



Vocational and Educational Services for Individuals with Disabilities

Vocational Rehabilitation

Standards for Automotive Adaptive Equipment

NEW YORK STATE EDUCATION DEPARTMENT
OFFICE OF VOCATIONAL AND EDUCATIONAL SERVICES
FOR INDIVIDUALS WITH DISABILITIES (VESID)

STANDARDS FOR AUTOMOTIVE ADAPTIVE EQUIPMENT FOR VEHICLE MODIFICATIONS FOR INDIVIDUALS
WITH DISABILITIES

TABLE OF CONTENTS

- 1.0 SCOPE, CLASSIFICATIONS, LIMITATIONS, and DEFINITIONS
 - 1.1 Scope
 - 1.2 Classifications
 - 1.3 Definitions
- 2.0 APPLICABLE DOCUMENTS
 - 2.1 V.A., Washington, D.C. & Engineering Center
 - 2.2 Society of Automotive Engineers
 - 2.3 American National Standards Institute
 - 2.4 American Society for Testing and Materials
 - 2.5 American Welding Society
 - 2.6 National Highway Traffic Safety Administration
 - 2.7 USA Department of Defense
 - 2.8 National Mobility Dealers Association (NMEDA)
- 3.0 DESIGN/PERFORMANCE STANDARDS
 - 3.1 Safety of Operation and Construction
 - 3.2 Conventional Use
 - 3.3 Mechanical and Assembly Design Guidelines
 - 3.4 Electrical and Electronic Design Guidelines
 - 3.5 Hydraulic, Pneumatic, Electric, and Vacuum Design Guidelines
 - 3.6 Installation of Automotive Adaptive Equipment
 - 3.7 Usability and Maintainability
 - 3.8 Quality and Warranties
- 4.0 SPECIFIC SUB-SYSTEM STANDARDS
 - 4.1 Primary Controls
 - 4.2 Secondary Controls
 - 4.3 Access Device
 - 4.4 Wheelchair/Scooter Handling Devices
 - 4.5 Occupant Protection

- o 4.6 Vehicle Structural Modifications
- o 4.7 Vehicle Electrical Modifications
- o 4.8 Vendor Qualifications
- o 4.9 Lowered Floor Minivans
- 5.0 Joystick Driving Systems (to be developed)

1.0 SCOPE, CLASSIFICATIONS, AND DEFINITIONS

1.1 Scope

Vehicle modifications are considered within the scope of "assistive technology devices" as defined in Section 7 (13) of the Rehabilitation Act; 29 U.S.C. 706(13) which reads in part "any item, piece of equipment, or product system, whether acquired commercially off the shelf, modified, or customized, that is used to increase, maintain, or improve functional capabilities of individuals with disabilities, etc."

These standards are applicable to automotive adaptive equipment available as options and vehicle modifications subject to purchase in whole or in part by the State Education Department's Office of Vocational and Education Services for Individuals with Disabilities (VESID) (herein referred to as state agency) on behalf of eligible consumers who require such adaptive equipment and/or modifications in order to drive or ride as a passenger.

VESID makes such purchases to assist eligible consumers to meet the employment goal of their Individual Plan for Employment (IPE). Within the parameters of the IWRP, the consumer's informed choice and appropriate evaluations as described in these standards, VESID determines which purchases will meet the consumer's functional needs in the most cost-effective manner.

Only adaptive equipment and/or modifications covered by these standards may be purchased by the state agency. Adaptive equipment and/or modifications not covered by these standards will require written approval by the state agency prior to authorization of work.

These standards cover devices, mechanisms, and additions to a motor vehicle which are or can be installed in a motor vehicle as an after-market manufacturer purchase item in order to adapt that motor vehicle to permit a physically disabled person to drive it on the public highway, or to permit a physically disabled person to ride as a passenger in a motor vehicle. Such adaptation includes devices and provisions for entering and leaving a motor vehicle, for operating the vehicle or components of the vehicle, and for restraint of drivers and passengers with disabilities and equipment associated with those persons, such as wheelchairs, canes, walkers, etc.

These standards also cover modifications to the existing sub-systems of a motor vehicle in order to effect adaptation for the driver or passenger with a disability. These sub-systems include but are not limited to electrical, mechanical, control and display, and structural members.

In the adoption of these standards the state agency's chief goal is maximum safety to VESID consumers, their passengers, and the motoring public.

1.2 Classifications

Automotive adaptive equipment is classified as follows:

1. **Primary Controls:** Hand Controls
 - A. Steering Assist Devices
 - B. Steering Column and Shaft Extension Steering Modifications
 - C. Braking Modifications
 - D. Left Foot Accelerator
2. **Secondary Controls:** Secondary Control Consoles
 - A. Transmission
 - B. Turn Signals
 - C. Hazard Warning Signals
 - D. Windshield Wiper/Wiper Washer
 - E. Ignition and Engine Start
 - F. Lights
 - G. Seat Adjustment
 - H. Power Windows
 - I. Heating, Ventilation and Air
 - J. Conditioning (HVAC) Controls
 - K. Door Locks
 - L. Parking Brake
 - M. Horn
3. **Access Devices:** Automatic Wheelchair Lifts
 - A. Semi-Automatic Wheelchair Lifts
 - B. Exterior Control Box and Devices
 - C. Automatic Door Openers
 - D. Ramps
 - E. Steps
 - F. Assist Handles
 - G. Wheelchair Handling Devices:
 - H. Wheelchair/Scooter Carriers
 - I. Wheelchair/Scooter Hoists
4. **Occupant Protection:** Seats
 - A. Passenger Restraints
 - B. Wheelchair Restraints (Occupied)
 - C. Wheelchair Restraints (Unoccupied)
5. **Vehicle Structural Modifications:**
 - A. Wheelchair Flooring
 - B. Lowered Floor
 - C. Wheelchair Power Pan (Driver Position)
 - D. Raised Roofs
 - E. Modified Doors
6. **Vehicle Electrical Modifications:**
 - A. Battery and Charging Systems
 - B. Auxiliary Power Units

C. Other Electrical Modifications

7. **Vendor Qualifications**

8. **Lowered Floor Minivans**

1.3 Definitions

(ABS) - Anti-Lock Brake System

Accessible - The property of being able to be reached, operated, and maintained by the user of the equipment.

Accommodation - The space that is provided for the user.

Actuator - Any mechanism for controlling or moving a component indirectly or at a distance from the input.

Ambient - That which is all around an object, such as air, and the condition of that surrounding at a given time.

Anthropometry - The dimensions, angles, area, volume, strength, and other physical characteristics of the human body.

Assistive Technology Device - Any item, piece of equipment, or product system, whether acquired commercially off the shelf, modified, or customized, that is used to increase, maintain, or improve the functional capabilities of an individual with a disability.

Assistive Technology Service - Any service that directly assists an individual with a disability in the selection, acquisition, or use of an assistive technology device, including (i) the evaluation needs of the individual with a disability, including a functional evaluation of the individual in his or her customary environment; (ii) purchasing, leasing, or otherwise providing for the acquisition by an individual with a disability of an assistive technology device; (iii) selecting, designing, fitting, customizing, adapting, applying, maintaining, repairing or replacing assistive technology devices; (iv) coordinating and using other therapies, interventions, or services with assistive technology devices, such as those associated with existing education and rehabilitation plans and programs; (v) training or technical assistance for an individual with a disability or, if appropriate, the family members, guardians, advocates, or authorized representatives of the individual; and (vi) training or technical assistance for professionals (including individuals providing education and rehabilitation services), employers, or others who provide services to, employ, or are otherwise substantially involved in the major life functions of individuals with disabilities, to the extent that training or technical assistance is necessary to the achievement of an employment outcome by an individual with a disability.

Augmentation - To increase or improve some function or mode of operation.

Automotive Adaptive Equipment - Any device or mechanism which permits a person with a disability to gain or regain driving capability and use a motor vehicle without an attendant, or allows a person with a disability to ride as a passenger.

Backup - Any device which duplicates or otherwise fulfills the function of another if the latter fails or becomes

- inoperative.

Bezel - The trim ring around a gauge or control by which it is mounted in a panel.

Cathode Ray Tube - The component in a TV set or computer that presents the picture for viewing.

Closed-Loop - See feedback loop.

Controls - Any device that accepts an input from a human being for the purpose of changing the state of the equipment to which the control is connected.

Crashworthiness - Degree to which the interior of a motor vehicle, devices installed in the passenger compartment, and the structure of the vehicle as a whole are designed to minimize injury to a passenger in the event of a crash.

Criterion - A rule or a test by which anything is tried in forming a correct judgement, respecting it.

Deploy - To extend or put something out.

Display - A device that imparts information to a human being for the purpose of operating piece of equipment.

Driver Rehabilitation Specialist - As defined in VESID's "Driver Rehabilitation Standards."

Durability - The quality of being able to last or withstand the wear-and-tear of being operated or used.

Dynamic - Active, moving, changing, as opposed to static.

Egress - Exit from a vehicle or enclosure by a human being.

Electro-Mechanical - Equipped with both mechanical and electrical components to accomplish the function.

Electro-Magnetic Interference (EMI)- Any electrical or electronic signal that can cause disruption or damage to an electronic device.

Electronic - Operated by electron flow and/or logic.

Eligible Consumer - A person with a disability who has been certified to receive vehicle modification services from VESID.

Ergonomics - The technology of designing equipment so that it can be operated in the most efficient and comfortable manner by the intended user.

Evaluator - A qualified Driver Rehabilitation Specialist who determines a disabled person's capability to drive a motor vehicle and recommends the adaptive equipment necessary to permit a person with a disability to drive safely and independently, or ride as a passenger.

Failure Mode - A way in which an item of equipment or device can fail, break, or otherwise cease to function.

Feedback Loop - The return to the input of a particular system of part of the output for the purpose of correcting the output to match the input.

Fluidics - A device which depends for operation on the pressures and flows of a fluid in precisely shaped channels.

G Force - The force acting on an object or body due to acceleration or deceleration of the body measured in multiples of the body's weight.

Gain - The ratio of the output of a system to the input to the system, when both are expressed in the same units of measurement.

Gauge or Gage - The thickness of a sheet of metal, specifically the U.S. Standard Sheet Metal Gauge system. The thicknesses in this system vary from 0.0062 inch (38 gauge) to 0.5 inch (0 000 gauge).

Hatch - A small door or opening to gain access.

Human Factors - See ergonomics.

Hydraulic - Operated, moved or effected by means of a fluid under pressure or in motion.

Ingress - To enter or get into a vehicle or other compartment by a human being.

Instrumentation - Devices for detecting and/or measuring some quality or state under observation.

Integrated Circuit - A tiny complex of electronic components and their connections that is produced in or on a single slice of material such as silicon.

Interface - The place at which independent systems meet, or act on, or communicate with one another. One of the driver/vehicle interfaces is the primary control group: throttle, brake, and steering.

Lag - The delay between input and output inherent in any system, which usually becomes larger as input changes become more frequent; to fall behind.

Liability - Obligation or responsibility according to law or equity.

Light Emitting Diode (LED) - A solid state electronic device which glows when a current passes through it.

Liquid Crystal Display (LCD) - A solid state electronic device changes reflectance when a current passes through it.

Maintain-Ability - Design considerations directed toward accomplishing necessary maintenance quickly, safely, accurately, and effectively with minimum requirements for personnel, skills, special tools, and cost.

Non-Skid - Surface treatment to render friction between a surface and an object moving across surface as high as possible.

◊ **OEM** - Original Equipment Manufacturer

Operability - Designer or installation considerations directed toward making a device capable of being controlled or made to work by the person for whom the device is designed.

Position Control (Zero Order) - Any system which responds to a change in the position of the control by a corresponding change in the position of the component being controlled such that the ratio of output displacement and input displacement is constant.

Pneumatic - Using the power of compressed air or other gas to actuate or accomplish some function.

Processor - Any device which performs logical operations on input information or otherwise operates on data. Essentially a dedicated purpose computer.

Quality Control - Activities designed to ensure adequate performance, durability, and finish in a manufactured product.

Reliability - The quality of being dependable in operation within the stated operational limits; probability that a system will perform a required function under specified conditions for a specified period or at a given time.

Rocker Switch - An electrical device which a person uses as a control for an electrical or electronic circuit. The device has a flat surface, one side of which is depressed for ON, the other side for OFF.

Safety - Freedom from conditions which can cause injury or death to humans and damage to property. The conservation of human life and its effectiveness, and the prevention of damage to property consistent with product or system requirements.

Schematics - Drawings or other diagrammatic representations of equipment.

Servo - A power driven device that supplements a primary control operated by a comparatively feeble force and involves a feedback loop and usually constitutes a position control.

Single Point Failure - Any failure mode that in happening results in hazard or otherwise adversely affects the safe operation of the system.

