



SURFACE VEHICLE INFORMATION REPORT

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Structural Modification for Personally Licensed Vehicles to
Meet the Transportation Needs of Persons with Disabilities

RATIONALE

SAE J1725 was last updated in 2021. Since the last revision, newer technology with regard to alternative fuel vehicles has been introduced and needs to be considered into the design for structural modification of vehicles for persons with physical disabilities. In addition, the document's content needed to be updated to reflect terms and definitions as currently used, as well as the addition of the new terms and definitions specific for this new technology for alternative fuel vehicles. Finally, this new technology requires updates and additions with regard to recommended vehicle preparation and specific vehicle modification processes.

FOREWORD

A variety of structural modifications to OEM personally licensed vehicles are necessary in order to meet the transportation needs of people with physical disabilities who use a wheelchair for daily mobility. These modifications allow people with physical disabilities to safely enter, exit, drive, and be transported in personally licensed vehicles.

Because of this need, a specialized industry has evolved to provide these modifications for consumers with physical disabilities. However, no current standards regulate structural modifications to vehicles such as sedans, crossovers, SUVs, MPVs, light trucks, and van-type vehicles that are powered by gas or alternative fuel such as electric, plug-in hybrid, or hybrid technologies.

This SAE Information Report provides state-of-the-art practices in the vehicle modification field and suggests minimum acceptable design requirements and performance criteria. Its goal is to promote a safe, reliable, and reasonable level of performance for modified vehicles.

With the realization that the field of vehicle structural modification is ever changing, it is intended that this document provide a general framework by which future revisions and additions can be incorporated.

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Full document details: SAE J1725_202506

For more information on this standard, visit https://www.sae.org/standards/content/J1725_202506/

Documents

Standard, visit Sharing Hub

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1. SCOPE

This SAE Information Report applies to structural integrity, performance, drivability, and serviceability of personally licensed vehicles not exceeding 10000 pounds GVWR such as sedans, crossovers, SUVs, MPVs, light trucks, and van-type vehicles that are powered by gas and alternative fuel such as electric, plug-in hybrid, or hybrid technologies. It provides engineering direction to vehicle modifiers in a manner that does not limit innovation, and it specifies procedures for preparing vehicles to enhance safety during vehicle modifications. It further provides guidance and recommendations for the minimum acceptable design requirements and performance criteria on general and specific structural modifications, thereby allowing consumers and third-party payers the ability to obtain and purchase equipment that meets or exceeds the performance and safety of the OEM production vehicle.

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue of SAE publications shall apply.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

SAE J140a	Seat Belt Hardware Test Procedure (4.33.01)
SAE J141 ¹	Seat Belt Hardware Performance Requirements (4.33.03)
SAE J155 ¹	Service Brake System Performance Requirements—Light Duty Truck
SAE J201	In-Service Brake Performance Test Procedure Passenger-Car and Light-Duty Truck (2.22.69)
SAE J229	Brake System Structural Integrity Test Procedure - Passenger Car (2.22.110)
SAE J299	Stopping Distance Test Procedure (2.22.133)
SAE J367	Passenger Car Door System Crush Test Procedure (4.34.227)
SAE J369	Flammability of Polymeric Interior Materials - Horizontal Test Method (1.11.152)
SAE J374	Vehicle Roof Strength Test Procedure (4.34.226)
SAE J383	Motor Vehicle Seat Belt Anchorages - Design Recommendations (4.33.06)
SAE J384	Motor Vehicle Seat Belt Anchorages - Test Procedure (4.33.08)
SAE J385 ¹	Motor Vehicle Seat Belt Anchorages - Performance Requirements (4.33.09)
SAE J398 ¹	Rated (Advertised) Fuel Capacity - Passenger Car, Multi-Purpose Passenger Vehicles, and Light Duty Trucks (3.24.415)
SAE J429 ¹	Mechanical and Material Requirements for Externally Threaded Fasteners (1.4.01)
SAE J514 ¹	Hydraulic Tube Fittings (2.19.51)
SAE J516 ¹	Hydraulic Hose Fittings (2.19.85)

¹ Denotes performance requirements.

