KKK-B-1579B
October 1, 1985
SUPERSEDING
KKK-B-1579A
February 1, 1980

FEDERAL SPECIFICATION

BUSES, MOTOR: SCHOOL, WITH HIGH HEADROOM, 20-, 28-, 36-, 44-, 58-PASSENGER, TWO-WHEEL DRIVE

This Federal specification has been approved by the Commissioner, Federal Supply Service, General Services Administration, for the use of all Federal agencies.

1. SCOPE

* 1.1 Scope. This specification covers gasoline and diesel engine driven, high headroom, two wheel drive school buses. Buses shall have an engine mounted partially (snub nose) or completely forward of the windshield. Vehicles procured under this specification are commercial items which shall be warranted (by a single prime contractor) as specified in 6.4 or in procurement documents.

1.2 Classification. Buses shall be of the following types as specified (see 6.2):

Type I	- 20 adult passenger
Type II	- 28 adult passenger
Type III	- 36 adult passenger
Type IV	- 44 adult passenger
Type V	- 58 to 60 school-age passenger
Type VI	- 48 school-age passenger
Type VII	- 36 school-age passenger

2. APPLICABLE DOCUMENTS

2.1 Government documents.

* 2.1.1 Specifications, standards, and handbooks. Unless otherwise specified, the following specifications, standards, and handbooks of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DoDISS) specified in the solicitation form a part of this specification to the extent specified herein.

SPECIFICATIONS

FEDERAL

O-E-915	- Extinguishers, Fire, Dry-Chemical (Hand-Portable).
W-B-131	- Battery, Storage: Vehicular, Ignition, Lighting and Starting.
ZZ-T-381	- Tires, Pneumatic, Vehicular (Highway).

FSC-2310

STANDARDS
FEDERAL
FED. STD. 297 - Rustproofing of Commercial (Nontactical) Vehicles.
FED. STD. 595 - Colors.

MILITARY
MIL-B-46176 - Brake Fluid, Silicone, Automotive, All Weather, Operational and Preservative.

STANDARDS
MILITARY
MIL-STD-1223 - Nontactical Wheeled Vehicles Treatment, Painting, Identification Marking and Data Plate Standards
MIL-STD-1474 - Noise Limits for Army Materiel.

* 2.1.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this specification to the extent specified herein.

* DEPARTMENT OF TRANSPORTATION (DoT)
Federal Motor Carrier Safety Regulations.
Federal Motor Vehicle Safety Standards.

(Application for copies should be addressed to the Department of Transportation, Federal Highway Administration, Washington, D.C. 20591.)

* ENVIRONMENTAL PROTECTION AGENCY (EPA)
Control of Air Pollution from New Motor Vehicles and New Motor Vehicle Engines.
Noise Emission Standards for Transportation Equipment - Medium and Heavy Trucks.

(Application for copies should reference the Code of Federal Regulations, 40 CFR, and the Federal Register and should be addressed to the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.)

(Copies of specifications, standards, handbooks, drawings, and publications required by manufacturers in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting officer.)

State of California:

Vehicle Code of California.

(Application for copies should be addressed to Department of Motor Vehicles, 2570 25th Street, Sacramento, CA 95809).

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. The issues of the documents which are indicated as DoD adopted shall be the issue listed in the current DoDISS and the supplement thereto, if applicable.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM STANDARDS

ASTM Designation: A525 - Specifications for General Requirements for Delivery of Zinc-Coated (Galvanized) Iron or Steel Sheets, Coils and Cut Lengths Coated by the Hot-Dip Method.

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

* SAE, INC.

SAE Standards and Recommended Practices

	J245	- Engine Rating Code - Spark Ignition.
	J381	- Windshield Defrosting Systems Test Procedure - Trucks, Buses and Multi-Purpose Vehicles.
	J382	- Windshield Defrosting Systems Performance Requirements Trucks, Buses and Multi-purpose Vehicles.
	J537	- Storage Batteries (DoD adopted).
	J551	- Performance Levels and Methods of Measurement of Electromagnetic Radiation From Vehicles and Devices (20-1000 MHz).
*	J588	- Turn Signal Lamps.
*	J589	- Turn Signal Switch.
	J683	- Tire Chain Clearance - Trucks, Buses, and Combinations of Vehicles (DoD adopted).
	J688	- Truck Ability Prediction Procedure (DoD adopted).
	J816	- Engine Test Code - Spark Ignition and Diesel.
*	J1349	- Engine Power Test Code - Spark Ignition and Diesel.

(Applications for copies should be addressed to SAE, Inc., 400 Commonwealth Drive, Warrendale, PA 15096.)

THE TIRE AND RIM ASSOCIATION, INC.
Yearbook.

(Application for copies should be addressed to The Tire and Rim Association, Inc., 3200 W. Market Street, Akron, OH 44313.)

(Industry association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies.)

* 2.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein, the text of this specification shall take precedence.

3. REQUIREMENTS

* 3.1 Standard vehicle and accessories. Except as specified in 3.1.1 through 3.1.1.11, the vehicles, components, assemblies, and accessories to be delivered under the contract shall be standard or optional items, which meet or exceed the requirements of this specification. All chassis items shall be as represented in the chassis manufacturer's technical data, and special bodies or mounted equipment shall be as represented in the body and equipment manufacturer's technical data. Technical data shall be limited to specifications and technical material identical to that furnished to the authorized company representatives for selection of vehicle models and components, and shall be on file in the engineering offices of the procuring activity, prior to delivery of the items. The chassis model furnished shall be not older than the chassis manufacturer's current model on the date of invitation for bids.

* 3.1.1 Special requirements. In addition to the standard vehicle and components specified in 3.1, the vehicle shall be furnished with special equipment as specified herein. Civil agencies shall specify (see 6.2) unusual operating conditions, items, exceptions, end use, etc., not specified herein. If in conflict with the manufacturer's standard and options, those specified shall take precedence.

3.1.1.1 Treatment and marking. The vehicle shall be treated and painted in accordance with MIL-STD-1223. As specified by the procuring activity for the appropriate military service (see 6.2), the exterior color shall be in accordance with MIL-STD-1223. For civil agencies, unless a specific color is specified (see 6.2), the exterior color shall be selected by the manufacturer from one of the manufacturer's standard, non-metallic light colors, except red and black shall not be furnished. When specified (see 6.2), color selection will be made after

contract award from the standard color charts to be supplied by the manufacturer. When type V bus is specified, both military and civil agency vehicles shall match color chip 13432 gloss yellow of FED. STD. No. 595.

3.1.1.2 Markings and data plates. As specified by the procuring activity for the appropriate military service (see 6.2), identification marking and data plates shall be in accordance with MIL-STD-1223. For civil agencies, a decal or sticker shall provide at least the following information: contract number; purchase order number; date of delivery month and year; and the warranty time, in months and miles (GSA Form 1398).

* 3.1.1.3 Rustproofing. When specified (see 6.2), the chassis and underbody, including fenders, skirts and wheelwells, shall be rustproofed in accordance with FED-STD-297.

* 3.1.1.4 Heavy duty cooling system. When specified (see 6.2), a heavy duty cycling system shall be furnished that will maintain engine coolant at a temperature below the boiling point with the vehicle loaded to rated gross vehicle weight (GVW) and operated at 10,000 feet above sea level or in an ambient air temperature of not less than 125 degrees Fahrenheit (^{o}F).

* 3.1.1.5 Drain plugs. Drain plugs installed in manual transmissions and rear axles shall be of the permanent magnet type.

3.1.1.6 Coolant system and indicators. Coolant system shall include a de-aeration system, a surge tank, or a coolant removery reservoir of not less than two-quart capacity. A low coolant level or high coolant temperature alarm buzzer and a red indicator warning light shall be provided on the dash instrument panel.

3.1.1.7 Wood treatment. Wood flooring (see 3.5.3) shall be treated in accordance with MIL-STD-1223.

* 3.1.1.8 Rear towing devices. Two closed loops for towing the bus shall be furnished on the rear of the bus. Towing devices and the rear of the bus shall withstand, without any sign of failure, lifting the rear end of the bus, turning the bus within its minimum turning radius, and backing the bus on a level roadway. Decals shall be provided on front and rear bumpers stating "LIFT AND TOW FROM REAR OF BUS." Complete towing instructions shall be furnished with the operator's manual.

3.1.1.9 Front tow attachments. Two tow chain attachment devices shall be provided at the front of the bus to allow recovery of the bus from a ditch or other impediment. Each front

attachment device shall provide an ultimate strength at least equal to the GVW rating of the vehicle furnished.

