# Memorandum

U.S. Department
of Transportation

**National Highway
Traffic Safety
Administration**

Subject: Full NPRM Regulatory Text with Color-Coded Redline Font for Reference Purposes; RIN:2127-AM06

Date: March 18, 2020

From: Louis Molino
Chief, Light Duty Vehicle Division

Reply to
Attn. Of:

To: **Docket No. NHTSA-2020-0014**

Thru: R. Ryan Posten
Associate Administrator for Rulemaking

Jonathan C. Morrison
Chief Counsel

On March 17, 2020, the Acting Administrator of the National Highway Traffic Safety Administration (NHTSA) signed a Notice of Proposed Rulemaking (NPRM) that seeks to adapt safety requirements for vehicles with Automated Driving Systems (ADS) by tuning the requirements and test procedures to account for the potential removal of manually-operated driving controls. The attached document contains the full regulatory text of each Federal Motor Vehicle Safety Standard (FMVSS) that NHTSA is proposing to change. Added text is in blue, bold, and underlined font. Deleted text is in red, strikethrough font. This regulatory text is being provided for the convenience of those reviewing and commenting on the NPRM and is for reference purposes only in order to put changes into their full context. The official regulatory text provided with the NPRM constitutes the actual proposal to which comments should address their attention.

Attachment

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## Appendix of Regulatory Text Revisions for Crashworthiness Standards

# §571.3 Definitions.

(a) *Statutory definitions.* All terms defined in section 102 of the Act are used in their statutory meaning.

(b) *Other definitions.* As used in this chapter—

*Act* means the National Traffic and Motor Vehicle Safety Act of 1966 (80 Stat. 718).

*Approved*, unless used with reference to another person, means approved by the Secretary.

*Boat trailer* means a trailer designed with cradle-type mountings to transport a boat and configured to permit launching of the boat from the rear of the trailer.

*Bus* means a motor vehicle with motive power, except a trailer, designed for carrying more than 10 persons.

*Curb weight* means the weight of a motor vehicle with standard equipment; maximum capacity of engine fuel, oil, and coolant; and, if so equipped, air conditioning and additional weight optional engine.

*Designated seating capacity* means the number of designated seating positions provided.

*Designated seating position* means:

(1) For vehicles manufactured prior to September 1, 2011, any plan view location capable of accommodating a person at least as large as a 5th percentile adult female, if the overall seat configuration and design and vehicle design is such that the position is likely to be used as a seating position while the vehicle is in motion, except for auxiliary seating accommodations such as temporary or folding jump seats. Any bench or split-bench seat in a passenger car, truck or multipurpose passenger vehicle with a GVWR less than 4,536 kilograms (10,000 pounds), having greater than 127 centimeters (50 inches) of hip room (measured in accordance with Society of Automotive Engineers (SAE) Recommended Practice J1100a, revised September 1975, "Motor Vehicle Dimensions" (incorporated by reference, see §571.5), shall have not less than three designated seating positions, unless the seat design or vehicle design is such that the center position cannot be used for seating. For the sole purpose of determining the classification of any vehicle sold or introduced into interstate commerce for purposes that include carrying students to and from school or related events, any location in such vehicle intended for securement of an occupied wheelchair during vehicle operation shall be regarded as four designated seating positions.

(2) For vehicles manufactured on and after September 1, 2011, *designated seating position* means a seat location that has a seating surface width, as described in §571.10(c) of this part, of at least 330 mm (13 inches). The number of designated seating positions at a seat location is determined according to the procedure set forth in §571.10(b) of this part. However, for trucks and multipurpose passenger vehicles with a gross vehicle weight rating greater than 10,000 lbs, police vehicles as defined in S7 of FMVSS No. 208, firefighting vehicles, ambulances, and motor homes, a seating location that is labeled in accordance with S4.4 of FMVSS No. 207 will not be considered a designated seating position. For the sole purpose of determining the classification of any vehicle sold or introduced into interstate commerce for purposes that include carrying students to and from school or related events, any location in such a vehicle intended for securement of an occupied wheelchair during vehicle operation is regarded as four designated seating positions.

*Driver* means the occupant of a motor vehicle seated immediately behind the steering control system.

***Driver air bag*** **means the air bag installed for the protection of the occupant of the driver's designated seating position.**

***Driver dummy*** **means the test dummy positioned in the driver's designated seating position.**

***Driver's designated seating position*** **means a designated seating position providing immediate access to manually-operated driving controls. As used in this part, the terms "driver's seating position" and "driver's seat" shall have the same meaning as "driver's designated seating position."**

*Emergency brake* means a mechanism designed to stop a motor vehicle after a failure of the service brake system.

*5th percentile adult female* means a person possessing the dimensions and weight of the 5th percentile adult female specified for the total age group in "Weight, Height, and Selected Body Dimensions of Adults: United States—1960-1962," first published as Public Health Service Publication No. 1000 Series 11-No. 8, June 1965 and republished as DHEW Publication No. (HRA) 76-1074 (incorporated by reference, see §571.5).

*Firefighting vehicle* means a vehicle designed exclusively for the purpose of fighting fires.

*Fixed collision barrier* means a flat, vertical, unyielding surface with the following characteristics:

(1) The surface is sufficiently large that when struck by a tested vehicle, no portion of the vehicle projects or passes beyond the surface.

(2) The approach is a horizontal surface that is large enough for the vehicle to attain a stable attitude during its approach to the barrier, and that does not restrict vehicle motion during impact.

(3) When struck by a vehicle, the surface and its supporting structure absorb no significant portion of the vehicle's kinetic energy, so that a performance requirement described in terms of impact with a fixed collision barrier must be met no matter how small an amount of energy is absorbed by the barrier.

*Forward control* means a configuration in which more than half of the engine length is rearward of the foremost point of the windshield base and the steering wheel hub is in the forward quarter of the vehicle length.

*Full trailer* means a trailer, except a pole trailer, that is equipped with two or more axles that support the entire weight of the trailer.

*Gross axle weight rating* or *GAWR* means the value specified by the vehicle manufacturer as the load-carrying capacity of a single axle system, as measured at the tire-ground interfaces.

*Gross combination weight rating* or *GCWR* means the value specified by the manufacturer as the loaded weight of a combination vehicle.

*Gross vehicle weight rating* or *GVWR* means the value specified by the manufacturer as the loaded weight of a single vehicle.

*H-Point* means the pivot center of the torso and thigh on the three-dimensional device used in defining and measuring vehicle seating accommodation, as defined in Society of Automotive Engineers (SAE) Recommended Practice J1100, revised February 2001, "Motor Vehicle Dimensions" (incorporated by reference, see §571.5).

*Head impact area* means all nonglazed surfaces of the interior of a vehicle that are statically contactable by a 6.5-inch diameter spherical head form of a measuring device having a pivot point to "top-of-head" dimension infinitely adjustable from 29 to 33 inches in accordance with the following procedure, or its graphic equivalent:

(a) At each designated seating position, place the pivot point of the measuring device—

(1) For seats that are adjustable fore and aft, at—

(i) The seating reference point; and

(ii) A point 5 inches horizontally forward of the seating reference point and vertically above the seating reference point an amount equal to the rise which results from a 5-inch forward adjustment of the seat or 0.75 inch; and

(2) For seats that are not adjustable fore and aft, at the seating reference point.

(b) With the pivot point to "top-of-head" dimension at each value allowed by the device and the interior dimensions of the vehicle, determine all contact points above the lower windshield glass line and forward of the seating reference point.

(c) With the head form at each contact point, and with the device in a vertical position if no contact points exists for a particular adjusted length, pivot the measuring device forward and downward through all arcs in vertical planes to 90° each side of the vertical longitudinal plane through the seating reference point, until the head form contacts an interior surface or until it is tangent to a horizontal plane 1 inch above the seating reference point, whichever occurs first.

*Interior compartment door* means any door in the interior of the vehicle installed by the manufacturer as a cover for storage space normally used for personal effects.

*Longitudinal* or *longitudinally* means parallel to the longitudinal centerline of the vehicle.

*Low-speed vehicle (LSV)* means a motor vehicle,

(1) That is 4-wheeled,

(2) Whose speed attainable in 1.6 km (1 mile) is more than 32 kilometers per hour (20 miles per hour) and not more than 40 kilometers per hour (25 miles per hour) on a paved level surface, and

(3) Whose GVWR is less than 1,361 kilograms (3,000 pounds).

***Manually-operated driving controls* means a system of controls:**

**(1) That are used by an occupant for real-time, sustained, manual manipulation of the motor vehicle's heading (steering) and/or speed (accelerator and brake); and**

**(2) That are positioned such that they can be used by an occupant, regardless of whether the occupant is actively using the system to manipulate the vehicle's motion.**

*Motorcycle* means a motor vehicle with motive power having a seat or saddle for the use of the rider and designed to travel on not more than three wheels in contact with the ground.