SAE J615 ²	Engine Mountings (3.24.220)
SAE J656g	Automotive Brake Definitions and Nomenclature
SAE J689 ²	Curbstone Clearance, Approach, Departure, and Ramp Breakover Angles—Passenger Car and Light Truck (4.32.03)
SAE J800	Motor Vehicle Seat Belt Assembly Installation
SAE J843d	Brake System Road Test Code - Passenger Car and Light-Duty Truck (2.22.90)
SAE J937b ²	Service Brake System Performance Requirements - Passenger Car
SAE J941 ²	Motor Vehicle Drivers' Eye Locations (4.34.104)
SAE J1030 ²	Maximum Sound Level for Passenger Cars and Light Trucks (3.26.17)
SAE J1047 ²	Tubing—Motor Vehicle Brake System Hydraulic (2.22.139)
SAE J1050a ²	Describing and Measuring the Driver's Field of View (4.34.157)
SAE J1100 ²	Motor Vehicle Dimensions (4.34.85)
SAE J1140 ²	Filler Pipes and Openings of Motor Vehicle Fuel Tanks (3.24.412)
SAE J1145	Emissions Terminology and Nomenclature
SAE J1145a	Emissions Terminology and Nomenclature
SAE J1147 ²	Welding, Brazing, and Soldering - Materials and Practices (1.9.07)
SAE J1174	Operator Ear Sound Level Measurement Procedure for Small Engine Powered Equipment
SAE J1214 ²	Tire to Body Clearance Check for Recreational Vehicles (4.35.04)
SAE J1292 ²	Automobile and Motor Coach Wiring (2.20.110)
SAE J1451	A Dictionary of Terms for the Dynamics and Handling of Single Track Vehicles (Motorcycles, Scooters, Mopeds, and Bicycles)
SAE J1517 ²	Driver Selected Seat Position for Class B Vehicles - Seat Track Length and SgRP (4.34.190)
SAE J1554	Identifying and Repairing High Strength Steel Vehicle Components
SAE J1555 ²	Recommended Practice for Optimizing Automobile Damageability and Repairability (4.42.19)
SAE J1715	Hybrid Electric Vehicle (HEV) and Electric Vehicle (EV) Terminology
SAE J1715/2	Battery Terminology
SAE J1766	Recommended Practice for Electric, Fuel Cell and Hybrid Electric Vehicle Crash Integrity Testing
SAE J1827	Unibody Weld Quality Testing (4.42.22)
SAE J1828 ²	Uniform Reference and Dimensional Guidelines for Collision Repair (4.42.27)

² Denotes performance requirements.

- SAE J1959³ Corrosion Preventative Compound, Underbody Vehicle Corrosion Protection (1.3.53)
- SAE J1976³ Outdoor Weathering of Exterior Materials (1.11.234)
- SAE J2094 Vehicle and Control Modifications for Drivers with Physical Disabilities Terminology
- SAE J2249 Wheelchair Tiedown and Occupant Restraint System for Use in Motor Vehicles
- SAE J2344 Guidelines for Electric Vehicle Safety
- SAE TSB 002 Preparation of SAE Technical Reports
- SAE HS-13³ Vehicle Occupant Restraint Systems and Components, November 1985

2.1.2 AWS Publications

Available from American Welding Society, 8669 NW 36 Street, #130, Miami, FL 33166-6672, Tel: 1-800-443-9353 or 305-443-9353, www.aws.org.

- AWS 1.3-81 Sheet Steel
- AWS D1.1-88 Structural Welding
- AWS D8.4-61 Automotive Welding Design
- AWS D8.5-66 Automotive Portable Gun Resistance Spot Welding
- AWS D8.7-78 Auto Weld Quality Resistance Spot Welding
- AWS D8.8-79 Auto Frame Weld Quality Arc Welding Specification

2.1.3 Code of Federal Regulations (CFR) Publications

Copies of these documents are available online at <https://www.ecfr.gov>.

- 49 CFR Part 571 Federal Motor Vehicle Safety Standards
- 49 CFR Part 581 Bumper Standard
- 49 CFR Part 595 Make Inoperative Exemptions

2.1.4 NFPA Publications

Available from National Fire Protection Association, 1 Battery Park, Quincy, MA 02169-7471, Tel: 617-770-3000, www.nfpa.org.

- NEC 2.240 Overcurrent Protection
- NEC 3.300 Wiring Methods
- NEC 5.551 Recreational Vehicles
- NEC 7.706 Energy Storage Systems

³ Denotes performance requirements.

2.1.5 NHTSA Publications

Available from National Highway Traffic Safety Administration, 1200 New Jersey Avenue, SE, Washington, DC 20590, Tel: 1-888-327-4236, <https://www.nhtsa.gov/>.

FMVSS 105	Hydraulic Brake Systems
FMVSS 106	Brake Hoses
FMVSS 116	Motor Vehicle Brake Fluids
FMVSS 126	Electronic Stability Control
FMVSS 135	Light Vehicle Brake Systems
FMVSS 204	Steering Control Rearward Displacement
FMVSS 206	Door Locks and Door Retention Components
FMVSS 207	Seating Systems
FMVSS 208	Occupant Crash Protection
FMVSS 209	Seat Belt Assembly
FMVSS 210	Seat Belt Assembly Anchorages
FMVSS 214	Side Impact Protection
FMVSS 216	Vehicle Roof Strength
FMVSS 225	Child Restraint Anchorage System
FMVSS 301	Fuel System Integrity
FMVSS 302	Flammability of Interior Materials
FMVSS 305	Electric-Powered Vehicles: Electrolyte Spillage and Electrical Shock Protection

2.1.6 OEM Manuals

2.1.6.1 Service Manuals

2.1.6.1.1 Ford and General Motors

Available from Helm Incorporated, P.O. Box 07130, Detroit, MI 48207, Tel: 313-865-5000 or 800-782-4356.