3.1.1.10 Towing brakes. Unless otherwise specified for vehicles with air brakes (see 6.2), in addition to the brake requirements specified herein (see 3.4.11), an emergency system for controlling at least the front brakes of the bus from a towing vehicle shall be provided. The installation shall be complete with air brake couplers; relay emergency valve with no-bleed-back feature, (except when spring applied emergency brake is furnished); and additional air lines and fittings. Towing brake installation shall not compromise conformance to any Federal Motor Carrier Safety Regulation or Federal Motor Vehicle Safety Standard (FMVSS) referenced herein. Couplers shall be mounted in a protected location at the rear of the bus and shall permit ready attachment of air hoses from the towing vehicle. Service coupler shall be located on the curbside and emergency coupler on the roadside.

* 3.1.1.11 Silicone brake fluid. When specified for vehicles with hydraulic brakes (see 6.2), and if available as the manufacturer's standard or optional brake fluid, brake fluid conforming to MIL-B-46176 shall be provided in the hydraulic brake system. A tag shall be placed near the master cylinder stating "CAUTION: USE SILICONE BRAKE FLUID ONLY, MIL-B-46176."

3.2 General design.

3.2.1 Federal Motor Vehicle Safety Standards. Type I, II, III and IV buses and furnished accessories shall comply with all Federal Motor Vehicle Safety Standards in effect on the date of manufacture, including standards applicable to only school buses; except as specified in 3.5.8 and 3.5.9, compliance with FMVSS No. 222 is not required. Type V, VI, and VII buses and furnished accessories shall comply with all Federal Motor Vehicle Safety Standards in effect on date of manufacture, including standards applicable to only school buses.

3.2.2 Air pollution control. The vehicle shall comply with the Environmental Protection Agency Regulations governing Control of Air Pollution from New Motor Vehicles and New Motor Vehicle Engines in effect on the date of manufacture. In addition, vehicles destined for California shall comply with State of California regulations governing air pollution control in effect on the date of manufacture.

* 3.2.3 Sound level. The interior sound level at the operator's location with driver in seated position shall be not greater than 85dB(A) when measured in accordance with MIL-STD-1474. The vehicle exterior sound level shall conform to the Interstate Motor Carrier

Noise Emission Standards of the EPA when tested in accordance with the Regulations of the Department of Transportation, Part 325. When specified (see 6.2), the exterior sound level shall not exceed the noise limits established by the California Vehicle Code, Section 27200.

* 3.2.4 Curb weight. Curb weight shall include weight of chassis, with all attachments, accessories, and equipment; full complement of fuel, lubricants and coolants.

* 3.2.5 Gross vehicle weight. Gross vehicle weight (GVW) shall consist of curb weight, the driver weight at 175 pounds, and payload weight evenly distributed through the passenger seat and standee area to provide not less than the GVW specified in table I.

TABLE I. Minimum GVW rating.

Vehicle type	GVW rating (pounds)
I	18,000
II	20,000
III	23,000
IV	24,000
V	23,000
VI	20,000
VII	18,000

* 3.2.6 Dimensions. Bus dimensions shall be as follows:

(a) Overall width shall be not greater than 96 inches; width over tires shall be not more than 100 inches.
(b) Overall height shall be not greater than 125 inches.
(c) Overall length shall be not greater than 25 feet for type I bus, not greater than 30 feet for type II, VI, and VII buses, not greater than 35 feet for type III and V buses, and not greater than 40 feet for type IV bus, and shall include all front and rear protrusions.
(d) Ground clearance shall be not less than 8-1/2 inches under axles and not less than 10 inches under all other parts, except that clearance under stepwell of type I bus shall be not less than 9 inches.

3.2.7 Ratings. Vehicle ratings shall be manufacturer's published rating. Component and vehicular ratings shall not be raised to meet the requirements of this specification. When published ratings are not available, verification of ratings must be submitted to the engineering office of the procuring activity.

3.2.8 Accessibility. The design of the vehicle and optional equipment shall permit ready accessibility for routine servicing and shall permit accessibility for replacement and adjustment of component parts and accessories with minimal disturbance of other components and systems.

3.2.9 Materials. The materials shall be new or new reclaimed material, not less than the quality conforming to current engineering and manufacturing practices. Materials shall be free of defects, suitable for the intended service.

3.3 Performance.

3.3.1 Speeds and gradeability. High and low speed requirements shall be met with the bus loaded to specified GVW.

* 3.3.1.1 High speed gradeability. The vehicle shall ascend a 1.75 percent grade at 50 miles per hour (mph). Gradeability shall be verified with calculations in accordance with SAE J688 (see 6.3).

3.3.1.2 Low speed. Low speed of a unit with a manual transmission shall be calculated with the engine operating at not less than 35 percent of recommended governed speed and shall provide a vehicle speed not greater than 4 mph. Low speed of a unit with an automatic transmission shall not exceed 12 mph at manufacturer's recommended governed speed.

* 3.3.1.3 Maximum geared speed. The maximum geared speed at engine governed speed shall be not less than 58 mph. Conformance to geared speed specified shall be determined by calculating in accordance with the following formula:

$$\text{Maximum geared speed (mph)} = \frac{\text{Governed speed (rpm)}}{\text{Total gear reduction x tire factor (see 6.3)}}$$

3.3.2 Turning radius. The turning radius, defined as the distance from the turning center of the centerline of the tire describing the largest circle while the vehicle is executing its sharpest practicable turn, shall be not greater than 30 feet for type I; 34 feet for type II, VI, and VII; and 45 feet for type III, IV, and V.

3.4 Chassis components.

3.4.1 Engine.

* 3.4.1.1 Gasoline engine. When specified (see 6.2), the engine shall be a liquid cooled,

internal combustion, four-stroke cycle, gasoline type, with not less than six cylinders. The engine shall produce the required vehicle performance when operated on unleaded fuel with a research octane rating of 91, at engine speed not more than manufacturer's recommended operating speed. The engine shall be capable of warranted operation on unleaded fuel when used in accordance with the operator's manual. Engine net horsepower used in performance prediction calculations shall be determined in accordance with SAE J245 or SAE J1349. A fan clutch shall be provided. The fan clutch shall reduce fan speed automatically when the fan is not required for engine cooling.

* 3.4.1.2 Diesel engine. Unless otherwise specified (see 3.4.1.1.), the engine shall be a liquid cooled, compression ignition, two-stroke or four-stroke cycle diesel type, with not less than six cylinders. Engine net horsepower used in performance prediction calculations shall be determined in accordance with SAE J816 or SAE J1349. A fan clutch shall be provided. The fan clutch shall reduce the fan speed automatically when the fan is not required for engine cooling.

3.4.1.3 Oil filter. A full flow type oil filter shall be furnished.

* 3.4.1.4 Governor. An engine governor shall be furnished and set to limit engine speed to maximum recommended operating speed. The governor shall be sealed at the specified setting.

* 3.4.1.5 Power plant heaters and fuel warmer. When specified (see 6.2), power plant heaters consisting of a coolant heater; engine oil heater; and fuel warmer (diesel engine driven vehicles only) shall be provided, unless otherwise specified (see 6.2), a battery heater shall be provided when power plant heaters are specified. Heaters shall operate on 110-volt alternating current (ac), and shall be wired through a junction block to a single three pronged (male), weatherproof, slave receptacle for receiving external power and grounding vehicle. A three wire connecting cable, 25 feet long and of adequate line capacity to supply power to all heater units simultaneously, shall be furnished. Connecting cable shall include a matching female connector at the vehicle end and a standard, weatherproof, three-pronged (two power plus one ground) male connector at the other end. Electrical apparatus shall conform to Federal Motor Carrier Safety Regulation 393.77 (c) (7). Electrical insulation of connecting cable shall withstand normal operating stresses in low ambient air temperatures (down to minus 60°F) without cracking or loss of dielectric capacity. All heater lead wires shall be installed without interfering with vehicle component operation and without loose excess wire. A carrier for the connecting

cable shall be mounted within the cab or engine compartment and shall provide positive cable retention during vehicle operation. Heaters shall be furnished as follows:

(a) Coolant heater, 1500-watt minimum rating, shall be installed in the engine block or lower, coolant inlet hose. A coolant circulating pump, driven by a 110-volt alternating current (ac) motor, shall be provided. Engine thermostat with an operating range of 170° to 195°F shall be installed.
(b) Immersion type engine oil heater, 300-watt minimum rating with 170°F to 195°F thermostat, shall be installed in the oil pan through any convenient opening.
(c) Battery heater shall have a capacity adequate to maintain the battery electrolyte at a temperature of not less than 10°F during vehicle exposure in ambient air temperatures as low as minus 60°F, and shall embody a thermostat to limit the temperature of the electrolyte to not more than 80°F.
(d) When a diesel engine is furnished, a fuel warmer or pre-heater shall be provided to prevent clogging of fuel filters due to wax crystallization in the fuel. The fuel warmer shall use engine coolant to transfer sufficient heat to the diesel fuel to heat it from an inlet temperature of minus 40°F to an outlet temperature of plus 9°F, with a flow rate not less than the maximum fuel demand of the engine fuel system. A coolant shutoff valve shall be provided for the coolant inlet side of the fuel warmer unit.

