLE NO. 5

PHYSICAL REQUIREMENTS

(1) Minimum Size Number of Passengers	(2) Overall Body Width Inches Maximum	(3) Rows of Seats Each	(4) Knee Spacings Inches Minimum	(5) Seat Width Inches Minimum	(6) Center Aisle Width Inches Minimum	(7) Floor to Ceiling Height Inches Minimum
24	96	5	24	39/26*	12	72
35	96	6	25	39**	12	72
47	96	8	25	39**	12	72
53	96	9	25	39**	12	72
59	96	10	25	39**	12	72
65	96	11	25	39**	12	72
71-S	96	12	24-3/4	39**	12	72
71-L	96	12	25	39**	12	72
83	96	14	24-3/4	39/26**	12	72

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

Column (5) - *39 inch minimum width for left hand (driver's side) seats
*26 inch minimum width for right hand (service door side) seats and left hand rear seats
**26 inch minimum width for left hand rear seat only

Column (7) - Floor to ceiling height shall be measured in the center of the body, between the No. 2 pillar and the last side body pillar ahead of the rear roof slope.

1.1.2. The overall length of a complete bus shall not exceed 40 feet.

1.2. BUMPER, REAR

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

1.3. CEILING

The ceiling shall be free of all projections likely to cause injury to passengers. (See **PHYSICAL REQUIREMENTS** above for ceiling height requirements and Paragraph **E.2.10.** for other ceiling requirements.)

1.4. LAMPS, SIGNALS, AND WARNING DEVICES

Each bus shall be furnished with the lamps listed below:

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

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

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

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

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

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

1.4.1.1. Each set of amber and red lamps shall have a Black* 3-inch minimum band around the set and a 3-inch band between the lamps in each set. If it is not possible to provide a 3-inch band between the lamps in the set, the manufacturer will then provide a band as wide as possible. Any visor or hood used to shade the lights and improve visibility will not interfere with the intensity and photometric performance of the warning lights. (See Figures 1-6, pages 42-45.)

*Federal Standard No. 595a, Black Enamel, Color No. 17038.

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

1.4.1.3. Complete instructions for the detailed operation of the warning signal lamp system shall be furnished with each school bus.

1.4.2. Backup Lamps - The color, requirement and mounting of backup lamps shall be in accordance with FMVSS No. 108, **except two are required by Texas Specifications.**

1.4.3. Clearance, Identification and Side Marker Lamps - Each bus shall be furnished with the lamps listed below. The quantities, colors, requirements, and mountings shall be in accordance with FMVSS No. 108. Each identification, clearance, and side marker lamp installed to indicate school bus height and/or width shall be the armored flush mounting type for protection of lens from damage during normal operation. Armored protectors shall in no way interfere with the intended purpose of the lamps. The armored type protectors shall be such as Grote Manufacturing Company, Madison, Indiana 47250, Model Numbers 45012 and 45013, or KD Lamp Company, 1910 Elm Street, Cincinnati, Ohio 45210, Model Numbers 38469-901 and 40268-301 or approved equal. Example of an approved equal: Peterson Model - PM122. (See Figures 1-6, pages 42-45, for the proper location of these and other lamps.)

1.4.3.1. Clearance Lamps

1.4.3.2. Identification Lamps

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

1.4.3.4. Side Marker Lamps

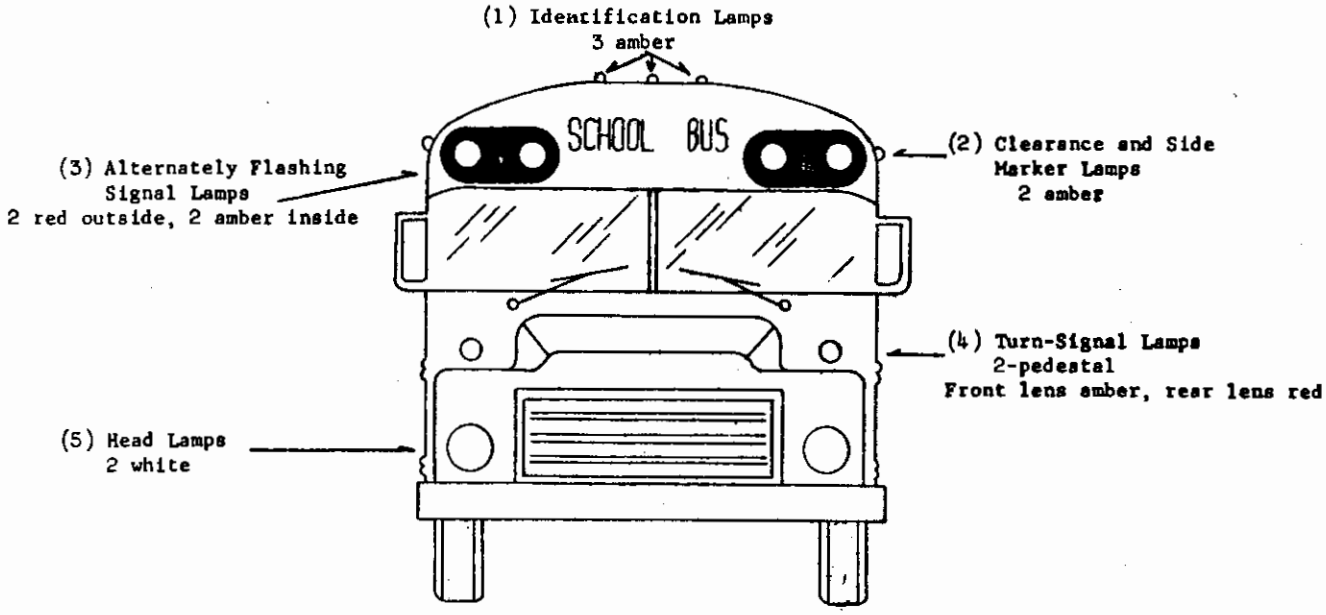


Figure 1 - Front View

24-71 PASSENGER SCHOOL BUS

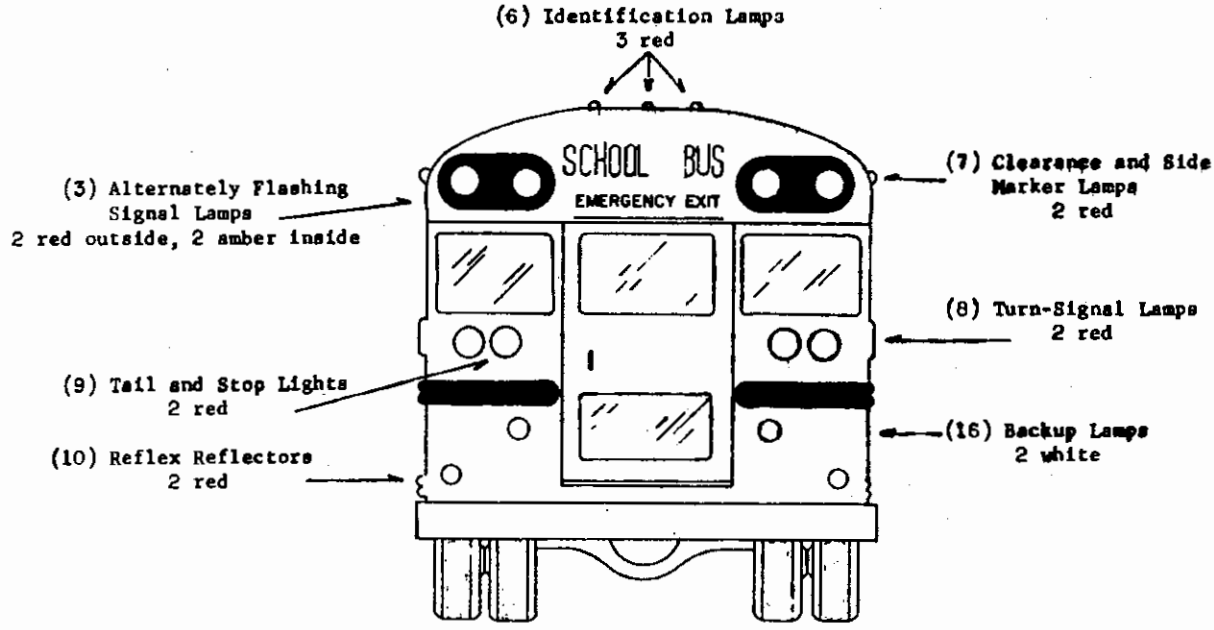
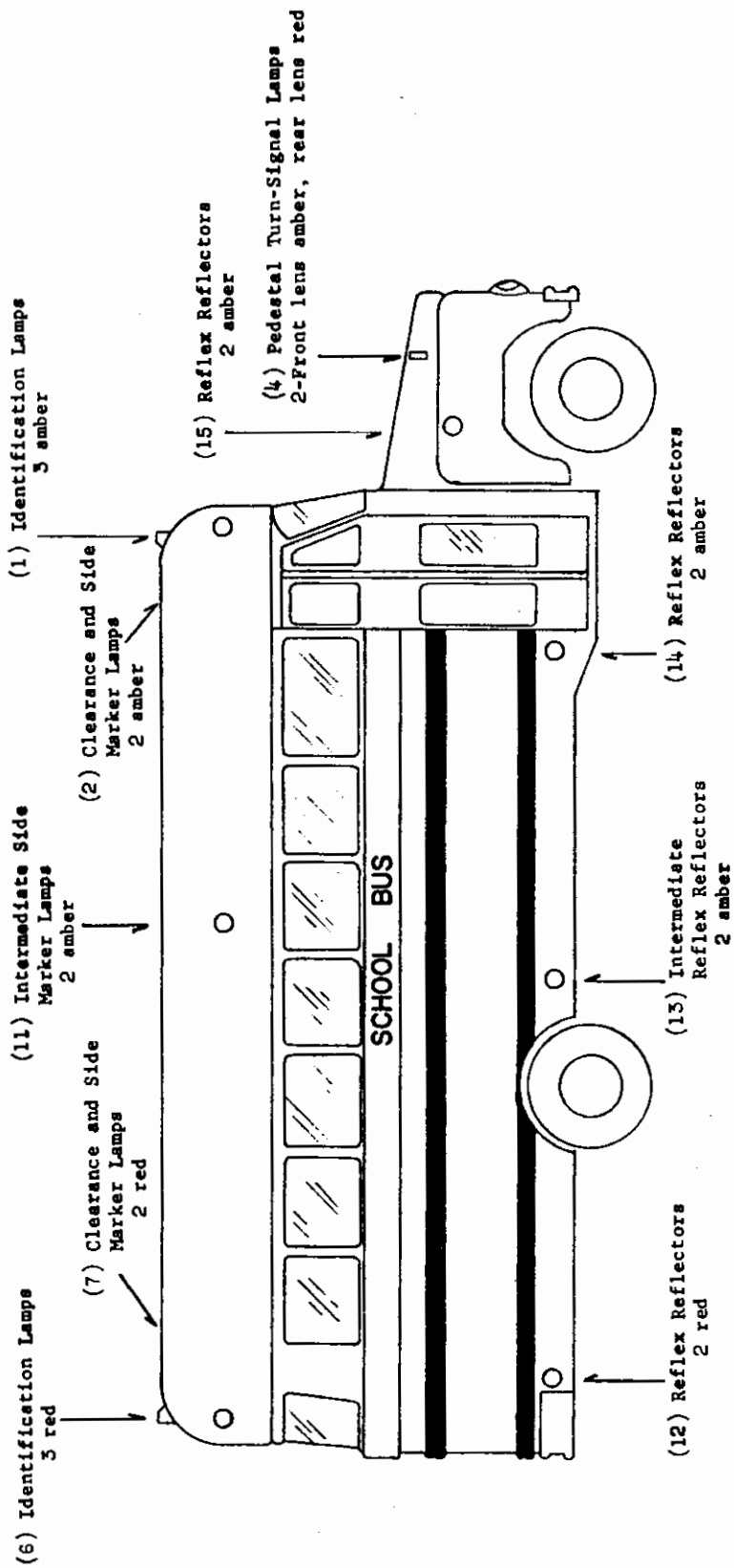


Figure 2 - Rear View

19-71 PASSENGER SCHOOL BUS



Items (11) and (13) do not apply to buses less than 30 feet long.