Sub-System - A combination of parts which performs an operational function within a system and is usually a major sub-division of that system.

System - A composite of equipment, capable of performing or supporting an operational role. A complete system includes all equipment, services, and personnel (e.g., the driver) required for its operation and support to the degree that it can be considered to be a self-sufficient unit in its intended operational environment. An automobile with a driver behind the wheel is a system.

Toggle switch - An electrical device which a person uses as a control for an electrical or electronic circuit. The device has a short handle to permit the operator to select one of several states for the controlled circuit.

Torque - A force which produces or tends to produce rotation or torsion; a turning or twisting force.

Transducer - A device which is actuated by power from one system and supplies power usually in another form to a second system. A microphone is a transducer and so is the temperature sensor in a cooling system.

Vacuum - A space partially empty of air such that the pressure in the space is below that of the surrounding air. This pressure difference is used as a source of power.

Vehicle Dynamics - The way in which a vehicle moves or responds as it is moving to control inputs.

Weldment - Any joint or seam between two pieces of metal which are joined through heating the two metals and forcing them to flow together.

Zero Order - See position control.

2.0 APPLICABLE DOCUMENTS

These *Standards for Vehicle Modifications* are designed to be used in conjunction with the most current version of the *Guidelines* of the National Mobility Equipment Dealers Association (NMEDA) which define NMEDA's Quality Assurance Program (QAP). While NMEDA suggests that these are recommended practices, VESID requires that the practices outlined by both NMEDA and VESID be followed. **In all instances, the most stringent standard will prevail. Federal and State laws as well as manufacturers' installation procedures supercede VESID Standards.**

Specifications or recommended practices (latest update) published by the following agencies and are applicable to the design, manufacture, supply, installation and use of automotive adaptive equipment and vehicle modifications.

While any list of specific documents is not intended to be inclusive, those publications that are perceived as most relevant have been identified. It is the responsibility of the vehicle modifier to be current on Federal, State, VESID, and NMEDA required practices.

2.1 Veteran's Administration, Washington, D.C. and Rehabilitation Engineering Center, New York

2.2 Society of Automotive Engineers

400 Commonwealth Drive
Warrendale, PA 15096

SAE J156 Fusible Links

SAE J163 Low Tension Wiring and Cable Terminal and Splice Clips

SAE J258 Circuit Breaker - Internal Mounted-Automatic Reset

SAE J378 Marine Engine Wiring

SAE J541 Voltage Drop for Starting Motor Circuits

- SAE J553 Circuit Breakers

SAE J554 Electric Fuses

SAE J561 Electrical Terminals - Eyelet and Spade Type

SAE J656g Automotive Brake Definitions and Nomenclature

SAE J858a Electrical Terminals - Blade Type

SAE J928 Electrical Terminals - Pin and Receptacle Type

SAE J937b Service Brake System Performance Requirements - Passenger Car

SAE J1139 Supplemental Information - Driver Hand

Controls Location for Passenger Cars, Multiple-Purpose Passenger Vehicles, and Trucks (10,000 GVW and Under)

SAE J1725 Structural Modification For Personally

Licensed Vehicles To Meet The Transportation Needs of Persons With Disabilities

SAE J1903 Automotive Adaptive Driver Controls, Manual

SAE J2249 Wheelchair Tiedown and Occupant Restraint Systems for Use In Motor Vehicles

SAE J2092 Testing Of Wheelchair Lifts For Entry To Or Exit From A Personally Licensed Vehicle

SAE J2093 Design Considerations For Wheelchair Lifts For Entry To Or Exit From A Personally Licensed Vehicle

SAE J2094 Vehicle and Control Modifications For Drivers With Physical Disabilities Terminology

2.3 American National Standards Institute

1430 Broadway
New York, NY 10018

2.4 American Society for Testing and Materials

1916 Race St.
Philadelphia, PA 19103

2.5 American Welding Society

2501 N.W. Seventh St.
Miami, FL 33125

AWS D1.1-86 Structural Welding Code

2.6 National Highway Traffic Safety Administration

U.S. Department of Transportation

400 Seventh St., S.W.

Washington, D.C. 20590

Federal Motor Vehicle Safety Standards (FMVSS) (49CFR571)

FMVSS 201 Occupant Protection in Interior Impact

FMVSS 207 Seating Systems

FMVSS 208

FMVSS 209 Seat Belt Assemblies

FMVSS 210 Seat Belt Assembly Anchorages

FMVSS 216 Roof Crush Resistance

FMVSS 220 School Bus Rollover Protection

FMVSS 301 Fuel System Integrity

FMVSS 302 Flammability of Interior Materials

2.7 USA Department of Defense

Washington, D.C. 20301

2.8 National Mobility Equipment Dealers Association

909 E. Scagway Ave

Tampa, FL 33604

1-800-833-0427

3.0 GENERAL DESIGN/PERFORMANCE STANDARDS

3.1 Safety of Operations and Construction

Safety to persons using automotive adaptive equipment and vehicles that have been modified shall be the primary design consideration. For any installation of equipment or modification of the motor vehicle, a good faith effort shall be made to avoid the introduction of new single point failures of the associated vehicle subsystem which otherwise do not exist in that subsystem and which compromise user safety, or safety of the motoring public. Any installation of equipment or modification of the motor vehicle shall not unnecessarily compromise crashworthiness provisions provided by the vehicle manufacturer in compliance with the applicable

- Federal Motor Vehicle Safety Standards, especially FMVSS 201, 203, 204, 209, and 210, nor present hazards to vehicle occupants such as sharp edges. The design of the adaptive equipment itself shall meet the applicable standards set forth below in this Standard.

3.1.1 Workmanship

Workmanship of any adaptive equipment and its installation in a motor vehicle shall be comparable to the best commercial practice. Where applicable, all installations shall be designed to be permanently installed in the vehicle and shall use hardware, fastenings, and connectors consistent with permanent installation. A good faith effort shall be made to retain OEM design and appearance. It is assumed that all installations will work, as recommended, 100% of the time.

3.2 Conventional Use

As a general design principle, all adaptive equipment and vehicle modifications should permit operation by an able bodied driver and transport of an able-bodied passenger, with as little change as possible from conventional subsystems operation and function. Adaptive equipment should not impede the operation of secondary controls.

3.3 Mechanical and Assembly Design Guidelines

3.3.1 Mechanical Design Requirements

Design of automotive adaptive equipment shall be consistent with accepted engineering principles and with automotive design practice with regard to materials, structures, lubricants, and maintainability. Any adaptive device or component shall be designed to enhance the usability of the vehicle by the disabled person, and not to degrade the vehicle, safety of operation or service life.

Automotive adaptive devices shall be constructed of materials that are compatible with the automotive environment as defined in SAE J1211 "Recommended Environmental Practices for Electronic Equipment Design" as applicable. The construction of adaptive devices shall be such as to prevent permanent deformation under the stress of normal usage as specified by the manufacturer and to operate reliably over an extended period of time comparable to the depreciable service life of the vehicle in which the device is installed.

At the state agency's option, any adaptive device or modification may be required to be submitted to an independent test and evaluation agency for evaluation before the adaptive device or modification is approved for purchase for eligible consumers by the state agency. At its discretion, the state agency may suspend the purchase of any product for which it believes that a safety hazard may result to the driver or passenger. Such suspensions shall be for whatever period of time is required for the manufacturer to satisfy the concerns of the state agency in this regard.

3.3.2 Assembly Requirements

Assembly of automotive adaptive equipment shall have good workmanship in accordance with good commercial practice and shall conform to the following specific requirements:

3.3.2.1 Mechanical and Assembly Weldments

The design and fabrication of any weldments shall conform to sections 1, 2, 3, and 4 of the American Welding Society Structural Welding Code, D1.1-72, most recent revision, for steel construction, or to the AWS Recommended Practices for Gas Shielded Arc Welding of Aluminum and Aluminum Alloy Pipe, D10.7-60, most recent revision as applicable.

3.3.2.2 Mechanical and Assembly Fasteners

All fasteners used shall conform to the SAE Standards or Recommended Practices as applicable. All fasteners used shall be designed or treated for resistance to loosening from vibration. These are the minimum standards and vendors are encouraged to use the best materials and methods when utilizing mechanical and assembly fasteners.

3.4 Electrical and Electronic Design Guidelines

3.4.1 General

Any electrical or electronic component of an automotive adaptive device shall be designed, assembled, and connected in a manner suitable for the automotive operational environment: temperature extremes, vibration, mechanical shock, dust and dirt contamination, electromagnetic and electrostatic interference, salt spray, splashing with water and other chemicals, especially petroleum type hydrocarbons, and moisture. These are the minimum standards and vendors are encouraged to use the best materials and methods.

3.4.2 Labeling of Controls and Displays

All labels for controls, operation of equipment, or for cautionary information shall be designed to be legible at the distance at which they should be expected to be read under normal operating conditions, under ambient daytime conditions of illumination. Under nighttime levels of illumination, certain labels are required to be illuminated as in FMVSS 101 if they are on the dash panel.

These controls if relocated to a panel visible to the driver in the driver position shall be illuminated. Such illumination shall be accomplished for visibility at night without glare.

Label nomenclature and symbols shall be designed to meet the standards of FMVSS 101, "Controls and Displays", unless OEM labels differ, in which case the OEM label for the same function shall be repeated.

All labels shall be designed to remain permanently affixed and legible for the design lifetime of the device or panel to which they are affixed. The use of temporary labels or labels made through the use of embossing devices on special pressure-sensitive tape is not acceptable unless permanently affixed.

3.5 Hydraulic, Pneumatic, Electric and Vacuum Design Guidelines

3.5.1 General

Any hydraulic, pneumatic, or vacuum operated subsystem of an automotive adaptive system shall be designed, assembled, and connected in a manner suitable for the automotive operational environments.

3.5.2 Hydraulic Design Requirements

- Hydraulic components, including pumps, actuators, valves, fittings, and hoses shall conform to the following SAE standards as applicable:

SAE J514 Hydraulic Tube Fittings

SAE J516 Hydraulic Hose Fittings

SAE J517 Hydraulic Hose

SAE J518c Hydraulic Flanged Tube, Pipe and Hose Connections, 4-Bolt Split Flange Type

Selection and installation of hydraulic hose shall conform to the general guidelines of: SAE J1273 Selection, Installation, and Maintenance of Hose and Hose Assemblies

All hoses used for adaptive equipment for power steering systems including servo controls shall meet the requirements of: SAE J190 Power Steering Pressure Hose-Wire Braid

3.5.2.1 Hydraulic System Integrity

All adaptive equipment using hydraulic components shall meet the criteria outlined in SAE J1273, and in addition must meet or leak less than minimum external leakage as defined in SAE J1176 "External Leakage Classifications for Hydraulic Systems" as a Class 3 leakage state, "Recurring fluid that results in the formation of a non-falling droplet".

3.5.3 Pneumatic Vacuum Design Requirements

Pneumatic and vacuum equipment includes actuators, valves, hoses and fittings designed for operation by either pressurized air or by engine manifold vacuum.

Pneumatic hoses and associated fittings shall meet the requirements of SAE J1402 "Automotive Air Brake Hose and Hose Assemblies".

Vacuum hoses and associated fittings shall meet the requirements of SAE J1403 "Vacuum Brake Hose". All vacuum hoses connected to adaptive equipment shall be secured by suitable hose clamps.

3.5.3.1 Pneumatic and Vacuum Integrity Inspection

Any audible leak in pneumatic equipment will disqualify that equipment from acceptance. Any vacuum operated adaptive equipment shall be capable of sustaining a vacuum of at least 10 inches of mercury when it is not operating but the vehicle engine is running.

3.6 Installation of Automotive Adaptive Equipment

3.6.1 Installation of Automotive Adaptive Equipment General Requirements

The installation of automotive adaptive equipment shall not require alterations of the motor vehicle which impair or reduce any safety features originally designed into the vehicle. A good faith effort shall be made to assure that the installation of automotive adaptive equipment does not impair the operation of safety features

originally designed into the vehicle. Although it is highly desirable not to deface the vehicle or otherwise reduce its resale value this desire is of secondary importance to assuring the secure installation of any device.

3.6.2 Fastenings and Hardware

All fasteners used shall conform to the SAE Standards or Recommended Practices as applicable. Bolts must be grade 5 and grade 8. All fasteners used shall be designed or treated for resistance to loosening from vibration. The construction and materials of mounting hardware shall be such as to resist permanent deformation or failure of the joints under the stress of normal use as specified by the manufacturer. Backing plates must be a minimum of 11 gauge and 3" diameter with corners bent down. All fasteners and hardware required for installation in a particular motor vehicle shall accompany the device.

3.6.3 Weldments

Any installation of adaptive equipment that requires weldments shall comply with the requirements of 3.3.2.1.