3.4.2 Electrical system. Electrical system shall be in accordance with Federal Motor Carrier Safety Regulations 393.27 through 393.31 and 393.33.

* 3.4.2.1 Radio interference suppression. Unless otherwise specified (see 6.2), the vehicle shall be suppressed to limit electromagnetic radiation in accordance with SAE J551. Any body equipment emitting radiation shall be suppressed to the same level as the vehicle chassis.

3.4.2.2 Ignition system (gasoline engine). For gasoline engine driven buses, an ignition system of 12-volt direct current (dc) potential shall be furnished. Alternator for type I, II, III, V, VI, and VII, which provides not less than 100-ampere rated capacity and not less than 20-ampere dc output at normal engine idle speed shall be furnished. Alternator for type IV which provides not less than 130-ampere rated capacity and not less than 40-ampere dc output at normal engine idle speed shall be furnished.

* 3.4.2.3 Starting system (diesel engine). For diesel engine driven vehicles, a 12-volt starting system and not less than a 130-ampere alternator which provides not less than 50-ampere

dc output at normal engine idle speed shall be furnished. Engine starting equipment shall include thermostatic control of engine coolant temperature and an ether starting system or a glow plug. Control of coolant temperature shall be accomplished by either thermostatically controlled radiator shutters or by thermostatically controlling the flow of all engine coolant. If an ether starting system is furnished in lieu of a glow plug it shall be of the measured shot type. Measured shot type ether systems shall be key operated or manually operated from the driver's compartment and shall be inoperative with the engine warm. Complete provisions for a replaceable reservoir of not less than 12 fluid ounces shall be furnished (a reservoir need not be furnished).

* 3.4.2.4 Batteries. Each battery shall be of 12-volt potential. The total reserve capacity rating and the total cold cranking ratings at 0^{o}F, both measured in accordance with SAE J537, shall be not less than specified in table II. Batteries shall be mounted on a sliding tray in an enclosed compartment. Sliding tray, with batteries mounted, shall be capable of being pulled out easily so that all cells shall be exposed for inspection and servicing without detaching batteries from vehicle. Trays shall be coated with acid-resistant material. Battery access door shall be provided on the side of the body and shall have a device installed for securing it in an open position to facilitate servicing the batteries. Battery cable shall be routed and secured in such a manner as to preclude chafing of the cable at any point. Vehicles shall be furnished with a one-piece batteryground cable and a one-piece battery-to solenoid cable. The cables shall be protected from all edges of all holes in metal members through which the cables pass. The batteries shall be of the maintenance free type having the maintenance free characteristics listed in W-B-131.

TABLE II. Batteries

	Reserve capacity	Cold cranking
	(minutes)	(ampheres)
Gasoline engine driven buses, all types	260	880
Diesel engine driven buses, type I, II, VI, and VII	320	1,200
Diesel engine driven buses, type III, IV and V	480	1,800

3.4.2.5 Lighting. Vehicle lights, reflectors, and wiring shall be as specified herein and shall conform to Federal Motor Carrier Safety Standard 108. Lights and reflectors shall not be mounted on rub rails or vehicle bumpers.

3.4.2.5.1 Exterior lighting. All exterior lights on the vehicle shall conform to Federal Motor Vehicle Safety Standard No. 108. Electrical system voltage shall be 12 volts. When specified (see 6.2), left dip headlights, as used on right hand drive vehicles, shall be furnished and shall be adjusted for driving on left side of road prior to shipment. Turn signals shall be of the self-canceling type.

3.4.2.5.2 Interior lighting. Interior lighting shall include, 15-candle power domelights, of grade and quality not less than 12 square inches (in^2) of polished, reflecting surface fitted with frosted translucent lens providing not less than 30 square inches area. Domelights shall be installed over each row of passenger seats, placed over the first or second seat from the front and thereafter over each second seat. One domelight shall be installed over the driver area and controlled with a separate switch. Door-operated step lamp(s) shall be furnished and installed to provide illumination of stepwell and ground adjacent to steps. An emergency door identification red light with not less than a 3-inch diameter lens shall be provided in accordance with Federal Motor Carrier Safety Regulation 393.92 (see 3.5.5.2).

3.4.2.6 Passenger signal buzzer. When specified (see 6.2), manufacturer's standard passenger signal buzzer equipment shall be furnished, operated by suitable pull cords on both sides of bus, and provided with a driver's cutout switch.

3.4.2.7 Horn. An electric horn, suitable for bus service, shall be provided.

3.4.2.8 School bus red signal lamps. Type V, VI, and VII buses, and other types of buses when specified (see 6.2), shall be equipped with four red signal lamps conforming to Federal Motor Vehicle Safety Standard No. 108.

* 3.4.3 Fuel system. The fuel system shall conform to Federal Motor Carrier Safety Regulations 393.65 and 393.67.

* 3.4.3.1 Air cleaner. A dry type air cleaner shall be furnished. The air cleaner shall include an indicator or light mounted on the dash or adjacent to the air cleaner, to indicate when filter should be changed.

* 3.4.3.2 Fuel tank(s). Safety fuel tank(s) conforming to Federal Motor Carrier Safety Regulations 393.65 and 393.67 shall be furnished. Total capacity of the fuel tank(s) for vehicles with and without air conditioning shall be not less than that specified in Table III. When

more than one tank is furnished on diesel engine driven vehicles, means shall be provided to assure equalized fuel level between the tanks feeding the chassis engine. When more than one tank is furnished on gasoline engine driven vehicles, a selector valve connecting either tank to the engine fuel intake shall be provided and means shall be provided to monitor the fuel level of each tank with single fuel gage. A photoetched, corrosion-resistant plate, permanently protected decal or stencil, marked to denote the type of fuel to be used, shall be located in a conspicuous place near the filler cap(s). When an air conditioning system is specified (see 3.5.13), the air conditioner auxiliary engine shall operate from the same type fuel as the chassis engine; and may operate from the main chassis fuel tank(s) or from a separate tank specified in 3.4.3.2.1. When specified (see 6.2), when the air conditioner engine operates from the main engine fuel tank(s), means shall be provided to assure the auxiliary engine does not draw below 20 percent of the chassis fuel tank capacity.

Table III Fuel Tank Capacity

Vehicle Type	Fuel Tank(s) Capacity (gallons)	
	w/out air conditioning	w/ air conditioning
I, II, VI and VII	30	50
III, IV, and V	60	80

* 3.4.3.2.1 Air conditioner auxiliary engine fuel tank. When an air conditioning system is specified (see 3.5.13), and a separate fuel tank to supply the air conditioner auxiliary engine is furnished, the auxiliary fuel tank shall have a capacity of not less than 20 gallons and shall be located under the floor. The auxiliary tank shall be a safety fuel tank of welded seam construction. The tank shall be provided with a fuel level sensor, connected to the single (main engine) fuel gage through a selector switch or to two separate fuel gages visable to the driver. Gage(s) shall be identified. A drain shall be provided in a fuel tank sump, located to avoid drainage of fuel on any part of the vehicle. A fuel tank filler neck shall be located on the side of the bus with access through a flush type door. Filler opening shall be identified as specified in 3.4.3.2. A shut off valve shall be provided in the fuel line adjacent to the tank. The fuel system shall conform to Federal Motor Carrier Safety Regulations 393.65 and 393.67.

* 3.4.4 Exhaust system. Exhaust system shall conform to Federal Motor Carrier Safety Regulation 393.83. Exhaust tailpipe shall extend to rear bumper and shall be so located as to minimize the possibility of exhaust fumes entering the body. For gasoline engine driven vehicles, the exhaust system beyond the engine compartment shall be insulated from the fuel

tank and tank connections by securely attached metal shields at any point where it is 12 inches or less from tank, tank connections, or any fuel line connections.

3.4.5 Transmission. Transmission input torque capacity shall be at least equal to maximum torque delivered by the engine.

3.4.5.1 Automatic transmission. Unless otherwise specified (see 3.4.5.2), a continuous drive, automatic transmission shall be provided. The transmission shall include a hydraulic torque converter and not less than four forward gear ratios. Normal driving range selector position shall provide not less than four gear ratios without movement of the selector.