Figure 3 - Side View

24-71 PASSENGER SCHOOL BUS

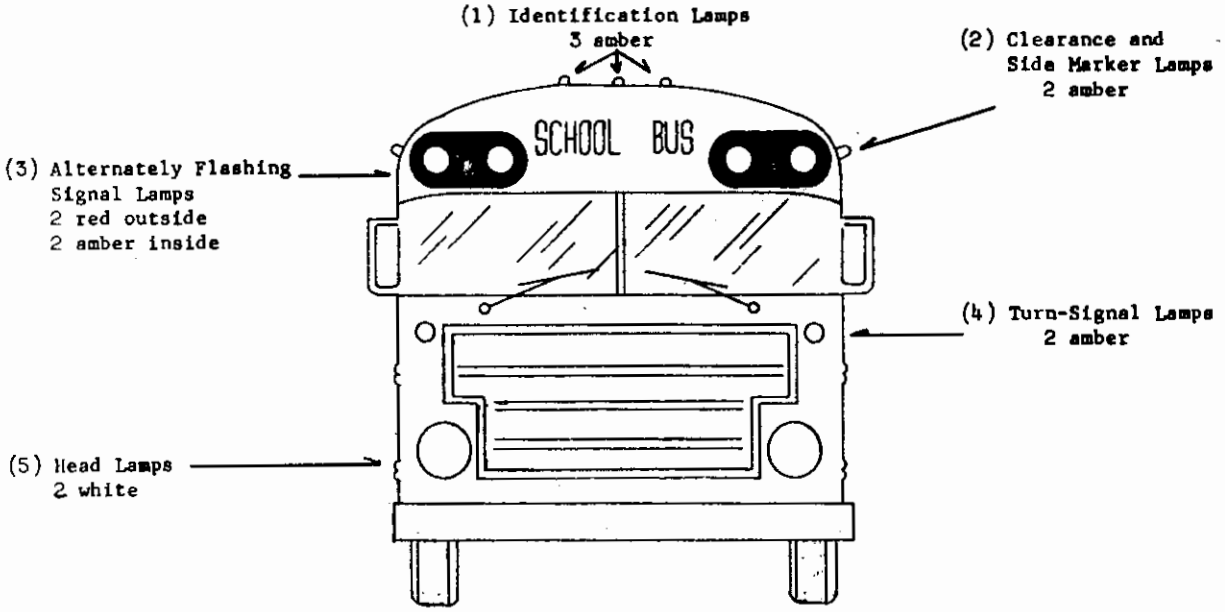


Figure 4 - Front View

83 PASSENGER SCHOOL BUS

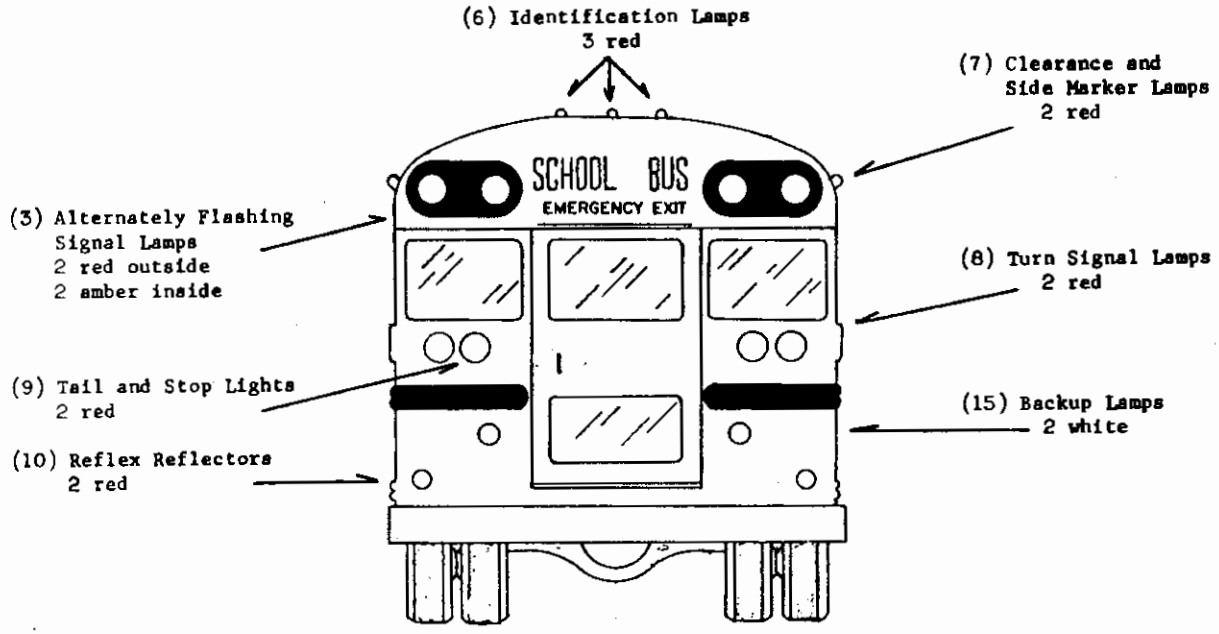


Figure 5 - Rear View

83 PASSENGER SCHOOL BUS

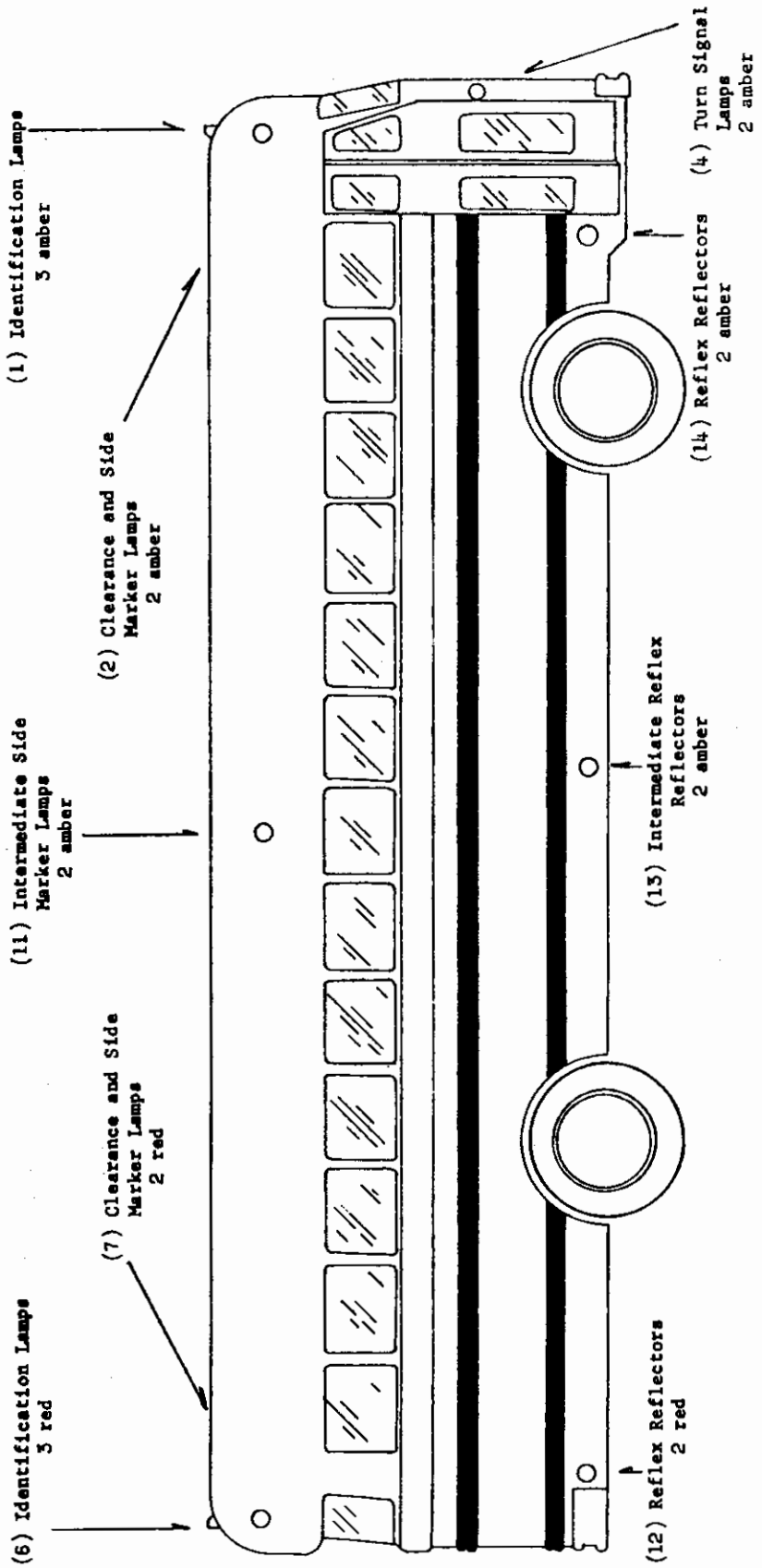


Figure 6 - Side View

85 PASSENGER SCHOOL BUS

1.4.4. Interior Lamps - Interior lamps shall be installed to properly and adequately illuminate the aisle and emergency passageway. The step-well shall be illuminated with a separate lamp which will be activated by opening the service door. The fixtures shall have white or clear plastic lenses attached to metal frames. The lamps shall be designed for a 12-volt electrical system and shall have installed a **minimum 15 candlepower lamp bulb.**

1.4.4.1. The quantity of interior lamps required for each size bus shall be as listed below. 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.

Size School Bus (Number of Passengers)	Interior Ceiling Lamps Required per Bus (Minimum)
24	3
35	3
47	4
53	4
59	5
65	5
71	6
83	6

1.4.4.2. Interior lamps approved for use are as follows:

Manufacturer	Catalog Number
Arrow Safety Device Company	045 or (035 with plastic lens)
Cardinal Manufacturing Company	1271-G1
Cats-Eye Lamp Division of Signal-Stat Company	5550
Grote Manufacturing Company	230 (61031)
K-D Lamp Company	KD530-12
Weldon Incorporated	8005

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

1.4.6. Reflex Reflectors and Intermediate Reflex Reflectors - The quantities, colors, requirements and mounting of reflex and intermediate reflex reflectors shall be in accordance with FMVSS No. 108, except one amber reflex reflector on the front, one amber intermediate reflex reflector on buses 30 feet or longer, and one red reflex reflector on the rear shall be mounted on each side of the bus body. The amber reflex reflectors mounted near the front and on each side of the chassis are required on Texas buses in addition to the reflectors required by FMVSS No. 108. (See Figures 1-6, pages 42-45, for mounting locations of reflectors.)

1.4.7. Tail and Stop Lamps - The quantities, colors, requirements and mounting of tail and stop lamps shall be in accordance with FMVSS No. 108, except stop lamps shall be 7 inches in diameter and mounted at approximately the belt line level of the bus. Base of lamps may be metal or durable plastic preferably with screw lens. (Example: Grote 78002 or 78102 taillight, KD Lamp Company Models 258-2601 or 258-2605, or approved equal.) An example of an approved equal is TRUK-LITE Model 90-91.

NOTE: Lenses shall be secured to lamps by a fastening method which requires a tool to remove the lens.

1.4.8. Turn-Signal/Hazard Warning Lamps - The quantities, colors, requirements, and mountings of turn-signal/hazard warning lamps shall be in accordance with FMVSS No. 108, except rear turn-signal lamps shall be 7 inches in diameter. The front turn-signal lamps shall be the double face pedestal type (except single faced type on 83 passenger) and shall be mounted in such a manner so as to be capable of withstanding all normal vibrations. The **front** lens shall be **amber; the rear** lens shall be **red.** (See Figures 1-6 for mounting locations of front turn-signal lamps.) The operating units and flasher for turn-signals and vehicular hazard warning signals shall meet the requirements of FMVSS No. 108.

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

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

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

1.5. WIRING

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

(1) Head, tail, stop (brake), and instrument panel lamps

(2) Clearance and step-well lamps. (Step-well lamp shall be actuated when service door is opened)

(3) Dome lamps

(4) Starter motor

(5) Ignition and emergency door signal

(6) Turn-signal (directional)

(7) Alternately flashing signal lamps

(8) Horn

(9) Heater and defroster

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

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

1.5.4. Each body circuit shall be coded by color, letter, or number and a diagram of the circuits shall be attached to the body in a readily accessible location.

1.6. LICENSE PLATE HOLDER

A recessed license plate holder shall be mounted on the left rear of the bus body. The recess shall be a minimum of 3/8 inch deep at the top and shall be located so that the license plate will receive illumination from the clear lens on the underneath side of the tail light, or by a separate lamp.

1.7. OPENINGS

All openings in the floorboard or fire wall between chassis and passenger carrying compartment, such as for gearshift lever, steering column, and auxiliary brake lever, **shall be sealed.** All openings between chassis and passenger carrying compartment made due to alterations by the body manufacturer **must be sealed.**

1.8. PAINTING

1.8.1. Preparation and Cleaning of Surfaces - 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.

All interior and exterior panels and rub rails to be painted or coated shall be thoroughly cleaned to remove all rust, grease, weld slag, and other foreign material prior to priming. Any welds on the components for the bus body or chassis shall be dressed, sanded, buffed, and thoroughly cleaned to remove any slag and to properly prepare the welds for priming. After proper cleaning, these components shall be thoroughly rinsed. Neither the cleaning process nor the rinses shall impair the zinc phosphate coating of the panels or rub rails.

1.8.2. Primer Coat - After the components have been thoroughly cleaned and prepared as described above, they shall be totally primed and dried. These components may be primed and dried either prior to or after installation. **All** components such as **rivet or bolt heads** and **damaged areas** shall be thoroughly cleaned and primed.

NOTE: 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. Exception: Clear coat is required on interior panels below the passenger windows.

1.8.3. Finish Coat - After all interior and exterior panels and rub rails have been prepared, cleaned and primed, as specified above, they shall be finished with a first quality baking enamel, applied and baked according to the paint manufacturer's instructions. These enamels, when applied over the paint manufacturer's recommended primer, shall have properties equal to or better than those specified by Federal Specification TT-E-489F, Class B. Both interior and exterior enamel finish coats shall have a minimum dry film thickness of 2 mils, when tested by a "dry film thickness gauge" conforming to Federal Specification TT-C-490B. (NOTE: Such as the "Elcometer Dry Film Thickness Gage", Gardner Laboratory, Inc., Bethesda, Maryland 20014.) 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.**

1.8.4. Alternate methods for preparing metal surfaces and painting procedures will be considered on an individual basis. Manufacturers will be required to submit their procedural data to the Specification Section of the Commission for approval where methods are used that differ from those specified above.

1.8.5. Lettering, Trim, and Insignias - The school bus bodies shall have the words "SCHOOL BUS" painted in neat, clearly defined block letters on the front, rear, and on both sides of the school bus. The letters shall be 8 inches high and shall have 1-inch wide strokes. A first quality black enamel shall be used for lettering and trim. The properties of the black enamel shall be equal to those of the finish coat enamels. The use of pressure sensitive tape or decals (except decals used for instructional purposes such as emergency door instructions, etc.), are not acceptable for trim and/or lettering (i.e., emergency door, emergency exit signs). **No logo, trademark, insignia or lettering 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 reasonably sized logo which has been approved by our Specification Section may be placed on the exterior bus body.

1.8.6. Colors

1.8.6.1. Interior - The interior of the complete bus body shall be finished in the manufacturer's standard color **unless otherwise specified in the Invitation for Bids.** Exception: Clear coat is required on interior panels below the passenger windows.

1.8.6.2. Exterior - The exterior of the complete bus body except for rub rails shall be finished in Color No. 13432, School Bus Yellow, of Federal Standard No. 595a.

1.8.6.3. Trim and Lettering - The trim on the exterior of the bus body and the lettering "SCHOOL BUS" on the front, rear, and on both sides of the bus body shall be in Color No. 17038, Black, of Federal Standard No. 595a.

1.8.6.4. Rub Rails - All rub rails except the pressed-in type window-level rub rails shall be painted Black (Color No. 17038). The pressed-in type rub rails shall be painted either Black (Color No. 17038) or School Bus Yellow (Color No. 13432) at the option of the manufacturer.

1.8.6.5. Outside Rearview Mirrors - The metal backs of mirrors, if painted, and the brackets and assemblies shall be finished in Color No. 37038, Lusterless Black, of Federal Standard No. 595a. (See Section E.3.7.)

1.9. UNDERCOATING

1.9.1. The requirement for the coating material in the sections on WHEEL HOUSING (E.2.5.), EXTERIOR PANELS (E.2.7.), and INTERIOR PANELS (E.2.10) is to provide for insulation, sound deadening, protection from road minerals, and rust prevention, as applicable. The material shall be applied as specified and described in these sections.

1.9.2. The entire underside of the bus body, including floor members, side panels below the floor level, and all metal fenders or fenders with metal liners shall be coated with 1/8 inch thick material as specified below. The undercoating shall be applied in accordance with the undercoating manufacturer's instructions. **Do not cover up or obliterate the truck identification plate.** (See A.7.4.)

1.9.3. Insulating and undercoating materials shall be an asphalt base underbody coating conforming to Federal Specification TT-C-520B or shall be Lion Nokorode Emulsion 331 as manufactured by Lion Oil Company, El Dorado, Arkansas 71730 **or** an approved equal. An example of an approved equal is Tectyl MC121B, manufactured by Ashland Petroleum Company, Box 391, Ashland, Kentucky 41101, applied to a dry film thickness greater than 20 mils.

E.2. CONSTRUCTION

2.1. GENERAL REQUIREMENTS

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

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

2.1.1.2. **The Floor System** - floor panels, main cross members, auxiliary cross members, wheel housing, steps, and step-well bracing.

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

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

2.1.2. Those components listed in **TABLE NO. 6**, shall be Type I steel or approved equal, **except as noted thereunder.** Construction shall provide a reasonably dustproof and watertight unit.

2.1.3. 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 requirements of section titled "CHASSIS FRAME COMPONENTS" under chassis specifications. 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 bus. (Any modification must have body manufacturer's warranty.)