2.1.6.1.2 Chrysler

Available from Dymont Dist. Services, P.O. Box 360450, Strongsville, OH 44136, Tel: 216-572-0740.

2.1.6.2 Body Builders Manuals

2.1.6.2.1 Ford Body Builder Advisory Service, Tel: 800-635-5560

2.1.6.2.2 Ram Body Builders Manual, Tel: 800-521-0953

2.1.6.2.3 General Motors Body Builders Manual, Tel: 800-923-2000

2.1.6.3 SEMA

Available from Specialty Equipment Market Association, 1575 S. Valley Vista Drive, Diamond Bar, CA 91765, Tel: 909-610-2030.

2.2 Related Publications

The following publications are provided for information purposes only and are not a required part of this SAE Technical Report.

2.2.1 Code of Federal Regulations (CFR) Publications

Copies of these documents are available online at <https://www.ecfr.gov>.

29 CFR Part 1910 Occupational Safety and Health Standards

49 CFR Part 567 Certification

49 CFR Part 568 Vehicles Manufactured in Two or More Stages—All Incomplete, Intermediate and Final-Stage Manufacturers of Vehicles Manufactured in Two or More Stages

49 CFR Part 575 Subpart A Regulations Issued Under Section 112(d) of the National Traffic and Motor Vehicle Safety Act; General

2.2.2 NFPA Publications

Available from National Fire Protection Association, 1 Battery Park, Quincy, MA 02169-7471, Tel: 617-770-3000, www.nfpa.org.

NEC 6.620 Wheelchair Lifts

3. DEFINITIONS

3.1 AFTERMARKET

Neither included nor available as a component, structure, or system on the OEM vehicle.

3.2 ANCHOR POINT

A location on a vehicle component, on the wheelchair, or a wheelchair tiedown/securement component that corresponds to the center of force transferred by an anchorage of a WTORS or vehicle belt restraint.

3.3 ANCHORAGE

The assembly of components and fittings by which loads are transferred directly by the WTORS or vehicle seat belt to an anchor point.

3.4 AUXILIARY BATTERY

Used within hybrid or electric vehicle battery system and/or supplemental battery for an auxiliary system. Normally a 12-V battery.

3.5 BATTERY DISCONNECT (BD)

A component that separates vehicle high voltage from the vehicle electrical architecture.

3.6 BATTERY ELECTRIC VEHICLE (BEV)

A vehicle that receives its on-board propulsion power solely from batteries, unlike a hybrid vehicle that may receive a portion of its power from a separately fueled power source, such as an internal combustion engine.

3.7 BATTERY PACK

Refer to SAE J1715/2.

3.8 BATTERY SYSTEM COMPONENTS

Refer to SAE J1715/2.

3.9 CERTIFIED WELDER

A welder who has been certified to the appropriate AWS standards related to vehicle modifications.

3.10 COMPOSITE MATERIAL

Material produced from two or more constituent materials, with different chemical or physical properties unlike the individual constituent materials.

3.11 CRUSH ZONE

In the event of a collision, that portion of a vehicle body designed for transforming kinetic energy into deformation work for the purpose of reducing deceleration and deformation of the vehicle interior.

3.12 ENTRANCE MODIFICATIONS

Any alteration or substitution of the OEM door system (e.g., threshold and/or header to increase the vertical and/or horizontal dimension of the door opening) facilitating access to the vehicle.

3.13 ELECTRIC VEHICLE (EV)

Refer to SAE J1715.

3.14 EYELLIPSE

A statistical representation of the population of driver eye location in a motor vehicle used to determine field of view both outside and inside (e.g., instrument panel) of the vehicle (modified from SAE J941).

3.15 FLOOR MODIFICATIONS

Alteration of the OEM vehicle floor to facilitate access, vision, positioning, and/or increase headroom. This includes the following:

- a. Flat floor: A floor modification that eliminates the uneven surface in a vehicle floor to provide a smooth surface for wheelchair movement.
- b. Lowered floor: An alteration that lowers certain portions of the vehicle floor.
- c. Power pan: A portion of the vehicle floor, usually in the driver area, that can be temporarily raised or lowered by a mechanism for the purpose of achieving a proper eyellipse height for wheelchair occupants.
- d. Wheelchair channels: Lowered portions of the vehicle floor which align with wheels of the wheelchair.
- e. Driving pan: The lowered portion of the floor in the area of the driver's station.
- f. Reverse power pan: Portion of vehicle floor, usually in driver area, that can be temporarily raised for the purpose of achieving a proper eyellipse height for occupants seated in wheelchairs.