3.4.5.2 Manual transmission. When specified (see 6.2), manufacturer's standard manually shifted transmission shall be furnished. Transmission shall provide one reverse speed and forward speeds as follows:

Type I, II, VI, and VII	- Four forward speeds, synchronized shift in second, third, and direct drive.
Type III, IV, and V	- Five forward speeds, synchronized shift in at least the four highest forward speeds.

3.4.5.2.1 Clutch. Clutch shall be the largest capacity offered for the size of engine furnished and with torque capacity exceeding maximum delivered engine torque.

3.4.6 Drive line components. Drive line components shall be adequate to transmit the maximum delivered torque of the engine as developed through the maximum gear train reduction. Propeller shaft guards shall be provided in accordance with Federal Motor Carrier Safety Regulation 393.89.

3.4.7. Chassis frame. Chassis frame for bus body mounting shall be so designed and constructed as to support body and load and to maintain stability under all operating conditions.

3.4.8 Suspension. Vehicle shall be equipped with suspension system with components having a rated capacity at least equal to the load imposed on each member, measured at the ground, with vehicle loaded to specified GVW. When suspension capacity is rated at the spring pads, unsprung weight shall be deducted. Vehicle shall be equipped with hydraulic, double-acting shock absorbers on the front and rear axles. If leaf-type front springs are used, spring design shall provide double-wrap spring eye, at least at stationary end of front spring.

Rear springs shall be progressive or variable rate. Rear wheels shall be designed and so located that they will not interfer with the use of tire chains (see 3.4.10.4).

3.4.9 Axles. Axle ratings shall be at least equal to the load imposed on each axle, measured at the ground, when vehicle is loaded to specified GVW.

3.4.9.1 Positive-traction differential. When specified (see 6.2), rear axle with positive-traction, limited-slip, or automatic locking differential shall be furnished.

* 3.4.10 Wheels, rims, tires, and tubes. Vehicle shall be equipped with single front and dual or tandem rear wheels. Rim size shall be the same for all wheels on the vehicle. Tire size and ply rating shall be the same for all tires on the vehicle. Rim and tire ratings shall conform to Tire and Rim Association recommendations for the type and size of tires furnished. When specified (see 6.2), disc type wheels with not less than 8 studs shall be furnished.

* 3.4.10.1 Tires. Unless otherwise specified (see 6.2), tires shall be tube or tubeless type with highway tread. Steel belted radial, or when specified (see 6.2), bias ply tires shall be furnished. Tires shall have a rated capacity at least equal to the load imposed on each tire, measured at each wheel, at the ground, with the vehicle loaded to specified GVW. When specified (see 6.2), for Civil Agencies only, non-directional tires with mud and snow tread shall be furnished. Tires shall conform to Tire and Rim Association recommendations or to ZZ-T-381 with a size designation system the same as the Tire and Rim Association.

3.4.10.2 Balancing. Each tire shall balance within practicable limits. Wheels, hubs, and brake drums shall be effectively in balance. Balancing shall be adequate to preclude wheel shimmy at all vehicle speeds.

3.4.10.3 Inner tubes. When tube type tires are furnished, inner tubes shall be of heavy-duty type and shall be of proper size for the tires furnished. Tire flaps shall be provided for tube type tires in accordance with Tire and Rim Association recommendations.

* 3.4.10.4 Tire chain clearance. There shall be no interference which will prevent use of tire chains on at least the outside driving tires in accordance with SAE J683. Allowance for spring deflection shall be included.

* 3.4.10.5 Spare wheel assembly. Unless otherwise specified (see 6.2), a spare wheel or rim shall be mounted on a carrier and installed in a readily accessible location. Spare wheel assembly shall be so located as to not protrude beyond body. Threaded fasteners, when used to

secure the spare wheel in the carrier, shall be constructed of or plated with corrosion-resistant material. The carrier design shall enable removal or mounting of spare wheel assembly using only tools specified in 3.4.15. When specified (see 6.2), a winch type carrier shall be furnished.

3.4.10.6 Spare tire assembly. Unless otherwise specified (see 6.2), an inflated spare tire mounted on the spare wheel or rim shall be furnished. The spare tire shall be of the same size, tread design and load range (ply rating) as the tires furnished on the vehicle. When mud and snow tires are required, spare tire tread shall be mud and snow design (Civil Agencies only).

3.4.11 Service brakes. Unless otherwise specified (see 6.2), type I and II shall be equipped with hydraulic brakes; type III, IV, and V shall be furnished with air brakes and type VI and VII shall be equipped with air or hydraulic brakes. Brakes shall conform to Federal Motor Carrier Safety Regulations 393.40 through 393.42 and 393.44 through 393.52.

* 3.4.11.1 Hydraulic brakes. Hydraulic brakes, shall be power assisted, hydraulic actuated, four wheel service brakes.

* 3.4.11.1.1 Split hydraulic brake system. Vehicles equipped with power assisted hydraulic brakes shall be equipped with a service brake system so arranged as to provide separate systems for at least two wheels and so designed and constructed that rupture or leakage-type failure of any single pressure component of the brake system, except structural failures of the brake master cylinder body, effectiveness indicator body or other housing common to the divided system, will not result in complete loss of function of the vehicle brakes when force on the brake pedal is continued. "Pressure component" means any internal component of the brake master cylinder or master control unit, wheel brake cylinder, brake line, brake hose, or equivalent, except vacuum assist components.

* 3.4.11.1.2 Indicator light. Split hydraulic brake system shall be equipped with an electrically operated red light mounted on the instrument panel to indicate system effectiveness. The light shall have an area of not less than 0.196 square inches. It shall illuminate before or upon application of the brakes when actuating-pressure component of the system has sustained a loss of pressure. The indicator light system shall include a means for testing by the vehicle operator to assure that the light bulb is operable.

* 3.4.11.2 Air brakes. Air brakes shall be of the four-wheel full air application type. The braking system, complete with all necessary components, shall include:

(a) Air compressor, unloaded-head type, engine driven and engine lubricated, air or water cooled, and having a capacity of not less than 7-1/4 cubic feet per minute (cfm).

(b) Air storage reservoir(s) with not less than 2,000 cubic inches total capacity; each tank equipped with drain, and with safety and check valves between compressor and last reservoir tank.

(c) Foot control, suspended or treadle type.

(d) Air control valves.

(e) Air pressure gage, visible to the driver.

(f) Low air pressure warning, visible and audible.

(g) Service brake stop lamp switch.

(h) Alcohol aspirator with unbreakable transparent container.

(i) Automatic moisture ejector.

(j) When specified (see 6.2), in lieu of subparagraph (h), an air dryer shall be furnished. The air dryer shall be of the after cooled or desiccant type.

(k) Automatic slack adjusters.

3.4.12 Steering. Manufacturer's standard power steering shall be furnished.

* 3.4.13 Windshield wipers and washers. The vehicle shall be equipped with dual windshield wipers and windshield washers. Windshield wipers shall be multispeed type and operated by either air or electric motor(s) and shall conform to Federal Motor Vehicle Safety Standard No. 104.

3.4.14 Bumpers. Front and rear bumpers shall be provided. Rear bumper shall conform to Federal Motor Carrier Safety Regulation 393.86 and shall be as specified in 3.5.11.6.

3.4.15 Tools. When specified (see 6.2), the vehicle shall be furnished with tools required for exchanging mounted tire assembly with a spare assembly (see 3.4.10.7) and shall include at least a hydraulic jack, jack handle, and wheel nut wrench. The jack shall be of such closed height as to permit its location under axle, or other satisfactory lift point, at any wheel with tire

flat. The jack, without blocking, shall be capable of raising any wheel of loaded vehicle to a height adequate to permit removal and replacement of wheel and tire assembly.

* 3.4.16 Controls and operating mechanisms. All controls and operating mechanisms shall be located for left hand drive. Controls shall be complete and conveniently operable by the driver in a seated position. Lever controls shall be designed and located to permit easy entrance and exit of the operator to and from driver's seat. Instruments and controls shall be identified as to their function and installed in a manner to facilitate removal and servicing. All instruments shall be visible to driver when seated in driving position.

* 3.4.17 Instruments and equipment. Chassis equipment shall be complete with all accessories/equipment furnished as standard equipment by the manufacturer. Instruments and lamp bulbs shall be easily accessible for maintenance, replacement and repair and shall be mounted on instrument panel in such a manner that each is clearly visible to driver in seated position. The instrument panel shall have lamps of sufficient candle power to illuminate all instruments and gages but so designed as to avoid undue glare. Unless otherwise specified (see 3.4.17.1), the following minimum equipment shall be furnished:

(a) Key-operated ignition switch.
(b) Ammeter, charging indicator voltmeter.
(c) Fuel gage.
(d) Oil pressure gage or indicator.
(e) Engine temperature gage or indicator.
(f) Speedometer.
(g) Recording odometer.
(h) Indicator light to show headlight highbeam operating.
(i) Tachometer (diesel engine driven buses only).