3.7 Usability and Maintainability

3.7.1 General Requirements

The state agency's goal is to provide simple, cost-effective, and reliable adaptive equipment that will remove as much as possible the barriers to using a personal motor vehicle that is presented by a physical disability. Awkward, needlessly complicated, makeshift equipment has no place in this program, and will not be purchased by the state agency. The design of all automotive adaptive equipment shall conform to generally accepted human factors principles of operation, as well as to anthropometric and force limitations as contained in standard human factors sources such as MIL-STD-1472E.

While it is understood that all equipment requires maintenance, VESID's goal is to provide adaptive equipment that has provisions for making periodic maintenance as simple, inexpensive, and time conservative as possible consistent with cost effectiveness. The VESID consumer will be provided with a schedule of required maintenance by the vehicle modifier upon receipt of the equipment.

3.7.2 User Information

The manufacturer, supplier or installer shall furnish a user manual with each adaptive device which contains information on the proper use and operation of the device: general operation, operation of all controls, required user actions.

3.7.3 Maintenance Information

The manufacturer of adaptive equipment shall specify if there is any user/owner maintenance to be performed, provide as part of the user instructions sufficient information to permit the user/owner to perform the maintenance operations, and identify those periodic or non-periodic maintenance operations which must or should be performed by the manufacturer, supplier or installer. This information shall include names, addresses, and telephone numbers of the manufacturer or his representative, and authorized service agencies or distributors.

3.8 Quality and Warranties

3.8.1 Quality

In view of the seriousness of in-service failures, quality control assurances are the responsibility of the manufacturers of adaptive equipment commercially sold. Evidence of such assurances can be in the form of a seal, inspection stamp, tag, or any other legible identification. In order to permit parts traceability, where provided by the manufacturer, each device that constitutes a separate subsystem shall bear a model number, a serial number, and the manufacturer's name and address.

The responsibility of product safety, reliability, and liability rests with the manufacturer of every adaptive device. Although devices may be accepted for purchase by VESID under the requirements of this standard, VESID assumes no liability for any claim arising from the use of such devices. If alterations are performed outside of the scope of these guidelines, the vendor, manufacturer or distributor must provide written documentation, at VESID's request, to ensure durability, usability and safety.

3.8.2 Warranties

A statement of warranty shall be provided with each adaptive device, when provided by the manufacturer, assuring the quality of materials and workmanship of the product that specifies exact coverage, period of warranty, and recourses. The warranty shall state that if defects are found during the warranty period, the device will be repaired, replaced, or a refund made by the seller or his authorized agent. The vehicle modifier has responsibility to send in all warranties for all consumers and send copies to consumers where applicable.

4.0 Specific Subsystem Standards

The standards contained in this section shall incorporate all the requirements identified in the previous general design standards section (3.0) as applicable. Where standards in the specific subsystem section exceed or are in conflict with general design/performance standards, the specific subsection standard shall govern.

4.1 Primary Controls

Primary controls are controls for implementing throttle, brake, and steering inputs to the motor vehicle. Any adaptive primary controls which do not fit the description of the controls may be evaluated on a case-by-case basis by VESID.

4.1.1 Hand Controls

Hand controls are those devices that a person with a disability uses to operate the accelerator and service brake of a vehicle. These standards are limited to mechanical (non-powered) hand controls manufactured for use by persons with disabilities.

4.1.1.1 Design Requirements

All standard hand controls shall meet the standard of the U.S. Veterans Administration (VAPC-A-7505-8) March 31, 1978, or as subsequently revised as of date of purchase. Hand controls that have not been tested by the VA may be accepted by state agency provided adequate VA standard test documentation and certification is furnished

4.1.1.1A Hand Controls

1. The hand controls must be installed to the manufacturer's specifications. Installers should be trained vehicle modifiers.
2. Hand controls for gas and brake shall only be installed in vehicles with power brakes, power steering and automatic transmission. Hand controls that are installed in vehicles without the above, must be authorized by the driver rehabilitation specialist, VESID counselor, and hand control manufacturer.
3. Modification or adaptation to hand controls must receive written approval of the hand control manufacturer.
4. All hand controls installed in any type of vehicle must be capable of full throttle and full braking without interference with any part of the vehicle.
5. All hand controls when installed into any vehicle, must not impair the operation of the foot accelerator or foot brake by an able-bodied person.
6. All hand controls for gas and brake must automatically return to a neutral position after acceleration or braking.

4.1.2 Steering Assist Devices

Steering assist devices are add-on devices for use with automotive steering wheels. These devices are used by drivers with disabilities who require some assistance in steering, gripping, or turning a wheel with one hand. These standards are limited to the mechanical (non-powered) approved steering assist devices manufactured for use by persons with disabilities.

4.1.2.1 Design Requirements

All standard steering assist devices shall meet the Standards of the U.S. Veterans Administration (VAPC-A-7505-8) March 31, 1978, or as subsequently revised as of date of purchase. Steering assist devices that have not been accepted by the VA may be accepted by VESID provided the steering assist device meets the applicable criteria in VAPC-A-7505-8.

4.1.2.1A Steering Wheel Devices

1. The location and type of the steering device shall be determined by the driver rehabilitation specialist.
2. The steering device or base attachment must not interfere with the motorist's visibility of any instruments located on the dash board.
3. Spanner bars may not be used with airbag type vehicles.
4. Any modification to steering devices must be authorized by the driver rehabilitation specialist and approved by the device manufacturer.
5. All steering devices must be of the quick release type, easily removable by an able bodied driver without the use of hand tools.

4.1.3 Steering Column and Shaft Extension

Steering column extension is an elongation of, addition to, or replacement of an OEM steering column, and steering shaft extension is any similar modification or replacement so that an individual with a physical disability can reach the steering wheel.

4.1.3.1 Design Requirements

- Either a steering shaft or column extension or both, shall provide accessibility to the driver to enable him or her to control the steering mechanism without introducing increased torque or differences in input requirements. The steering column shall provide sufficient bearing support to the steering shaft and/or its extension to preserve the original function of steering control input.

Steering column extension may be of a complete replacement or add-on. It shall be of a durable material at least comparable to that used for the OEM column and shall meet 3.3.

4.1.3.2 Safety Provisions

A reasonable effort shall be made to retain, to the greatest extent possible, the original safety provisions and collapsibility of the steering system.

4.1.3.2A Steering Column Extension

1. The following are acceptable methods of extending a steering column:

- A. Add-On Post Extension

The use of a spacer made of steel, aluminum, or stainless steel, must have a non-reflective surface to avoid any glare from the sun. This spacer must be attached to the original steering column, using bolts that are of OEM quality.

All bolts attaching the spacer to both the column and the steering wheel must be sealed using a medium grade Loc-Tite. This is to prevent vibration and/or loosening of the wheel and/or column. The maximum length of a steering post extension is 6".

- B. Integral Column Extension

An extension bracket may be built in order to relocate the steering column to a more rearward position. A steel spacer is then welded into the column. This keeps the ignition switch, shift lever, and signal lever in their original positions in relation to the steering wheel. This work must be done by a certified welder.

The type of steering column extension (e.g., integral column or add-on post extension), as well as the length of such extension, will be specified by the driver rehabilitation specialist.

The steering column extensions must be equivalent to the original steering column in function. An effort shall be made to conserve OEM appearance to the greatest extent possible.

4.1.4 Steering Modifications

Steering modifications are any modifications which are made to the hydraulic control mechanism of OEM power steering systems provided as original equipment. Maximum safety for drivers with disabilities, passengers, and the general public is of primary concern. These standards are limited to modifications for lowering the amount of driver effort required to operate the steering system which retain a steering wheel and the OEM mechanical steering systems for steering control, with unchanged steering gearbox ratio, and additional equipment which is installed to provide needed redundancy for backup/emergency operation.

4.1.4.1 Steering Modifications Design Requirements

Steering modifications shall meet the draft standards of the U.S. Veterans Administration (VAREC-A-8110-01). The burden of proof is upon the manufacturer or supplier to provide documentation to the state agency based on engineering analysis and test results, that the intent of this standard has been satisfied.

4.1.4.1A Reduced Effort Steering

1. The term "reduced effort steering" indicates that the effort required to start the wheel in motion is reduced to a specified level below that needed for power steering. The two reductions specified in this document are "low" effort steering and "no" effort steering.
 - A. Definitions: As measured on an OEM wheel
Factory Power Steering: 2¼ lbs. to 3 lbs.
Low Effort Steering: 2 lbs. or less
No Effort Steering: 10 oz. or less
 - B. When either one of the two types of reduced effort steering are installed into a vehicle an emergency back-up steering unit must be installed.
 - C. If a smaller diameter steering wheel is required other than the original manufacturer's steering wheel, the size should be determined by the driver rehabilitation specialist

4.1.4.1B Emergency Back-Up Steering

1. An automatically actuated back-up system is mandatory on all reduced effort steering systems. The emergency back-up steering will activate automatically in the event of engine power failure, low pressure or power steering belt loss.
2. Upon activation, the driver shall receive an audio and/or visual notification that the system has been activated. If visual, it must be located within the driver's view.
3. The emergency back-up system shall have the capability of being pre-tested to make sure the system is functioning.
4. The emergency back-up system will allow a minimum of 180 seconds use under the most adverse emergency conditions.
5. All hoses, lines and fittings shall be of OEM quality or superior.

4.1.4.1C Horizontal Steering

1. If the original steering column is altered in the vehicle, it must retain the same collapsibility feature as OEM column.
2. The system shall have the capability of being consistently set at the most beneficial position for the driver. All horizontal columns shall be powered up and down with a switch located so that an individual with minimal dexterity can operate.
3. Position of steering wheel will be determined by the driver rehabilitation specialist and person the equipment is specified for.
4. Horizontal steering columns must be installed by a trained vehicle modifier and comply to the manufacturer's specification.

4.1.5 Braking Modifications

Braking modifications are a special class of automotive assistive equipment which consists of modifications to the vacuum actuated power booster of stock power brake systems provided as original equipment to lower the amount of driver effort required to operate the brakes. These standards are limited to modifications of vehicles not equipped with ABS and which retain a standard brake pedal and associated linkage, the stock master cylinder and all plumbing down to and including the brake wheel cylinders or actuators, and additional equipment which is installed to provide needed redundancy for backup/emergency operation. Specifically excluded are adaptive devices which use power augmentations to lower drive effort other than obtainable with mechanical hand controls, but not including modifications of the power booster.

4.1.5.1 Design Requirements

Maximum safety for drivers with disabilities, passengers, and the general public is of primary concern. All brake modifications shall meet the draft standard of the U.S. Veterans Administration. The burden of proof is upon the manufacturer or supplier to provide documentation to the state agency based on engineering analysis and test results, that the intent of this standard has been satisfied.

4.1.5.1A Reduced Effort Braking

1. The term "reduced effort braking" will be defined in this document as a modification to reduce the effort required to brake the vehicle to a specified level below that needed for factory power braking. Reduced effort braking will be of two types, low effort and no effort. The amount of reduction shall be determined by the driver rehabilitation specialist.
2. Low effort braking must reduce the pressure to operate to 11 foot-pounds or less.
3. No effort braking must reduce the pressure to operate to 7 foot-pounds or less.
4. Emergency back-up braking and automatically actuated emergency back-up braking system is mandatory on all no effort braking systems. The back-up system shall provide protection in the event of engine failure. Upon activation, the driver will receive an audio and/or visual notification that the system has been activated. Mounting location must be placed for the driver to hear or see the emergency notification.
5. All vacuum hose lines and fittings shall be of OEM quality or superior.
6. All vacuum hoses must be clamped onto all fittings.

4.1.6 Left Foot Accelerator

Left foot accelerators are devices which are added to the accelerator pedal to enable a driver who has lost function or mobility of the right leg to operate the accelerator pedal with the left foot. These standards are limited to the pedals, extensions and brackets manufactured for use by the physically disabled.

4.1.6.1 Design Requirements

All standard left foot accelerators shall meet the standards of the U.S. Veterans Administration (VAPC-A-7505-8) March 31, 1978, or as subsequently revised as of date of purchase. Left foot accelerators that have not been accepted by the VA may be accepted by the state agency provided the left foot accelerator meets the applicable criteria in VAPC-A-7505-8.

4.1.6.1A Pedal Accelerator/Brake Modifications

1. Pedal modifications, such as pedal extensions, foot supports, or enlarged pedal surface areas, must be securely attached to the original pedal of the vehicle with a minimum of grade 5 bolt. The type of pedal modification, size and extension shall be determined by the driver rehabilitation specialist. The preference is for a permanently affixed pedal modification, however, the consumer, with full information, may choose a removable device.
2. Foot pedal surfaces must be of non-skid material.
3. Installation must meet or exceed the manufacturer's guidelines.