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

2.1.5. The body shall be attached to the chassis frame by means of 7/16 inch U-bolts 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 1/2 inch past the nuts. The 24 passenger buses shall have a minimum of 4 U-bolts; and 35, 47, and 53 passenger buses shall have not less than six of these U-bolts; the 59, 65, 71, and 83 passenger buses shall have not less than eight of these U-bolts. U-bolts on the 24 passenger buses shall be placed at approximately 1/3 and 2/3 of the length of each chassis frame. One U-bolt shall be mounted at each end and in the approximate center of each chassis frame of the 35, 47, and 53 passenger buses. On the 59, 65, 71, and 83 passenger buses one U-bolt shall be mounted at each end of the two chassis frames and one each at points approximately 1/3 and 2/3 of the length of each of the two frame members. All other main cross members on all sizes of bodies shall be attached to the chassis with the manufacturer's standard fastening devices where possible. Shear bolts or other equally effective devices approved by the Specification Section, State Purchasing And General Services Commission, may be used in addition to U-bolts and standard clips to eliminate slippage. Antisqueak material in continuous strips or rubber pads shall be permanently and firmly attached to rails or cross members to insulate chassis from the body.

2.1.6. Buses equipped with chassis manufacturer's cowl shall be furnished with the body securely attached to the rear face of the chassis cowl with a minimum of 9 bolts, nuts and lock washers. On all such buses the junction between cowl and body shall be sealed to form a gastight and watertight seam. The sealant used shall be either the best grade of molded or extruded rubber weather stripping or a good quality, pressure applied, silicone elastomer sealant.

2.1.7. On 24 passenger buses and approved equal semi-forward control 59, 65, and 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:

(1) A sufficiently reinforced grille assembly

(2) Headlamps and parking/turn-signal lamps as required by FMVSS No. 108

(3) Hood cover with latching mechanism providing access to the forward part of engine.

(4) Fenders, properly braced, 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.

2.1.8. 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 the U-bolts, their nuts and washers, shall be parkerized, cadmium-plated, or otherwise rustproofed.

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

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

2.1.9.2. For electrical wire moldings and light fixtures, or,

2.1.9.3. Seat back construction (See Paragraph E.2.15.), or

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

2.1.9.5. In certain cases, for attachment of exterior mirrors (See Paragraph E.3.7.), or,

2.1.9.6. In the installation of rub rails or emergency door handles and latches where it is impossible to use rivets or bolts, nuts, and lock washers and then only when these fasteners are used in conjunction with the manufacturer's standard metal adhesive which is used to meet joint strength requirements.

2.1.9.7. In window frames when applied with the metal adhesive.

2.1.9.8. In the installation of header pads over the doors.

*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.

2.1.10. 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, Paragraph F.4.5. The tail pipe shall not extend beyond the rear bumper.

2.1.11. 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 E.2.9.4. for other requirements for filler opening.)

2.1.12. A flexible, tenacious, high quality caulking compound or adhesive must 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 of the heater or the drain openings at the bottom of the rub rails. The compound shall be applied to the required areas in a neat and workmanlike manner **without voids or skips.**

2.1.13. Each body shall bear in a prominent place a permanently attached plate showing the name of the manufacturer and the body serial number. (See **A.7.**)

2.1.14. The use of wood shall be limited to the construction of passenger seats, seat back cushions, to insulate floors, on header pads, and the bottom of a tool compartment, when furnished.

2.1.15. The windows (or any other surface) shall not be positioned any closer than two inches to the steering wheel.

2.2. BODY FRAME

2.2.1. The body frame system (see Paragraph **E.2.1.**) shall be of the type, grade, and thickness of steel specified in **TABLE NO.** 6, page 53, or approved equal, and shall meet the requirements of FMVSS No. 220. The frame shall have a formed shape with a minimum cross sectional depth of 1.25 inches. Frame members running from one side main cross member to the other side main cross member may be continuous bow frames, or they may consist of side posts and roof bows. If side posts and roof bows are used, every pair of side posts must be connected by a roof bow to form the equivalent of a continuous bow frame. The side posts shall be set on not more than 30 inch centers, except that one side post and bow or one bow frame may be set on a maximum of 38.75 inch center, or three bow frame sections not exceeding 36.5 inches may be used in any one body. Each of the side posts or bow frames shall be securely welded, riveted or lock bolted to the floor system at each main cross member or to the longitudinal frame member which is located at the floor line. Each side post and/or bow frame must also be attached, as specified above, to the remaining longitudinal frame members.

2.2.2. The body frame shall have not less than four individual side longitudinal frame members extending the full length of the body (except as interrupted by side posts or when cut for an opening for the wheel housing). **One each shall be located at the floor line, the seat line, the belt line, and at the window header line.** The belt line longitudinal member may be replaced by an exterior rub rail, i.e., an extra rub rail in the belt line area. This rub rail must meet requirements specified under **RUB RAILS,** Paragraph **E.2.9.**

2.2.3. The front frame shall be a unitized framework of formed sections designed with the necessary stress members required to withstand the torsional stresses set up by or in the chassis. The corner posts shall extend from the bottom of the body to the windshield header and shall not cause or produce a "blind spot" for the driver. The front assembly shall be securely attached to the floor system by lock bolting, welding, or riveting and shall be securely bolted to the chassis cowl in such a manner as to cause <u>no</u> undue strain. (See E.2.2.1.)

2.2.4. The rear frame shall consist of a formed sill, two posts (one on either side of the emergency door, extending from the sill to the roof bow and intersected by a rear header at the proper point), and suitable strainers to form a rigid framework. This framework shall be assembled and attached to the floor system by welding, riveting, or lock bolting.

2.2.5. 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.

2.3. BATTERY COMPARTMENT

If the battery is to be 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. The battery compartment shall provide complete weather protection for the battery as well as total accessibility at all times. (See also F.6.2.) **Battery cables of sufficient length shall be provided by the chassis manufacturer to accommodate 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. FLOOR

2.4.1. The floor system (See E.2.1.1.2.) shall be of the type, grade and thickness of steel specified in **TABLE NO. 6**, page 53, or approved equal. 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.

The cross members shall be spaced not more than 10 inches center to center. The floor panels and cross members shall be designed so as to completely and adequately support all fixed and changeable loads under all operating conditions without deformation of the underbody structure, strains to body, or fractures of member joints. The design and strength of the understructure shall be sufficient to eliminate the necessity of installing outriggers attached to the chassis except at the front entrance. The undersurface of the entire floor structure, including wheel housing and step-well, shall be sprayed with material at least 1/8 inch thick conforming to that specified in the paragraphs on **UNDERCOATING.** (See **E.1.9.**)

2.4.2. The floor in the underseat area, including tops of wheel housings, driver's compartment, and toeboard (except transmission inspection plate), shall be covered with fire-resistant rubber floor covering or equivalent having minimum overall thickness of 0.125 (1/8) inch. Floor covering on toeboard shall be held in place by trim strip or molding.

2.4.3. Floor covering in aisle shall be of aisle type fire-resistant rubber or equivalent, and shall be nonskid, wear-resistant, and ribbed. Minimum overall thickness shall be 0.1875 inch measured from tops of ribs. Rubber aisle floor covering shall meet Federal Specification ZZ-M-71D. Seams shall be covered with the bus body manufacturer's standard aluminum trim.

2.4.4. Floor covering, except that on the toeboard, must be permanently bonded to the floor with water proof adhesive material and must not crack when subjected to sudden changes in temperature. All seams shall be sealed with waterproof sealer.

2.4.5. Extruded aluminum metal strips of a minimum 0.1875 inch high and 1 inch wide 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 the adjoining edges of the underseat covering. Each aisle strip shall consist of not more than three pieces of the metal stripping. The strips shall be secured to the flooring with flush-mounted flat head screws; holes for the screws shall be countersunk. The screws shall be placed not more than 9 inches apart for the full length of the metal strips except that the ends of each piece of stripping shall have screws placed at not more than 0.75 inch from each end.

TABLE NO. 6

NOMINAL METAL THICKNESSES AND ZINC COATING DESIGNATIONS FOR STEEL COMPONENTS

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

***NOTE:** Lower interior panels (Item No. 9d) shall be clear coated galvanized or galvalume embossed steel, ASTM designation A446-76.

****NOTE:** It is mandatory that all components listed in **TABLE NO.** 6 be of the following types of steel, unless otherwise specified, and except Item No. 14 may be of aluminum alloy 6063-T6 having a minimum thickness of .062 inch. Any and all other metal components not listed in **TABLE NO. 6 may** also be of 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, to have a smooth, minimized spangle surface which has been zinc phosphate treated by the steel mill or by 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 bus body manufacturer.

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

2.5. WHEEL HOUSING

The wheel housing shall be of the type, grade, and thickness of steel specified in **TABLE NO. 6**, page 53, or approved equal. The wheel housing 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 wheel housing 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 wheel housing 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 wheel housing. The undersurface shall be sprayed with 0.125 inch thick material conforming to that specified in Paragraph **E.1.9., UNDERCOATING.**

2.6. STEPS

2.6.1. The first step at the service door shall be not less than 12 inches, and not more than 16 inches, from the ground when the bus is unloaded. Service door entrance may be equipped with two-step or three-step entrance. Risers in each case shall be approximately equal. The step-well shall not protrude beyond the side body line and shall be fully enclosed to prevent accumulation of ice, snow, and dust. A grab handle not less than 10 inches in length shall be provided and placed in an unobstructed location inside the doorway.

2.6.2. All steps and the floor line platform area shall be covered with .1875 inch rubber metal-backed treads with at least 1.5 inch white nosing as an integral piece without any joint. Three inch white rubber step edge with metal back may be substituted in the floor line platform area. Step tread minimum overall thickness shall be 0.1875 inch ribbed design, similar to the ribbed design of the aisle rubber. Metal back of tread, minimum 24-gauge cold rolled steel, shall be permanently bonded to ribbed rubber. Grooved design shall be such that said grooves run at 90-degree angle to long dimension of step tread.

2.6.3. The rubber portion of the step treads shall have the following characteristics:

2.6.3.1. Special compounding for good abrasion resistance and high coefficient of friction.

2.6.3.2. Sufficient flexibility so that it can be bent around a .5 inch mandrel both at 130°F and 20°F without breaking, cracking, or crazing.

2.6.3.3. Shore A Durometer or equivalent hardness 85 to 95.

2.7. EXTERIOR PANELS

2.7.1. All exterior panels (See E.2.1.1.3.) shall be of the type, grade, and thickness of steel specified in **TABLE NO. 6**, page 53, or approved equal.

2.7.2. The front and rear exterior panels shall be formed into the desired contours to give a smooth, pleasing appearance to the bus. The front and rear exterior roof panels shall be of not more than three pieces welded or riveted together to form a continuous piece over the front and rear frame.

2.7.3. All exterior panels shall be attached to bow frames and strainers so as to act as an integral part of the structural frame. All exterior panels 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. Joints shall meet the requirements of FMVSS No. 221.

2.7.4. The exterior side panels shall be installed either vertically or longitudinally. Vertical panels shall be one-piece and shall extend from the window line to or below the floor line. Longitudinal panels shall be installed starting at or below the floor line and extending upward to the window line with each ascending panel overlapping the preceding panel. Rub rails shall not be considered as part of the paneling.

2.7.5. All exterior panels shall be completely sprayed on the inside of the main exposed surfaces, and shall featheredge to the edge of the attaching members, with 1/16 inch thick material conforming to that specified in the paragraph on **UNDERCOATING (E.1.9.)**. The spraying shall be done after the panels are installed.

2.8. SKIRT REINFORCEMENTS

Side skirts shall be gusseted or braced on not more than 30 inch centers and wherever required for rigidity and to prevent vibration. An exception to this is that no more than three sections may be on 36 inch (or less) centers if the body sections are authorized to be longer than 30 inches and:

2.8.1. Exterior skirt level rub rails are provided, or

2.8.2. Angle iron bracing, minimum 1/8 inch, is welded across the bottom portion of roof bows extended from the bottom of one skirt to the other.

2.9. RUB RAILS

2.9.1. Three separate one piece continuous rub rails of the type, grade, and thicknesses of steel specified in **TABLE NO. 6**, page 53, or approved equal, shall be installed on the body. One rub rail shall be located at or near the floor level, one at or near the seat level, and one near the window line. One additional rub rail may be furnished in lieu of one longitudinal frame member. (See Paragraph E.2.2.2.)

2.9.2. 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.

2.9.3. The seat level rub rail shall be installed from the service door completely around the bus body (except for emergency door and rear engine) to the point of curvature near outside cowl on left side. The rails may be two-piece with the joint being near the rear side of the bus body. The rail extension shall be joined to the continuous side rail by one of the following means: (1) butt welding; (2) jogged lapped by not less than one inch and riveted; (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.

2.9.4. The floor level rub rail 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 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 opening to be enlarged, or to meet requirements in E.2.1.11.

2.9.5. 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) shall be closed by a rounded end cap which shall be butt or flash welded to the rub rail, or (3) shall be closed by a rounded end cap inserted with an approximate one inch sleeve inside of the rub rail, riveted in position at the top and bottom of the rub rail flange, and sealed in the same manner as the top flange of the rub rails.

2.9.6. 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 E.2.1.9.). Provisions for one-piece rails may be accomplished by butt or flash welding. All welds including those for the end caps shall be dressed, sanded, and buffed.

2.9.7. The bottom edge of each rub rail (except the pressed-in-type which may be used near the window line) shall have provisions for drainage of accumulated moisture. One of the following drainage methods shall be used: (1) the bottom flange of the rub rail shall have 1 x 0.032 inch (minimum) formed slots spaced on not more than 12 inch centers, or (2) one 0.25 inch diameter hole or slot per foot in the lowest part of the rub rail **drilled prior to the priming, painting, and installation of the rub rail.** Holes drilled after rub rail installation are **not** acceptable. Formed slots are preferred over drilled or cut holes.

2.9.8. The top joint of the rub rail shall be sealed with a caulking compound or adhesive as specified in Paragraph E.2.1.12.

2.10. INTERIOR PANELS

2.10.1. All interior panels shall be of the type, grade and thickness of steel specified in **TABLE NO. 6**, page 53, or approved equal. Front and rear panels shall be formed to present a smooth, pleasing appearance. Roof panels shall be continuous from header to header. If the ceiling is constructed so as to contain lapped joints, the forward panel shall be lapped by the rear panel and all exposed edges shall be beaded, hemmed, flanged, or otherwise treated to minimize sharp edges.

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

2.10.3. The space between the inner and outer panels shall be lined with 1.5 inch minimum thickness fiberglass of an R factor value at least 6.3., securely adhered to the exterior panels.

2.11. DOORS

The service door and the emergency door shall be of the type, grade, and thickness of steel specified in **TABLE NO. 6**, page 53, or approved equal. The hinges for both the service and 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 only. Self-tapping bolts may be used for alignment when bolt heads are tack welded to the hinge. (See Paragraph E.2.1.9.)

2.11.1. Service Doors

2.11.1.1. General - Service or entrance doors shall have a minimum horizontal opening of approximately 24 inches and a minimum vertical opening of about 68 inches. The service door shall have lower and upper glass panels to permit the driver to see entering passengers as well as the passenger landing area. These glass panels shall be set in rubber.

Both vertical closing edges of this door shall be equipped with rubber or rubberized material to protect passengers' fingers. The inside top of the door, head impact area, shall be protected by an energy absorbing padded header board of sufficient size (width, depth, and length) to prevent injury when accidentally impacted. There shall be no door at the left of the driver.

2.11.1.2. The entrance door for 35, 47, 53, 59, 65, and 71 passenger conventional buses shall be manually operated. The door control must be the hand lever type, driver-operated, and shall be designed so as to afford easy release and to prevent accidental opening. The two-piece or folding type service door shall be located on the right side near the front of the bus in direct view of the driver.