* 3.4.17.1 Panel meters and gages. When specified (see 6.2), the manufacturer's standard or optional meters or gages shall be furnished in lieu of indicators specified in 3.4.17 (b), (d) and (e) above.

3.5 Body. The bus shall provide adequate seating for the number of adult or school-age passengers specified (see 1.2). Body shall have sides of the full-skirted type, shall present a generally symmetrical appearance, shall effectively exclude engine fumes and exhaust gases from the bus interior, and shall provide safe and comfortable transportation for passengers and driver.

3.5.1 Inside body dimensions. At seat level, body inside width shall be not less than 90 inches. Between the first and last vertical roof bow, through center of aisle, inside height shall be not less than 76 inches.

3.5.2 Construction. Body and roof framing shall be constructed of steel sections, with metal panels attached outside and inside and properly insulated. All parts, where applicable, shall be fastened together in a manner which will preclude loosening of bolts, screws, and rivets, and cracking of welded joints when the vehicle is properly maintained and operated under the intended service conditions. Wood shall not be used for structural framing. Outside body panels and other sheet metal shall be of aluminum alloy or steel and of proper gages, not less than the gages, as applicable, regularly furnished by the body manufacturer in the bus of the model offered. The body, roof, and panel joints shall be watertight and leakproof. Unless zinc coated steel panels are used, joints shall be sealed with "Alumelastic" compound or equivalent. All steel 12-gage (0.1046 inch) and lighter shall be zinc coated in accordance with ASTM Designation: A525, and table I, Coating Glass G 60, or aluminum zinc coating.

3.5.3 Floor. Floor frame and floor plates, with entrance step and wheel housing shall be of substantial construction; properly integrated with the body structure, and shall conform to Federal Motor Carrier Safety Regulation 393.84. Flooring shall be treated as specified in 3.1.1.7. Plywood used in floor panels shall be water resistant, exterior grade, fir or dense southern pine. Floor panels shall be of not less than (a) 3/4-inch, seven-ply plywood; or (b) 1/2-inch, five-ply plywood over 10-gage steel; or (c) 5/8-inch, five-ply plywood over 14-gage steel. Steel crossmembers not less than 2 inches in depth and spaced to provide support for the loads imposed shall be furnished under the floor.

3.5.3.1 Stepwell. Stepwell shall be enclosed two-step type constructed of steel, covered with 3/16-inch thick rubber or synthetic rubber blend ribbed material. Height of bottom step shall not exceed 16 inches.

3.5.3.2 Wheelhousings. Wheelhousings shall include splash shields, front and rear, under the body. Ample clearance for the use of tire chains on at least the outside driving tires shall be provided.

3.5.3.3 Floor covering. The under seat floor area and the wheelhousings shall be covered with not less than 1/8-inch thick rubber or synthetic rubber blend material. The aisle and entrance area shall be covered with not less than 3/16-inch thick rubber or synthetic rubber blend, ribbed material. Coverings shall be properly installed and adequately sealed at the joints. Aisle joints shall be covered with strips, securely fastened with screws. The floor in the driver's area shall be covered with a mat or with the same materials as used in the underseat or aisle area.

3.5.4 Sides and roof. Sides and roof shall have sheet metal outer panels, lined on the inside and integrated with body structure.

3.5.4.1 Exterior. Sides shall be full-skirted and equipped with two full-length rub rails extending along each side of the body, one below platform level and one approximately at seat height. Seat height rub rail shall extend across rear to within 6 inches or less of emergency door.

3.5.4.2 Interior. Body interior, including sides, roof and front and rear ends, shall be fully lined with sheet metal panels.

* 3.5.4.3 Insulation. Non settling, fungus resistant, fire retardant, insulation shall be installed in roof, side, and end walls. In addition, material shall be applied to the inner (not exposed) surfaces of exterior panels and other exterior sheet metal as added insulation and to prevent drumming. Insulation shall have a K factor of not more than .15 Btu/sq. ft./deg. F/hr./in. thickness.

3.5.4.4 Designation-sign compartment. When specified (see 6.2), designation sign compartment shall be installed at front center of roof above windshield. Compartment shall provide not less than 180 square inches of glass-enclosed frontal area, of a height to permit reading of 6-inch letters on the sign roller and shall be readily accessible, through latched door, from inside the bus. Compartment shall be illuminated to permit reading of destination sign at night. Destination sign shall be a roller type of a capacity to apply 15 listings of 6-inch high letters and shall be operable from interior of bus, unless otherwise specified, destination sign roll will be furnished blank.

3.5.5 Doors. Two doors shall be provided in the bus, unless otherwise specified, service door shall be at the front on the side opposite the driving controls, for use by entering and departing passengers. Emergency exit door shall be located in rear. Each door shall be provided with effective compression or overlapping seals to minimize entry of dust, water, and cold air. When specified (see 6.2), the service door shall be located on left side of bus, behind the driver is seat and forward of the rear axle for buses to be used in certain overseas areas. Reduction of seating capacity up to and including four adults or six children is acceptable.

3.5.5.1 Service door. Service door shall be of two leaf-type with manual control conveniently located for driver operation. Service door shall be provided with upper and lower safety glass panels. Operating linkage shall be installed within the body or enclosed to preclude accumulation of mud, ice, and snow. Minimum dimensions of clear opening shall be 24 by 74 inches, unobstructed by door seals or door operating mechanisms.

3.5.5.2 Emergency door. Emergency door shall be sedan-type, located for convenient egress, and equipped with a slide-bar, cam operated lock with readily operable interior handle. A permanently installed handle shall be provided for opening the emergency door from outside the bus. A red emergency exit identification light (see 3.4.2.5.2) shall be installed on the emergency exit header. The header shall be marked with the following in block letters not less than 2 inches high "EMERGENCY DOOR." A warning light, wired through the ignition switch, shall be installed on dash or panel.

3.5.6 Windshield. A windshield affording maximum practical driver vision shall be installed at a slope sufficient to minimize external glare or reflections from inside the body. Glass conforming to Federal Motor Vehicle Safety Regulation No. 205 shall be used in the windshield. A step and a grab handle shall be provided on each side of the bus to facilitate cleaning the windshield.

3.5.7 Windows. Windows shall be provided with fingertip control, permitting ready opening and adjustment to various desired openings. Windows shall be rattle-proof and when closed, rainproof, waterproof, and windproof. Driver's window(s) shall permit use for signaling and ventilation. All windows shall be fitted with locking devices. The top edge of the glass area in the side windows, if furnished, shall be not less than 57 inches above the aisle floor level.

* 3.5.7.1 Tinting. When air conditioning is furnished (see 3.5.13), tinted, heat absorbing safety window glass window(s) and windshield shall be in accordance with the manufacturer's standard for tinted glass. The side windows in the passenger area shall be tinted to double density allowing not more than 55 percent light transmission. The rear window(s) shall be tinted to quadruple density allowing not more than 40 percent light transmission. For passenger area side and rear windows, safety tinted glass shall be used.

3.5.8 Seating. Seats for type I, II, III and IV buses shall be the manufacturer's standard 34 - 36 inch width, two passenger type with a seat cushion free depth of not less than 17 inches. Seats for type V, VI and VII buses shall be the manufacturer's standard 39-inch width, (except left hand rear seat may be reduced to comply with Federal Motor Vehicle Safety Standards) three passenger type with a seat cushion free depth of not less than 15 inches. Seat cushion free depth shall be measured from a vertical plane at the front edge of cushion to a vertical plane at the most forward part of the seat back cushion. Seat cushions shall be solid foam padding tapering from a minimum of 5 inches at the front to 3 inches at the rear or not less than 2 inches of padding on a spring base. Seat backs shall be shaped and padded to assure

passenger comfort. Seat backs shall be not less than 18 inches free height from seat cushion to top of seat back cushion. The top, the upper corners, and the upper 10 inches of the rear surface of each passenger seat back (except the rearmost seats) shall be constructed of or covered with force distributing material. The material shall minimize force and spread the area of contact upon impact by an occupant in the next seat to the rear. The rear surface of the seat back below the force distributing material shall be upholstered or on type I, II, III, and IV buses it may be covered with aluminized steel or bright finish zinc coated steel. Seats shall be secured to prevent shifting under all operating conditions. Anchorage for adult seats shall conform to FMVSS 222/6. Seats located at or near wheelhousings shall be installed to minimize interference with passenger comfort. Seat spacing shall be not less than 30 inches on centers for type I, II, III and IV buses and the spacing on centers allowed by Federal Motor Vehicle Safety Standard No. 222 for type V, VI and VII buses shall provide a minimum of 24 inches knee room. Spacing at barrier, modesty panel or other obstructions at the door entrance shall be not less than 12 inches from front of seat cushion on type I, II, III and IV.