4.2 Secondary Controls

Secondary controls are any devices that accept a control input from a driver for the purpose of operating the sub-systems of the motor vehicle, other than those associated with the primary control of steering, throttle,

and brake.

The classification of secondary controls are not indicative of a lack of importance or safety. These controls are associated with the following sub-systems:

Secondary Control Consoles

Transmission

Turn Signals

Hazard Warning Signals

Windshield Wiper/Washer

Ignition and Engine Start

Lights

Seat Adjustment

Power Windows

Heating, Ventilation, and Air Conditioning

Door Locks

Parking Brake

Horn

Power Mirrors

Dual Tank Control

Voice Control Systems

These standards are limited to adaptive extensions, relocations of controls to a position within reach of a driver with a disability, or to devices which accept a coded input from a driver and translates that input into an actuation of one of the subsystems identified above. The coded input must be by means of movements of a member or members of the driver's body, any kind of electrical instrumentation that transduces any process in the driver's body, such as muscle potentials, galvanic skin response, electroencephalograph, eye movements, etc.

Secondary controls that are excluded from general acceptance under this paragraph may be accepted on a case-by-case basis after engineering study and approval by VESID.

4.2.1 General Design Requirements

The purpose of any secondary control adaptation is to restore effective use of the motor vehicle operating systems to a driver with a disability, so that he or she may drive and operate that motor vehicle in a similar manner and with the same degree of safety as a driver who is not disabled. Thus secondary control system adaptive equipment must be:

1. accessible to the driver with a disability for whom they are designed when he or she is behind the wheel (exception is remote ignition and engine start control, 4.2.7.4);
2. not susceptible to inadvertent operation which may be inconvenient or dangerous for the driver and the motoring public;
3. a good faith effort shall be made to make secondary controls which are suitable for use by drivers who are not disabled and who may have a need to operate the motor vehicle, based upon the consumer's choice.

4.2.2 Secondary Control Consoles

- A secondary control console is a housing with a panel which may contain relocated secondary controls or more advanced design secondary controls, including associated automotive system displays such as a voltmeter, door open indicators or warning lamps, shift quadrant indicators, or even display formats presented by a cathode ray tube or liquid crystal display. The purpose of the secondary control console is to provide a point of access for the driver, and a protective housing for the electronic components.

4.2.2.1 Design Requirements

The secondary control console shall be designed to provide positive retention of all controls and displays mounted in or on it through use of materials suitable for an automotive environment as defined in SAE J1211 and of sufficient strength and rigidity to be comparable to OEM panels for the same purpose of the unmodified vehicle.

The secondary control console shall be designed to minimize non-essential hazard to vehicle driver or other occupants in the event of a collision, with specific provisions for padding of surfaces likely to be contacted by occupants who are properly restrained, avoidance of sharp edges through suitable protection or rounding. Supports must be designed to yield, deform, or break away under collision-level loadings for components that are located directly in front of the driver.

4.2.2.2 Design Requirements for Maintainability

A secondary control console shall be designed to protect the components that it houses from the interior environmental extremes of the vehicle, inadvertent contact by vehicle occupants, or contamination. Any hazards to service personnel or to the equipment which can come about because access to the console is provided shall be prominently labeled by an appropriately worded label when the access hatch or cover is removed.

4.2.2.3 Labeling of Controls and Displays

Shall meet requirements of 3.4.2 in its entirety. Illumination of labels may be accomplished by general flood lighting of the control console panel, provided such lighting does not present a source of glare to the driver or significantly affect his or her adaptation. Back lighting of secondary consoles is the preferred method of illumination.

4.2.2.3A Secondary Controls

1. All secondary controls must be operable by the driver. The type of adaptation required, its location and operation shall be determined by the driver rehabilitation specialist.
2. Door consoles must be securely fastened to the driver's door. No sharp edges on console are permitted. All wires shall be secure.
3. All switches must be labeled as to function. Refer to section 4.2.2.3 Labeling of controls and displays for additional information.
4. Entire housing must be enclosed. The housing cover must be removable for maintenance and/or trouble shooting. The console wiring harness must be properly secured and grommited at entry into housing.
5. Arrangement of switches shall be in a manner consistent with operational need, taking into account the driver's physical limitations, safety and driving efficiency.
 - A. All switches shall be positioned to be utilized by the driver and given adequate ambience to ensure safe and efficient use. Positioning must also prevent inadvertent engagement of a switch while operating

any adjacent switches.

6. The housing cover must be removable for maintenance or trouble-shooting. Any quick release system must have a locking pin or device so that the console is removable but cannot be released accidentally by the driver entering or leaving the driving compartment, or during sudden stops.
7. Consoles must not be located in a position that would interfere with visibility out of the front windshield or with vision in the right or left side mirrors.
8. Overhead console switches will be acceptable if the switches do not interfere with the driver's visibility for driving, or are not positioned so that there would be a dangerous protrusion to cause injury to the driver.
9. When wiring any type of high amperage (in excess of 10 amps) console, there must be a main circuit breaker panel mounted either under the hood or dash of the vehicle except where differently specified by the manufacturer. The main power supply cable to this panel must be of at least 10 gauge wire, and have its own circuit breaker mounted within 12" of the main power supply. This panel must have an I.D. plate or tag to identify each circuit breaker's function and location.

4.2.3 Transmission

1. The driver must be able to safely and efficiently operate the gear shift lever to each desired gear position. The type and/or modification required will be determined by the driver rehabilitation specialist.
2. Gear shift crossover. After this device is positioned so that the driver can shift the vehicle without difficulty, the crossover unit must be securely fastened to the original shift lever.
3. Gear shift lever extension. The standard gear shift lever may be altered, such as bending, adding length, or adding special type grips. When these types of modifications are performed, appearance must stay as close to OEM as possible.
4. If an electric transmission unit is mounted under the van, it must be in a water tight container or modified to be water resistant. All wiring, and/or cables must be wired tied away from the drive shaft, exhaust pipes, etc.
5. The console switch shall be sufficiently spaced from other switches so that it cannot be inadvertently hit and engaged into an undesired gear.

4.2.3.1 Extension Levers

All extension levers for transmission control shall meet the Standards of the U.S. Veterans Administration (VAPC-A-7505-8) March 31, 1978, or as subsequently revised as of date of purchase. Extension levers that have not been accepted by the VA may be accepted by the state agency provided the extension lever meets the applicable criteria in VAPC-A-7505-8.

4.2.3.2 Relocated Transmission Control

A relocated transmission control is a device which either replaces or is connected to the automatic transmission control linkage in a manner other than an extension lever. The power input may be mechanical, hydraulic, electric, pneumatic, or any combination of these.

All transmission range selections available with the OEM transmission selector shall be available with the relocated transmission control. Any ignition interlocks shall not be defeated by the relocated control design or installation unless specified by the Driver Rehabilitation Specialist. Powered controls must stop at and indicate each drive position automatically.

A relocated transmission control shall be designed and positioned such that the possibility of inadvertent operations at any time is minimized.

FMVSS 102 as applicable shall be met by all relocated transmission controls.

4.2.3.3 Electronic or Fluidic

Any adaptive control system for transmission selection which incorporates electronic or fluidic circuits intervening between the control interface with the driver and the transmission shall meet all of the requirements of 4.2.3.2, and shall also be evaluated on a case-by-case basis by VESID.

4.2.4 Turn Signals Controls

The turn signals shall be designed to be operable by the driver of the motor vehicle while he or she is in the driver's position and the vehicle is in motion.

4.2.4.1 Levers Extension

All extension levers for turn signals shall meet the Standards of the U.S. Veterans Administration (VAPC-A-7505-8) March 31, 1978, or as subsequently revised as of date of purchase. Extension levers that have not been accepted by the VA may be accepted by the state agency provided the extension lever meets the applicable criteria in VAPC-A-7505-8.

4.2.4.2 Relocated

A relocated turn signal is a device which either replaces or is wired in parallel with the standard switching system for operating turn signals. Such a relocated system must not interfere in the operation of another system.

A relocated turn signal control shall incorporate or leave intact the following provisions:

1. Positive indication that the turn signals are operating.
2. Visible indication of the direction of turn.
3. Automatic cancellation of the signal either by reverse turn of the steering system as on the OEM installation or by an automatic timeout circuit or manual cancellation with an audible beeper.
4. Indication of signal lamp or other failures.

4.2.4.3 Electronic or Fluidic

Any adaptive turn signal control system which incorporates electronic or fluidic circuits intervening between the control interface with the driver and the turn signal circuit shall meet all of the requirements of 4.2.4.2.

4.2.5 Hazard Warning Controls

4.2.5.1 Extension Grip

An add-on extension grip to the OEM hazard warning switch handle, usually located on the steering column, may be a clamp-on or bolt-on lever, or may be a lanyard or similar device. The device shall be designed such that it does not interfere with either primary or secondary control functions. The hazard warning extension shall be designed to be operable by the driver of the motor vehicle while he or she is in the driver's position. Shut off of the hazard warning should be possible under the same conditions of operation.

4.2.5.2 Relocated

A relocated hazard warning control is a device which must

be wired in parallel with the standard switching system for operating the hazard warning flashers.

4.2.5.3 Electronic or Fluidic

Any adaptive hazard warning signal control system which incorporates electronic or fluidic circuits intervening between the control interface with the driver and the hazard warning signal circuit shall meet all of the requirements of 4.2.5.2.

4.2.6 Windshield Wiper/Washer Control

The windshield wiper/washer shall be designed to be operable by the driver of the motor vehicle while he or she is in the driver's position and the vehicle is in motion.

4.2.6.1 Extension

An add on extension to the OEM windshield wiper and/or washer control handle or switch may be a clamp-on or bolt-on device, or this extension may replace the OEM handle or switch lever. FMVSS 104 as applicable to the windshield wiper/washer system, shall be met by all extensions.

4.2.6.2 Relocated

A relocated windshield wiper/washer control is a device which is wired in parallel with the standard switching system for operating the windshield wipers and washers or otherwise operable by an able-bodied driver. A relocated windshield wiper/washer control shall incorporate or leave intact the following functions:

1. Wipers with originally more than one speed must maintain at least a high and low speed and wash.
 - A. Automatic parking of the wiper arms when the wiper system is shut off and the ignition is on.

4.2.6.3 Electronic or Fluidic

Any adaptive windshield wiper/washer control system which incorporates electronic or fluidic circuits intervening between the control interface with the driver and the windshield wiper/washer system shall meet all the requirements of 4.2.6.2.

4.2.7 Ignition and Engine Start Controls

4.2.7.1 Extension Handle

An add-on extension to the OEM bezel that with the ignition system status and the engine start function may be a clamp-on or bolt-on device. This device shall be designed to be operable by the driver of the vehicle while he or she is in the driver's position. However, express provisions to minimize the possibility of inadvertent operation.

4.2.7.2 Relocated

Relocated ignition/engine start controls are devices suitably designed for use by a disabled driver. The ignition control and engine start control may be integrated as they are in almost all motor vehicles but they may also be separate controls if they are relocated so as to be accessible and/or operable by a disabled driver. A relocated ignition switch shall incorporate the following provisions:

1. Inadvertent operation, particularly operation which shuts off the ignition, shall be minimized by isolating or guarding the switch or control such that although it is still accessible to the driver, it is not likely to be operated through mistake or accident.
There are a number of methods for physically isolating or guarding a switch in sources such as MIL-STD-1472E, Paragraph 5.4.1.8 as applicable.
2. The OEM provision to disconnect ignition controlled load from the battery during engine cranking.

A relocated engine start switch or control shall incorporate or leave intact the following provisions:

1. Interlock with transmission position such that engine cranking is only possible in PARK or NEUTRAL,
2. The OEM provision to disconnect ignition controlled load from the battery during engine cranking.

A good faith effort shall be made to adhere to as many provisions as possible of FMVSS 102, and MIL-STD-1472E, 5.4.1.8 by all relocated ignition/engine start switches separately or combined.

4.2.7.3 Electronic (or Fluidic)

Any adaptive ignition/engine start control system which incorporates electronic (or fluidic) circuits intervening between the control interface with the driver and the ignition/engine start system shall meet all of the requirements of 4.2.7.2.

4.2.7.4 Remote

A remote ignition and start control shall meet all of the applicable requirements of 4.2.7.2. The remote control shall incorporate encoding strategies such as minimizing inadvertent operation of the system by electromagnetic interference, or transmissions from mobile telephones, CB's, garage door openers, model airplane controllers, or other similar devices.

An interlock system is required to prevent the vehicle from being moved or driven on remote start.

4.2.8 Lights

4.2.8.1 Panel and Exterior Light Control

4.2.8.1.1 Extension Handle

An add-on extension handle or lever for a light switch may be a clamp-on or bolt-on device, the OEM light switch knob or lever. This device shall be designed to be operable by the driver of the vehicle while he or she is in the driver's position.