2.11.1.3. On 24 passenger buses and on the semi-forward control buses, the entrance door shall be operated from controls at or near the bus driver's seated position. The doors may be actuated either pneumatically (pressure or vacuum), electrically, or manually, and shall be designed to allow manual opening in case of an emergency. To prevent accidental opening while the bus is in motion, the system shall require at least a 125 pound force applied to its center in order to manually open the door.

2.11.1.4. The service or entrance door(s) on 83 passenger buses may be either manual, electric or air (pressure or vacuum operated). If the door is manual type, door control must be the hand lever type and shall be designed so as to afford easy release and to prevent accidental opening. The two-piece or folding type service door shall be located on the right side near the front of the bus. At least two-thirds of its opening width shall be ahead of a point opposite the back of the driver's seat.

2.11.2. Emergency Door

2.11.2.1. The emergency door shall be located in center of the rear of the body (See 2.11.2.2. below for rear engine buses) and shall have a minimum horizontal opening of 30 inches and a minimum vertical opening of 48 inches measured from the floor level. The emergency door shall be marked "EMERGENCY DOOR" or "EMERGENCY EXIT", both on the inside and on the outside with at least 2-inch high lettering painted on the top of or directly above the door.

2.11.2.2. Left side emergency door, meeting the requirements of FMVSS No. 217, shall be provided on rear engine buses.

2.11.2.3. The emergency door shall be equipped with a slidebar rack and pinion (cam) operated latch. The slidebar shall be approximately 1.25 inches wide and 0.375 inch thick and shall have a minimum stroke of 1.125 inches. The slidebar shall be spring loaded so as to retain the bar in the closed position and have a minimum of one inch of horizontal bearing surface beyond the edge of the door frame when the door is in a latched position.

2.11.2.4. The movement of the latch handle through its full arc of operation shall not be obstructed by or extend 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 in order that the door can be closed securely for positive fastening. Provisions for opening from the outside shall consist of a handle (device) of such design so as to prevent "hitching" but to permit opening when necessary. The outside handle, when in the closed position, shall extend down from its pivot center.

2.11.2.5. The emergency door latch shall be equipped with a heavy-duty electric plunger-type switch connected to a warning buzzer located in driver's compartment. The switch shall be enclosed in a metal case, and wires leading from switch shall be concealed in the bus body.

This switch shall be mounted plumb, parallel, and perpendicular to the striker plate of the lock slidebar. 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.

2.11.2.6. The emergency door shall be hinged on the right side or on the forward side on 83 passenger 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. No steps shall lead to the emergency door. No seat or other object shall be so placed in the body as to restrict the passage to the emergency door to less than 12 inches.

2.11.2.7. The glass* in the emergency door shall be not less than 299 square inches in area and shall be set solid in a waterproof manner. The installation of glass in the lower section of the emergency door is also required and shall meet the same requirements except in rear engine buses. The lower glass shall be the manufacturer's standard size.

*All glass used in service and emergency doors shall be a minimum of 0.125 inch thick safety glass. **Only safety glass approved by the Texas Department of Public Safety shall be used.** The glass shall be so mounted that the permanent identification mark is visible and shall be of sufficient quality as to prevent distortion of view in any direction.

2.12. WINDSHIELD AND WINDOWS

2.12.1. All glass used in the driver's window, side windows and rear windows shall be a minimum of 0.125 inch thick safety glass. The glass in the windshield shall be AS-1 grade and the glass in all side and rear windows shall be AS-2 grade or better, as specified in American National Standards Institute Safety Code Z26.1. **Only safety plate and safety glass approved by the Texas Department of Public Safety shall be used.** The glass shall be mounted so that the permanent identification mark is visible and shall be of sufficient quality to prevent distortion of the view in any direction. Windshield glass and side windows shall be inset in rubber channels or approved equivalent material. AS-3 grade glass may be used in side passenger windows only when deep tinted windows are required by the ordering agency.

2.12.2. The windshield glass shall be a minimum of 0.21875 inch thick safety plate and shall be heat absorbent, laminated plate. The windshield shall have a horizontal gradient band (tinted) starting slightly above line of driver's vision and gradually decreasing in light transmittance by 20 percent or less at top of windshield. The windshield shall be slanted back at the top not less than 2 inches. The maximum width of the windshield center post shall not exceed 2.5 inches.

2.12.3. The driver's window shall be a 2-piece window of either of the following types:

2.12.3.1. Front part opening either in or out and rear part lowering and raising by use of a regulating handle.

2.12.3.2. Two-piece sliding-sash type. This type will be acceptable only when the bus is equipped with an adequate air scoop to draw outside air into the driver's compartment. When the driver's ventilation is drawn through the heater system, this air shall be shielded from heat sources and a hot water cut-off valve is to be provided in the driver's compartment.

2.12.4. Passenger side windows shall be the split-sash type and shall provide an unobstructed opening 22 inches wide and between 9 and 10 inches high. All exposed edges of glass shall be banded. **Side windows that can be individually latched in an uneven position are not acceptable.**

2.12.5. Rear windows shall be installed on each side of the rear emergency door. Each rear window glass shall be a minimum of 140 square inches in area and shall be set solid in a waterproof manner.

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

2.13. VENTILATION

The bus shall be equipped with a suitable, controlled ventilation system of sufficient capacity to maintain a satisfactory ratio of outside to inside air under operating conditions without opening windows except in warm weather. A static-type, nonclosable exhaust ventilator shall be installed in low-pressure area of roof.

2.14. SEAT BARRIERS

Seat barriers shall be furnished and installed in accordance with FMVSS No. 222. Hand rail(s) shall be installed on or in front of the right hand front seat barrier to assist passenger ingress or egress. Method of attachment shall be manufacturer's option.

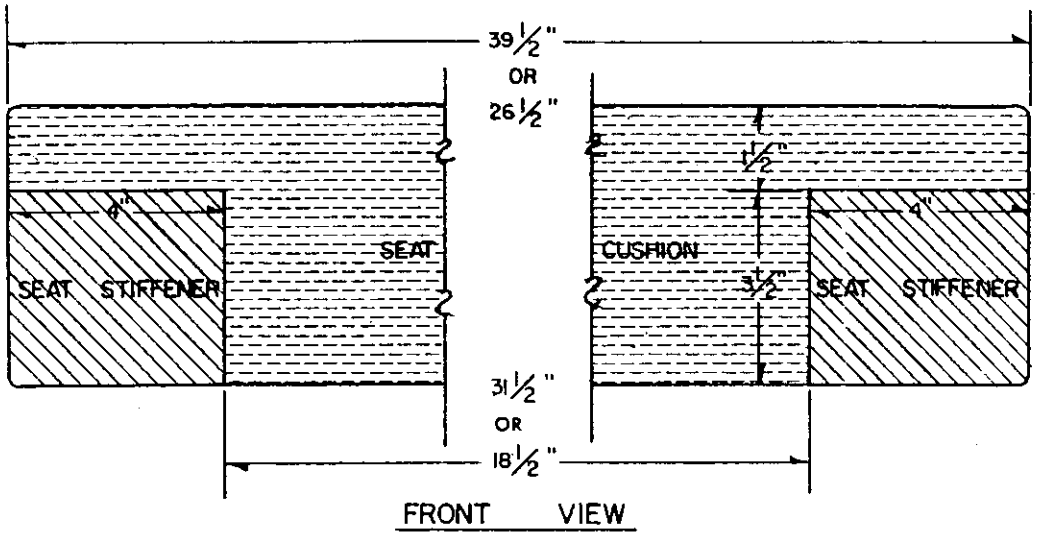
2.15. SEATS

2.15.1. The seat frames shall be constructed of the type, size, and gauge of steel as required to meet FMVSS No. 222.

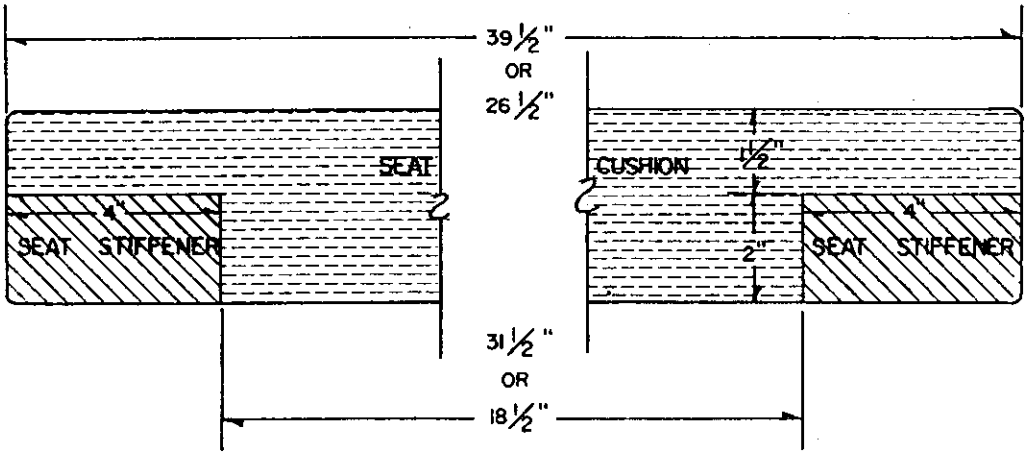
2.15.2. Seat frames shall be two, four, or six pedestal type and shall be mounted with bolts, flat washers, lock washers, and nuts, or approved equal. Where it is impossible to use bolts and nuts at certain floor points because of main cross members or floor sill interference, thread forming or cutting bolts and **lock washers** may be used.

FIGURE 7

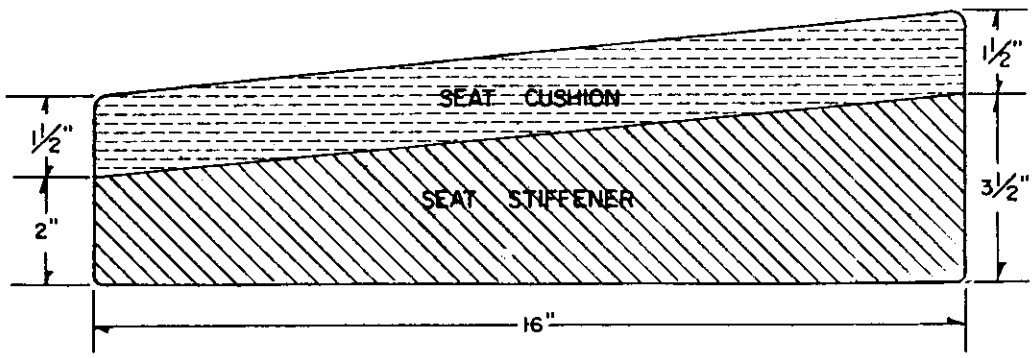
SEAT CUSHION ASSEMBLY



FRONT VIEW



REAR VIEW



SIDE VIEW

2.15.3. All buses shall meet or exceed the seat spacing and crash protection requirements of FMVSS No. 222 and Amendment. In addition, as indicated below, Texas buses shall be provided with the **minimum knee space** measured horizontally (front to back) between seat backs, approximately 4 inches above the seat cushion center. That minimum knee space shall be 24 inches for the 24 passenger bus, 24 3/4 inches for the (short wheelbase) 71 passenger bus and the 83 passenger, and 25 inches for all other buses in this specification. Allowing for manufacturer's standard tolerances, Texas requires the maximum allowable knee space on buses consistent with **overland** standard body lengths, and generally no less than the minima cited immediately above. See **TABLE NO.** 5 and Option 16.

2.15.4. The minimum aisle width between rows of seats shall be 12 inches for standard and 30 inches for wheelchair equipped buses (See Paragraph G.2.3.3, Wheelchair Lift Buses, for aisle requirements). The entire seat frame, except that section of the seat back frame which is padded and upholstered, shall be thoroughly cleaned, primed and painted. The paint shall have adhesive qualities which will not permit the removal of the paint by means of the thumbnail-scratch method without first chipping a starting place.

2.15.5. The 39 inch minimum seat cushion unit shall be designed to adequately support three passengers of 125 pounds each. The 26-inch minimum seat cushion unit shall be designed to adequately support two passengers of 125 pounds each. The seat cushion unit shall consist of a base, a spring assembly with padding or a polyurethane foam cushion assembly or a one-piece polyurethane foam cushion, and upholstery. The manufacturer shall have the option of furnishing the spring assembly with padding or the polyurethane foam cushion assembly; however, **both types of construction may not be used on the same bus body.** The seat cushion unit components shall be as follows:

2.15.5.1. Base - The base shall be 1/2 inch nominal thickness C-D interior grade plywood with exterior grade glue, identification index 32/16, manufactured in conformance with U.S. Product Standard PS 1-83 for Construction and Industrial Plywood, and identified as to veneer grade and glue bond type by the trademarks of an approved testing agency or made of approved "Donnite" material, manufactured by Donnite Corporation, Flora and Harrison, Plymouth, Indiana 46563, of equal or greater strength and thickness. **Plywood with blue stain in sapwood is not acceptable.**

2.15.5.2. Spring Assembly with Padding - The spring assembly shall be 37.5 inches long by not less than 11.875 inches wide at the bottom. The spring unit shall be constructed of 24 hourglass type coil springs having a 4 inch top and bottom diameter and fabricated from No. 10 gauge spring wire. The border wire shall be made of No. 8 gauge spring wire. (This does not preclude the use of No. 9 gauge spring wire for outside coils on the front and the sides of the spring unit.)

The method of construction for the spring unit shall be as follows:

Laced Wire Method - The coil springs shall be laced together longitudinally and transversely by pairs of two-ply 19 gauge or single-ply 17 gauge helical coiled lace wires to form a flexible top surface. The wires shall be interlocked and securely engaged with each coil at four points on all center springs, thereby producing a square design around the top ring of each coil. All outer coils shall be engaged at three different points by the lace wires, with the exception of the corner coils which are engaged at only two points. The ends of the lace wires shall be secured to the border wire. The border wire shall be rigidly fastened to each of the outside coils by 20 gauge, 3-prong metal clips. All four corner coils shall be fastened to the border wire at two points with the same type clips. The bottom of the coils shall be clinch-stapled directly to the baseboard with a minimum of three 15 gauge wire staples to each coil. The top of the spring assembly shall be covered with a cotton and sisal or cotton and coir (coconut fiber) pad not less than 1.25 inches thick before compression.

2.15.5.3. Polyurethane Foam Cushion Assembly - The foam cushion assembly shall be constructed of unfilled polyurethane foam conforming to the following physical requirements. **Rebonded polyurethane foams are not acceptable for seat cushion or seat stiffeners.**

Physical Property (ASTM D 3574)		Seat Cushion	Seat Stiffeners
Density	- lbs./cu. ft., min.	1.8	2.4
Load Deflection	- 4 inches thick at 25% Indentation-lbs., min	38	80
Indentation Load	- Ratio 65%/25%, min.	1.9	2.5
Compression Set	- 50% Deflection (22 hrs. at 158°F)-%, max.	20	20
Tensile Strength	- psi, min.	12	12
Tensile Elongation	- %, min.	225	75
Tear Resistance	- lbs./inch, min.	2.0	1.5

The seat cushion assembly shall be fabricated in accordance with the nominal dimensional requirements as shown in Figure 7.