*Motor-driven cycle* means a motorcycle with a motor that produces 5-brake horsepower or less.

*Motor home* means a multipurpose passenger vehicle with motive power that is designed to provide temporary residential accommodations, as evidenced by the presence of at least four of the following facilities: Cooking; refrigeration or ice box; self-contained toilet; heating and/or air conditioning; a potable water supply system including a faucet and a sink; and a separate 110-125 volt electrical power supply and/or propane.

*Multifunction school activity bus* (MFSAB) means a school bus whose purposes do not include transporting students to and from home or school bus stops.

*Multipurpose passenger vehicle* means a motor vehicle with motive power, except a low-speed vehicle or trailer, designed to carry 10 persons or less which is constructed either on a truck chassis or with special features for occasional off-road operation.

*Open-body type vehicle* means a vehicle having no occupant compartment top or an occupant compartment top that can be installed or removed by the user at his convenience.

*Outboard designated seating position* means a designated seating position where a longitudinal vertical plane tangent to the outboard side of the seat cushion is less than 12 inches from the innermost point on the inside surface of the vehicle at a height between the design H-point and the shoulder reference point (as shown in fig. 1 of Federal Motor Vehicle Safety Standard No. 210) and longitudinally between the front and rear edges of the seat cushion. **As used in this part, the terms "outboard seating position" and "outboard seat" shall have the same meaning as "outboard designated seating position."**

*Overall vehicle width* means the nominal design dimension of the widest part of the vehicle, exclusive of signal lamps, marker lamps, outside rearview mirrors, flexible fender extensions, and mud flaps, determined with doors and windows closed and the wheels in the straight-ahead position.

*Parking brake* means a mechanism designed to prevent the movement of a stationary motor vehicle.

*Passenger car* means a motor vehicle with motive power, except a low-speed vehicle, multipurpose passenger vehicle, motorcycle, or trailer, designed for carrying 10 persons or less.

***Passenger seating position*** **means any designated seating position other than the driver's designated seating position. As used in this part, the term "passenger seat" shall have the same meaning as "passenger seating position." As used in this part, "passenger seating position" means a *driver's designated seating position* with stowed manual controls.**

*Pelvic impact area* means that area of the door or body side panel adjacent to any outboard designated seating position which is bounded by horizontal planes 7 inches above and 4 inches below the seating reference point and vertical transverse planes 8 inches forward and 2 inches rearward of the seating reference point.

*Pole trailer* means a motor vehicle without motive power designed to be drawn by another motor vehicle and attached to the towing vehicle by means of a reach or pole, or by being boomed or otherwise secured to the towing vehicle, for transporting long or irregularly shaped loads such as poles, pipes, or structural members capable generally of sustaining themselves as beams between the supporting connections.

*Recreation vehicle trailer* means a trailer, except a trailer designed primarily to transport cargo, designed to be drawn by a vehicle with motive power by means of a bumper, frame or fifth wheel hitch and designed to provide temporary residential accommodations, as evidenced by the presence of at least four of the following facilities: cooking; refrigeration or ice box; self-contained toilet; heating and/or air conditioning; a potable water supply system including a faucet and a sink; and a separate 110-125 volt electrical power supply and/or propane. "Recreation vehicle trailer" includes trailers used for personal purposes, commonly known as "sport utility RVs" or "toy haulers," which usually have spacious rather than incidental living

quarters and provide a cargo area for smaller items for personal use such as motorcycles, mountain bikes, all terrain vehicles (ATVs), snowmobiles, canoes or other types of recreational gear.

***Row* means a set of one or more seats whose seat outlines do not overlap with the seat outline of any other seats, when all seats are adjusted to their rearmost normal riding or driving position, when viewed from the side.**

*School bus* means a bus that is sold, or introduced in interstate commerce, for purposes that include carrying students to and from school or related events, but does not include a bus designed and sold for operation as a common carrier in urban transportation.

*Seating reference point* (SgRP) means the unique design H-point, as defined in Society of Automotive Engineers (SAE) Recommended Practice J1100, revised June 1984, "Motor Vehicle Dimensions" (incorporated by reference, see §571.5), which:

(1) Establishes the rearmost normal design driving or riding position of each designated seating position, which includes consideration of all modes of adjustment, horizontal, vertical, and tilt, in a vehicle;

(2) Has X, Y, and Z coordinates, as defined in Society of Automotive Engineers (SAE) Recommended Practice J1100, revised June 1984, "Motor Vehicle Dimensions" (incorporated by reference, see §571.5), established relative to the designed vehicle structure;

(3) Simulates the position of the pivot center of the human torso and thigh; and

(4) Is the reference point employed to position the two-dimensional drafting template with the 95th percentile leg described in Society of Automotive Engineers (SAE) Standard J826, revised May 1987, "Devices for Use in Defining and Measuring Vehicle Seating Accommodation" (incorporated by reference, see §571.5), or, if the drafting template with the 95th percentile leg cannot be positioned in the seating position, is located with the seat in its most rearward adjustment position.

*Semitrailer* means a trailer, except a pole trailer, so constructed that a substantial part of its weight rests upon or is carried by another motor vehicle.

*Service brake* means the primary mechanism designed to stop a motor vehicle.

*Speed attainable in 1 mile* means the speed attainable by accelerating at maximum rate from a standing start for 1 mile, on a level surface.

*Speed attainable in 2 miles* means the speed attainable by accelerating at maximum rate from a standing start for 2 miles, on a level surface.

***Steering control system* means the manually-operated driving control(s) used to control the vehicle heading and its associated trim hardware, including any portion of a steering**

**column assembly that provides energy absorption upon impact. As used in this part, the term "steering wheel" and "steering control" shall have the same meaning as "steering control system."**

*Torso line* means the line connecting the "H" point and the shoulder reference point as defined in Society of Automotive Engineers (SAE) Standard J787b, revised September 1966, "Motor Vehicle Seat Belt Anchorage" (incorporated by reference, see §571.5).

*Trailer* means a motor vehicle with or without motive power, designed for carrying persons or property and for being drawn by another motor vehicle.

*Trailer converter dolly* means a trailer chassis equipped with one or more axles, a lower half of a fifth wheel and a drawbar.

*Truck* means a motor vehicle with motive power, except a trailer, designed primarily for the transportation of property or special purpose equipment.

*Truck tractor* means a truck designed primarily for drawing other motor vehicles and not so constructed as to carry a load other than a part of the weight of the vehicle and the load so drawn.

*Unloaded vehicle weight* means the weight of a vehicle with maximum capacity of all fluids necessary for operation of the vehicle, but without cargo, occupants, or accessories that are ordinarily removed from the vehicle when they are not in use.

*95th percentile adult male* means a person possessing the dimensions and weight of the 95th percentile adult male specified "Weight, Height, and Selected Body Dimensions of Adults: United States—1960-1962," first published as Public Health Service Publication No. 1000 Series 11-No. 8, June 1965 and republished as DHEW Publication No. (HRA) 76-1074 (incorporated by reference, see §571.5).

*Vehicle fuel tank capacity* means the tank's unusable capacity (i.e., the volume of fuel left at the bottom of the tank when the vehicle's fuel pump can no longer draw fuel from the tank) plus its usable capacity (i.e., the volume of fuel that can be pumped into the tank through the filler pipe with the vehicle on a level surface and with the unusable capacity already in the tank). The term does not include the vapor volume of the tank (i.e., the space above the fuel tank filler neck) nor the volume of the fuel tank filler neck.

[33 FR 19703, Dec. 25, 1968. Redesignated at 35 FR 5118, Mar. 26, 1970]

# §571.201 Standard No. 201; Occupant protection in interior impact.

S1. *Purpose and scope.* This standard specifies requirements to afford impact protection for occupants.

S2. *Application.* This standard applies to passenger cars and to multipurpose passenger vehicles, trucks **with at least one designated seating position**, and buses with a GVWR of 4,536 kilograms or less, except that the requirements of S6 do not apply to buses with a GVWR of more than 3,860 kilograms.

S3. *Definitions.*

*A-pillar* means any pillar that is entirely forward of a transverse vertical plane passing through the seating reference point of the driver's **designated** seat**ing position or, if there is no driver's designated seating position, any pillar that is entirely forward of a transverse vertical plane passing through the seating reference point of the rearmost designated seating position in the front row of seats**.

*Ambulance* means a motor vehicle designed exclusively for the purpose of emergency medical care, as evidenced by the presence of a passenger compartment to accommodate emergency medical personnel, one or more patients on litters or cots, and equipment and supplies for emergency care at a location or during transport.