4.2.8.1.2 Relocated

Relocated light controls are devices suitably designed for use by a disabled driver. Although panel lights and exterior lights are generally on the same switch assembly, these functions may be separate switches if relocated. Exterior lights shall be controlled by a single switch assembly, such that exterior lights, exclusive of

headlights, are controlled by one position of the switch, and all lights by the other, with a third position for OFF.

4.2.8.1.3 Electronic (or Fluidic)

Any adaptive light control system which incorporates electronic (or fluidic) circuits intervening between the control interface with the driver and the lighting system shall meet all of the requirements of 4.2.8.1.2. Nothing in this paragraph shall be construed to apply to OEM devices for automatic or semi-automatic control of any of the lighting systems of the motor vehicle.

4.2.8.2 Headlight Beam Selector

This device is often referred to as a "dimmer switch" and is designed to accomplish the function of selecting the upper and the lower beam headlights while the vehicle is in motion.

4.2.8.2.1 Extension or Relocated

All extension levers, handles, or relocated beam selectors shall meet the Standards of the U.S. Veteran's Administration (VAPC-A-7505-8) March 31, 1978, or as subsequently revised as of date of purchase, as applicable. Extension levers or switches that have not been accepted by the VA may be accepted by the state agency provided the adaptive device meets the applicable criteria in VAPC-A-7505-8.

All relocated beam selectors shall retain an equivalent high beam indicator which shall indicate to the driver when he or she has selected the high beam headlights.

4.2.8.2.2 Electronic or Fluidic

Any adaptive control system for headlight beam selection which incorporates electronic (or fluidic) circuits intervening between the control interface with the driver and the light selector circuit shall meet all the requirements of 4.2.8.2.1.

Nothing in this paragraph shall be construed to apply to OEM devices for automatic or semi-automatic control of any of the lighting systems of the motor vehicle.

4.2.9 Seat Adjustment

Adaptive devices for seat adjustment range from simple add-on levers to existing manual released on motor vehicle seats to relocated control panels for power seats. These devices have the common purpose of bringing seat adjustment controls of whatever kind within reach of the driver with a disability and suitable for the direction and level of strength that he or she may have.

4.2.9.1 Manual Extension Levers

An add-on extension handle or grip to assist a driver with a disability to release a seat for manual adjustment may be a clamp-on or bolt-on device, or may be a strap or similar device. The device shall be designed such that it does not interfere with either primary or secondary control functions, nor present a hazard to vehicle occupants in the event of a collision.

4.2.9.2 Power

A power seat control may be an OEM power seat control panel which is placed in a location more accessible for a driver with a disability, or the panel may be designed to control a special adaptive seat. The panel shall be designed and installed in such a manner that it does not interfere with operation of either primary or secondary controls, and that the probability of inadvertent operation of the seat is prevented when the vehicle is in motion. In the case of a powered seat which facilitates transfer of the driver from a wheelchair to the driver position, a control panel shall be located at the point of transfer and also accessible to the driver when he or she is in the driver position.

4.2.9.2A Power Seat Base

1. Power driver seat base may have one or more of the following features:
 - A. Up/down
 - B. Forward/reverse
 - C. Rotate 90 degrees minimum, left/right
 - D. Tilt up/recline
2. All wires shall be protected against entanglement, possible disengagement or stretching, when the seat moves in any given direction.
3. The power seat base and the seat itself must be mounted and secured with automotive type bolts.
4. If the seat base is not bolted through a cross support frame of the vehicle, a steel backing plate, of at least 11 gauge steel must be used. This backing plate will reduce stress on the floor of the vehicle. Each mounting bolt must have a backing plate. Backing plates as supplied by the seat base manufacturer may be acceptable.
5. When a power seat base is used in conjunction with a transfer seat, a wheelchair tie-down to secure the wheelchair in the transfer position is required. This must secure the wheelchair during the transfer process and while the vehicle is in motion. This tie-down must be independently operable by the person specified for and must be labeled "for unoccupied wheelchair only", unless the tie-down has been safety tested and approved for occupied use.
6. The type of driver's seat and power seat base will be determined by the driver rehabilitation specialist.
7. Controls for the power seat base shall be accessible to the driver permanently mounted and clearly labeled.
 - A. A good faith effort must be made to meet FMVSS standard #207.

4.2.10 Power Windows

Power windows for after market adaptation of motor vehicles for use by drivers who are disabled are devices which are sold by accessory manufacturers to replace manual window cranks. The standards in this section do not apply to OEM power windows.

4.2.10.1 Controls Design Requirements

Switch design shall be tailored to drivers with disabilities degree of dexterity, but toggle switches are preferable to rocker switches.

4.2.10.2 Unit Design Requirements

Power window unit design shall be such as to preclude binding or loss of engagement between the power unit and the splined shaft of the original manual window crank. Power window units shall not interfere with seating,

operation of any primary or secondary control, or with ingress or egress of the vehicle. Wiring bundles to power window units shall be secured to the door panel or housed within the door panel.

Wire bundles that bridge the gap between the door and the adjacent vehicle structure shall be housed in flexible rubber or plastic boots to prevent chafe or pinching of the bundle, or otherwise protected from such damage during opening and closing of the vehicle door. All holes through which wires are routed shall be protected by grommets.

4.2.11 Heating, Ventilation, and Air Conditioning (HVAC) Controls

This class of secondary controls refers to adaptive equipment to permit operation of selected functions or all functions built into a motor vehicle HVAC system. HVAC must have a heating, defrost, and ventilation system.

4.2.11.1 Extension Handles

An add-on extension to any control on the HVAC panel may be installed to render that control accessible to a driver in the driving position.

If extensions are installed, provisions should be made to operate the functions in the following order of priority:

1. Accessible to driver position
 - A. defroster mode
 - B. fan speed
 - C. temperature range
 - D. heating, air conditioning modes
 - E. vent (outside air)
 - F. any other function

An "up to 4 inch" extension handle shall be securely fastened or clamped, and shall be designed and installed so as to not interfere with the operation of primary adaptive controls.

4.2.11.2 Replaced

Replaced HVAC controls are devices suitably designed for use by driver with a disability which replace the standard HVAC control panel. The priorities of replacement of functions are the same as in 4.2.11.1. Movement of replaced controls should either follow the movements of the original panel, or should be designed in accordance with the SAE J1139. HVAC controls must include at least two blower speeds.

4.2.11.3 Electronic or Fluidic

Any adaptive control for HVAC functions which incorporates electronic or fluidic circuits intervening between the control interface with the driver and the HVAC control circuit or device shall meet all the requirements of 4.2.11.2. This requirement does not apply to any electronic or fluidic device for automatic or semi-automatic control of functions (e.g., temperature) that is part of the OEM HVAC system.

4.2.12 Door Locks

- Locks as secondary controls include extensions or modifications to the manual door locks to make them accessible and controllable from the driver's position, and controls for operating power door locks.

4.2.12.1 Manual Extensions

An add-on extension to the OEM manual door lock handle may be a clamp-on or bolt-on device, or this extension may be a replacement for the OEM handle to make it more accessible or easier to operate by the driver with a disability when he or she is in the driver's position. Positive retention of the add-on or replacement device shall be a primary concern to the modifier, since failure of the extension or replacement handle could result in marooning the driver with a disability in the vehicle.

4.2.12.2 Relocated, Power

A relocated power door lock control is a device which is wired in parallel with the standard switching system for operating (a) all the door locks or (b) any particular door lock. Location and direction of motion of door locks shall be as follows:

Power door lock controls shall move in the following directions to effect door lock opening (raise door lock button), depending upon placement:

1. Horizontal placement of switch - switch shall move toward front of vehicle.
2. Placement on door panel - switch shall move upwards.

Engaging of door lock shall be accomplished in all cases above by a control movement in the opposite direction.

Switch design shall be tailored to disabled driver degree of dexterity, but toggle switches are preferable to rocker switches.

4.2.13 Parking Brake

Parking brakes as secondary controls include extensions to bring release handles within reach, to render foot-operated parking brakes operable by hand, and remotely-controlled actuators which apply and release the parking brake.

1. If the driver is unable to operate a foot-controlled parking brake, the type of parking brake modification needed will be determined by the driver rehabilitation specialist.
2. The parking brake shall be held in the applied position by mechanical means and not hydraulic, pneumatic, or vacuum where loss of pressure over time would grossly affect the performance of the parking brake.
3. There will be a light visible from the driver's station to indicate that the parking brake is engaged when the ignition switch is on.
4. The two types of parking brake modifications acceptable will be:
 - A. Manual Parking Brake Extension
This non-powered brake extension shall be positioned so that the emergency brake can be operated safely and easily by the driver. It must not interfere with the driver's transfer in and out of the vehicle.
 - B. Electric Brake
Spool-type design must be chain driven. The location of the switch will be determined by the driver rehabilitation specialist. Exterior-mounted, water-resistant, cable-design units shall be exempt from this requirement.

4.2.13.1 Extensions

An add-on extension to the OEM parking brake may be a clamp-on or bolt-on device, to make applying or releasing the parking brake more accessible or less effort for the driver with a disability when that driver is in the driver position. All extensions to parking brake controls shall meet the Standards of the U.S. Veterans Administration (VAPC-A-7508-8) dated March 31, 1978 or as subsequently revised as of date of purchase.

4.2.13.2 Relocation

A relocated parking brake control is a device which permits the OEM parking brake controls to be operated remotely by the driver, or which replaces part or all of the actuating mechanism of the parking brake in order to permit the driver to apply or release the parking brake. Such a device shall incorporate or leave intact the following provisions:

1. Positive indication that the parking brake is engaged.
2. Ability to engage or release parking brake independent of engine state or transmission state.
3. Limit switches or similar means to prevent either over application of brakes with consequent damage to the linkage or other working parts, or such slackness in the linkage that an effective application of the brake is compromised.
4. Ability for the driver to continuously control brake application from full release to full lock and the reverse.

4.2.13.3 Electronic or Fluidic

Any adaptive parking brake control which incorporates electronic or fluidic circuits between the control interface with the driver and the parking brakes shall meet all of the requirements of 4.2.13.2. Nothing in this paragraph shall be construed to apply to OEM devices for automatic application or release of parking brakes.

4.2.14 Horn

A horn or auditory warning device must remain in working order.

4.2.14.1 Extension

An adaptive extension to a turn signal lever which also operates the horn shall meet all the requirements of 4.2.4.1, plus shall render the horn operable by the driver at all times.

Extensions to other types of OEM horn controls shall be permanently affixed and designed such that they do not interfere with either primary or secondary control functions.

4.2.14.2 Parallel System

A wired in parallel horn control may place that control on a secondary control console, or on a steering wheel mounted on a steering column extension, or at some other location accessible to the driver who is disabled. Such a control shall be designed such as to permit sounding of the horn for so long as the driver is in contact with the control and not require a separate control motion to terminate the horn operation.

4.2.14.3 Electronic or Fluidic

- Any adaptive horn control system which incorporates electronic or fluidic circuits intervening between the horn control interface with the driver and the horn circuit shall meet all the requirements of 4.2.14.2.

4.3 Access Devices

4.3.1 Automatic Wheelchair/Scooter Lifts

Automatic wheelchair/scooter lifts include a variety of electric powered mechanical and hydraulic systems used to raise or lower a person in a wheelchair from one level to another. They are classified by van door application and by power transfer method (e.g., hydraulic, electro-mechanical or others). These standards are limited to power lift systems manufactured for use by persons with disabilities and retrofitted for motor vehicles (e.g., vans).

An automatic wheelchair lift permits a person with a disability who uses a wheelchair to ingress and egress a motor vehicle in the wheelchair without assistance.

4.3.1.1 Design Requirements

Wheelchair/lifts shall meet the standard of the U.S. Veterans Administration. Those lifts which are not VA accepted can only be purchased after documentation is provided that the lift was tested and certified as meeting VA standards. This VA standard does not apply to mini van automatic wheelchair lifts. Lift must have a manual back-up system.

4.3.1.1A

1. Any wheelchair lift which has met the Veterans Administration's specifications is acceptable.
2. The type of entry system shall be specified on the recommendation report after determination by the driver rehabilitation specialist.
3. The entry system must be installed to manufacturer's specifications. Vendors must have factory training on any entry system they install.
4. A ground cable, installed from the lift to the body of the vehicle or from the negative terminal of the battery to the chassis, will be used when any type of entry system is installed. The size of this cable will be the same size as power cable for the entry system or a minimum of 4 gauge standard wire, no longer than 18 inches.
5. All surfaces of the entry system that the wheelchair tires come in contact with must be of non-skid material.
6. All switches shall be labeled as to function and direction of operation.
7. All entry systems must have an emergency back-up system to allow the person to exit the van if power failure occurs. The auxiliary system must have the potential to lower the lift platform and return to the floor level of the van.
8. All new entry systems must have a minimum one year limited warranty as provided by the equipment manufacturer.