The seat cushion shall be either of one-piece construction or may be constructed of more than one piece at the manufacturer's option. If the seat cushion is of more than one piece, the top 1.5 inches of the cushion shall be of one continuous foam piece. All parts of the seat cushion and the seat stiffeners shall be securely cemented or otherwise bonded together to form the seat cushion assembly shown on page 59.

2.15.5.4. Polyurethane Foam Cushion, One-Piece - The one-piece foam cushion shall be solid polyurethane foam conforming to the following physical requirements. **Rebonded or molded polyurethane foams are not acceptable for seat cushions.**

Physical Property (ASTM D 3574)		One-Piece Seat Cushion
Density	- lbs./cu. ft., min.	3.0
Load Deflection	- 4 inches thick at 25% Indentation - lbs., min.	50
Indentation Load	- Ratio 65%/25%, min.	2.3
Compression Set	- 50% Deflection (22 hrs. at 158°F) - %, max.	20
Tensile Strength	- psi, min.	7.5
Tensile Elongation	- %, min.	110
Tear Resistance	- lbs./inch, min.	1.5

The seat cushion dimensions shall be in accordance with the nominal dimensional requirements as shown in Figure 7.

All seat cushion materials shall meet or exceed the requirements of FMVSS No. 302, Flammability of Interior Materials for Buses.

2.15.5.5. Upholstery - The seat cushion unit shall be covered on top and four sides with a vinyl resin coated upholstering material. This material shall have a regular fire-resistant treatment and shall be artificial leather equal to coated fabrics as follows:

TABLE NO. 7

Manufacturer	Fabric	oz./yd.^{2}	oz./lin.yd.	Backing
Naugahyde	1037R	28.0	42.0	1.06 broken twill
Athol	1042FR	28.0	42.0	polyester cotton knit
Masland-Dura	6042 MXP-076	25.5	38.0	polyester cotton twill
*General Tire	2.73	24.0	38.0	polyester drill
*Uniroyal	E 7097-1	25.5	38.0	polyester knit
*Athol	536FR	25.5	38.0	polyester twill

*approved equal

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.

2.15.6. The seat backs shall slope backward to provide a comfortable seating angle. Seat backs that are set in a vertical plane or that tilt forward are not acceptable.

2.15.7. The base of the driver's seat shall be of the adjustable pedestal type or the platform type giving approximately 4 inches "Fore and Aft", and a separate minimum 1 inch vertical adjustment. The back of the driver's seat shall be heavily padded and formfitted. The pedestal or platform shall be mounted with bolts, flat washers, lock washers, and nuts except where it is impossible due to interference from floor sills or main cross members. Thread forming or cutting bolts and lock washers may be used there.

2.15.8. A Type 1 seat belt assembly conforming to FMVSS No. 209 shall be provided for the driver. The belt assembly furnished shall be equipped with reel-type retractors incorporated as part of each mounting bracket.

2.15.9. The anchored ends of the belt assembly shall be fitted with a minimum 8 inch semirigid plastic boot which will prevent that portion of the belt between the buckle and the retractor reel from contacting the floor of the bus and to keep belt from hitting the feet of the passengers in the front seat immediately behind the driver.

2.15.10. Seat belt assemblies designed with a single webbing take-up adjustment shall have the adjustable half of the belt assembly anchored to the left side of the driver's seat. The location of the seat belt anchorage shall conform to SAE Standard J383 with the driver's seat adjusted to its rearmost position.

E.3. ACCESSORIES - REQUIRED AND OPTIONAL

3.1. DEFROSTERS

Defrosting equipment shall keep the windshield, the window to the left of the driver, and 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.

3.2. FIRE EXTINGUISHERS

3.2.1. Each bus shall be equipped with at least one refillable stored pressure dry-chemical type (monoammonium phosphate or potassium bicarbonate base) fire extinguisher of at least 5 pound capacity, mounted in extinguisher manufacturer's bracket of automotive type, and located in driver's compartment in full view of and readily accessible to driver. Fire extinguisher shall bear Listing Mark of Underwriters Laboratories Inc., showing rating of not less than 2A 20-B:C.

3.2.2. Fire extinguishers shall be furnished with a pressure gauge. Fire extinguishers with nylon heads are acceptable provided they have been approved by the Specification Section, State Purchasing and General Services Commission. Example of acceptable nylon head fire extinguisher: Kidde Model 2A40B:C, 2A40B:C Rating.

Example of an approved equal fire extinguisher:

American Safety Products (ASP) Model 13000, 2A 40-B:C Rating. For those who prefer the type, this fire extinguisher is available with a 13 pound charge of combined halon gas. It is not permissable to transport these units after refilling, therefore the manufacturer offers a 5 year warranty and replacement of discharged units with a new unit at half price.

3.3. FIRST AID KIT

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

2 single units - 1 in. x 2 1/2 yds. adhesive tape
2 single units - sterile gauze pads 3 in. x 3 in. (12 per unit)
1 single unit - 3/4 in. x 3 in. adhesive bandages (100 per unit)
1 single unit - 2 in. bandage compress (12 per unit)
1 single unit - 3 in. bandage compress (12 per unit)
2 single units - 2 in. x 6 yds. sterile gauze roller bandage
2 single units - nonsterile triangular bandage approximately 40 in. x 36 in. x 54 in., with 2 safety pins
3 single units - sterile gauze 36 in. x 36 in. (U.S.P. 24 x 28 count)
3 single units - sterile eye pads (1 per unit)
1 pair - scissors

3.4. HEATER

3.4.1. 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 having a minimum free flow output rating of 45,000 BTU/hr for buses with a capacity of 35 passenger or less, and a minimum free delivery output rating of 80,000 BTU/hr for buses with a capacity greater than 35 passengers. The BTU/hr rating shall be in accordance with Standard SBMI No. 001, The School Bus Manufacturer's Institute Code for Testing and Rating Automotive Bus Hot Water Heating Equipment. The heater shall be installed near the front of the bus body with the controls readily accessible to the driver. Heater hose connections shall be installed above the floor of the bus body and through the fire wall to the engine compartment. Heated conduits inside the bus shall be insulated or shielded to prevent injury to the driver or passengers.

3.4.2. Each heater installation shall include two **all brass** shutoff valves or cocks installed as follows:

3.4.2.1. One between the heater hose connection and the water pump outlet;

3.4.2.2. One between the heater hose connection and the motor block.

3.4.3. 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.

3.4.4. 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 motor 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.

3.4.5. **When so specified in the Invitation for Bids,** a second recirculating heater shall be furnished, and 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.2.15.2. The heater shall have a minimum output rating of 40,000 BTU/hr (recirculating air rating - **not** fresh air intake rating) for buses having a capacity of 24 or 35 passengers and a minimum output rating of 60,000 BTU/hr (recirculating air rating - **not** fresh air intake rating) for buses having a capacity greater than 35 passengers. Heater hose, when used, shall conform to SAE 20R3, Class C, as defined in SAE Standard J20e.

3.5. LUGGAGE RACK

When so specified in the Invitation for Bids, a luggage rack (See Option 12) shall be mounted on top of the bus. The rack shall be a minimum of 81 inches in length on buses having a capacity of 53 passengers or less. On 59-passenger and larger buses, the rack shall be a minimum of 135 inches in length. The rack shall be a minimum of 60 inches wide. The floor or bottom of the luggage rack shall consist of minimum 19 gauge steel stiffened by the application of spot welded pressed channels or pressed-in panels. The bottom shall be flat and shall be adequately perforated for water drainage.

The side rail shall be a minimum of 0.75 inch O.D. steel tubing having a wall thickness of at least 0.0625 inch or channels of equal strength. The rack shall have a minimum of three side rails on all four sides and the top rail shall be approximately 12 inches above the flat bottom floor of the rack. Both the right and left sides of the rack shall have a minimum of four footman loops to accommodate tarpaulin tie down straps. The vertical posts shall not extend above the top rail. The ends and sides from the flat bottom floor to the roof of the bus shall be enclosed with metal flashing. The complete luggage rack shall be painted, either Black or Yellow, in accordance with the manufacturer's standard practice. The rack shall have no sharp or rough edges to cause excessive tarpaulin wear. A metal ladder mounted at the rear of the bus shall provide access to the luggage rack. **Folding steps will not be acceptable.** The luggage rack shall be mounted to the roof with rivets or bolts, nuts and lockwashers attached to each roof bow under the rack and at other places in accordance with standard industry practices.

3.6. MUD FLAPS

3.6.1. **When so specified in the Invitation for Bids,** mud flaps (See Option 14) 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 wheel housing and shall reach within approximately 8 inches of the ground when 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 while the vehicle is in reverse motion. **There shall be no advertisement on the mud flaps.**

3.6.2. **When so specified in the Invitation for Bids,** brackets only (See Option 15) for the rear mud flaps as specified above shall be installed. Brackets shall be undercoated the same as the underside of the body whether or not mud flaps are to be furnished. They shall be installed prior to undercoating.

3.7. MIRRORS

Mounting of exterior mirrors to the bus body shall be by means of bolts, nuts, and lock washers, where possible; otherwise No. 10 hexagon head sheet metal bolts with star lock washers or No. 10 hexagon head sheet metal screws with serrated surface shall be used. Exterior mirrors shall conform to the requirements of FMVSS No. 111.

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 Color No. 37038, Lusterless Black, of Federal Standard No. 595a.

3.7.1. Crossover - An exterior wide angle (crossview) metal backed mirror (minimum 40 square inches of surface area) shall be installed on the left front of the bus and shall comply with the requirements of Section IV B.1.e of Federal Safety Standard No. 17, or as amended. This mirror shall have a tripod bracket assembly.

Exception: For 83 passenger buses, one or two convex mirrors may be installed on the right side only, either mounted securely to the bracket of the exterior rearview mirror or on a separate tripod bracket, under the following conditions:

The mirror shall be adjusted to provide for localized viewing of the area from the front right corner of the bus back to the rear of the service door; and,

The mirror shall also provide a view of the front of the bus which is not within the direct view of the driver. See 3.7.2.3.

3.7.2. Exterior Rearview

3.7.2.1. Two metal-backed, exterior clear-vision rearview mirrors not less than 6 inches wide by 16 inches long shall be mounted outside, one to the left and one to the right of the driver. The right side rearview mirror shall be the split view (dual view) type, such as the Grote Manufacturing Company Model 16042, or the Duplex "T" No. T-616 as manufactured by Elmsford Die Casting Company, 4 Vernon Lane, Elmsford, New York 10523; or a split view mirror with a prefocused convex (blind spot) mirror such as Sure-View Model 7002, manufactured by Sure-View, Inc., 1337 North Meridian Street, Wichita, Kansas 67023, or approved equal.

3.7.2.2. Each exterior mirror shall be mounted in the brackets and assemblies shown on Texas State Purchasing and General Services Commission Drawings Numbered 040-35(1), 040-35(2), 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.

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

3.7.2.3. An exterior wide angle, minimum 40 square inch, convex mirror such as Grote Model No. 12182/3, or Sure Plus Model No. 1010, manufactured by Sure Plus Manufacturing Company, 641-647 W. 120th Street, Chicago, Illinois 60628, shall be installed with a tripod bracket assembly on the right front fender (right front of 83-passenger buses) of the bus for localized viewing of the total front area of the bus and the total right side area back to the service door. On 83 passenger buses, this mirror may be mounted securely to the bracket of the exterior rearview mirror.

3.7.3. Interior Rearview - A clear-vision interior rearview mirror, conforming to FMVSS No. 111, at least 6 inches high by 30 inches long and affording a good view of the road to the rear as well as of the passengers, shall be furnished and installed. The mirror shall be made of safety glass and have rounded corners and protected edges.

3.8. STIRRUP STEPS

There shall be one stirrup step and a suitably located handle on each side of bus body front for easy accessibility in cleaning windshield and lamps (except 24 passenger bus, unless necessary to clean windshield and lamps). The stirrup step shall be on or in the bumper on 83 passenger buses.

3.9. SUN VISOR

3.9.1. A two-post adjustable 6 inch by 30 inch (minimum size) sun visor with a minimum thickness of 0.125 inch and constructed of tinted plexiglass shall be installed above the interior windshield on the driver's side. Means shall be provided for tension adjustment.

3.9.2. In lieu of the above type of installation, the sun visor may be mounted to the inside rearview mirror at each end with lock type nuts . The mirror shall have an adjustable reinforcing bracket at each end to reduce any vibration distortion caused by the weight of the sun visor.

3.10. TOOLS

Jacks, lug wrenches, or other tools are not required.

3.11. WINDSHIELD WIPERS AND WASHERS

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

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

F. CHASSIS SPECIFICATIONS - 24 THROUGH 83 PASSENGER

F.1. GENERAL

1.1. GENERAL REQUIREMENTS

1.1.1. The requirements for gross vehicle weight ratings, gross axle weight ratings (front and rear) and tire sizes and load ranges, as specified in **TABLE NOS. 8-16,** pages 73-82, for each chassis are **minimum** requirements. **The requirements are for school buses with standard equipment. The added weights of optional equipment, such as air conditioning, luggage racks, lifts for the physically impaired 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.

1.1.2. The above requirements are not applicable for chassis only which are to be used by the State of Texas for remounting of bus bodies.

1.2. COLOR

The chassis, including bumpers and wheels, shall be painted Black*; cowl, fenders and hood shall be painted School Bus Yellow**.

*Federal Standard No. 595a, Color 17038.
**Federal Standard No. 595a. Color 13432.

F.2. CHASSIS FRAME AND RELATED COMPONENTS

2.1. CHASSIS FRAME SIDE MEMBERS

Each frame side member shall be of one-piece construction. If the frame side members are extended, such extension shall be designed, furnished, and guaranteed by the installing manufacturer. The installation shall be made by either the chassis or body manufacturer. Extensions of frame lengths are permissible only when such extensions are comparable in strength and configuration to the rail and welded on behind the hanger of the rear spring. This specification does not permit wheelbase extensions.

2.2. BUMPER, FRONT

The front bumper shall be furnished by the chassis manufacturer and must extend to the outer edges of the body at the bumper top line (to assure maximum fender protection). The front bumper on the 83 passenger bus shall be heavy duty transit type, not less than 0.1875 inch by 9.75 inch steel. It must be of sufficient strength to permit pushing a vehicle of equal gross weight without permanent distortion to the bumper, chassis or body.

2.3. FUEL TANK

2.3.1. All buses except the 24 and 83 passenger capacity buses shall be furnished with a fuel tank having a minimum capacity of 30 gallons. The 24 passenger bus shall be furnished with a 20 gallon (minimum) capacity tank and shall be mounted as recommended by the chassis manufacturer. The 83 passenger bus shall be furnished with a 60 gallon (minimum) capacity fuel tank.

2.3.2. Each tank (including fuel tanks provided under Options) shall be constructed of 16 gauge terneplate or equivalent and shall be equipped with baffles. Each tank may be mounted on either the right or left side of the chassis. All fuel tanks shall be in accordance with requirements of FMVSS No. 301-75 as applicable to school buses.

2.3.3. **When so specified in the Invitation for Bids,** the 47 through 71 capacity chassis shall be furnished with a fuel tank (or tanks) having a minimum capacity of 60 gallons installed by the chassis manufacturer. The 24 passenger bus shall be equipped with a fuel tank (or tanks) having a minimum capacity of 30 gallons installed by the chassis manufacturer when this option is ordered. (35 passenger bus chassis does not have an optional fuel tank available.) 83 passenger buses shall be furnished with fuel tank (or tanks) having a minimum capacity of 90 gallons installed by the chassis manufacturer when this option (No. 9) is ordered.