*B-pillar* means the forwardmost pillar on each side of the vehicle that is, in whole or in part, rearward of a transverse vertical plane passing through the seating reference point of the driver's **designated** seat**ing position or, if there is no driver's designated seating position, the forwardmost pillar on each side of the vehicle that is, in whole or in part, rearward of a transverse vertical plane passing through the seating reference point of the rearmost designated seating position in the front row of seats**, unless:

(1) There is only one pillar rearward of that plane and it is also a rearmost pillar; or

(2) There is a door frame rearward of the A-pillar and forward of any other pillar or rearmost pillar.

*Brace* means a fixed diagonal structural member in an open body vehicle that is used to brace the roll-bar and that connects the roll-bar to the main body of the vehicle structure.

*Convertible* means a vehicle whose A-pillars are not joined with the B-pillars (or rearmost pillars) by a fixed, rigid structural member.

*Convertible roof frame* means the frame of a convertible roof.

*Convertible roof linkage mechanism* means any anchorage, fastener, or device necessary to deploy a convertible roof frame.

*Daylight opening* means, for openings on the side of the vehicle, other than a door opening, the locus of all points where a horizontal line, perpendicular to the vehicle longitudinal centerline, is tangent to the periphery of the opening. For openings on the front and rear of the vehicle, other than a door opening, *daylight opening* means the locus of all points where a horizontal line, parallel to the vehicle longitudinal centerline, is tangent to the periphery of the opening. If the

horizontal line is tangent to the periphery at more than one point at any location, the most inboard point is used to determine the daylight opening.

*Door frame* means the rearmost perimeter structure, including trim but excluding glass, of the forward door and the forwardmost perimeter structure, including trim but excluding glass, of the rear door of a pair of adjacent side doors that:

(1) Have opposing hinges;

(2) Latch together without engaging or contacting an intervening pillar;

(3) Are forward of any pillar other than the A-pillar on the same side of the vehicle; and

(4) Are rearward of the A-pillar.

*Door opening* means, for door openings on the side of the vehicle, the locus of all points where a horizontal line, perpendicular to the vehicle longitudinal centerline, is tangent to the periphery of the side door opening. For door openings on the back end of the vehicle, *door opening* means the locus of all points where a horizontal line, parallel to the vehicle longitudinal centerline, is tangent to the periphery of the back door opening. If the horizontal line is tangent to the periphery at more than one point at any location, the most inboard point is the door opening.

*Dynamically deployed upper interior head protection system* means a protective device or devices which are integrated into a vehicle and which, when activated by an impact, provide, through means requiring no action from occupants, protection against head impacts with upper interior structures and components of the vehicle in crashes.

*Forehead impact zone* means the part of the free motion headform surface area that is determined in accordance with the procedure set forth in S8.10.

*Free motion headform* means a test device which conforms to the specifications of part 572, subpart L of this chapter.

*Interior rear quarter panel* means a vehicle interior component located between the rear edge of the side door frame, the front edge of the rearmost seat back, and the daylight opening.

*Mid-sagittal plane of a dummy* means a longitudinal vertical plane passing through the seating reference point of a designated seating position.

*Other door frame* means the rearmost perimeter structure, including trim but excluding glass, of the forward door and the forwardmost perimeter structure, including trim but excluding glass, of the rear door of a pair of adjacent side doors that:

(1) Have opposing hinges;

(2) Latch together without engaging or contacting an intervening pillar; and

(3) Are rearward of the B-pillar.

*Other pillar* means any pillar which is not an A-pillar, a B-pillar, or a rearmost pillar.

*Pillar* means any structure, excluding glazing and the vertical portion of door window frames, but including accompanying moldings, attached components such as safety belt anchorages and coat hooks, which:

(1) **If there is a driver's designated seating position, ~~S~~s**upports either a roof or any other structure (such as a roll-bar) that is above the driver's head**, or if there is no driver's designated seating position, supports either a roof or any other structure (such as a roll-bar) that is above the occupant in the rearmost designated seating position in the front row of seats**, or

(2) Is located along the side edge of a window.

*Roll-bar* means a fixed overhead structural member, including its vertical support structure, that extends from the left to the right side of the passenger compartment of any open body vehicles and convertibles. It does not include a header.

*Seat belt anchorage* means any component involved in transferring seat belt loads to the vehicle structure, including, but not limited to, the attachment hardware, but excluding webbing or straps, seat frames, seat pedestals, and the vehicle structure itself, whose failure causes separation of the belt from the vehicle structure.

*Seat belt mounting structure* means:

(a) A vehicle body or frame component, including trim, that incorporates an upper seat belt anchorage conforming to the requirements of S4.2.1 and S4.3.2 of 49 CFR 571.210, that is located rearward of the rearmost outboard designated seating position, and that extends above a horizontal plane 660 mm above the seating reference point (SgRP) of that seating position; and

(b) A vehicle body or frame component, including trim, that incorporates an upper seat belt anchorage conforming to the requirements of S4.2.1 and S4.3.2 of 49 CFR 571.210, that is located forward of the rearmost outboard designated seating position, and that extends above a horizontal plane 460 mm above the SgRP of that seating position located rearward of the anchorage.

(c) The seat belt mounting structure is not a pillar, roll bar, brace or stiffener, side rail, seat, interior rear quarter panel, or part of the roof.

*Sliding door track* means a track structure along the upper edge of a side door opening that secures the door in the closed position and guides the door when moving to and from the open position.

*Stiffener* means a fixed overhead structural member that connects one roll-bar to another roll-bar or to a header of any open body vehicle or convertible.

*Upper roof* means the area of the vehicle interior that is determined in accordance with the procedure set forth in S8.15.

*Windshield trim* means molding of any material between the windshield glazing and the exterior roof surface, including material that covers a part of either the windshield glazing or exterior roof surface.

S4 *Requirements*

S4.1 Except as provided in S4.2, each vehicle shall comply with either:

(a) The requirements specified in S5, or,

(b) The requirements specified in S5 and S6.

S4.2 Vehicles manufactured on or after September 1, 1998 shall comply with the requirements of S5 and S6.

S5 *Requirements for instrument panels, seat backs, interior compartment doors, sun visors, and armrests.* Each vehicle shall comply with the requirements specified in S5.1 through S5.5.2.

S5.1 *Instrument panels.* Except as provided in S5.1.1, when that area of the instrument panel that is within the head impact area is impacted in accordance with S5.1.2 by a 6.8 kilogram, 165 mm diameter head form at—

(a) A relative velocity of 24 kilometers per hour for all vehicles except those specified in paragraph (b) of this section,

(b) A relative velocity of 19 kilometers per hour for vehicles that meet the occupant crash protection requirements of S5.1 of 49 CFR 571.208 by means of inflatable restraint systems and meet the requirements of S4.1.5.1(a)(3) by means of a Type 2 seat belt assembly at ~~the right~~**any** front **passenger** designated seating position, the deceleration of the head form shall not exceed 80 g continuously for more than 3 milliseconds.

S5.1.1 The requirements of S5.1 do not apply to:

(a) Console assemblies;

(b) Areas less than 125 mm inboard from the juncture of the instrument panel attachment to the body side inner structure;

(c) Areas closer to the windshield juncture than those statically contactable by the head form with the windshield in place;

(d) **If the steering control is present,** ~~A~~**a**reas outboard of any point of tangency on the instrument panel of a 165 mm diameter head form tangent to and inboard of a vertical longitudinal plane tangent to the inboard edge of the steering ~~wheel~~**control**; or

(e) Areas below any point at which a vertical line is tangent to the rearmost surface of the panel.

S5.1.2 *Demonstration procedures.* Tests shall be performed as described in SAE Recommended Practice J921 (1965) (incorporated by reference, see §571.5), using the specified instrumentation or instrumentation that meets the performance requirements specified in SAE Recommended Practice J977 (1966) (incorporated by reference, see §571.5), except that:

(a) The origin of the line tangent to the instrument panel surface shall be a point on a transverse horizontal line through a point 125 mm horizontally forward of the seating reference point of **any**~~the~~ front outboard passenger designated seating position, displaced vertically an amount equal to the rise which results from a 125 mm forward adjustment of the seat or 19 mm; and

(b) Direction of impact shall be either:

(1) In a vertical plane parallel to the vehicle longitudinal axis; or

(2) In a plane normal to the surface at the point of contact.

S5.2 *Seat Backs.* Except as provided in S5.2.1, when that area of the seat back that is within the head impact area is impacted in accordance with S5.2.2 by a 6.8 kilogram, 165 mm diameter head form at a relative velocity of 24 kilometers per hour, the deceleration of the head form shall not exceed 80g continuously for more than 3 milliseconds.

S5.2.1 The requirements of S5.2 do not apply to seats installed in school buses which comply with the requirements of Standard No. 222, *School Bus Passenger Seating and Occupant Protection* (49 CFR 571.222) or to rearmost side-facing, back-to-back, folding auxiliary jump, and temporary seats.