3.5.8.1 Driver's seat. Driver's seat shall be heavy-duty, bus-type, pedestal mounted, and adjustable fore and aft and for height without the use of tools. Seat shall be positioned for convenient and safe operation of all controls by the driver. The seat cushion and back shall be padded, contoured to provide maximum driver comfort, and covered with heavy-duty vinyl simulated leather. The seat and back shall be substantially constructed and provide driver comfort. A lap style seat belt with retractors shall be installed for the driver's seat. When specified see 6.2), seat tilting adjustment shall be furnished.

3.5.8.2 Seat covering. Seat and force distributing cover material shall be first grade, heavy duty, plastic-coated, grained surface fabric of not less than 42 ounce weight per linear yard of 54-inch width or shall be 54-inch, 35 ounce 2.73 polyester drill. All seat materials shall be flash- flameproof and nonexplosive. Color of upholstery shall be appropriate with exterior color and shall harmonize with interior color.

3.5.9 Stanchions, barriers, and grab rails. Except for type V, VI and VII buses, which shall conform to Federal Motor Vehicle Safety Standard No. 222, a modesty panel shall be provided at rear of service door entrance and between driver and front passenger seat. A stanchion and grab rail at front and rear of entrances, arranged, to safely assist passengers entering or leaving the bus, shall be provided. Except for type V, VI and VII buses, full-length grab rails shall be attached to the ceiling on each side of the aisle and shall extend from the face

of first passenger seat to a point within 18 inches of the face of the rear seat. Grab rail or stanchion at the front of the service door and the ceiling grab rails shall be at least 1-inch diameter stainless steel, stainless steel clad, or plastic-coated steel tubing.

3.5.10 Heating, defrosting, and ventilating. Heating, defrosting, and ventilating systems shall conform to Federal Motor Carrier Safety Regulations 393.77 and 393.79.

3.5.10.1 Heater. A hot water heating system having a total capacity of not less than the number of Btu per hour specified in table IV at 150°F water to ambient air temperature differential, shall be installed. Adjustable manual controls shall be provided to permit outside air, recirculated air, or variable mixtures as desired, to circulate through at least the main heater core. Heater(s) shall be located to assure flow of heater air to driver's area, to all parts of the passenger compartment and located in protected positions. When specified (see 6.2), there shall be not less than four heaters: two front, one middle, and one to the rear. A 12-volt coolant booster pump shall be furnished when a diesel engine is required.

Table IV. Heater requirements, system

Type	Number of Btu
I	70,000
II, VI, and VII	110,000
III and V	120,000
IV	130,000

3.5.10.2 Defroster. Defroster outlets with suitable connections and independent blower(s) shall be furnished. The windshield defrosting systems shall conform to SAE 381 and SAE 382. When specified (see 6.2), a right hand heater, blower, and defroster shall be provided for severe weather conditions.

3.5.10.3 Ventilator. Ventilator(s), of the static type, capable of providing an adequate supply of fresh air and of properly ejecting foul air under all conditions of operation shall be provided in the roof. Vent openings shall be provided with a weather-proof cover with means for opening and closing the cover from inside the vehicle. Outside openings for heaters and ventilators shall be so located as to minimize entry of fumes, rain, road dust, and road wash.

3.5.11 Body equipment. Body equipment shall be complete with all accessories listed by the manufacturer as standard equipment and, in addition, shall include items specified in 3.5.11.1 through 3.5.11.9 herein.

3.5.11.1 Mirrors. Two outside rear view mirrors shall be provided. Combination (flat and convex) mirrors, enclosed in a common housing, shall be furnished. Each combination mirror shall have at least 50 square inches of flat reflective area and a convex surface having at least 20 square inches of reflective area. Inside rearview mirror shall have a reflective surface area of not less than 80 square inches. One nonglare type mirror shall be mounted inside the bus and two mirrors outside, one each at left-hand and right-hand sides. A front view convex mirror, not less than 3 inches in diameter, shall be provided for future installation on the front fender of the vehicle on the driver's side on type V, VI, and VII buses and when specified (see 6.2), on other types of buses. The mirror shall permit driver observation of the area immediately in front of the vehicle. The convex mirror, brackets, bolts, and assembly instructions shall be stowed inside the vehicle for shipment. All accessory mounting brackets, bolts, and holes in the fender shall be provided unless a forward control type bus is furnished.

3.5.11.2 Sunvisor. An adjustable sunvisor, not less than 6 by 16 inches, shall be furnished.

* 3.5.11.3 Emergency reflective triangles. Three emergency reflective trianges conforming to Federal Motor Carrier Safety Regulation 393.95(f)(2)(i) shall be furnished and properly stowed.

3.5.11.4 Emergency equipment. A 5-lb dry chemical type fire extinguisher conforming to Federal Motor Carrier Safety Regulation 393.95(a) shall be mounted convenient to the driver. The fire extinguisher shall have an Underwriter's Laboratory rating of 10 B:C or more, shall include a metal safety pin and wire, and shall conform to type I or type II, class 2, size 5 of O-E-915. The fire extinguisher shall permit visual determination as to whether it is fully charged. Emergency equipment compartment with glass door or two compartments shall be furnished and located within the driver's compartment. When two compartments are furnished, one compartment shall include bracket and space for subsequent installation of first-aid kit, 12-unit type, properly identified. First-aid kit size is 9-7/16 inches long, 3-7/16 inches wide, and 2-7/8 inches thick. First-aid kit not required to be furnished with vehicle.

3.5.11.5 Stowage compartment(s). Provision shall be made for weatherproof stowage of tools and tire chains, when carried, to be secured by padlock. Padlock is not required.

3.5.11.6 Rear bumper. Rear bumper shall be a heavy steel channel type with antiride and antihitch features attached in a manner to permit the bus to be pushed without permanent distortion of bumper, body, or chassis.

3.5.11.7 Keys. Keys in duplicate for all key-operated locks, properly identified, shall be safely packed and secured to vehicle steering wheel or otherwise stowed in an approved manner for shipment. All locks on the same vehicle shall be of same key code except ignition key.

3.5.11.8 Signs. Signs to read "DANGER - DO NOT EXTEND ARMS FROM WINDOWS" shall be affixed to the interior of the body at not less than four appropriate locations legible at a distance of 20 feet; one at the front, one at the rear, and one on each side.

3.5.11.9 Standee line. Areas prohibited to standees shall be marked in accordance with Federal Motor Carrier Safety Regulation 393.90.

3.5.12 Body mounting. Heavy rubber cushions or anti-squeak material shall be utilized between body frame and attaching chassis parts. Reinforcements or filler blocks shall be used where mounting devices might otherwise deform frame flanges. Mounting devices shall be locked units which will minimize loosening but which may be tightened if necessary.

* 3.5.13 Air conditioning. When specified (see 6.2), the buses shall be equipped with the manufacturer's standard independent air conditioning system conforming to 3.5.13.1 through 3.5.13.4.4. The manufacturer shall furnish to the engineering department of the requisitioning activity the rated capacity of the specified conditions of the entire unit, either by the air measurement or the flow meter method.

* 3.5.13.1 Air conditioning system performance. The air conditioner shall have sufficient net cooling capacity (Btu per hour) to provide specified cooling. The air conditioner system in a 95°F ambient temperature and in all conditions of solar radiation, shall be capable of maintaining not more than 80°F dry bulb and a 68°F wet bulb and an effective temperature of 74°F in the bus. The humidity shall be not less than 30 percent, and not more than 60 percent. The inside temperature shall be measured 6 inches from the floor, 6 inches ceiling, and at seat level. Longitudinal measurement shall be taken at the front seat, at the rear seat, and midway of the passenger area. The inside temperature gradient within the bus shall be not more than 6°F. The cooling performance specified herein shall be met when the bus is traveling at 50 mph and when standing still. The air conditioning system shall be independent of the heating system and shall automatically proportion air in the ratio of 20 percent fresh air to 80 percent recirculated air. All air shall pass through the filter system.