2.3.4. 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.

Exception: Not required on 24 passenger buses.

2.4. **STEERING, POWER**

2.4.1. The bus chassis shall be furnished with manufacturer's power steering as standard.

2.4.2. The steering gear shall be approved by the manufacturer and designed to assure safe and accurate performance when the vehicle is operated with maximum load and at maximum speed. The mechanism must provide for easy adjustment for lost motion. No changes shall be made in the steering apparatus which are not approved by the chassis manufacturer.

F.3. AXLES, SUSPENSION AND RELATED COMPONENTS

3.1. **AXLES**

3.1.1. The axle capacity for each size chassis is shown in **TABLE NOS. 8-17**, pages 73-82. **Increased axle capacities** shall be furnished to accommodate optional equipment such as diesel engines or other heavy accessories as required.

3.1.2. Rear axle ratios shall be compatible with required engines and gradeability requirements for school buses driven at governed top rated road speeds of 55 to 65 mph.

3.2. **BRAKES**

3.2.1. Hydraulic service brakes, emergency stopping system, and parking brakes for each 24, 35, 47 and 53 passenger school bus chassis shall meet the requirements set forth in FMVSS No. 105-75. Schools may order hydraulic brakes as optional equipment on 59, 65, and 71 passenger buses.

3.2.2. Air brakes - Each 59, 65, 71, 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.

3.2.2.1. Air compressor on 83 passenger bus shall have minimum 12 cu.ft. capacity.

3.2.2.2. Air tank(s) on 83 passenger bus shall be equipped with automatic waterdrain valves.

3.2.2.3. **When so specified in the Invitation for Bids,** four automatic slack adjusters shall be furnished and installed. **(For air brake equipped buses only.)**

3.2.2.4. **When so specified in the Invitation for Bids,** automatic moisture ejectors shall be furnished and installed. **(For air brake equipped buses only.)**

3.3. **SHOCK ABSORBERS**

Chassis shall be equipped with heavy-duty, double-acting front shock absorbers of sufficient size to adequately stabilize the loaded bus over rough roads.

3.4. **SPRINGS**

Springs or suspension aseemblies 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 **TABLE NOS. 8-17.** Rear springs shall be of the progressive type. If leaf type front springs are used, stationary eyes shall be protected by a fullwrapper leaf in addition to the main leaf.

3.5. TIRES AND WHEELS

3.5.1. Tires and Tubes - All tires shall be of the construction type which is furnished as standard equipment on the chassis. All tires shall be new and the tread style furnished shall be the tire manufacturer's standard design **unless otherwise specified in the Invitation for Bids.** All standard tires for the 35-71 passenger bus chassis shall be of the tube type only; tires for the 24 and 83 passenger bus chassis shall be either tube type or tubeless. Schools may order steel belted radial tubless tires as optional equipment on buses. For tire size and load range for each size chassis, see **TABLE NOS. 8-17,** pages 73-82.

3.5.2. Each chassis shall be equipped with dual rear wheels.

3.5.3. **When so specified in the Invitation for Bids,** each chassis (35 through 83 passenger) shall be equipped with a properly installed spare wheel or rim complete with carrier, but less tire and tube.

NOTE: Carrier not available for 24 passenger body; spare wheel **only** may be ordered for 24 passenger buses.

3.5.4. **When so specified in the Invitation for Bids,** the chassis shall be equipped with steel disc wheels. (See Options 24 and 25, pages 15 and 16.)

3.5.5. Wheels on 83 passenger bus shall be disc type.

3.6. HUBODOMETER

3.6.1. Each chassis shall be equipped with one hubodometer, such as Engler Instruments, 250 Culver Ave., Jersey City, New Jersey 07305 or Veeder-Root, Hartford, Connecticut 06102. Hubodometers shall be calibrated in miles and installed by the manufacturer with standard mounting bracket (preferably on the right) at the rear axle drive wheel before the bus is delivered to the school.

F.4. ENGINE AND RELATED COMPONENTS

4.1. ENGINE

4.1.1. Engines for the 24 through 71 passenger buses shall be the gasoline type unless otherwise specified. The engine for the 83 passenger bus shall be 4-cycle diesel. Engine requirements for each size chassis are specified in **TABLE NOS. 8-17,** pages 73-82. SAE net horsepower is calculated with required accessories (including the fan) installed and operating.

4.1.2. **When so specified in the Invitation for Bids,** the 24 through 71 passenger bus chassis shall be furnished with a 4-cycle **diesel engine** (Option 7). The diesel engine displacement, SAE net horsepower, and SAE net torque are given under **TABLES** on pages 73-80. Each diesel engine shall be equipped with a full-flow oil filter and a primary and a separate secondary fuel filter installed between fuel tank and injector pumps.

4.1.3. Power Requirements - Each engine provided on Texas School Buses shall meet the following minimum criteria:

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

4.1.3.2. Gradeability of 1.5% minimum at 50 mph.

4.1.3.3. Gradeability of 5% minimum at 25 mph.

4.1.3.4. Startability of 20% minimum.

4.1.3.5. Top rated road speed geared at a range from 55 to 65 mph.

4.2. ENGINE WARNING SYSTEM

Shall be provided for the 35 through 83 passenger diesel powered bus and shall be factory installed. Audible (which may also be visual) signals shall indicate to the driver when the oil pressure is too low and/or the engine temperature is too high for safe operation. These signals shall begin within 8 seconds or less after the condition begins in order that the engine can be shut down before permanent damage occurs to the engine. A manual engine shut-down device is preferred.

4.3. AIR CLEANER

Each chassis shall be equipped with a factory installed heavy-duty one quart minimum oil bath type air cleaner or its equivalent in a replaceable element type air cleaner.

4.4. 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 heavy-duty reinforced type. Thin pressed fan blades are not acceptable.

4.5. EXHAUST SYSTEM

4.5.1. The exhaust pipe, muffler, and tailpipe shall be mounted under the bus and attached to the chassis frame.

4.5.2. The tailpipe shall be constructed of seamless or electrically welded tubing of 16 gauge steel or equivalent, and shall extend at least 5 inches beyond the chassis frame. The size of the tailpipe shall not be reduced after it leaves the muffler.

4.5.3. The exhaust system shall be properly insulated from the fuel tank and tank connections by a securely attached metal shield at any point where it is 12 inches or less from tank or tank connections.

4.5.4. The noise level shall meet the current EPA "Noise Emission Standards".

4.6. GOVERNOR

A governor set to the manufacturer's recommended maximum engine speed (RPM) shall be installed by the chassis manufacturer.

4.7. OIL FILTER

An oil filter with replaceable element or cartridge type shall be provided and shall be connected by flexible oil lines if it is not of built-in or engine-mount design. Oil filter shall have an oil capacity of at least one quart.

4.8. TACHOGRAPH

A tachograph containing a combination clock/speedometer/recorder shall be installed, **when so specified in the Invitations for Bids.** (See Option 18, page 15).

F.5. TRANSMISSION AND RELATED COMPONENTS

5.1. CLUTCH

The clutch torque capacity shall be not less than 10 percent in excess of maximum net torque output of engine. All chassis of 24, 35, 47, 53, and 59 passenger capacity buses shall be equipped with a clutch of 12 inch minimum diameter. Chassis of 65 and 71 passenger capacity buses shall be equipped with a clutch of 13 inch minimum diameter or a clutch of equivalent performance.

5.2. DRIVE SHAFT GUARD

Each drive shaft section shall be equipped with protective metal guard or guards to prevent the shaft from whipping through the floor or dropping to the ground when broken.

Exception: Drive shaft guard is not required on rear engine, rear drive bus.

5.3. STANDARD TRANSMISSIONS

Unless otherwise specified in the Invitation for Bids, the standard type transmission shall be furnished on all 24 through 71 passenger buses but not the 83 passenger bus which requires an automatic transmission (See below). The transmission shall be the synchromesh (all gears except first and reverse) type. It shall be of sturdy construction, and the input torque capacity shall be at least 10 percent above the maximum net torque developed by the engine. Its design shall provide for four forward and one reverse speeds for 24, 35, 47, and 53 passenger size chassis, and five forward (direct in fifth) and one reverse speeds for 59, 65, and 71 passenger size chassis. See **TABLE NOS.** 8-15 for each size chassis.

5.4. AUTOMATIC TRANSMISSION

5.4.1. **When so specified in the Invitation for Bids,** 24 passenger buses shall be furnished with a three forward speed automatic type transmission which shall be the manufacturer's standard for this size chassis. Other buses (i.e., 35 through 71 inclusive) - shall be furnished with a minimum four forward speed type (optional) automatic transmission. The transmission shall be the Allison AT 545, or equal, which has the approval of the Commission and the Education Agency.

5.4.2. The 83 passenger bus chassis shall be furnished with an automatic transmission with a minimum of 4-forward speeds. The transmission shall be the Allison MT-643 or equal, which has the approval of the State Purchasing and General Services Commission and the Texas Education Agency.

F.6. ELECTRICAL SYSTEM

6.1. ALTERNATOR

6.1.1. The alternator with rectifier shall have an electrical output of at least 80 amperes (100 for 83 passenger) in accordance with SAE rating with a minimum charging rate of 40 amperes (50 for 83 passenger) at the manufacturer's recommended engine idle speed (12-volt system), and shall be ventilated and voltage controlled and, if necessary, current controlled. Dual belt drive shall be used with the alternators provided on the 35 through 83 passenger buses.

6.1.2. **When so specified in the Invitation for Bids,** the bus chassis (except 83 passenger) shall be equipped with a minimum 100 ampere alternator with a minimum charging output of at least 50 amperes at manufacturer's recommended engine idle speed (12 volt system) and shall be ventilated and voltage controlled and, if necessary, current controlled. Drive shall be dual belt system. (See Option 3.) This item is required on buses which are equipped with air conditioning or wheelchair lifts **and** 83 passenger buses.

6.2. BATTERY

6.2.1. The storage batteries furnished with each chassis shall be of sufficient capacity to supply current for adequate operation of the engine starter, lights, signals, heater, and all other electrical equipment required by this specification.

6.2.2. The batteries furnished with gasoline engines shall have a potential of 12 volts and shall have a minimum performance level as follows: Cold cranking capacity of not less than 360 amperes @ 0°F with a minimum 100 ampere reserve capacity (BCI Rating).

6.2.3. The batteries required for diesel engines (single or dual 12 volt or dual 6 volt) shall have a minimum performance level as follows: Cold cranking capacity of not less than 450 amperes @ 0°F with a minimum 130 ampere reserve capacity (BCI rating).

6.2.4. 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.** for requirements of diesel powered buses and other battery mounting location.)

6.2.5. The battery cables shall be one piece and of sufficient length to allow pull out or lift out of the battery for servicing or removal and arranged so as to prevent damage to the battery posts when removed.

6.3. HORNS

6.3.1. Each bus shall be equipped with horn or horns of standard make. Each horn shall be capable of producing audible sounds in a range between 82 and 102 decibels.

6.3.2. The sound level measurements shall be made at a distance of 50 feet directly in front of the vehicle in accordance with SAE J377, Performance of Vehicle Traffic Horns.

6.4. INSTRUMENTS AND INSTRUMENT PANEL

The bus shall be equipped with the following nonglare illuminated instruments and gauges mounted for easy maintenance and repair and in such a manner that each is clearly visible to the seated driver. **Indicator warning lights in lieu of gauges are not acceptable.**

(1) Speedometer

(2) Odometer

(3) Fuel Gauge

(4) Oil Pressure Gauge

(5) Water Temperature Gauge

(6) Ammeter or Voltmeter with graduated charge and discharge indications

(7) Vehicle manufacturer's standard Keyed Ignition Switch shall be provided.

(8) Upper Beam Headlamp Indicator

(9) Vacuum Gauge (Air Pressure Gauge where air brakes are used)

6.5. LAMPS

6.5.1. Each school bus shall be equipped with at least two white headlamps meeting the requirements of FMVSS No. 108. These lamps shall be furnished with a dimmer switch located at the far left of the steering column.

6.5.2. Each school bus shall be equipped with adequate parking lamps operated by a switch in common with the headlamps.

F. CHASSIS SPECIFICATIONS - 24 THROUGH 83 PASSENGER

TABLE NO. 8
24 Passenger Bus

Refer to General Requirements, Page 3

Item	1985 Min. Rqmts.	Chevrolet CP31042	GMC TP31042
GVWR, lbs	14500	14500	14500
Front Axle Capacity, lbs	5000	5000	5000
Rear Axle Capacity, lbs	11000	11000	11000
Front GAWR, lbs	4500	4500	4500
Rear GAWR, lbs	11000	11000	11000
Front Spg. Ground Rate, lbs	as req'd	2500	2500
Rear Spg. Ground Rate, lbs	as req'd	5900	5900
Wheelbase, in.	133	133	133
Front Track, in.	65.22	65.22	65.22
Rear Track, in.	62.81	62.81	62.81
Length, in.	238.8	238.8	238.8
Engine CID*	**	350-V8	350-V8
SAE Net Horsepower	**	160	160
SAE Net Torque, lb-ft	**	250	250
Transmission	4 Spd.	4 Spd.	4 Spd.
Tire Size-Load Range	Dual Rear	8.19.5E	8.19.5E
Alternator-Amperes	80	80	80

*See Option No. 7

DIESEL ENGINES (Optional)

24 Passenger	1985 Min. Rqmts.	Chevrolet	GMC
Engine Displacement-Liters	**	6.2N	6.2N
SAE Net Horsepower	**	135	135
SAE Net Torque, lb-ft	**	240	240

**See minimum power requirements in Section F.4.1.3., page 69.

Engines listed here are approved to meet or exceed power requirements under normal operating conditions. Other engines must be submitted for approval by the Commission.

F. CHASSIS SPECIFICATIONS - 24 THROUGH 83 PASSENGER

TABLE NO. 9
35 Passenger Conventional Bus

Refer to General Requirements, Page 3

Item	1985 Min. Rqmts.	Chevrolet B6P042	Ford B 600	GMC B6P042	IHC** 1753
GVWR	17400	19400	18400	19400	17400
Front Axle Capacity	5000	7500	6000	7500	5000
Rear Axle Capacity	15000	15000	15000	15000	15000
Front GAWR	5000	7000	6000	7000	5000
Rear GAWR	12400	12400	12400	12400	12400
Wheelbase, in.	149	149	151	149	152
Cowl to Axle, in.	125	125	127	125	127
Cowl to Frame End, in.	217	228	231	228	217
Engine CID*	***	350-V8	370-V8	350-V8	
SAE Net Horsepower	***	161	157	161	
SAE Net Torque, lb-ft	***	275	279	275	
Transmission Fwd. Gears	4	4	4	4	4
Front Brake Lining, in.	as shown (Disc)	14.75x1.31	180.87 Area	14.75x1.31	15x1.43
Rear Brake Lining, in.	as shown	15x5	15x5x.75	15x5	15x1.43 Disc
Tire Size-Load Range	7.50-20E	7.50-20E	7.50-20E	7.50-20E	7.50-20E
Rim Size, in.	6.0	6.5	6.0	6.5	6.0

*See Option 7, page 15, and **DIESEL TABLE** below.