S5.2.2 *Demonstration procedures.* Tests shall be performed as described in SAE Recommended Practice J921 (1965) (incorporated by reference, see §571.5), using the specified instrumentation or instrumentation that meets the performance requirements specified in SAE Recommended Practice J977 (1966) (incorporated by reference, see §571.5), except that:

(a) The origin of the line tangent to the uppermost seat back frame component shall be a point on a transverse horizontal line through the seating reference point of the right rear designated seating position, with adjustable forward seats in their rearmost design driving position and reclinable forward seat backs in their nominal design driving position;

(b) Direction of impact shall be either:

(1) In a vertical plane parallel to the vehicle longitudinal axis; or

(2) In a plane normal to the surface at the point of contact.

(c) For seats without head restraints installed, tests shall be performed for each individual split or bucket seat back at points within 100 mm left and right of its centerline, and for each bench seat back between points 100 mm outboard of the centerline of each outboard designated seating position;

(d) For seats having head restraints installed, each test shall be conducted with the head restraints in place at its lowest adjusted position, at a point on the head restraint centerline; and

(e) For a seat that is installed in more than one body style, tests conducted at the fore and aft extremes identified by application of subparagraph (a) shall be deemed to have demonstrated all intermediate conditions.

S5.3 *Interior compartment doors.* Each interior compartment door assembly located in an instrument panel, console assembly, seat back, or side panel adjacent to a designated seating position shall remain closed when tested in accordance with either S5.3.1(a) and S5.3.1(b) or S5.3.1(a) and S5.3.1(c). Additionally, any interior compartment door located in an instrument panel or seat back shall remain closed when the instrument panel or seat back is tested in accordance with S5.1 and S5.2. All interior compartment door assemblies with a locking device must be tested with the locking device in an unlocked position.

S5.3.1 *Demonstration procedures.*

(a) Subject the interior compartment door latch system to an inertia load of 10g in a horizontal transverse direction and an inertia load of 10g in a vertical direction in accordance with the procedure described in section 5 of SAE Recommended Practice J839b (1965) (incorporated by reference, see §571.5), or an approved equivalent.

(b) Impact the vehicle perpendicularly into a fixed collision barrier at a forward longitudinal velocity of 48 kilometers per hour.

(c) Subject the interior compartment door latch system to a horizontal inertia load of 30g in a longitudinal direction in accordance with the procedure described in section 5 of SAE Recommended Practice J839b (1965) (incorporated by reference, see §571.5), or an approved equivalent.

S5.4 *Sun visors.*

S5.4.1 A sun visor that is constructed of or covered with energy-absorbing material shall be provided for each front outboard designated seating position.

S5.4.2 Each sun visor mounting shall present no rigid material edge radius of less than 3.2 mm that is statically contactable by a spherical 165 mm diameter head form.

S5.5 *Armrests.*

S5.5.1 *General.* Each installed armrest shall conform to at least one of the following:

(a) It shall be constructed with energy-absorbing material and shall deflect or collapse laterally at least 50 mm without permitting contact with any underlying rigid material.

(b) It shall be constructed with energy-absorbing material that deflects or collapses to within 32 mm of a rigid test panel surface without permitting contact with any rigid material. Any rigid material between 13 and 32 mm from the panel surface shall have a minimum vertical height of not less than 25 mm.

(c) Along not less than 50 continuous mm of its length, the armrest shall, when measured vertically in side elevation, provide at least 50 mm of coverage within the pelvic impact area.

S5.5.2 *Folding armrests.* Each armrest that folds into the seat back or between two seat backs shall either:

(a) Meet the requirements of S5.5.1; or

(b) Be constructed of or covered with energy-absorbing material.

S6 *Requirements for upper interior components.*

S6.1 *Vehicles manufactured on or after September 1, 1998.* Except as provided in S6.3 and S6.1.4, for vehicles manufactured on or after September 1, 1998 and before September 1, 2002, a percentage of the manufacturer's production, as specified in S6.1.1, S6.1.2, or S6.1.3 shall conform, at the manufacturer's option, to either S6.1(a) or S6.1(b). For vehicles manufactured by final stage manufacturers on or after September 1, 1998 and before September 1, 2006, a percentage of the manufacturer's production as specified in S6.1.4 shall, except as provided in S6.3, conform, to either S6.1(a) or S6.1(b). The manufacturer shall select the option by the time it certifies the vehicle and may not thereafter select a different option for the vehicle.

(a) When tested under the conditions of S8, comply with the requirements specified in S7 at the target locations specified in S10 when impacted by the free motion headform specified in S8.9 at any speed up to and including 24 km/h (15 mph). The requirements do not apply to any target that cannot be located using the procedures of S10.

(b) When equipped with a dynamically deployed upper interior head protection system and tested under the conditions of S8, comply with the requirements specified in S7 at the target locations specified in S10 as follows:

(1) Targets that are not located over any point inside the area measured along the contour of the vehicle surface within 50 mm (2.0 inch) of the periphery of the stowed system projected perpendicularly onto the vehicle interior surface, including mounting and inflation components but exclusive of any cover or covers, shall be impacted by the free motion headform specified in S8.9 at any speed up to and including 24 km/h (15 mph). The requirements do not apply to any targets that can not be located by using the procedures of S10.

(2) Targets that are over any point inside the area measured along the contour of the vehicle interior within 50 mm (2.0 inch) of the periphery of the stowed system projected perpendicularly onto the vehicle interior surface, including mounting and inflation components but exclusive of any cover or covers, when the dynamically deployed upper interior head protection system is not deployed, shall be impacted by the free motion headform specified in S8.9 at any speed up to and including 19 km/h (12 mph) with the system undeployed. The requirements do not apply to any target that can not be located using the procedures of S10.

(3) Each vehicle shall, when equipped with a dummy test device specified in Part 572, subpart M, and tested as specified in S8.16 through S8.28, comply with the requirements specified in S7 when crashed into a fixed, rigid pole of 254 mm in diameter, at any velocity between 24 kilometers per hour (15 mph) and 29 kilometers per hour (18 mph).

S6.1.1 *Phase-in Schedule #1*

S6.1.1.1 *Vehicles manufactured on or after September 1, 1998 and before September 1, 1999.* Subject to S6.1.5(a), for vehicles manufactured by a manufacturer on or after September 1, 1998 and before September 1, 1999, the amount of vehicles complying with S7 shall be not less than 10 percent of:

(a) The manufacturer's average annual production of vehicles manufactured on or after September 1, 1996 and before September 1, 1999, or

(b) The manufacturer's production on or after September 1, 1998 and before September 1, 1999.

S6.1.1.2 *Vehicles manufactured on or after September 1, 1999 and before September 1, 2000.* Subject to S6.1.5(b), for vehicles manufactured by a manufacturer on or after September 1, 1999 and before September 1, 2000, the amount of vehicles complying with S7 shall be not less than 25 percent of:

(a) The manufacturer's average annual production of vehicles manufactured on or after September 1, 1997 and before September 1, 2000, or

(b) The manufacturer's production on or after September 1, 1999 and before September 1, 2000.

S6.1.1.3 *Vehicles manufactured on or after September 1, 2000 and before September 1, 2001.* Subject to S6.1.5(c), for vehicles manufactured by a manufacturer on or after September 1, 2000 and before September 1, 2001, the amount of vehicles complying with S7 shall be not less than 40 percent of:

(a) The manufacturer's average annual production of vehicles manufactured on or after September 1, 1998 and before September 1, 2001, or

(b) The manufacturer's production on or after September 1, 2000 and before September 1, 2001.

S6.1.1.4 *Vehicles manufactured on or after September 1, 2001 and before September 1, 2002.* Subject to S6.1.5(d), for vehicles manufactured by a manufacturer on or after September 1, 2001 and before September 1, 2002, the amount of vehicles complying with S7 shall be not less than 70 percent of:

(a) The manufacturer's average annual production of vehicles manufactured on or after September 1, 1999 and before September 1, 2002, or

(b) The manufacturer's production on or after September 1, 2001 and before September 1, 2002.

S6.1.2 *Phase-in Schedule #2*

S6.1.2.1 *Vehicles manufactured on or after September 1, 1998 and before September 1, 1999.* Subject to S6.1.5(a), for vehicles manufactured by a manufacturer on or after September 1, 1998 and before September 1, 1999, the amount of vehicles complying with S7 shall be not less than seven percent of:

(a) The manufacturer's average annual production of vehicles manufactured on or after September 1, 1996 and before September 1, 1999, or

(b) The manufacturer's production on or after September 1, 1998 and before September 1, 1999.