* 3.5.13.2 Air conditioning system installation. The air conditioning compressor and auxiliary engine (see 3.5.13.4) shall be located in a compartment under the floor, in a compartment at the rear or on the roof and shall be accessible for ease of maintenance and service. A lamp, switch and junction panel shall be installed in the compartment. The compartment door shall be capable of being opened and secured without the use of tools. When the compressor and engine are roof mounted, an access ladder shall be provided. The condenser and evaporator may be roof mounted. Mountings shall be so as to minimize transfer of vibration, the size and weight of the assembly shall be to a minimum consistent with the performance requirements specified herein.

* 3.5.13.3 Air conditioning controls. The air conditioning system shall be designed for bus operation and shall be complete with all necessary controls for automatic operation of the unit after the auxiliary engine has been started. Air conditioner controls shall be panel mounted within easy reach of the seated driver. A second set of controls shall be located in the auxiliary engine compartment in series with the driver controls and with a safety switch to cut out the driver controls. A thermostat control shall be located in the return air stream. The compressor shall be controlled automatically on demand of the thermostat.

* 3.5.13.4 Air conditioning auxiliary engine. The air conditioning system shall be powered by an auxiliary engine. The auxiliary engine shall operate on the same type of fuel as the chassis engine (see 3.4.3.2 and 3.4.3.2.1). The engine shall be of sufficient horsepower so that when fully loaded at sea level conditions it shall not utilize more than 65 percent of available power output under constant load conditions. Diesel engine shall be a two- or four-stroke cycle and gasoline engine shall be four-stroke cycle. The engine shall be equipped with at least the following components:

(a) Magneto, electronic or coil and battery type ignition (for gasoline engine only).
(b) Self-starter, 12-volt.
(c) Resistor-type spark plugs, or resistor-type ignition wiring (for gasoline engine only).
(d) Air cleaner.
(e) Automatic choke (for gasoline engine only).

* 3.5.13.4.1 Governor. A variable-speed governor shall be furnished. The governor shall automatically control the engine speed at the selected rated speed.

* 3.5.13.4.2 Electrical system. The electrical system shall utilize the bus-chassis batteries and shall conform to Federal Motor Carrier Safety Regulations 393.30 through 393.33.

* 3.5.13.4.3 Fuel pump. A fuel pump shall be furnished and when lifting fuel against ahead of 4 feet, the pump shall have sufficient capacity to supply the engine at its maximum rated load. An in-line fuel filter shall be provided, either as a component of the fuel pump or between fuel pump and carburetor.

* 3.5.13.4.4 Exhaust system. The exhaust system shall be furnished with a spark arresting muffler and means shall be provided to vent the exhaust fumes away from the body.

* 3.6 Servicing and adjusting. Prior to acceptance of the vehicle by the Government, the contractor shall inspect, service and adjust each vehicle for operational use in accordance with an approved manufacturer's prescribed predelivery servicing form GSA Form 1455. The areas to inspected and adjusted, if necessary, shall include, at least the following: aligning of headlights; adjustment of the engine; electrical and brake system; filling and charging of battery(s); alinement of front wheels; inflation of all tires; complete lubrication of body, chassis, engine and running gear, with grade of lubricants recommended for the ambient air temperature at the delivery point; servicing cooling system with a solution of ethylene glycol type antifreeze and water in equal parts by volume; and servicing of windshield washer reservoir with water and appropriate additives.

3.7 Workmanship. Defective components or parts and assemblies which have been repaired or modified to overcome deficiencies shall not be furnished. Welded, bolted, and riveted construction utilized shall be in accordance with the highest standards of the industry. Vehicles shall be free from defects which may impair their serviceablility or detract from appearance.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements. The supplier shall

provide the Government inspection representative instruments and such assistance as the representative may find necessary.

4.1.1 Classification of inspections. The inspections are classified as follows:

(a) Source inspection (4.1.2).
(b) Destination examination (4.1.3 civil agencies only).

4.1.2 Source inspection. Vehicles shall have final inspection for the completed vehicle by the Government prior to shipment from manufacturer's factory or assembly plant.

4.1.3 Destination examination (Civil agencies only). When specified, the contracted vehicle(s) shall be examined at the destination. The vehicle(s) shall be visually examined to determine compliance to the contract requirements and shall include operational check of 4.1.4. Vehicle failures, defects, and/or shortcomings may be accepted subject to correction by the contractor.

4.1.4 Operational checks. Operational checks shall cover all controls, systems and devices, doors, windows, accessories, and road testing of the completed vehicle. Vehicle shall be driven at various speeds; brakes tested for dependability; and bus checked for rattles, squeaks, and compliance to 3.6.

4.2 Government verification. Quality assurance operations performed by the contractor will be subject to Government verification at unscheduled intervals. Verification will consist of observation of the operations to determine that practices, methods, and procedures of the contractor's inspection are being properly applied. Failure of the contractor to promptly correct product deficiencies discovered shall be cause for suspension of acceptance until correction has been made or until conformance of product to specification criteria has been demonstrated.

* 4.3 First production vehicle inspection (for military services only). The first production vehicle of each type produced under the contract for the military services shall be inspected by the contractor at his plant under the direction and in the presence of Government representatives. The purpose of the inspection shall be to determine vehicle conformity with the contract. Acceptance of the first production vehicle shall not constitute a waiver by the Government of its rights under the provisions of the contract.

* 4.3.1 Radio frequency suppression verification. The vehicle manufacturer shall indicate on the questionnaire (vehicle commercial engineering data) if the vehicle will be suppressed to limit electromagnetic radiation in accordance with SAE J551.

4.3.2 Vehicle weight. The first production vehicle shall be weighed to determine curb weight and the distribution of curb weight on the front and rear axles. The imposed loading of front and rear axles will be computed using the curb weight and the payload, uniformly distributed over the vehicle load area, to provide the specified GVW. Calculated imposed loads on front and rear axles will be utilized to ascertain that the suspension, axles, and tires furnished are of adequate capacity to meet contractual requirements.

* 4.3.3 Road test. The first production vehicle will be examined and road tested less payload by the contractor to assure that the vehicle will operate in accordance with the contract requirements.

* 4.3.3.1 Road test details. Unless otherwise specified (see 6.2), the first production vehicle of each type provided under the contract shall be road tested, less payload, on highways and roads for a distance of not less than 100 miles.

* 4.3.4 Heater certification. The contractor shall furnish certification that the heater conforms to the Btu requirements of 3.5.10.1.

* 4.3.5 Wood treatment certification. Manufacturer's records, acceptable to the Government, shall be furnished to verify that all wood requiring treatment in accordance with MIL-STD-1223 has been treated.

* 4.3.6 Air conditioning. For buses with air conditioning, to verify conformance to the air conditioning performance requirements specified in 3.5.13, the manufacturer shall test the vehicle under actual or simulated conditions at least as stringent as specified herein. Simulated conditions shall be acceptable to the Government. Inside temperature may be calculated either with the specified number of seated passengers, or the use of simulated heat, for sensible cooling. Solar radiation may be employed or simulated by calculating solar load effective in Btu, based on the square foot surface and the angle of, incidence that will be exposed to the sun at the same time.

* 4.3.7 Production sample. Upon acceptance of the first production vehicle, it shall remain at the manufacturing facility as a production sample, and be the last vehicle shipped on the contract. The contractor shall maintain the vehicle in a serviceable condition for the duration of the contract.

* 4.4 Failure. Failure of the first production vehicle to meet requirements of the contract shall be cause for the Government to refuse acceptance of all vehicles under contract until corrective action has been taken.

* 4.5 Inspection of production vehicles. The contractor's inspection system shall as a minimum assure that the vehicle conforms to the physical and dimensional requirements and is capable of meeting performance requirements contained herein. For each vehicle under contract, the contractor shall make available to the Government, at the point of final acceptance records acceptable to the Government indicating that the servicing and adjusting required by 3.6 have been accomplished. For civilian agencies, GSA Form 1455, or an approved equivalent form, shall be used.

4.6 Removable instruments and controls. The requirements in 3.4.16 and 3.4.17 shall not be construed as requiring the removal of the instruments and controls as part of the final examination and tests. However, the presentation of the complete vehicle with said instruments and controls in place shall be tantamount to a certification that said instruments and controls are installed in a manner that facilitates their removal and servicing.

4.6.1 Rejection. Deficiencies of workmanship and nonconformance to any requirements of the contract shall be cause for rejection until corrective action has been taken.

5. PREPARATION FOR DELIVERY

5.1 Vehicle processing. The vehicle shall be processed for shipment, from manufacturer's plant to initial receiving activity, in accordance with the manufacturer's standard commercial practice.

6. NOTES

6.1 Intended use. The vehicles covered by this specification are intended for general administration use by the Government in transporting both children and adults over roads and highways encountered by the civil agencies and military services in the continental United States and overseas areas, and for operation in all climates. The principal use of the vehicles will be in stop-go, short haul, medium and low speed operatons.