4.3.2 Semi-Automatic Wheelchair Lifts

Semi-automatic wheelchair/scooter lifts include a variety of electric powered, mechanical, and hydraulic systems used to raise or lower a person in a wheelchair from one level to another. They are classified by van door application, by power transfer method (e.g., hydraulic, electro-mechanical, or others). A semi-automatic lift is designed to be operated by a person who is not being raised or lowered by the lift, e.g., an attendant,

and is not suitable for drivers with disabilities who can otherwise drive a vehicle without another person.

These standards are limited to power lift systems manufactured for use by persons with disabilities and retrofitted in motor vehicles, and which must be operated by an attendant.

4.3.3 Exterior Controls

Exterior controls are any electrical control device mounted on the exterior of a vehicle which are designed to operate adaptive or other equipment by operator with a disability, such as:

1. Lift door open/close.
2. Unfold/close lift platform.
3. Control up/down operation of lift platform or other adaptive devices that may be necessary for the particular operation, e.g., engine start up.
4. Magnetic, remote or other alternative remote controls may be used if required because of the consumer's needs.

4.3.3.1 Design Requirements

All controls shall possess a water-tight seal to prevent moisture from penetrating below the control panel. Controls shall have a lock which can be operated by an individual with limited finger dexterity.

4.3.3.2 Installation

The vehicle body cutout to accommodate exterior controls shall be no longer than required for installation and mounting or as specified in the manufacturer's installation instructions. If holes in the vehicle body must be drilled for passage of wires or hoses to or from exterior controls, such holes shall be protected by means of suitable grommeting.

4.3.3.2A All interlocks and safety devices provided in installation kit shall be installed.

4.3.4 Automatic Door Openers

Automatic door openers are any powered device which open and close vehicle doors to enable drivers with disabilities access to the vehicle.

4.3.4.1 Design Requirements

Automatic door openers controls shall meet standards in 4.3.3.

Automatic lighting shall be installed in conjunction with automatic power doors to illuminate the lowest lift platform position when the automatic doors are opened. Automatic interior lights shall go on when door is opened and shut off when door is closed. OEM existing lights remain functional.

Mechanisms should be enclosed to the extent feasible to prevent dirt and moisture from contamination of working parts and subsequent premature failure. Mechanisms shall be enclosed or guarded if they present a hazard to vehicle occupants while vehicle is in motion.

Automatic door openers shall have interior emergency quick release mechanisms in case of power failure or

malfunction. The quick release mechanism will permit opening and closing of doors during power failures.

4.3.4.2 Installation

Automatic door openers shall not compromise the mechanical or structural integrity of the fit between doors and vehicle body. Doors shall be moisture sealed to prevent water entry in full closed position.

Provisions shall be made for adjustments to insure complete closure.

4.3.5 Ramps

Ramps are inclined plane devices that permit an occupant in a wheelchair/scooter to be pushed into and out of a motor vehicle. These devices may be permanently installed in or on the sill of a vehicle door, or they may be detachable and stored at some location in or on the vehicle when not in use. Ramps may be mechanically deployed or may be placed in position by an attendant. Tracks or channels that perform the function of a ramp are not included.

4.3.5.1 Design Requirements

Ramps designed to be used with the assistance of an attendant shall not exceed a slope of 1:3.75 or 15 degrees (MIL-570-1472E, Paragraph 5.7.7.1.1).

Any ramp shall incorporate rails to prevent the wheelchair/ scooter wheels from rolling or falling off the side of the ramp. The ramp surface shall be finished with a nonskid surface material.

4.3.5.2 Structural Requirements

A ramp shall be capable of supporting the weight of a powered wheelchair and a 95th percentile weight occupant (a design weight in combination of 400 lbs.) plus the weight of a 95th percentile attendant (if the ramp is designed to be traversed with the assistance of an attendant of 220 lbs.). The ramp must support this total weight of 620 lbs. without permanent deformation.

4.3.6 Steps

Steps are either folding or fixed to be used by ambulatory persons with disabilities to gain access or assist in departing a vehicle. OEM steps or running boards are excluded from the provision of this standard.

4.3.6.1 Design Requirements

Steps will have a nonskid surface. They will be affixed to the vehicle to withstand 220 lbs. of force without permanent deformation or separation from the vehicle structure

4.3.7 Assist Handles

Assist handles are hand grips provided for the purpose of aiding a person with a disability in transferring from one location to another during entering or leaving a vehicle, moving around inside a vehicle, or other similar maneuvers. OEM assist handles are excluded from consideration under this section of the standard.

4.3.7.1 Structural Requirements

Handles shall be designed and installed such that they can support a weight of 220 lbs. without permanent deformation or separation from the vehicle structure.

4.4 Wheelchair/Scooter Handling Devices

Wheelchair/scooter handling devices are devices for retaining a wheelchair/scooter on or in a motor vehicle. This function includes provisions for:

1. Hoisting or otherwise lifting the wheelchair/scooter onto or into the motor vehicle after its user exits the chair.
2. Retaining the wheelchair/scooter on or in the motor vehicle.
3. Placing the wheelchair/scooter within reach of the user after a trip in the motor vehicle is completed.

4.4.1 Wheelchair Carriers

Wheelchair carriers include any mechanism for loading and unloading a wheelchair into and out of a closed container specially designed for this purpose and permanently mounted on the motor vehicle. Any wheelchair handling device that loads or unloads a chair into the passenger compartment or into a luggage compartment or pickup bed of the motor vehicle is not a wheelchair carrier as herein defined. Such a device shall be governed by the standards of 4.4.2.

4.4.1.1 Design Requirements

All wheelchair carriers shall incorporate an enclosure or cover to protect the wheelchair from the elements, and to prevent damage to the chair, when it is in the stowed position. The wheelchair shall be positively secured or restrained at all times by the carrier when the chair is stowed.

Hoist devices may be levers or arms, or may incorporate flexible cables or chains. Components, even when in a worn condition, shall not expose the wheelchair user to sharp edges or abrasion during any point in the operation of a wheelchair carrier.

Wheelchair containers or covers shall be designed to fulfill their function without damage to the chair through excessive contact, sharp edges, vibration damage, moisture, or deformation of the chair.

4.4.1.2 Installation

A carrier with intended wheelchair load shall not be so heavy as to statically deform the motor vehicle sheet metal on which it is resting in excess of 0.125 inch at any single point of contact. Any penetrations into the passenger or luggage compartment for carrier retention or for electrical cables or similar connections shall be sealed to prevent moisture entering the passenger compartment. Exterior controls shall meet the requirements of 4.3.3 as applicable. Wheelchair carriers controls shall be located such as to allow the wheelchair user to operate the carrier unassisted during all phases of the loading, stowing, and unloading operation.

4.4.1.2A Wheelchair Roof Carriers/Loaders

1. Unit case shall be fiberglass, aluminum or rigid plastic design.

2. All wires shall be color coded. Switches shall be marked as to function and direction of use.
3. The lift mechanism shall have no rough edges which may cut user if touched when in operation.
4. The lift hook shall be capable of being custom set for variable wheelchair seat depth.
5. Mounting plates shall be secured with rivets or equivalent fasteners. Any attachment to the roof shall cause minimum bend or deflections to the roof.
6. All roof mounting points shall be moisture sealed and waterproofed.
7. The unit shall have momentary switches which demand continuous pressure on the switch by the operator.
8. Switch location shall not interfere with the motorist entry or exit from the wheelchair to the driver's or passenger seat.
9. Control switches shall be placed in a position most convenient to ensure the motorist's independent use.
 - A. Automatic stop must be included in system to prevent run out of the chain or cable
 - B. Front and back windshields must be free of any obstruction that would interfere with the driver's field of vision.
 - C. The device must be installed to the manufacturer's specifications.
 - D. In case of mechanical or electrical failure, a manual override must be available so wheelchair can be removed from the device.

4.4.2 Wheelchair/Scooter Hoists

Wheelchair/scooter hoists include any mechanism for loading and unloading a wheelchair/scooter from the passenger compartment of a motor vehicle, the luggage compartment, or the bed of a pickup which does not fit the description of a wheelchair/scooter lift (4.3.1 or 4.3.2) or a wheelchair carrier (4.4.1). These devices assist a driver with a disability to pull a chair into the vehicle, extract the chair from its stowed position, and place it back onto the pavement. Wheelchair/scooter hoists may be manually operated or power operated.

4.4.2.1 Design Requirements

Hoist devices may be levers, arms, or may incorporate flexible cables and chains. Such components even when in a worn condition shall not expose the wheelchair user to sharp edges or abrasion during any part of the operation of a wheelchair/scooter hoist. Hooks or other devices for retaining the chair during loading or unloading shall incorporate provisions for avoiding accidental release.

A wheelchair/scooter hoist shall not compromise crashworthiness provisions of the motor vehicle, nor be located in such a position that the driver of the vehicle or any front-seat passenger is likely to strike a structural member of the loader if they are properly restrained in their seats.

4.4.2.2 Installation

Any mounting holes drilled in the vehicle structure to install the hoist shall be sealed if exterior moisture impinges upon the mounting hardware or fasteners. Electrical wiring shall be routed and/or protected to limit abrasion or interference with any vehicle mechanism, or interference with the driver's ability to ingress or egress the vehicle.

Installation of the hoist in a pickup truck bed shall not interfere with the use or normal operation of the tailgate. Installation of the hoist in a luggage compartment shall not interfere with the closure of the luggage compartment deck lid.

Wheelchair/scooter hoist controls or operating mechanisms shall be located such as to allow the wheelchair user to operate the hoist unassisted during all phases of the loading, stowage, and unloading operation.

4.5 Occupant Protection

4.5.1 Seats

Seats as covered herein are limited to vehicle seats which are provided as replacements or supplementary to OEM seats, but are specifically designed for automotive installation. The category of "seat" specifically excludes wheelchairs, whether occupied or not, household or office furniture of any kind, hospital equipment such as beds, cots, or any other non-automotive device. Seats include special adaptive seat assemblies that move a driver with a disability from a wheelchair transfer position to a position behind the controls or to a position suitable for riding as a passenger. It is understood that FMVSS 207 is not able to be met when modifications occur to the seat or seat base. Vehicle modifiers shall make a good faith effort to install or modify seating adaptation to applicable provisions of FMVSS 207.

4.5.1.1 Design Requirements

Vehicle seats that replace or supplement OEM seats in a motor vehicle shall be specifically designed for automotive use, and a good faith effort shall be made to adhere to as many applicable provisions of FMVSS 207 and FMVSS 302 as possible. Seats shall either incorporate OEM restraint devices or provisions shall be made for installation of restraint devices which meet the requirements of 4.5.2, when the occupant is in the driving or riding position.

Vehicle seats shall have provision for positive locking in position unless their method of adjustment is by means of power actuators as part of a power seat assembly, or transfer assembly, provided that the power train remains positively attached to the movable seat.

Any cable, wire bundle, or other connective device associated with a vehicle seat shall be designed to remain clear of pinch points, abrasion, or other damage and to remain connected throughout the range of movement of the seat. Individual wires or hoses shall be bundled or secured in a workmanlike manner so as to comprise no more than two bundles for each seat.

4.5.1.2 Special Design Requirements, Powered

A powered seat is any seat other than an OEM power seat which may be installed for adaptive reasons in a motor vehicle. Controls for the power seat's operation shall be located such as to be accessible and operable by the seat occupant at any point during the translation cycle of the power seat.

Powered seat controls (if visible by the driver) shall be permanently labeled with seat movement direction. Direction of movement of the powered seat controls shall be consistent with the direction of translation of the chair occupant from that occupant's position, as provided in MIL-STD 1472E.

4.5.2 Passenger Restraints

4.5.2.1 Design Requirements

- All passenger(including driver)restraints shall comply with the FMVSS standards as well as any applicable New York State laws. These shall be made available to all occupant positions in the vehicle and must include both lap and shoulder belts. It is understood that the FMVSS 209 and 210 standards are not able to be met when modifications occur to the driver restraints. Vehicle modifiers must install or modify passenger restraints as close to the FMVSS 209 and 210 as is possible.

4.5.2.2 Usability by Driver

All driver restraints installed as part of an adaptive equipment modification to a motor vehicle shall be suitable for independent operation by the driver with a disability for which it is supplied.

Any restraint system which is installed on, attached to, or in any manner derives its structural integrity from the accommodation provided for the person who is being restrained, does not meet the requirements for a passenger restraint.

4.5.2.2A Safety Restraints

1. All safety restraints systems must be installed according to the manufacturer's specifications.
2. Chest restraints installed to driver's seat must be designed for the person specified to use without assistance.
3. Type of safety restraint must be determined by the driver rehabilitation specialist(and vehicle modifier).