S6.1.2.2 *Vehicles manufactured on or after September 1, 1999 and before September 1, 2000.* Subject to S6.1.5(b), for vehicles manufactured by a manufacturer on or after September 1, 1999 and before September 1, 2000, the amount of vehicles complying with S7 shall be not less than 31 percent of:

(a) The manufacturer's average annual production of vehicles manufactured on or after September 1, 1997 and before September 1, 2000, or

(b) The manufacturer's production on or after September 1, 1999 and before September 1, 2000.

S6.1.2.3 *Vehicles manufactured on or after September 1, 2000 and before September 1, 2001.* Subject to S6.1.5(c), for vehicles manufactured by a manufacturer on or after September 1, 2000 and before September 1, 2001, the amount of vehicles complying with S7 shall be not less than 40 percent of:

(a) The manufacturer's average annual production of vehicles manufactured on or after September 1, 1998 and before September 1, 2001, or

(b) The manufacturer's production on or after September 1, 2000 and before September 1, 2001.

S6.1.2.4 *Vehicles manufactured on or after September 1, 2001 and before September 1, 2002.* Subject to S6.1.5(d), for vehicles manufactured by a manufacturer on or after September 1, 2001 and before September 1, 2002, the amount of vehicles complying with S7 shall be not less than 70 percent of:

(a) The manufacturer's average annual production of vehicles manufactured on or after September 1, 1999 and before September 1, 2002, or

(b) The manufacturer's production on or after September 1, 2001 and before September 1, 2002.

S6.1.3 *Phase-in Schedule #3*

S6.1.3.1 Vehicles manufactured on or after September 1, 1998 and before September 1, 1999 are not required to comply with the requirements specified in S7.

S6.1.3.2 Vehicles manufactured on or after September 1, 1999 shall comply with the requirements specified in S7.

S6.1.4 *Phase-in Schedule #4* A final stage manufacturer or alterer may, at its option, comply with the requirements set forth in S6.1.4.1 and S6.1.4.2.

S6.1.4.1 Vehicles manufactured on or after September 1, 1998 and before September 1, 2009 are not required to comply with the requirements specified in S7.

S6.1.4.2 Vehicles manufactured on or after September 1, 2009 shall comply with the requirements specified in S7.

S6.1.5 *Calculation of complying vehicles.*

(a) For the purposes of complying with S6.1.1.1 or S6.1.2.1, a manufacturer may count a vehicle if it is manufactured on or after May 8, 1997, but before September 1, 1999.

(b) For the purposes of complying with S6.1.1.2 or S6.1.2.2, a manufacturer may count a vehicle if it:

(1) Is manufactured on or after May 8, 1997, but before September 1, 2000, and

(2) Is not counted toward compliance with S6.1.1.1 or S6.1.2.1, as appropriate.

(c) For the purposes of complying with S6.1.1.3 or S6.1.2.3, a manufacturer may count a vehicle if it:

(1) Is manufactured on or after May 8, 1997, but before September 1, 2001, and

(2) Is not counted toward compliance with S6.1.1.1, S6.1.1.2, S6.1.2.1, or S6.1.2.2, as appropriate.

(d) For the purposes of complying with S6.1.1.4 or S6.1.2.4, a manufacturer may count a vehicle if it:

(1) Is manufactured on or after May 8, 1997, but before September 1, 2002, and

(2) Is not counted toward compliance with S6.1.1.1, S6.1.1.2, S6.1.1.3, S6.1.2.1, S6.1.2.2, or S6.1.2.3, as appropriate.

S6.1.6 *Vehicles produced by more than one manufacturer.*

S6.1.6.1 For the purpose of calculating average annual production of vehicles for each manufacturer and the number of vehicles manufactured by each manufacturer under S6.1.1 through S6.1.4, a vehicle produced by more than one manufacturer shall be attributed to a single manufacturer as follows, subject to S6.1.6.2.

(a) A vehicle which is imported shall be attributed to the importer.

(b) A vehicle manufactured in the United States by more than one manufacturer, one of which also markets the vehicle, shall be attributed to the manufacturer which markets the vehicle.

S6.1.6.2 A vehicle produced by more than one manufacturer must be attributed to any one of the vehicle's manufacturers specified by an express written contract, reported to the National Highway Traffic Safety Administration under 49 CFR part 585, between the manufacturer so specified and the manufacturer to which the vehicle would otherwise be attributed under S6.1.6.1.

S6.2 *Vehicles manufactured on or after September 1, 2002 and vehicles built in two or more stages manufactured after September 1, 2006.* Except as provided in S6.1.4 and S6.3, vehicles manufactured on or after September 1, 2002 shall, when tested under the conditions of S8, conform, at the manufacturer's option, to either S6.2(a) or S6.2(b). Vehicles manufactured by final stage manufacturers on or after September 1, 2006 shall, except as provided in S6.3, when tested under the conditions of S8, conform, at the manufacturer's option, to either S6.2(a) or S6.2(b). The manufacturer shall select the option by the time it certifies the vehicle and may not thereafter select a different option for the vehicle.

(a) When tested under the conditions of S8, comply with the requirements specified in S7 at the target locations specified in S10 when impacted by the free motion headform specified in S8.9 at any speed up to and including 24 km/h (15 mph). The requirements do not apply to any target that cannot be located using the procedures of S10.

(b) When equipped with a dynamically deployed upper interior head protection system and tested under the conditions of S8, comply with the requirements specified in S7 at the target locations specified in S10 as follows:

(1) Targets that are not located over any point inside the area measured along the contour of the vehicle surface within 50 mm (2.0 inch) of the periphery of the stowed system projected perpendicularly onto the vehicle interior surface, including mounting and inflation components but exclusive of any cover or covers, shall be impacted by the free motion headform specified in S8.9 at any speed up to and including 24 km/h (15 mph). The requirements do not apply to any targets that cannot be located by using the procedures of S10.

(2) Targets that are over any point inside the area measured along the contour of the vehicle interior within 50 mm (2.0 inch) of the periphery of the stowed system projected perpendicularly onto the vehicle interior surface, including mounting and inflation components but exclusive of any cover or covers, when the dynamically deployed upper interior head protection system is not deployed, shall be impacted by the free motion headform specified in S8.9 at any speed up to and including 19 km/h (12 mph) with the system undeployed. The requirements do not apply to any target that cannot be located using the procedures of S10.

(3) Except as provided in S6.2(b)(4), each vehicle shall, when equipped with a dummy test device specified in 49 CFR part 572, subpart M, and tested as specified in S8.16 through S8.28, comply with the requirements specified in S7 when crashed into a fixed, rigid pole of 254 mm in diameter, at any velocity between 24 kilometers per hour (15 mph) and 29 kilometers per hour (18 mph).

(4) Vehicles certified as complying with the vehicle-to-pole requirements of S9 of 49 CFR 571.214, *Side Impact Protection*, need not comply with the pole test requirements specified in S6.2(b)(3) of this section.

S6.3 A vehicle need not meet the requirements of S6.1 through S6.2 for:

(a) Any target located on a convertible roof frame or a convertible roof linkage mechanism.

(b) Any target located rearward of a vertical plane 600 mm behind the seating reference point of the rearmost designated seating position. For altered vehicles and vehicles built in two or more stages, including ambulances and motor homes, any target located rearward of a vertical plane 300 mm behind the seating reference point of the driver's designated seating position **or the rearmost designated seating position in the front row of seats, if there is no driver's designated seating position** (tests for altered vehicles and vehicles built in two or more stages do not include, within the time period for measuring HIC(d), any free motion headform contact with components rearward of this plane). If an altered vehicle or vehicle built in two or more stages is equipped with a transverse vertical partition positioned between the seating reference point of the driver's designated seating position and a vertical plane 300 mm behind the seating reference point of the driver's designated seating position, any target located rearward of the vertical partition is excluded.

(c) Any target in a vehicle manufactured in two or more stages that is delivered to a final stage manufacturer without an occupant compartment. Note: Motor homes, ambulances, and other vehicles manufactured using a chassis cab, a cut-away van, or any other incomplete vehicle delivered to a final stage manufacturer with a furnished front compartment are not excluded under this S6.3(c).

(d) Any target in a walk-in van-type vehicles.

(e) Any target located on the seat belt mounting structures, door frames and other door frames before December 1, 2005.

S7 *Performance Criterion.* The HIC(d) shall not exceed 1000 when calculated in accordance with the following formula:

$$HIC = \left[\frac{1}{(t_2 - t_1)}\int_{t_1}^{t_2} a\,dt\right]^{2.5}(t_2 - t_1)$$

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Where the term *a* is the resultant head acceleration expressed as a multiple of *g* (the acceleration of gravity), and t1 and t2 are any two points in time during the impact which are separated by not more than a 36 millisecond time interval.

(a) For the free motion headform; HIC(d) = 0.75446 (free motion headform HIC) + 166.4.