* 6.2 Ordering data. Procurement documents should specify the following:

(a) Title, number, and date of this specification.

(b) Type of vehicle (see 1.2).
(c) Special requirements, unusual operating conditions, items, exceptions or end use, civil agencies only (see 3.1.1).
(d) Paint color, exterior, if other than specified, civil agencies only (see 3.1.1.1.).
(e) Exterior color selection after award of contract, if required (see 3.1.1.1).
(f) Identification of appropriate service for painting and marking (see 3.1.1.1).
(g) Concealed marking, if required (see 3.1.1.1).
(h) Rustproofing, if required (see 3.1.1.2).
(i) Exterior sound level in accordance with the California Vehicle Code, if required (see 3.2.3).
(j) Heavy duty cooling system, if required (see 3.1.1.3).
(k) Silicone brake fluid, if required (see 3.1.1.10).
(l) Gasoline engine, if required (see 3.4.1.1).
(m) Power plant heaters and fuel warmer, if required (see 3.4.1.5).
(n) If a battery heater is not required (see 3.4.1.5).
(o) If radio interference suppression is not required (civil agencies only) (see 3.4.2.1).
(p) Left dip headlights, if required (see 3.4.2.5.1).
(q) Passenger signal buzzer, if required (see 3.4.2.6).
(r) School bus red signal lamps, if required (see 3.4.2.8).
(s) Special capacity protection for main fuel tanks serving air conditioner system, if required (see 3.4.3.2).
(t) Manual transmission, if required (see 3.4.5.2).
(u) Positive traction, limited slip or automatic locking differential, if required (see 3.4.9.1).
(v) Disc type wheels, if required (see 3.4.10).
(w) Bias ply tires, if required (see 3.4.10.1).
(x) Non-directional, mud and snow tread, if required (civil agencies only) (3.4.10.1).
(y) If a spare wheel assembly is not required (see 3.4.10.5).
(z) Winch type carrier, if required (see 3.4.10.5).
(aa) If a spare tire is not required (see 3.4.10.6).
(ab) If brake type other than specified is specified (see 3.4.11).
(ac) Desiccant type air dryer, if required (see 3.4.11.2 subparagraph J).
(ad) Tools, if required (see 3.4.15).
(ae) Manufacturer's standard or optional meters or gages in lieu of indicators, if required (see 3.4.17).
(af) Destination sign compartment, if required (see 3.5.4.4.).
(ag) Left side service door, if required (see 3.5.5.).
(ah) Seat tilting adjustment, if required (see 3.5.8.1).
(ai) Four heaters and coolant pump, if required (see 3.5.10.1).

(aj) Right hand heater, blower, and defroster, if required (see 3.5.10.2).
(ak) Front view convex mirror, if required (see 3.5.11.1).
(al) Air conditioning, if required (see 3.5.13).
(am) Road test details, if different (military services only) (see 4.3.3.1).

6.3 Performance prediction. Completed copies of SAE Truck Ability Prediction Procedure form and computation for low speed requirement for each vehicle model furnished under contract should be submitted as specified in the contract. Unless other conditions are cited in the contract, computations should be made for normal atmospheric pressure, normal ambient air temperature, and still, dry air. The factors to be used in predicting truck ability (see 3.3.1.1) are established as follows for the corresponding SAE J688, Truck Ability Prediction Tables:

	Table 1	- Tire Factor. This factor must relate to the size of tires furnished by the contractor in accordance with this specification.
	Table 2	- Altitude Factor. 1.00
	Table 3	- Rolling Factor. 1.613
	Table 4	- Area Factor. 0.197
	Table 5	- Velocity Factor. 250.0
	Table 6	- Altitude Factor. 1.00
*	Table 7	- Chassis Friction Horsepower. Use applicable power unit GVW (to nearest, higher, tabulated 1,000 pounds) and the engine rpm (to nearest 100 revolutions) which is required for 50 mph geared speed. For GVW and engine speed beyond the range of this table, the following formula shall be used: FHP=l + (0.0000002 rpm) (GVW).
	Table 8	- Grade Factor. 0.75.
	Table 8A	- Correction Factor. Not required.
	Table 9	- Road Factor. 0.0.

6.4 Procurement requirements (civil agencies only). Invitation for bids contract, or orders should contain the following contractual requirements (see 6.5 thru 6.8) except in those instances where it is determined that inclusion thereof would not be to the best interest of the Government.

6.5 Warranty.

6.5.1 Warranty coverage. The contractor shall warrant the vehicle and furnished equipment against parts failure or malfunction due to design, construction, or installation errors, detective workmanship, and missing or incorrect parts (6.5.4 exceptions) for a minimum period

of 12 months and 15 months for vehicles outside the contiguous (48) United States and District of Columbia from date of acceptance*, or 12,000 miles of operation, exclusive of any authorized accumulated driveaway mileage, whichever occurs first. Engine and power train components (as covered by the vehicle manufacturer's standard warranty to the general public for the current year of manufacture) shall be warranted at 50 percent of the normal charge for parts and labor imposed by the dealer or other authorized facility from 12,001 to 50,000 miles, provided this occurs within the United States, and the District of Columbia. However, if the contractor receives from any supplier or subcontractor additional warranty on the whole or any component of the vehicle, in the form of time and/or mileage, including any pro rata arrangements, or the contractor generally extends to his commercial customers a greater or extended warranty coverage, the Government shall receive corresponding warranty benefits.

*The warranty begins when the Government accepts the vehicle from the contractor FOB point or origin/destination.

6.5.2 Domestic use. When vehicles are used within the fifty states of the United States, the District of Columbia, Puerto Rico, and the Virgin Islands, the warranty shall include the furnishing, without cost to the Government (FOB contractor's nearest dealer or branch to vehicle's location or station), new parts and assemblies to replace any that failed or malfunctioned within the warranty period. In addition, when the Government elects to have the work performed at the contractor's plant, branch, dealer, or with the contractor's approval: (i) to correct the supplies itself or (ii) to have them corrected by a commercial garage facility, the cost of the labor involved in the replacement of the failed or malfunctioned parts or assemblies shall be borne by the contractor.

6.5.3 Foreign use. When vehicles are used outside the fifty States of the United States, the District of Columbia, Puerto Rico, and the Virgin Islands, the warranty shall include the furnishing of new parts or assemblies to replace any returned to the contractor by the Government which failed or malfunctioned within the warranty period. The replacement parts or assemblies shall be delivered by the contractor to the port of embarkation in the United States designated by the Government. The contractor shall not be required to bear the cost of the labor involved in correcting defects in vehicles operated in foreign countries.

6.5.4 Warranty exceptions. Unless within the additional coverage under 6.5.1, the following items are considered normal maintenance and repair for which the contractor need not

assume liability for reimbursing the Government regardless of the vehicle age or mileage.

(a) Abuse, negligence, or unapproved alteration of original parts.
(b) Damage from accidents.
(c) Brake and standard clutch adjustments.
(d) General tightening, head lamp adjustments.
(e) Wheel alignment or tire balancing.
(f) Tires, and batteries (if warranted by their manufacturers).
(g) Miscellaneous expenses such as fuel, towing, telephone, travel, lodging, or loss of personal property.

6.6. Operators, servicing, and parts manuals. The successful bidder shall furnish at least one operator's and maintenance handbook, including a handbook(s) for any furnished special equipment. When specified (see 6.2), parts lists or book and shop repair manual(s) for the vehicle and equipment furnished shall be provided.

6.7 Repair parts and service. As continuous operation of the vehicles contemplated by this specification is of utmost importance, it is necessary that the successful bidder be in a position to render prompt service by furnishing a list of branch offices or agencies where complete stocks of repair parts are maintained and can be secured within a reasonable time after ordering by part number from the manufacturer's parts book and at such discount as may be quoted from year to year by the manufacturer of the vehicle purchased under this specification.

6.8 Statement of Origin or Bill of Sale. A manufacturer's Statement of Origin or Bill of Sale showing the applicable purchase order number is required for each vehicle procured under this specification. Unless otherwise specified, such documents shall be forwarded to the consignee.

NOTICE - The margins of this document are marked with an asterisks (*) to indicate where changes (additions, modifications, corrections, deletions) from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content regardless of the marginal notations and relationship to the previous issue.

MILITARY INTEREST:

Custodians

Air Force - 84, 85
Army - AT, EL
Navy - YD, MC

CIVIL AGENCY COORDINATING ACTIVITIES:

DC Gov't - DCG
DOE
Interior - BIA
State Dept. - AID
USDA - FS
GSA - FSS

Preparing activity:

Army - AT
Project Number 2310-0432