4.5.3 Wheelchair Tie-down and Occupant Restraint System

All wheelchair tie-down and occupant restraint systems for this guideline shall be referred to as WTORS.

4.5.3.1

All WTORS in the non-driving position shall place the consumer parallel to the sides of the vehicle facing forward and meet the following standards.

1. WTORS shall not be attached to any part of the wheelchair designed for easy removal (e.g. foot rests or arm rests) or to a van door. Attachment to the wheelchair cross-member is also acceptable.
2. A combination lap/shoulder belt shall be provided. It shall encircle both the wheelchair and its occupant.
3. All safety belts shall be installed to meet the performance criteria of FMVSS 209 and 210, and shall be installed according to manufacturer's instructions for placement. It is understood that the FMVSS Standards 209 and 210 may not always be met when modifications occur to the restraint system. Vehicle modifiers must install or modify restraint adaptations as close to FMVSS 209 and 210 as is possible.
4. All WTORS shall be through-bolted to a structural member with a minimum of one-half inch Grade 5 bolts; if attached to sheet metal, a steel backing plate of at least 1/8 inch x 3 inch shall be provided to help transfer any load to a larger area.
5. All WTORS shall prevent movement of the wheelchair and its occupants during normal driving conditions and keep the wheelchair and its occupant securely positioned. Only 30 mph/20g crash tested tie-downs shall be used for this purpose.
6. The user shall be able to independently maneuver his/her wheelchair into and out of the driving position and secure the wheelchair.
7. When the wheelchair is maneuvered into the driving position, there shall be an audible or visual signal warning the driver to make sure the wheelchair is fully engaged.
8. Powered tie-down devices shall be equipped with a manual release in case of a power failure. The manual release shall be marked.

9. When possible, a combination shoulder lap belt shall be provided and attached to the van and not to the wheelchair, unless successfully crash tested. Installation requirements shall be as in this section. It shall be independently operable by the consumer. Passive restraint system is acceptable as long as this does not become entangled with the wheelchair.
10. Chest straps or other equipment to stabilize the consumer during driving or as a passenger may be added per the Driver Rehabilitation Specialist's recommendations. These shall be independently operable by the consumer. Chest straps are separate from and do not replace the combination lap/shoulder belt described above.

4.5.3.2 Wheelchair/Scooter Restraints - Unoccupied

1. Vehicles (equipped with transfer seats) shall have tie-downs to secure the unoccupied wheelchair or scooter, and shall be placed in such a position to allow adequate consumer transfer.
2. The tie-down, whether power or manual, shall be independently operable by the consumer.
3. This tie-down shall be clearly labeled "For Unoccupied Wheelchair Only."

4.6 Vehicle Structural Modifications

4.6.1 Wheelchair Sub-Flooring

Wheelchair sub-flooring is a covering on the floor of the vehicle which promotes ease of use and safety of mobility of a wheelchair. Wheelchair sub-flooring must be provided in all areas of the van where the wheelchair is used unless otherwise specified by the driver rehabilitation specialist.

Design Requirement

On ribbed vehicle floors, wheelchair flooring shall be constructed either of plywood (exterior grade or better) with a minimum thickness of 3/8 inch or of sheet steel at least 14 gauge. On flat floors, wheelchair flooring shall be constructed either of plywood (exterior grade or better) with a minimum thickness of 3/8 inch or of sheet steel at least 24 gauge. Other materials may be acceptable as equivalent in structure to plywood or sheet steel. Wheelchair flooring must not warp or camber under load.

Installation

Installation of wheelchair flooring shall be designed to be permanent. Method of fastening may be bolts, rivets, spot welding, bonding or other methods. In the event of removal and to insure the work was performed according to specifications, (VESID will pay for re-installation of the flooring) the flooring must be re-installed. All methods of fastening shall satisfy 3.5.

4.6.1.2 Wheelchair Flooring

1. Wheelchair sub-flooring must provide a smooth surface for attachment of the floor covering.
2. Floor covering material must be of a commercial grade non-skid surface and shall be securely attached over the entire area of the wheelchair flooring using a bonding agent suitable for the purpose.
3. All floor covering must meet or surpass specification FMVSS 302 (burn resistance requirements).
4. The wheelchair sub-flooring must cover the complete floor area from the rear doors to behind the driver and passenger seats, unless otherwise specified by the driver rehabilitation specialist.
5. Any holes that may exist after removal of seats or other equipment must be plugged to prevent water leaks. All sharp edges/corners must be smooth to prevent possible damage to the wheelchair and person.

4.6.1.2A Lowered Floor For Full-Framed Vehicles (Non-Unibody Vehicles)

A lowered floor may be a box-like section with a sloping side which merely allows a wheelchair to descend to a lower height within the van, or it may be a more complex structure which supports or otherwise is integral with a wheelchair power pan.

OEM floors are excluded from the provisions of this standard.

Design Requirements

The lowered floor shall be constructed of steel, 11 gauge minimum, welded with a continuous bead unless otherwise specified by the manufacturer.

The entry to the lowered floor area shall be covered with a non-skid surface material. All exposed metal surfaces shall be primed and painted to retard corrosion.

The driver step well (if any) shall be covered over unless otherwise specified and shall not have rough edges that could catch or impede a wheelchair.

Installation

Every effort shall be made to avoid compromise to the vehicle structural integrity in cutting the van floor and installing the lowered floor. In instances where the vehicle rails are cut or modified in any manner, vehicle modifiers are required to document for VESID, in advance, what methods they will use to preserve structural integrity. A written inspection of the work is also required prior to work that will result in the area being covered up.

Installation of the lowered floor shall be by means of continuous seam welding. All seams shall be waterproof and treated to prevent corrosion through application of a suitable sealant, primer and paint. An undercoating shall also be applied to the exterior surfaces of the lowered floor.

Installation shall not leave gaps or holes of any kind between the original floor and the lowered floor.

4.6.2.2A Floor Lowering

1. The size (e.g., depth, length, and width) of the lowered floor will be determined by the driver rehabilitation specialist (and van modifier).
2. Any modification required to install the lowered floor shall maintain as closely as possible the OEM design of the body mounts. There shall be no welding or direct bolting of the body to the frame without the use of an OEM or equivalent grommet. Where possible, the number and horizontal location of all body mounts should duplicate the OEM configuration. Method of attachment of body mounts to frame rail shall be by bolts.
3. A quick release, removable seat base must be provided in all vans set up for wheelchair driving. The driver seat on casters is primarily for use during emergency or mechanical repairs.
4. The lowered floor must not warp or camber under load.
5. When lowering the floor, to accomplish optimal visual height for the wheelchair driver, it shall be accomplished in one of the following manners:
 - A. Center/Driver/Passenger Modification

Center/driver/passenger modification with side entry, signifies a floor modification extending from the driver's and passenger compartment to the front of the rear wheel wells to the side entry.

B. Center/Driver Modification

Center/driver modification with side entry signifies a floor modification extending from the driver's compartment to the front of the rear wheel wells to the side entry.

All specifications for floor cuts with regard to material, welding, waterproofing, sealing, painting, undercoating, and heat shield, must be observed.

C. Center Cut Modification

Center cut modification is primarily recommended for a transporter vehicle. The floor must be lowered from the rear of the driver/passenger seats to the front of the rear wheel wells and to the side entry of the vehicle.

- i. Replacement floor material should be a minimum of 11 gauge steel. The body mounts, which insulate the floor from the frame, must be welded and sealed to prevent water leaks.

Heat shield equivalent to original equipment must be applied over the muffler and catalytic converter and must allow a minimum of 1" of air space between the lowered floor and the heat shield. There must be a minimum of a 3" space between the heat shield and exhaust system.

It is recommended the driver's area be level and a minimum of 1" wider and 1" longer than the wheelchair.

4.6.3 Wheelchair Power Pan - Driver Position

A wheelchair power pan is a lowered floor in a van or van-type vehicle which incorporates an electrically, pneumatically, manually or hydraulically powered device to lower a person in a wheelchair down into a well which places the occupant at an appropriate eye height from which to drive. OEM devices to accomplish this purpose are excluded from the provision of this Standard.

4.6.3.1 Design Requirements

If the power pan also provides occupied wheelchair restraints, the lowering pan shall meet all of the requirements for occupied wheelchair restraints, as applicable, contained in 4.5.3. Controls for operating the power pan shall be placed so as to be accessible at all times by the wheelchair occupant.

Direction of movement of the power pan controls shall be consistent with the direction of translation of the chair occupant from that occupant's position.

Any surfaces of the power pan which are in contact with the wheelchair wheels shall be covered or coated with a non-skid surface material.

The power pan mechanism shall have provision for positive locking in position at either extent of travel, unless the method of raising or lowering is by means of a power actuator which is self-locking.

Any cable, wire bundle or other connective device associated with a power pan shall be designed to remain clear of pinch points, abrasion, or other damage and to remain connected throughout the range of movement of the seat. Individual wires or hoses shall be bundled or secured in a workmanlike manner.

4.6.3.2 Installation

Every effort shall be made to avoid compromise to the vehicle structural integrity in cutting the van floor and installing the power pan. The vehicle chassis or frame rails shall not be cut or modified in any manner.

- Installation of the power pan shall be by means of continuous seam welding. All seams shall be waterproofed and treated to prevent corrosion through application of a suitable sealant, primer, and paint. An undercoating shall also be applied to the exterior surfaces of the power pan. There shall be no welding or direct bolting of the lowering pan to the frame without the use of an OEM or equivalent grommet.

4.6.3.2A Wheelchair (Lowering) Power Pan in Driver's Position

1. The size (e.g., depth, length, and width) of the power pan will be determined by the driver rehabilitation specialist (and van modifier).
 - A. The pan floor must have a minimum of one drain hole.
 - B. Any modification required to install the lowering mechanism shall not compromise the integrity of the vehicle's frame and/or rubberized body mounts.
 - C. The power pan unit must be made of 16 gauge steel minimum, and all seams and joints must have a continuous weld construction.
 - D. A quick-release, removable seat base must be provided in all vans set up for the wheelchair driver. (The driver seat on casters is primarily for use during emergency or mechanical repairs).

4.6.4 Raised Roofs

Raised roofs are structural modifications to any motor vehicle that substitutes an after-market roof for the original roof of the vehicle body. The after-market roof is installed to increase vertical clearance inside the vehicle to facilitate entry, egress, and maneuvers inside the vehicle by a person in a wheelchair. Such a structural conversion is very common in the recreational vehicle industry, and is usually applied to vans, either full-sized or minivans, and to other similar vehicles. Although it would be an unusual conversion, nothing in this section prohibits a raised roof being used with a passenger car body of any kind, except for a convertible.

4.6.4.1 Design Requirements

Raised roofs shall be constructed of durable materials suitably finished to resist the effects of sunlight, moisture, snow and ice, and temperature extremes. Any fixtures mounted in such a roof such as windows, ventilators, antennas, etc. shall be designed to be air and moisture leak resistant.

The principal objective of this Standard is to prevent any unreasonable compromise to vehicle structural integrity presented by removal of the original sheet metal roof and reinforcing members, and substitution of a raised roof. Thus any raised roof conversion which does not restore such rigidity and is not an integral structure with the vehicle body, shall be provided with suitable reinforcement members. These members connect the sides of the vehicle body and preserve interior space in the event of a major collision or rollover.

The foremost and rearmost reinforcement support must remain intact when installing a raised roof. If either one of the reinforcement supports must be removed to accommodate head clearance, a modified reinforcement support must be re-designed in its place.

The minimum reinforcement structure for a raised roof that requires such structure shall have transverse bars and longitudinal members equal to or greater than the original body design. This structure shall be attached to a header which shall be installed along the top interior sides of the vehicle body. The location of the forward bar shall be just ahead of the side door on a van, or directly behind the front seat line; the location of the after bar shall be aft of the side door opening or rear-most side door.

Both bars shall be located as much as practical over the door pillars, and tied into that structure. Additional structure may be supplied in addition to these minimum requirements. All bars and longitudinal members shall be constructed of 1 X 2 inch tubular steel frame, 14 gauge or thicker material. The steel frame must maintain the same number of stringers and longitudinal supports as prior to the modification. At the point all roof reinforcement structural members are attached to the OEM roof rail, a minimum of six square inch ¼ inch weld plate reinforcement area shall be installed. This entire reinforcing structure shall be welded using methods specified in AWS D1 1-86 "Structural Welding Code."

Roof structural support shall be required for all raised door modifications. Such support shall consist of 1 X 2 inch tubular steel frame of 14 gauge steel or thicker. The stringers shall be attached to the fore and aft sides of the raised door. The first longitudinal member shall be attached to the top of the raised door. The remaining two longitudinal members shall be located in the center of the vehicle and on the driver's side.