3.16 FMVSS

An abbreviation for U.S. Federal Motor Vehicle Safety Standards (49 CFR Part 571 or Canadian equivalent).

3.17 FUEL SYSTEM

The energy source used to provide power to the vehicle and associated components (e.g., battery, blower, fuel tank). (Refer to SAE J1145a.)

3.18 GROSS VEHICLE WEIGHT RATING (GVWR)

The value specified by the manufacturer as the maximum allowable loaded weight. (Refer to SAE J1451.)

3.19 HEADER

The uppermost outboard structural member of the roof line connecting the A-D pillars.

3.20 HIGH VOLTAGE (HV)

Any vehicle wiring system which contains one or more circuits operating above 60 VDC or 30 VAC.

3.21 HYBRID ELECTRIC VEHICLE (HEV)

Refer to SAE J1715.

3.22 HYBRID VEHICLE

Refer to SAE J1715.

3.23 HV BATTERY

Referred to as high voltage or hybrid vehicle battery. Generally consists of hundreds to thousands of individual cells of various shapes and performance classes. These cells are joined into modules, which together form the final traction/drivetrain battery. Extremely dangerous and typically carry voltage levels of 300 to 800 V.

3.24 JOUNCE

The range of vertical motion of the vehicle suspension starting with the steady-state suspension deflection and ending with the suspension compressed to the point where the suspension bump stops are 50% compressed.

3.25 NEW COMPONENT

Any part or mechanism installed during the vehicle alteration process which is wholly fabricated by the vehicle modifier or is a purchased aftermarket component.

3.26 NONINTEGRATED BODY/FRAME

Construction composed of vehicle body supported by a separate load-bearing chassis or frame. In this construction, the body panels are not load-bearing members.

3.27 OCCUPANT RESTRAINT

A system or device designed to limit movement of motor-vehicle occupants in crash events, vehicle rollovers, and emergency vehicle braking and turning to prevent occupant ejection from the vehicle and to prevent or limit occupant contact with vehicle interior components and other occupants.

3.28 ORIGINAL EQUIPMENT MANUFACTURER (OEM)

This refers to the vehicle and its systems as they are designed and produced by the automobile manufacturer.

3.29 OEM MANUAL

Includes, but is not limited to, the following:

- a. Shop manual,
- b. Body manual,
- c. Service manual,
- d. Safety manual, or
- e. Any document which is authorized by the OEM and gives guidance for alteration, installation, removal, or finishing of OEM components.

3.30 PAYLOAD

That which a vehicle carries, including passengers and cargo.

3.31 PERSONALLY LICENSED VEHICLE

A car, van, or light truck licensed to an individual for private use.

3.32 PHYSICAL DISABILITY

The absence or reduction of neuromuscular or orthopedic function of the human body.

3.33 PLUG-IN ELECTRIC VEHICLE (PEV)

Refer to SAE J1715.

3.34 PLUG-IN HYBRID ELECTRIC VEHICLE (PHEV)

Refer to SAE J1715.

3.35 POWER PAN

See FLOOR MODIFICATIONS.

3.36 POWERPLANT

The engine, motor, or any other apparatus that provides energy to the vehicle.

3.37 RAISED ROOF

An alteration or substitution of OEM roof to provide greater interior headroom.

3.38 RAMP

An inclined plane used to provide access between two levels.

3.39 REBOUND

The movement of the suspension back to the vehicle's natural state after the suspension has been either compressed or extended. Can also refer to the rate of return.

3.40 REGENERATIVE BRAKING

Refer to SAE J1715.

3.41 REVERSE POWER PAN

See FLOOR MODIFICATIONS.

3.42 SERVICE BRAKE

The primary system used for slowing and stopping a vehicle. (Refer to SAE J656g.)

3.43 SHALL

The term used to denote "mandatory."

3.44 SHOULD

The term used whenever noncompliance with the specific recommendation is permissible. (Refer to SAE TSB 002.)

3.45 SUPPLEMENTAL RESTRAINT SYSTEM

Equipment in addition to the seat belts that enhance passenger safety in certain types of collisions.

3.46 THRESHOLD

The bottom of the entryway under the door, which may or may not be below the vehicle floor or floor modification.

3.47 TORSIONAL STIFFNESS

The extent to which a rigid body or structure exhibits rotational deformation when subjected to an external torsional moment. This is a function of the rigid body geometry and material.