(b) For the part 572, subpart M, anthropomorphic test dummy; HIC(d) = HIC.

S8 *Target location and test conditions.* The vehicle shall be tested and the targets specified in S10 located under the following conditions.

S8.1 *Vehicle test attitude.*

(a) The vehicle is supported off its suspension at an attitude determined in accordance with S8.1(b).

(b) Directly above each wheel opening, determine the vertical distance between a level surface and a standard reference point on the test vehicle's body under the conditions of S8.1(b)(1) through S8.1(b)(3).

(1) The vehicle is loaded to its unloaded vehicle weight, plus its rated cargo and luggage capacity or 136 kg, whichever is less, secured in the luggage area. The load placed in the cargo area is centered over the longitudinal centerline of the vehicle.

(2) The vehicle is filled to 100 percent of all fluid capacities.

(3) All tires are inflated to the manufacturer's specifications listed on the vehicle's tire placard.

S8.2 *Windows and Sunroofs.*

(a) Movable vehicle windows are placed in the fully open position.

(b) For testing, any window on the opposite side of the longitudinal centerline of the vehicle from the target to be impacted may be removed.

(c) For testing, movable sunroofs are placed in the fully open position.

S8.3 *Convertible tops.* The top, if any, of convertibles and open-body type vehicles is in the closed passenger compartment configuration.

S8.4 *Doors.*

(a) Except as provided in S8.4(b) or S8.4(c), doors, including any rear hatchback or tailgate, are fully closed and latched but not locked.

(b) During testing, any side door on the opposite side of the longitudinal centerline of the vehicle from the target to be impacted may be open or removed.

(c) During testing, any rear hatchback or tailgate may be open or removed for testing any target except targets on the rear header, rearmost pillars, or the rearmost other side rail on either side of the vehicle.

S8.5 *Sun visors.* Each sun visor shall be placed in any position where one side of the visor is in contact with the vehicle interior surface (windshield, side rail, front header, roof, etc.).

S8.6 *Steering ~~wheel~~**control** and seats.*

(a) During targeting, the steering ~~wheel~~**control** and seats may be placed in any position intended for use while the vehicle is in motion.

(b) During testing, the steering ~~wheel~~**control** and seats may be removed from the vehicle.

S8.7 *Seat belt anchorages.* If a target is on a seat belt anchorage, and if the seat belt anchorage is adjustable, tests are conducted with the anchorage adjusted to a point midway between the two extreme adjustment positions. If the anchorage has distinct adjustment positions, none of which is midway between the two extreme positions, tests are conducted with the anchorage adjusted to the nearest position above the midpoint of the two extreme positions.

S8.8 *Temperature and humidity.*

(a) The ambient temperature is between 19 degrees C. and 26 degrees C., at any relative humidity between 10 percent and 70 percent.

(b) Tests are not conducted unless the headform specified in S8.9 is exposed to the conditions specified in S8.8(a) for a period not less than four hours.

S8.9 *Headform.* The headform used for testing conforms to the specifications of part 572, subpart L of this chapter.

S8.10 *Forehead impact zone.* The forehead impact zone of the headform is determined according to the procedure specified in (a) through (f).

(a) Position the headform so that the baseplate of the skull is horizontal. The midsagittal plane of the headform is designated as Plane S.

(b) From the center of the threaded hole on top of the headform, draw a 69 mm line forward toward the forehead, coincident with Plane S, along the contour of the outer skin of the headform. The front end of the line is designated as Point P. From Point P, draw a 100 mm line forward toward the forehead, coincident with Plane S, along the contour of the outer skin of the headform. The front end of the line is designated as Point O.

(c) Draw a 125 mm line which is coincident with a horizontal plane along the contour of the outer skin of the forehead from left to right through Point O so that the line is bisected at Point O. The end of the line on the left side of the headform is designated as Point a and the end on the right as Point b.

(d) Draw another 125 mm line which is coincident with a vertical plane along the contour of the outer skin of the forehead through Point P so that the line is bisected at Point P. The end of the line on the left side of the headform is designated as Point c and the end on the right as Point d.

(e) Draw a line from Point a to Point c along the contour of the outer skin of the headform using a flexible steel tape. Using the same method, draw a line from Point b to Point d.

(f) The forehead impact zone is the surface area on the FMH forehead bounded by lines a-O-b and c-P-d, and a-c and b-d.

S8.11 *Target circle.* The area of the vehicle to be impacted by the headform is marked with a solid circle 12.7 mm in diameter, centered on the targets specified in S10, using any transferable opaque coloring medium.

S8.12 *Location of head center of gravity.*

(a) *Location of head center of gravity for front outboard designated seating positions (CG-F).* For determination of head center of gravity, all directions are in reference to the seat orientation.

(1) *Location of rearmost CG-F (CG-F2).* For front outboard designated seating positions, the head center of gravity with the seat in its rearmost normal design driving or riding position (CG-F2) is located 160 mm rearward and 660 mm upward from the seating reference point.

(2) *Location of forwardmost CG-F (CG-F1).* For front outboard designated seating positions, the head center of gravity with the seat in its forwardmost adjustment position (CG-F1) is located horizontally forward of CG-F2 by the distance equal to the fore-aft distance of the seat track.

(b) *Location of head center of gravity for rear outboard designated seating positions (CG-R).* For rear outboard designated seating positions, the head center of gravity (CG-R) is located 160 mm rearward, relative to the seat orientation, and 660 mm upward from the seating reference point.

S8.13 *Impact configuration.*

S8.13.1 The headform is launched from any location inside the vehicle which meets the conditions of S8.13.4. At the time of launch, the midsagittal plane of the headform is vertical and the headform is upright.

S8.13.2 The headform travels freely through the air, along a velocity vector that is perpendicular to the headform's skull cap plate, not less than 25 mm before making any contact with the vehicle.

S8.13.3 At the time of initial contact between the headform and the vehicle interior surface, some portion of the forehead impact zone of the headform must contact some portion of the target circle.

S8.13.4 *Approach angles.* The headform launching angle is as specified in Table 1. For components for which Table 1 specifies a range of angles, the headform launching angle is within the limits determined using the procedures specified in S8.13.4.1 and S8.13.4.2, and within the range specified in Table 1, using the orthogonal reference system specified in S9.

Table 1—Approach Angle Limits (in Degrees)

| Target component | Horizontal Angle | Vertical angle |
|---|---|---|
| Front Header | 180 | 0-50 |
| Rear Header | 0 or 360 | 0-50 |
| Left Side Rail | 270 | 0-50 |
| Right Side Rail | 90 | 0-50 |
| Left Sliding Door Track | 270 | 0-50 |
| Right Sliding Door Track | 90 | 0-50 |
| Left A-Pillar | 195-255 | −5-50 |
| Right A-Pillar | 105-165 | −5-50 |
| Left B-Pillar | 195-345 | −10-50 |
| Right B-Pillar | 15-165 | −10-50 |
| Left Door Frame | 195-345 | −10-50 |
| Right Door Frame | 15-165 | −10-50 |
| Other Left Pillars | 270 | −10-50 |
| Other Right Pillars | 90 | −10-50 |
| Other Left Door Frame | 270 | −10-50 |
| Other Right Door Frame | 90 | −10-50 |
| Left Rearmost Pillar | 270-345 | −10-50 |
| Right Rearmost Pillar | 15-90 | −10-50 |

| | | |
|---|---|---|
| Upper Roof | Any | 0-50 |
| Overhead Rollbar | 0 or 180 | 0-50 |
| Brace or Stiffener | 90 or 270 | 0-50 |
| Left Seat Belt Mounting Structure | 195-345 | −10-50 |
| Right Seat Belt Mounting Structure | 15-165 | −10-50 |
| Seat Belt Anchorages | Any | 0-50 |

S8.13.4.1 *Horizontal Approach Angles for Headform Impacts.*

(a) *Left A-Pillar Horizontal Approach Angles.*

(1) Locate a line formed by the shortest horizontal distance between CG-F1 for the left seat and the right A-pillar. The maximum horizontal approach angle for the left A-pillar equals 360 degrees minus the angle formed by that line and the X-axis of the vehicle, measured counterclockwise.

(2) Locate a line formed by the shortest horizontal distance between CG-F2 for the left seat and the left A-pillar. The minimum horizontal approach angle for the left A-pillar impact equals the angle formed by that line and the X-axis of the vehicle, measured counterclockwise.

(b) *Right A-Pillar Horizontal Approach Angles.*

(1) Locate a line formed by the shortest horizontal distance between CG-F1 for the right seat and the left A-pillar. The minimum horizontal approach angle for the right A-pillar equals 360 degrees minus the angle formed by that line and the X-axis of the vehicle, measured counterclockwise.