4.6.4.2 Installations

All sharp edges left by removal of the OEM roof shall be suitably protected or covered to prevent injury to vehicle occupants. All interior sharp edges must be suitably protected or covered to prevent injury to vehicle occupants. Interior edges that are not exposed to outside elements will not require primer or paint. All such body work shall be primed and painted in accordance with accepted standards of automotive practice and shall be comparable to original finish. Installation of the raised roof shall be accomplished with sealant at the seams or a gasket so as to preclude air or water leaks.

Any reinforcement structure shall be rigidly attached to the original vehicle structure, especially to the vertical pillars in that structure. Method of attachment will be by welding. The reinforcement structure shall be covered with padding or other material to prevent chafe and wear at any point that this structure comes in contact with the raised roof.

A raised roof shall not be used as a mounting surface or anchor for assist handles or other devices which place a significant load on the mounting surface, unless the roof is specifically designed or modified for such an installation. Under no circumstances shall a raised roof of any kind be used for passenger or driver anchorage. A reinforcement structure may be used for occupant restraint anchorage provided it is not the only anchorage structure so used; and provided that the reinforcement structure is shaped, sized and connected to resist appropriate loads.

4.6.4.2A Raised Roof

1. Once the raised roof is installed there must not be any leaks or water collection points that could later cause damage.
2. All raised roofs must meet the minimum requirements specified by the automotive manufacturer.

4.6.5 Modified Doors

Any alteration to the OEM vehicle doors that necessitates changes to the doorframe constitutes a modified door. These modifications may be accomplished to increase entry height or width to accommodate a raised roof or wheelchair lift installation, or for other special needs. (Must meet roof support standards specified in section 4.6.4.)

4.6.5.1 Design Requirements

Extensions to doors to make them higher or wider shall be accomplished in such a manner as to preserve the original door strength and rigidity. Corresponding alterations to door pillars and frames shall also preserve the structural integrity of the original body member. Replacement glazing shall be comparable to OEM glass. All such body work shall be primed and painted in accordance with accepted standards of automotive practice, and shall be comparable to original finish.

Trim of the interior of a modified door shall be the original trim of the door. Door modifications shall be free of exposed burrs or sharp metal edges. A modified door or doorframe shall incorporate gaskets to prevent intrusion of water.

Any alterations to the door should cosmetically match the vehicle color.

4.6.5.1A Extended Doors

1. Extended doors and doorframes must be braced or reinforced in a manner consistent in strength to the original door.
2. Extended doors should be designed and constructed in such a way as to incorporate a drip rail on the outer edge of the extended door lintel. This will insure that water, which is coming off the roof of the vehicle, is channeled to the sides of the door assembly, and not down onto the person or the entry system platform.
3. A support adaption must be attached to the top side of the area above the doorway. The roof is to be attached to this support adaption.
4. The inside perimeter of the extended door shall be sealed with rubber trim equivalent to factory rubber trim.

4.6.6 Fuel Tanks

Where structural modifications are required to the area where OEM fuel tank was located, the only acceptable modification will be an FMVSS-compliant fuel system

4.7 Vehicle Electrical Modification

4.7.1 Battery and Charging Systems

Dual batteries are required only as designated by the manufacturer.

4.7.2 Auxiliary Power Units

Auxiliary power units (APU) are engine-driven generators which are independent of the motor vehicle engine, but are contained in or carried on the motor vehicle. The provision of an APU shall be on a case-by-case basis with prior approval by VESID.

4.7.2.1 Design Requirements

Adaptive equipment which is provided for (a) control of the motor vehicle throttle, steering, or brakes (primary controls), (b) control of vehicle systems (secondary controls) shall not be powered by an APU, but must be powered by the motor vehicle. An APU shall be capable of being started, operated, and shut down by the driver

with a disability for whom it is designed without necessitating exit from the motor vehicle.

4.7.2.2 Installation

No APU, other than gel batteries, shall not be located within the passenger compartment of a motor vehicle. The exhaust from an APU shall be directed such as to minimize intake of the exhaust gases into the passenger compartment.

4.7.3 Other Electrical Modifications

Other modifications or additions to the motor vehicle electrical system or devices powered by the motor vehicle electrical system not covered by 3.4, 4.7.1, and 4.7.2, shall be subject to individual consideration and approval by VESID.

4.7.3A General Electrical Specifications

1. All switches must be equivalent to original equipment manufacturer.
2. All wiring shall be automotive stranded type and color coded, with no wires of the same color in the same loom or harness.
3. All wiring to the same equipment shall be grouped together and protected by an aircraft type loom, to withstand abrasion. Shrink tubing is acceptable.
4. Wire size shall be sufficient to voltage and to prevent overheating.
5. Wiring shall have sufficient slack to accommodate all normal motion of parts or equipment to which it is attached.
6. Wiring shall be supported and located to prevent enmeshing in moving parts.
7. All wiring under the vehicle must be attached to the vehicle a maximum of every 18 inches.
8. All wires passing near mufflers, exhaust pipes, exhaust manifolds, catalytic converters, etc., shall be appropriately shielded to protect from heat or other damage.
9. All holes through which wires pass shall be grommets (top and bottom), or an acceptable feed through connector employed. In addition, all such holes must be water and moisture sealed, if routed to interior of vehicle.
10. Each electrical circuit shall have a self re-setting circuit breaker or fuse within 12" of the power supply. The fuse or circuit breaker size will be in accordance with the product manufacturer's specifications. Anything that is not covered by the manufacturer's specifications or elsewhere that pertains to electrical specification must be equal to OEM.
11. Adequate provision shall be made for proper grounding of electrical equipment.
12. Wiring diagrams and service manuals, on all wiring work by the vehicle modifier must be provided to the vehicle owner or driver. A copy of these diagrams and manuals should be kept on file by the vehicle modifier.
13. Scotch Lock type electrical connectors should be used only when all three of the following conditions are met:
 - A. when recommended by equipment manufacturer
 - B. Scotch Lock is properly sized
 - C. Application of less than 10 amps.

Scotch Lock type electrical connectors are not to be used on fusible links or teflon-coated wire. Only OEM type connectors or properly soldered connections will be permitted.

1. All circuit breakers and solenoids added to the vehicle must be labeled. (Labeling must be of permanent type.)

2. Sealed (watertight) connectors, which join two wires such as "jelly butts", liquid electrical tape or shrink tubing shall be used on all connections outside of vehicle cab.

4.8 Vendor Qualifications

Vehicle modification vendors must sign an agreement with NYSED - VESID to abide by the Standards set forth from NYSED - VESID. Failure of the vehicle modification vendor to comply with these requirements shall result in loss of approval to provide services until such time that correction is made. Vendors must ensure service availability within a minimum radius of 50 miles. If vendors have sought and accepted bids from VESID beyond this distance, every reasonable effort must be made to provide service in a timely manner. Anticipated increase in warranty service costs due to travel should be calculated in during the time the modification is bid.

1. Vehicle Modification Bids

Vehicle modification vendor agrees to comply with all regulations and procedures pertaining to VESID bidding practices. Vehicle modification vendors may bid only on products for which they are qualified to install per the manufacturer's specifications.

2. Facility And Product Certificates

Vehicle modifier must meet the Quality Assurance Program (QAP) practices of the National Mobility Equipment Dealers Association (NMEDA) as modified by VESID to apply these standards. Note that membership in NMEDA is not required, only participation in QAP.

All welding must be done by a welder, who meets or exceeds the applicable requirements of the American Welding Society (AWS)

3. Liability Insurance

The vehicle modifier must carry insurance in an amount not less than \$1,000,000. to cover any liabilities incurred in connection with modifications and related services provided to VESID consumers. The insurance liability coverage will include: Completed Operations, General Liability, Garage Keepers Liability, and Garage Keepers Legal Liability. VESID, or its agent, must be provided with evidence of such insurance annually.

4. Warranties

Vehicle modification vendors will use only new products that are warranted in writing by the manufacturer for a minimum of one year against any defects. If the vehicle modifier installs a product for which the manufacturer does not provide a one-year warranty, then the vehicle modifier must provide that one-year warrantee. Furthermore, the manufacturer must provide up to an additional 90 days of warranty on parts and labor for any part replaced within 90 days of the end of the one-year warranty period. In cases of equipment failure, VESID will determine consumer and/or vehicle modifier responsibility for vehicle transport based upon the individual circumstances. All warranty cards must be completed and given to the consumer at the time of final inspection.

5. Sub-Contracting

Vehicle modification vendors may sub-contract any work, including service and repairs, but accepts responsibility for the sub-contractor's work. Sub-contract work must meet or exceed the same quality standards and guidelines expected of the vehicle modification vendor including arrangements for service and repairs by certified technicians available in a proximity to the vendor as stated in section 4.8.

Vehicle modification vendors will use only products guaranteed for a minimum of one year (parts and labor) by the manufacturer. In cases where the manufacturer does not provide such a one year guarantee, the vehicle modification provider must provide such a guarantee. Furthermore, a part replaced with 90 days of the end of the one year period will retain a minimum of 90 days of additional guarantee.

If the vehicle requires hauling to the sub-contractor's facility, the vendor must have prior approval in writing from the vehicle owner. The vehicle must be hauled on flat bed style truck, unless the vehicle owner has given written approval to use another alternative. The vendor will incur all transportation expenses and is culpable for any damage to the vehicle during transit and at the sub-contractor's expense.

4.9 Lowered Floor Minivans

4.9.1.1

Approved lowered floor minivan conversions shall be limited to those vehicles for which the modifier has provided crash test data from the manufacturer, and for which the manufacturer has indicated acceptance by an independent source or a product engineer indicating crash test results. VESID shall maintain a list of such models. This test must include, but is not limited to, FMVSS 210, 207, 209, 204, 212, 219, including rear impact and roll over test of the fuel tank system. It is understood that FMVSS 209, 210 is not able to be met when modifications occur to the restraint system. Vehicle modifiers must install or modify restraints as close to FMVSS 209, 210 as is possible.

4.9.2

Ramps integral with lowered floor minivan conversions shall meet the following standards:

4.9.2.1

They shall have a non-skid surface.

4.9.2.2

They shall have an emergency backup system for egress.

4.9.2.3

They shall support a routine operating load of 600 pounds.

4.9.2.4

They shall weigh no more than 50 pounds.

4.9.2.5

They shall have a ramp angle of no more than 13 degrees measured from the ground up to the vehicle floor height while the van is in the raised position.

4.9.2.6

They shall have a primary usable ramp surface with a width of a minimum of 29 inches.

4.9.3

The powered door integral with the lowered floor minivan conversion shall meet the following standards:

4.9.3.1

There shall be no light showing around doors in the powered closed position.

4.9.3.2

There shall be no water leaks when the doors are in the powered closed position.

4.9.3.3

All powered doors shall have a mechanical quick release in the event of a power failure.

4.9.3.4

All wiring shall be run through a breakered system to protect the system.

4.9.3.5

Operation of the door opening system shall be integrated with operation of the ramp system so that the ramp cannot deploy unless the door is in the full open position.

4.9.4

The entire lowered floor area shall be covered with commercial grade carpeting of flame-retardant material, secured to the floor with contact cement, or with a rubberized non-skid surface.

4.9.5

The entire floor from the firewall to the rear bench seat shall be lowered, with the exception of a rear entry van when noted by the consumer and driving evaluation facility.

4.9.6

A minimum of 950 pound payload capacity shall be met.

4.9.7

The van shall have anti-lock brakes, except where reduced effort braking is installed, unless the informed consumer has chosen not to have anti-lock brakes.

4.9.8

Occupant restraint systems in lowered floor minivans shall meet all requirements as stated in Section 4.5 Occupant Restraints.

4.9.9

If a power transfer seat base is employed in a lowered floor minivan conversion, the vendor shall ensure that the seat base can accommodate the 8 inch or 10 inch drop floor and still position the driver for proper visibility.

4.9.10

Lowered floor minivan conversions shall be approved for the extended length vehicle (over 119 inch) wheelbase, unless the driving evaluation facility and consumer verifies that the short wheel base (112-inch) vehicle will be satisfactory.

4.9.11

All vendors bidding a lowered floor minivan shall have a designated service location within a reasonable proximity to the consumer. These service technicians shall be trained, certified, and supervised by the lower floor conversion manufacturer.

1. In the event of failure, all kneeling systems must fail in a position that allows the consumer to drive the vehicle for repair with safety and without damage to the vehicle.

5.0 Joystick Driving Systems

(To be completed with future revisions)

Related Information:

- Policy: 441.00 Vehicle Modifications, Adaptive and Automotive Equipment Policy
 - Procedure: 441.00P Vehicle Modifications, Adaptive and Automotive Equipment Policy
 - FIS 07-01: Vehicle Modification Memo
 - Standards for Driver Rehabilitation
-