**Furnished with diesel engine only - See Option 7. Tilt hood and diesel engine are standard.

DIESEL ENGINES (Optional)

35 Passenger	1985 Min. Rqmts.	Ford B 600	GMC/Chevrolet B6P042	IHC 1753
Engine Displacement-Liters	***	8.2N	8.2N	6.9N
SAE Net Horsepower	***	139	134	154.9
SAE Net Torque, lb-ft	***	326	310	312

***See minimum power requirements in Section F.4.1.3., page 69.

Engines listed here are approved to meet or exceed power requirements under normal operating conditions. Other engines must be submitted for approval by the Commission.

F. CHASSIS SPECIFICATIONS - 24 THROUGH 83 PASSENGER

TABLE NO. 10
47 Passenger Conventional Bus

Refer to General Requirements, Page 3

Item	1985 Min. Rqmts.	Chevrolet B6P042	Ford B 602	GMC B6P042	IHC 1753**
GVWR	20200	21200	20200	21200	20200
Front Axle Capacity	6000	7500	6000	7500	6000
Rear Axle Capacity	15000	15000	15000	15000	15000
Front GAWR	6000	7000	6000	7000	6000
Rear GAWR	14200	14200	14200	14200	14200
Wheelbase, in.	189	189	193	189	193
Cowl to Axle, in.	165	165	169	165	168
Cowl to Frame End, in.	268	268	280	268	274
Engine CID*	***	350-V8	370-V8	350-V8	
SAE Net Horsepower	***	161	157	161	
SAE Net Torque, lb-ft	***	275	279	275	
Transmission Fwd. Gears	4	4	4	4	4
Front Brake Lining, in.	as shown (Disc)	14.75x1.31	180.87 Area	14.75x1.31	15x1.43
Rear Brake Lining, in.	as shown	15x5	15x5x.75	15x5	15x1.43(Disc)
Tire Size-Load Range	8.25-20E	8.25-20E	8.25-20E	8.25-20E	8.25-20E
Rim Size, in.	6.5	6.5	6.5	6.5	6.5

*See Option 7, page 15, and **DIESEL TABLE** below.

**Available only when Option 7 is ordered. Tilt hood and diesel engine are standard.

DIESEL ENGINES

47 Passenger	1985 Min. Rqmts.	Ford B60	GMC/Chevrolet B6P042	IHC 1753
Engine Displacement-Liters	***	8.2N	8.2N	6.9N
SAE Net Horsepower	***	159	153	154.9
SAE Net Torque, lb-ft	***	352	336	312

***See minimum power requirements in Section F.4.1.3., page 69.

Engines listed here are approved to meet or exceed power requirements under normal operating conditions. Other engines must be submitted for approval by the Commission.

F. CHASSIS SPECIFICATIONS - 24 THROUGH 83 PASSENGER

TABLE NO. 11
53 Passenger Conventional Bus

Refer to General Requirements, Page 3

Item	1985 Min. Rqmts.	Chevrolet B6P042	Ford B 602	GMC B6P042	IHC 1753**
GVWR	20200	21200	20200	21200	20200
Front Axle Capacity	6000	7500	6000	7500	6000
Rear Axle Capacity	15000	15000	15000	15000	15000
Front GAWR	6000	7000	6000	7000	6000
Rear GAWR	14200	14200	14200	14200	14200
Wheelbase, in.	217	218	217	218	218
Cowl to Axle, in.	193	194	193	194	193
Cowl to Frame End, in.	295	295	323	295	305
Engine CID*	***	350-V8	370-V8	350-V8	
SAE Net Horsepower	***	161	157	161	
SAE Net Torque, lb-ft	***	275	279	275	
Transmission Fwd. Gears	4	4	4	4	4
Front Brake Lining, in.	as shown (Disc)	14.75x1.31	180.87 Area	14.75x1.31	15x1.43
Rear Brake Lining, in.	as shown	15x5	15x5x.75	15x5	15x1.43(Disc)
Tire Size-Load Range	8.25-20E	8.25-20E	8.25-20E	8.25-20E	8.25-20E
Rim Size, in.	6.5	6.5	6.5	6.5	6.5

*See Option 7, page 15, and **DIESEL TABLE** below.

**Available only when Option 7 is ordered. Tilt hood and diesel engine are standard.

DIESEL ENGINES

53 Passenger (Conv.)	1985 Min. Rqmts.	Ford B60	GMC/Chevrolet B6P042	IHC 1753
Engine Displacement-Liters	***	8.2N	8.2N	6.9N
SAE Net Horsepower	***	159	153	154.9
SAE Net Torque, lb-ft	***	352	336	312

***See minimum power requirements in Section F.4.1.3., page 69.

Enginesd listed here are approved to meet or exceed power requirements under normal operating conditions. Other engines must be submitted for approval by the Commission.

F. CHASSIS SPECIFICATIONS - 24 THROUGH 83 PASSENGER

TABLE NO. 12
59 Passenger Bus (Full Air Brake Standard)

Refer to General Requirements, Page 3

Item	1985 Min. Rqmts.	Chevrolet B6P042	Ford B 70	GMC B6P042	IHC 1753***
GVWR	23660	23660	24100	23660	23660
Front Axle Capacity	7500	7500	8000	7500	7500
Rear Axle Capacity	17000	17500	17500	17500	17000
Front GAWR	7500	7500	8000	7500	7500
Rear GAWR	16160	16160	16160	16160	16160
Wheelbase, in.	235	235	237	235	235
Cowl to Axle, in.	211	211	213	211	211
Cowl to Frame End, in.	323	323	345	323	329
Engine CID**	****	350-V8	370-V8	350-V8	
SAE Net Horsepower	****	161	157	161	
SAE Net Torque, lb-ft	****	275	279	275	
Transmission Fwd. Gears*	5	5	5	5	5
Front Brake Lining, in.	15x3.5	15x4	15x4	15x4	15x3.5
Rear Brake Lining, in.	16.5x5	16.5x6	16.5x7	16.5x6	16.5x6
Tire Size-Load Range	9.00-20E	9.00-20E	9.00-20E	9.00-20E	9.00-20E
Rim Size, in.	7.0	7.0	7.0	7.0	7.0

*Direct in fifth gear.

See Option 7, page 15 and **DIESEL TABLE below.

***Available only when Option 7 is ordered. Tilt hood and diesel engine are standard.

DIESEL ENGINES

59 Passenger	1985 Min. Rqmts.	Ford B70	GMC/Chevrolet B6P042	IHC 1753
Engine Displacement-Liters	****	8.2N	8.2N	6.9N
SAE Net Horsepower	****	159	153	154.9
SAE Net Torque, lb-ft	****	352	336	312
Front Axle Capacity, lbs	9000	9000	9000	9000

****See minimum power requirements in Section F.4.1.3., page 69.

Engines listed here are approved to meet or exceed power requirements under normal operating conditions. Other engines must be submitted for approval by the Commission.

F. CHASSIS SPECIFICATIONS - 24 THROUGH 83 PASSENGER

TABLE NO. 13
65 Passenger Bus (Full Air Brake Standard)

Refer to General Requirements, Page 3

Item	1985 Min. Rqmts.	Chevrolet B6P042	Ford B 70E	GMC B6P042	IHC 1753***
GVWR	24500	25000	25500	25000	24500
Front Axle Capacity	7500	7500	8000	7500	7500
Rear Axle Capacity	17000	17500	17500	17500	17000
Front GAWR	7500	7500	8000	7500	7500
Rear GAWR	17000	17500	17500	17500	17000
Wheelbase, in.	254	254	255	254	254
Cowl to Axle, in.	229	230	231	230	229
Cowl to Frame End, in.	349	349	377	349	359
Engine CID**	****	350-V8	370-V8	350-V8	
SAE Net Horsepower	****	161	157	161	
SAE Net Torque, lb-ft	****	275	281	275	
Transmission Fwd. Gears*	5	5	5	5	5
Front Brake Lining, in.	15x3.6	15x4	15x4	15x4	15x3.5
Rear Brake Lining, in.	16.5x5	16.5x6	16.5x7	16.5x6	16.5x6
Tire Size-Load Range	9.00-20F	9.00-20F	9.00-20F	9.00-20F	9.00-20F
Rim Size, in.	7.0	7.0	7.0	7.0	7.0

*Direct in fifth gear.

See Option 7, page 15, and **DIESEL TABLE below.

***Available only when Option 7 is ordered. Tilt hood and diesel engine are standard.

DIESEL ENGINES

65 Passenger	1985 Min. Rqmts.	Ford B70	GMC/Chevrolet B6P042	IHC 1753
Engine Displacement-Liters	****	8.2N	8.2N	6.9N
SAE Net Horsepower	****	159	153	154.9
SAE Net Torque, lb-ft	****	352	336	312
Front Axle Capacity, lbs	9000	9000	9000	9000

****See minimum power requirements in Section F.4.1.3., page 69.

Engines listed here are approved to meet or exceed power requirements under normal operating conditions. Other engines must be submitted for approval by the Commission.

P. CHASSIS SPECIFICATIONS - 24 THROUGH 83 PASSENGER

TABLE NO. 14
71 Passenger-Short W/B Bus (Full Air Brake Standard)

Refer to General Requirements, Page 3

Item	1985 Min. Rqmts.	Chevrolet B6P042	Ford B700	GMC B6P042	IHC 1753***
GVWR	26500	26500	27000	26500	26500
Front Axle Capacity	7500	7500	8000	7500	7500
Rear Axle Capacity	19000	19000	19000	19000	19000
Front GAWR	7500	7500	8000	7500	7500
Rear GAWR	19000	19000	19000	19000	19000
Wheelbase, in.	254	254	255	254	254
Cowl to Axle, in.	229	230	231	230	229
Cowl to Frame End, in.	349	349	377	349	359
Engine CID**	****	366-V8	370-V8	366-V8	
SAE Net Horsepower	****	184	181	184	
SAE Net Torque, lb-ft	****	300	295	300	
Transmission Fwd. Gears*	5	5	5	5	5
Front Brake Lining, in.	15x3.5	15x4	15x4	15x4	15x3.5
Rear Brake Lining, in.	16.5x7	16.5x7	16.5x7	16.5x7	16.5x7
Tire Size-Load Range	10.00-20F	10.00-20F	10.00-20F	10.00-20F	10.00-20F
Rim Size, in.	7.5	7.5	7.5	7.5	7.5

*Direct in fifth gear.

See Option 7, page 15, and **DIESEL TABLE below.

***Available only when Option 7 is ordered. Tilt hood and diesel engine are standard.

DIESEL ENGINES

71 Passenger SWB	1985 Min. Rqmts.	Ford B70	GMC/Chevrolet B6P042	IHC 1753
Engine Displacement-Liters	****	8.2N	8.2N	6.9N
SAE Net Horsepower	****	159	153	154.9
SAE Net Torque, lb-ft	****	352	336	312
Front Axle Capacity, lbs	9000	9000	9000	9000

****See minimum power requirements in Section F.4.1.3., page 69.

Engines listed here are approved to meet or exceed power requirments under normal operating conditions. Other engines must be submitted for approval by the Commission.

F. CHASSIS SPECIFICATIONS - 24 THROUGH 83 PASSENGER

TABLE NO. 15
71 Passenger-LWB Bus (Full Air Brake Standard)

Refer to General Requirements, Page 3

Item	1985 Min. Rqmts.	Chevrolet B6P042	Ford	GMC B6P042	IHC 1753***
GVWR	27500	27500	28000	27500	28000
Front Axle Capacity	9000	9000	9000	9000	9000
Rear Axle Capacity	19000	19000	19000	19000	19000
Front GAWR	9000	9000	9000	9000	9000
Rear GAWR	18500	18500	19000	18500	19000
Wheelbase, in.	274	274	275	274	276
Cowl to Axle, in.	250	250	251	250	251
Cowl to Frame End, in.	368	368	387	368	387
Engine CID**	****	366-V8	370-V8	366-V8	
SAE Net Horsepower	****	184	181	184	
SAE Net Torque, lb-ft	****	300	290	300	
Transmission Fwd. Gears*	5	5	5	5	5
Front Brake Lining, in.	15x4	15x4	15x4	15x4	15x4
Rear Brake Lining, in.	16.5x7	16.5x7	16.5x7	16.5x7	16.5x7
Tire Size-Load Range	10.00-20F	10.00-20F	10.00-20F	10.00-20F	10.00-20F
Rim Size, in.	7.5	7.5	7.5	7.5	7.5

*Direct in fifth gear.

See Option No. 7, page 15 and **DIESEL TABLE below.

***Available only when Option 7 is ordered. Tilt hood and diesel engine are standard.

DIESEL ENGINES

71 Passenger LWB	1985 Min. Rqmts.	Ford	GMC/Chevrolet B6P042	IHC 1753
Engine Displacement-Liters	****	8.2N	8.2N	6.9N
SAE Net Horsepower	****	159	153	154.9
SAE Net Torque, lb-ft	****	352	336	312
Front Axle Capacity, lbs	9000	9000	9000	9000

****See minimum power requirements in Section F.4.1.3., page 69.

Engines listed here are approved to meet or exceed power requirements under normal operating conditions. Other engines must be submitted for approval by the Commission.

TABLE NO. 16
83 Passenger (Full Air Brake) Front Engine Bus

Refer to General Requirements, Page 3

SERIES I Item	1985 Min. Rqmts.	Blue Bird Blue Bird	Wayne 5N3906L IHC 1853FC
GVWR, lbs	34000	34000	34900
Front Axle Capacity, lbs	13200	13200	13200
Rear Axle Capacity, lbs	22000	23000	22000
Front GAWR, lbs	13180	13180	13180
Rear GAWR, lbs	21720	23000	21720
Wheelbase, in.	236	246.5	236
Engine Displacement-Liters	**	8.2T	7.6N
SAE Net Horsepower	**	188.8	198.3
SAE Net Torque, lb-ft	**	427	476
Automatic Transmission*	MT 643	MT 643	MT 643
Front Brake Lining, in.	16.5x5	16.5x5	16.5x5
Rear Brake Lining, in.	16.5x7	16.5x7	16.5x7
Brake Lining Area, sq. in.	754	754	782
Tire Size-Load Range	11.00x 20G	11.00Rx22.5XH	11.00x20G
Rim Size, in.	7.5	7.5	8.0

*Direct in fourth gear.

**See minimum power requirements in Section F.4.1.3., page 69.

Engines listed here are approved to meet or exceed power requirements under normal operating conditions. Other engines must be submitted for approval by the Commission.

TABLE NO. 17
83 Passenger (Full Air Brake) Rear Engine Bus

Refer to General Requirements, Page 3

SERIES II Item	1985 Min. Rqmts.	Blue Bird	Thomas
GVWR, lbs	33840	34000	33840
Front Axle Capacity, lbs	13200	13200	13200
Rear Axle Capacity, lbs	23000	23000	23000
Front GAWR, lbs	12080	13180	12080
Rear GAWR, lbs	21760	23000	21760
Wheelbase, in.	246.5	246.5	265
Engine Displacement-Liters	**	8.2T	8.2T
SAE Net Horsepower	**	188.8	188.8
SAE Net Torque, lb-ft	**	427	427
Automatic Transmission*	MT 643	MT 643	MT 643
Front Brake Lining, in.	16.5x5	16.5x5	16.5x6
Rear Brake Lining, in.	16.5x7	16.5x7	16.5x8.625
Brake Lining Area, sq. in.	754	754	988
Tire Size-Load Range	10.00x 20H	11.00Rx22.5XH	10.00x20H
Rim Size, in.	7.5	7.5	7.5

*Direct in fourth gear.