(2) Locate a line formed by the shortest horizontal distance between CG-F2 for the right seat and the right A-pillar. The maximum horizontal approach angle for the right A-pillar impact equals the angle formed by that line and the X-axis of the vehicle measured counterclockwise.

(c) *Left B-Pillar Horizontal Approach Angles.*

(1) Locate a line formed by the shortest horizontal distance between CG-F2 for the left seat and the left B-pillar. The maximum horizontal approach angle for the left B-pillar equals the angle formed by that line and the X-axis of the vehicle measured counterclockwise, or 270 degrees, whichever is greater.

(2) Locate a line formed by the shortest horizontal distance between CG-R for the left seat and the left B-pillar. The minimum horizontal approach angle for the left B-pillar equals the angle formed by that line and the X-axis of the vehicle measured counterclockwise.

(d) *Right B-Pillar Horizontal Approach Angles.*

(1) Locate a line formed by the shortest horizontal distance between CG-F2 for the right seat and the right B-pillar. The minimum horizontal approach angle for the right B-pillar equals the angle formed by that line and the X-axis of the vehicle measured counterclockwise, or 90 degrees, whichever is less.

(2) Locate a line formed by the shortest horizontal distance between CG-R for the right seat and the right B-pillar. The maximum horizontal approach angle for the right B-pillar equals the angle between that line and the X-axis of the vehicle measured counterclockwise.

(e) *Left door frame horizontal approach angles.*

(1) Locate a line formed by the shortest horizontal distance between CG-F2 for the left seat and the left door frame. The maximum horizontal approach angle for the left door frame equals the angle formed by that line and the X-axis of the vehicle measured counterclockwise, or 270 degrees, whichever is greater.

(2) Locate a line formed by the shortest horizontal distance between CG-R for the left seat and the left door frame. The minimum horizontal approach angle for the left door frame equals the angle formed by that line and the X-axis of the vehicle measured counterclockwise.

(f) *Right door frame horizontal approach angles.*

(1) Locate a line formed by the shortest horizontal distance between CG-F2 for the right seat and the right door frame. The minimum horizontal approach angle for the right door frame equals the angle formed by that line and the X-axis of the vehicle measured counterclockwise, or 90 degrees, whichever is less.

(2) Locate a line formed by the shortest horizontal distance between CG-R for the right seat and the right door frame. The maximum horizontal approach angle for the right door frame equals the angle formed by that line and the X-axis of the vehicle measured counterclockwise

(g) *Left seat belt mounting structure horizontal approach angles.*

(1) Locate a line formed by the shortest horizontal distance between CG-F2 for the left seat and the left seat belt mounting structure. If the seat belt mounting structure is below a horizontal plane passing through CG-F2 for the left seat, locate the point 200 mm directly below CG-F2 and locate a line formed by the shortest horizontal distance between that point and the left seat belt mounting structure. The maximum horizontal approach angle for the left seat belt mounting structure equals the angle formed by that line and the X-axis of the vehicle measured counterclockwise, or 270 degrees, whichever is greater.

(2) Locate a line formed by the shortest horizontal distance between CG-R for the left seat and the left seat belt mounting structure. If the seat belt mounting structure is below a horizontal plane passing through CG-R for the left seat, locate the point 200 mm directly below CG-R and locate a line formed by the shortest horizontal distance between that point and the left seat belt mounting structure. The minimum horizontal approach angle for the left seat belt mounting

structure equals the angle formed by that line and the X-axis of the vehicle measured counterclockwise. If the CG-R does not exist, or is forward of the seat belt mounting structure, the maximum horizontal approach angle is 270 degrees.

(h) *Right seat belt mounting structure horizontal approach angles.*

(1) Locate a line formed by the shortest horizontal distance between CG-F2 for the right seat and the right seat belt mounting structure. If the seat belt mounting structure is below a horizontal plane passing through CG-F2 for the right seat, locate the point 200 mm directly below that CG-F2 and locate a line formed by the shortest horizontal distance between that point and the right seat belt mounting structure. The minimum horizontal approach angle for the right seat belt mounting structure equals the angle formed by that line and the X-axis of the vehicle measured counterclockwise, or 90 degrees, whichever is less.

(2) Locate a line formed by the shortest horizontal distance between CG-R for the right seat and the right seat belt mounting structure. If the seat belt mounting structure is below a horizontal plane passing through CG-R, locate the point 200 mm directly below CG-R and locate a line formed by the shortest horizontal distance between that point and the right seat belt mounting structure. The maximum horizontal approach angle for the right seat belt mounting structure equals the angle formed by that line and the X-axis of the vehicle measured counterclockwise. If the CG-R does not exist, or is forward of the seat belt mounting structure, the maximum horizontal approach angle is 90 degrees.

S8.13.4.2 *Vertical Approach Angles*

(a) Position the forehead impact zone in contact with the selected target at the prescribed horizontal approach angle. If a range of horizontal approach angles is prescribed, position the forehead impact zone in contact with the selected target at any horizontal approach angle within the range which may be used for testing.

(b) Keeping the forehead impact zone in contact with the target, rotate the FMH upward until the lip, chin or other part of the FMH contacts the component or other portion of the vehicle interior.

(1) Except as provided in S8.13.4.2(b)(2), keeping the forehead impact zone in contact with the target, rotate the FMH downward by 5 degrees for each target to determine the maximum vertical angle.

(2) For all pillars, except A-pillars, and all door frames and seat belt mounting structures, keeping the forehead impact zone in contact with the target, rotate the FMH downward by 10 degrees for each target to determine the maximum vertical angle.

S8.14 *Multiple impacts.*

(a) A vehicle being tested may be impacted multiple times, subject to the limitations in S8.14(b), (c), (d) and (e).

(b) As measured as provided in S8.14(d), impacts within 300 mm of each other may not occur less than 30 minutes apart.

(c) As measured as provided in S8.14(d), no impact may occur within 150 mm of any other impact.

(d) For S8.14(b) and S8.14(c), the distance between impacts is the distance between the center of the target circle specified in S8.11 for each impact, measured along the vehicle interior.

(e) No impact may occur within the "exclusion zone" of any pillar target specified in S10.1 through S10.4, door frame target specified in S10.14 and S10.15, upper roof target specified in S10.9, or seat belt mounting structure target specified in S10.16. The "exclusion zone" is determined according to the procedure in S8.14(f) through S8.14(k).

(f) Locate the point, Point X, at the center of the target circle specified in S8.11 for the tested target.

(g) Determine two spheres centered on Point X. Radii of these spheres are 150 mm and 200 mm, respectively.

(h) Locate a horizontal plane passing through Point X. Determine the intersection points, if they exist, of the small sphere surface, the horizontal plane, and the vehicle interior surface. Relative to Point X, the point on the left is Point L and the point on the right is Point R.

(i) Locate a vertical plane, Plane Z, passing through Point X and coincident (within ±5°) with the horizontal approach angle used or intended for use in testing the target centered on Point X.

(j) If either Point L or Point R does not exist, extend Line LX and/or Line RX, as appropriate, perpendicular to Plane Z beyond Point X by 150 mm. The end of the line is designated as Point L or Point R, as appropriate.

(k) Locate a vertical plane, Plane ZL, passing through Point L and parallel to Plane Z. Locate another vertical plane, Plane ZR, passing through Point R and parallel to Plane Z. The "exclusion zone" is the vehicle interior surface area between Plane ZL and Plane ZR below the upper boundary of the smaller sphere and above the lower boundary of the larger sphere. Points on the intersection of the vehicle interior surface and the large sphere below the target, the small sphere above the target, Plane ZL and Plane ZR are not included in the "exclusion zone."

S8.15 *Upper Roof.* The upper roof of a vehicle is determined according to the procedure specified in S8.15 (a) through (h).

(a) Locate the transverse vertical plane A at the forwardmost point where it contacts the interior roof (including trim) at the vehicle centerline.

(b) Locate the transverse vertical plane B at the rearmost point where it contacts the interior roof (including trim) at the vehicle centerline.

(c) Measure the horizontal distance (D1) between Plane A and Plane B.

(d) Locate the vertical longitudinal plane C at the leftmost point at which a vertical transverse plane, located 300 mm rearward of the A-pillar reference point described in S10.1(a), contacts the interior roof (including trim).

(e) Locate the vertical longitudinal plane D at the rightmost point at which a vertical transverse plane, located 300 mm rearward of the A-pillar reference point described in S10.1(a), contacts the interior roof (including trim).

(f) Measure the horizontal distance (D2) between Plane C and Plane D.

(g) Locate a point (Point M) on the interior roof surface, midway between Plane A and Plane B along the vehicle longitudinal centerline.

(h) The upper roof zone is the area of the vehicle upper interior surface bounded by the four planes described in S8.15(h)(1) and S8.15(h)(2):

(1) A transverse vertical plane E located at a distance of (.35 D1) forward of Point M and a transverse vertical plane F located at a distance of (.35 D1) rearward of Point M, measured horizontally.