**See minimum power requirements in Section F.4.1.3., page 69.

Engines listed here are approved to meet or exceed power requirements under normal operating conditions. Other engines must be submitted for approval by the Commission.

G. WHEELCHAIR LIFT SPECIFICATIONS

The following lift specifications cover one type wheelchair lift, and special requirements for passenger safety and wheelchair retention.

G.1. (OPTIONS 28, 29, 30) - FLOOR-MOUNTED WHEELCHAIR LIFT, ELECTRIC (HYDRAULIC OR MECHANICAL) (To be furnished only when specified in the Invitation for Bids for 15-71 passenger buses.)

1.1. GENERAL

1.1.1. This section describes a floor mounted, 12 VDC electric-hydraulic or electric-mechanical operated wheelchair lift with a minimum 700 pounds lifting capacity. The vertical lift (platform travel) shall be a minimum of 30 inches. Design of lift shall be one which is self-contained with mounting directly to the existing vehicular body floor.

1.1.2. All parts which are not specifically mentioned, that are necessary for the unit to be complete and ready for operation or which are normally furnished as standard equipment, shall be furnished by the successful bidder. All parts shall conform in strength, quality, and workmanship to the accepted standards of the industry.

1.1.3. The wheelchair lift described in the following paragraphs shall be installed by bus body manufacturer or authorized dealers of lift manufacturers.

1.1.4. Repair manual, parts list and instructions for adjustment of hydraulic valves, mechanical parts, and electrical equipment, shall be furnished with each lift ordered.

1.1.5. Wheelchair lift equipped buses shall be provided with alternators of a minimum 100 ampere rating and at least 50 ampheres at the engine manufacturer's recommended idle speed (RPM).

1.2. FRAME

Frame of lift shall be constructed of heavy-duty steel and designed to support platform extention, toe board and other parts necessary for proper operation, plus a minimum of 700 pounds additional weight. Installation shall be such that vibrations will be minimal.

1.3. PLATFORM - AUTOMATIC FOLDING TYPE

1.3.1. The platform shall be of sturdy construction and covered with minimum 0.125 inch safety plate steel or 0.125 inch expanded metal (open grate) with maximum 0.75 inch openings. Minimum dimensions of platform shall be not less than 29 inches in width and 43 inches long. Any portion of platform in the folded (travel position) which obstructs window vision shall be covered with expanded metal.

1.3.2. Action of lift must be power up and controlled descent, with slow (gentle) movement. Design of platform must be such that it will be level at all times during raising and lowering action. Load limit switch shall also be installed on platform to prevent accidental folding while loaded with wheelchair passenger.

1.3.3. Safety rails, minimum 0.125 inch by 1 inch height on both sides shall be provided. The front of lift shall have a folding type safety rail not less than 3 inches in height. Safety rail folding action may be either manual or automatic.

1.3.4. Toe board, angled approximately 8 degrees below horizontal, shall be installed on front end of platform to provide easy loading and unloading of wheelchairs.

1.4. HYDRAULIC CYLINDERS AND COMPONENTS

1.4.1. Hydraulic cylinders (on electric-hydraulic lifts) shall be installed for lift operations. Piston rod diameter of each cylinder shall be not less than 0.75 inch. Cylinders shall have a minimum of 34 inches extension action and capability for lifting a minimum of 700 pounds.

1.4.2. The hydraulic system shall be equipped with adjustable valves to control speed of cylinders used in each separate action of lift. The system shall also be equipped with either a relief valve or other mechanical means to allow the platform to be lowered and raised for entrance or exit of wheelchair passengers in case of power failure. A bypass valve, or other means, shall be provided to prevent the lifting of the bus by over extending the hydraulic cylinders.

1.4.3. Reservoir for hydraulic oil shall be furnished and installed in an accessible location to allow easy checking of oil level and filling as necessary. Oil capacity and type to be as recommended by manufacturer of lift.

1.4.4. Hose, hose fittings and hydraulic fittings shall meet the requirements of SAE J517d, J516b, J514j, respectively, for nominal size(s) furnished.

1.4.5. Weather and dust protection shall be provided for exposed hydraulic cylinders, pumps and any other parts requiring such protection for proper durable operation.

1.5. ELECTRICAL SYSTEM

1.5.1. Motor shall be heavy-duty, 12 VDC type with shaft running on bearings. The motor, electric wiring, switches and any connections or components likely to pose a safety hazard shall be enclosed in an insulated housing(s) to protect passengers and equipment.

1.5.2. Wiring and wiring connectors shall meet requirements of SAE J561b.

1.6. SHIELDS, SAFETY

Safety shields (full height of lift), or equally effective devices, shall be provided on lift to completely cover hydraulic cylinders, frame of lift or any mechanical assemblies to protect passengers from moving parts (scissor action) of lift. Design and material for safety shields shall be that recommended by bus body or lift manufacturer. The effectiveness of the safety shields will be the responsibility of the company or firm installing wheelchair lift.

1.7. WHEELCHAIR LIFT CONTROLS

1.7.1. Controls for each movement of lift shall be through a remote pendant-type control or equivalent, with automatic return-to-off switches. Electrical cables shall be good quality copper, covered by heavy-duty rubberized sheath and of sufficient length to allow operation of lift from either inside or outside of bus.

1.7.2. Safety switch shall be installed at or near service doors to prevent operation of lift, except when all special service doors are substantially open.

1.8. MOUNTING

1.8.1. The lift shall be mounted on right side (curb side) of vehicle to body floor and securely bolted in place. Floor frame shall be reinforced as required to support lift and load. Lift shall be positioned approximately 36 inches behind main entrance door for 24 through 71 passenger buses leaving sufficient space for one regular bus seat or one wheelchair. **NOTE: If body is designed so space specified above is not available, lift shall be mounted as far forward as practical to minimize floor space loss.**

1.8.2. Exception: See Option (30) - School district may specify rear curb side mounting of lift and wheelchair positions for the 24 through 71 passenger buses only.

1.8.3. Chassis springs and suspension shall be adjusted to compensate for this additional weight on the curb side.

1.9. DOORS, SPECIAL SERVICE

1.9.1. The special service door(s) may be the standard double swingout doors or sliding door (with glass) furnished by vehicle manufacturers on vehicles used for converted van buses (15 passenger capacity), or the special service doors shall be constructed of zinc coated steel (G-60), minimum 0.0396 inch thickness and meeting ASTM Specification A-525. Door widths may be either standard widths or as required for lift furnished. The doors shall extend from the window header to the bottom of floor line.

1.9.2. Doors, other than vehicle manufacturer's standard, shall be installed using piano or butt type hinges and attached to body by means of rivets or bolts, nuts and lock washers. **NOTE: Neither metal screws nor self-tapping bolts are acceptable** (except for alignment purposes). When self-tapping bolts are used to align doors, they shall be tack-welded at the head.

1.9.3. Exterior side(s) of special service doors shall have two rub rails with end caps at the same level as side rub rails. The rub rails and installation shall be in accordance with requirements outlined in Paragraph **C.2.8. and E.2.9.**

1.9.4. The door(s) opening operation may be either manual, vacuum, pneumatic or electrical. Controls for doors, other than manually operated, shall be located in driver's compartment and designed to allow easy manual opening in case of an emergency. A **flashing amber signal light**, mounted near the other dashboard instruments, shall warn the driver when the ignition switch is activated and the special service doors are not completely closed.

1.9.5. Drip rails shall be furnished full length over service doors.

1.9.6. Doors, when closed and lift is in travel position, shall be water and weather tight.

1.9.7. A device shall be provided on the swing-out type door to hold it (them) in the fully opened position.

G.2. PASSENGER SAFETY AND WHEELCHAIR RETENTION DEVICES

2.1. LAMP, INTERIOR, LIFT COMPARTMENT

2.1.1. The lift compartment shall have one interior lamp installed in roof panel, above center of lift compartment, to illuminate platform area. Lamp shall be minimum 15 candlepower.

2.1.2. The lamp shall be one of the approved lamps listed in Paragraph E.1.4.4.2., of this specification.

2.2. PAINTING

2.2.1. Exterior side of special service doors shall be primed and painted in accordance with painting requirements in Paragraph E.1.8., of this specification.

2.2.2. Interior side of door(s) shall be painted manufacturer's standard color but must match interior color of bus.

2.3. WHEELCHAIR LOCK(S) (RETAINERS) AND SEAT BELTS

2.3.1. Wheelchair locks, adjustable type for varying chair widths from 13 inches to 30 inches, shall be provided for **wheelchair capacity specified on face of the Invitation for Bids.**

2.3.2. The wheelchair lock(s) shall be of heavy-duty steel and designed to permit quick locking/release of chair wheels. The wheelchair lock(s) may be designed to lock each chair wheel individually or both wheels simultaneously by means of a lever control or other device located between the two wheel locks. Each wheelchair lock combination shall be capable of withstanding a minimum force of 5000 pounds.

NOTE: Wheelchair locks which utilize webbed cloth belts are not acceptable.

2.3.3. Preferred placement of wheelchair lock(s) which may provide for side facing wheelchairs, is in the front section of bus body, securely mounted to side of body. The locks shall be positioned so as to provide an aisle width sufficient for moving large wheelchairs from their locking locations to the wheelchair lift and to the emergency door. In no case shall the aisle in this area be less than 30 inches. Wheelchair positions in other than the front section of bus shall be as recommended by body manufacturer to provide number of wheelchair spaces which are specified in the Invitation for Bids. In buses which have an interior width of at least 90 inches, 30 inch minimum width seats may be used on either or both sides where necessary to construct the required 30 inch aisle. For buses with less than 90 inch interior widths, 26 inch minimum seats may be used where necessary to construct the required 30 inch minimum aisle if this cannot be done with 30 inch minimum width seats.

EXCEPTION: See Option (30) School district may specify rear mounting of wheelchair lift and wheelchair positions for 24 through 71 passenger buses.

NOTE: Number of wheelchair positions required will be **specified on face of the Invitation for Bids.** Successful bidder shall provide locks mounted (positioned) to meet requirements of Paragraph G.2.3.2.

2.3.4. Seat belts shall be provided for each wheelchair (**number required to be in accordance with chair capacity specified on face of the Invitation for Bids**). The seat belt assemblies shall conform to FMVSS No. 209 for buses. The belt assembly furnished shall be equipped with reel-type retractors incorporated as part of each mounting bracket.

2.4. **FLOOR COVERING**

Aisle floor covering shall be the same as required in Paragraphs E.2.4.3. of this specification. Floor in area of wheelchairs and front of lift shall be smooth and free of projections.

H. AIR CONDITIONING SPECIFICATIONS

(Option 1 and 2) for 15 and 19 passenger school bus bodies.
(To be furnished only when specified in Invitation for Bids.)

H.1. SPECIAL REQUIREMENTS

Small school buses ordered with Option 1 or 2, Air Conditioning, shall be furnished with the following accessories:

1.1. Alternator with a minimum rating of 100 amperes shall provide a minimum 40 amps at manufacturer's recommended engine idle speed for the 19 passenger bus and 50 amps at idle speed for the 15 passenger bus.

1.2. Plywood floor covering, minimum 5/8 inch nominal thickness, installed over existing or manufacturer's standard steel floor for insulation (See Paragraph C.2.3.1. for plywood requirements).

1.3. Windshield and all windows tinted to reduce light transmittance by approximately 30% (See also Option 10).

H.2. GENERAL

2.1. This specification outlines performance requirements for the efficient air conditioning of small vehicle type school buses.

2.2. Air conditioners furnished to meet the requirements of this specification shall be the mechanical vapor compression refrigeration type. The refrigerant for the system must be nontoxic, nonflammable, and nonexplosive. The air conditioner shall conform to SAE J639, SAFETY PRACTICES FOR MECHANICAL VAPOR COMPRESSION REFRIGERATION EQUIPMENT OR SYSTEMS USED TO COOL PASSENGER COMPARTMENTS OF MOTOR VEHICLES.

2.3. Any item not mentioned in the components section, **H.4.**, page 87, which is necessary for complete operation or installation shall be furnished.

2.4. Air conditioning units furnished under this specification shall be of the current year's production.

H.3. REQUIREMENTS

3.1. Cooling capacity (in BTU/hr. @ 95°F) shown below is approximate rating only for small vehicle type school buses. The BTU/hr rating for either bus size, with full passenger capacity, shall be of sufficient capacity to maintain a minimum interior temperature of 75°F or lower throughout the entire passenger compartment while traveling at 30 miles per hour, with an exterior ambient temperature of 100°F. The air conditioner unit(s) shall be capable of maintaining an 80°F interior temperature with the bus engine running at idle with an exterior ambient temperature of 100°F. **Interior cooling will be measured at 50 percent relative humidity.**

SIZE	BTU/HR RATING (Minimums) STANDARD COOLING	EXTRA COOLING
15 passenger (614 cu. ft. approx.)	19,245	33,500
19 passenger (790 cu. ft. approx.)	25,660	40,000

NOTE: The air conditioning system furnished to provide the minimum cooling capacity above may be accomplished by either one or two evaporator coils.

3.2. Each air conditioner shall produce sufficient energy for simultaneous cooling, circulating, cleaning, and dehumidifying the air stream.

H. AIR CONDITIONING SPECIFICATIONS

3.3. Air Flow Rate - Flow rate shall be a minimum of 450 CFM for the 15 passenger bus and a minimum of 900 CFM for the 19 passenger bus with standard cooling. The values shall be 900 CFM and 1200 CFM for the 15 and 19 passenger buses, respectively, when the extra cooling option (2) is ordered.

H.4. COMPONENTS

4.1. **Compressor** - The compressor shall be the chassis engine mount type and compatible with engine RPM. Oiling of all moving parts shall be accomplished automatically. An automatic (electric) clutch shall be provided on the compressor. Compressor shall have not less than a 10 cubic inch displacement. A larger displacement shall be furnished if required for each unit provided.

4.2. **Condenser** - The condenser shall be mounted as recommended by manufacturer of unit. Construction of the condenser shall be of nonferrous metal tubes and metal fins securely bonded to the condenser tubing. Fittings and joints shall be brazed.

4.3. **Refrigerant Dryer** - An adequate dryer shall be installed in the refrigerating circuit.

4.4. **Evaporator (Cooling Coil)** - The cooling coil shall be of the copper-tube, metal-fin type with the fins securely bonded to the tubes. Fittings and joints shall be brazed or welded.

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

4.6. **Controls** - A control box or panel shall be permanently installed to house inside temperature and fan speed(s) controls. The control box or panel shall be located in driver's compartment.

H.5. IDENTIFICATION

Each unit shall have affixed a legible and durable nameplate with the following information:

5.1. Name and address of manufacturer.

5.2. Cooling capacity (BTU/hr).

5.3. Type of refrigerant and recommended operating charge.

H.6. INSTALLATION

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

6.2. **Poor or shoddy installation will be grounds for immediate rejection of the complete bus.**

H.7. PERFORMANCE TESTING

Portions of ASHRAE 16-69, Methods of Testing for Rating Room Air Conditioners, will be used to test:

7.1. Cooling capacity.

7.2. Recirculation and ventilation of air quantity.

H.8. AVAILABILITY OF SERVICE AND REPAIR PARTS

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