(2) A longitudinal vertical plane G located at a distance of (.35 D2) to the left of Point M and a longitudinal vertical plane H located at a distance of (.35 D2) to the right of Point M, measured horizontally.

S8.16 *Test weight—vehicle to pole test.* Each vehicle shall be loaded to its unloaded vehicle weight, plus 136 kilograms (300 pounds) or its rated cargo and luggage capacity (whichever is less), secured in the luggage or load-carrying area, plus the weight of the necessary anthropomorphic test dummy. Any added test equipment shall be located away from impact areas in secure places in the vehicle.

S8.17 *Vehicle test attitude—vehicle to pole test.* Determine the distance between a level surface and a standard reference point on the test vehicle's body, directly above each wheel opening, when the vehicle is in its “as delivered” condition. The “as delivered” condition is the vehicle as received at the test site, filled to 100 percent of all fluid capacities and with all tires inflated to the manufacturer's specifications listed on the vehicle's tire placard. Determine the distance between the same level surface and the same standard reference points in the vehicle's “fully loaded condition.” The “fully loaded condition” is the test vehicle loaded in accordance with S8.16. The load placed in the cargo area shall be centered over the longitudinal centerline of the vehicle. The pretest vehicle attitude shall be the same as either the “as delivered” or “fully loaded” attitude or is between the “as delivered” attitude and the “fully loaded” attitude. If the test configuration requires that the vehicle be elevated off the ground, the pretest vehicle attitude must be maintained.

S8.18 *Adjustable seats—vehicle to pole test.* Initially, adjustable seats shall be adjusted as specified in S8.3.2.1 of Standard 214 (49 CFR 571.214).

S8.19 *Adjustable seat back placement—vehicle to pole test.* Initially, position adjustable seat backs in the manner specified in S8.3.2.2 of Standard 214 (49 CFR 571.214).

S8.20 *Adjustable steering ~~wheel~~**control**s—vehicle to pole test.* Adjustable steering controls shall be adjusted so that the steering ~~wheel~~**control** hub is at the geometric center of the locus it describes when it is moved through its full range of driving positions.

S8.21 *Windows and sunroof—vehicle to pole test.* Movable windows and vents shall be placed in the fully open position. Any sunroof shall be placed in the fully closed position.

S8.22 *Convertible tops—vehicle to pole test.* The top, if any, of convertibles and open-body type vehicles shall be in the closed passenger compartment configuration.

S8.23 *Doors—vehicle to pole test.* Doors, including any rear hatchback or tailgate, shall be fully closed and latched but not locked.

S8.24 *Impact reference line—vehicle to pole test.* On the striking side of the vehicle, place an impact reference line at the intersection of the vehicle exterior and a transverse vertical plane passing through the center of gravity of the head of the dummy seated in accordance with S8.28, in ~~the~~**any** front outboard designated seating position.

S8.25 *Rigid Pole—vehicle to pole test.* The rigid pole is a vertical metal structure beginning no more than 102 millimeters (4 inches) above the lowest point of the tires on the striking side of the test vehicle when the vehicle is loaded as specified in S8.16 and extending above the highest point of the roof of the test vehicle. The pole is 254 mm ±3 mm (10 inches) in diameter and set off from any mounting surface, such as a barrier or other structure, so that the test vehicle will not contact such a mount or support at any time within 100 milliseconds of the initiation of vehicle to pole contact.

S8.26 *Impact configuration—vehicle to pole test.* The rigid pole shall be stationary. The test vehicle shall be propelled sideways so that its line of forward motion forms an angle of 90 degrees (±3 degrees) with the vehicle's longitudinal center line. The impact reference line shall be aligned with the center line of the rigid pole so that, when the vehicle-to-pole contact occurs, the center line of the pole contacts the vehicle area bounded by two transverse vertical planes 38 mm (1.5 inches) forward and aft of the impact reference line.

S8.27 *Anthropomorphic test dummy—vehicle to pole test.*

S8.27.1 The anthropomorphic test dummy used for evaluation of a vehicle's head impact protection shall conform to the requirements of subpart M of part 572 of this chapter (49 CFR part 572, subpart M). In a test in which the test vehicle is striking its left side, the dummy is to be configured and instrumented to strike on its left side, in accordance with subpart M of part 572.

In a test in which the test vehicle is striking its right side, the dummy is to be configured and instrumented to strike its right side, in accordance with subpart M of part 572.

S8.27.2 The part 572, subpart M, test dummy specified is clothed in form fitting cotton stretch garments with short sleeves and midcalf length pants. Each foot of the test dummy is equipped with a size 11EEE shoe, which meets the configuration size, sole, and heel thickness specifications of MIL-S-13192 (1976) and weighs 0.57 ±0.09 kilograms (1.25 ±0.2 pounds).

S8.27.3 Limb joints shall be set at between 1 and 2 g's. Leg joints are adjusted with the torso in the supine position.

S8.27.4 The stabilized temperature of the test dummy at the time of the side impact test shall be at any temperature between 20.6 degrees C. and 22.2 degrees C.

S8.27.5 The acceleration data from the accelerometers installed inside the skull cavity of the test dummy are processed according to the practices set forth in SAE Recommended Practice J211, March 1995, "Instrumentation for Impact Tests," Class 1000.

S8.28 *Positioning procedure for the Part 572 Subpart M test dummy—vehicle to pole test.* The part 572, subpart M, test dummy is initially positioned in the front outboard seating position on the struck side of the vehicle in accordance with the provisions of S12.1 of Standard 214 (49 CFR 571.214), and the vehicle seat is positioned as specified in S8.3.2.1 and S8.3.2.2 of that standard. The position of the dummy is then measured as follows. Locate the horizontal plane passing through the dummy head center of gravity. Identify the rearmost point on the dummy head in that plane. Construct a line in the plane that contains the rearward point of the front door daylight opening and is perpendicular to the longitudinal vehicle centerline. Measure the longitudinal distance between the rearmost point on the dummy head and this line. If this distance is less than 50 mm (2 inches) or the point is not forward of the line, then the seat and/or dummy positions is adjusted as follows. First, the seat back angle is adjusted, a maximum of 5 degrees, until a 50 mm (2 inches) distance is achieved. If this is not sufficient to produce the 50 mm (2 inches) distance, the seat is moved forward until the 50 mm (2 inches) distance is achieved or until the knees of the dummy contact the dashboard or knee bolster, whichever comes first. If the required distance cannot be achieved through movement of the seat, the seat back angle is adjusted even further forward until the 50 mm (2 inches) distance is obtained or until the seat back is in its fully upright locking position.

S9. *Orthogonal Reference System.* The approach angles specified in S8.13.4 are determined using the reference system specified in S9.1 through S9.4.

S9.1 An orthogonal reference system consisting of a longitudinal X axis and a transverse Y axis in the same horizontal plane and a vertical Z axis through the intersection of X and Y is used to define the horizontal direction of approach of the headform. The X-Z plane is the vertical longitudinal zero plane and is parallel to the longitudinal centerline of the vehicle. The X-Y plane is the horizontal zero plane parallel to the ground. The Y-Z plane is the vertical transverse zero plane that is perpendicular to the X-Y and X-Z planes. The X coordinate is negative forward of the Y-Z plane and positive to the rear. The Y coordinate is negative to the left of the X-Z

plane and positive to the right. The Z coordinate is negative below the X-Y plane and positive above it. (See Figure 1.)

S9.2 The origin of the reference system is the center of gravity of the headform at the time immediately prior to launch for each test.

S9.3 The horizontal approach angle is the angle between the X axis and the headform impact velocity vector projected onto the horizontal zero plane, measured in the horizontal zero plane in the counter-clockwise direction. A 0 degree horizontal vector and a 360 degree horizontal vector point in the positive X direction; a 90 degree horizontal vector points in the positive Y direction; a 180 degree horizontal vector points in the negative X direction; and a 270 horizontal degree vector points in the negative Y direction. (See Figure 2.)

S9.4 The vertical approach angle is the angle between the horizontal plane and the velocity vector, measured in the midsagittal plane of the headform. A 0 degree vertical vector in Table I coincides with the horizontal plane and a vertical vector of greater than 0 degrees in Table I makes an upward angle of the same number of degrees with that plane.

S10 *Target Locations.*

(a) The target locations specified in S10.1 through S10.16 are located on both sides of the vehicle and, except as specified in S10(b), are determined using the procedures specified in those paragraphs.

(b) Except as specified in S10(c), if there is no combination of horizontal and vertical angles specified in S8.13.4 at which the forehead impact zone of the free motion headform can contact one of the targets located using the procedures in S10.1 through S10.16, the center of that target is moved to any location within a sphere with a radius of 25 mm, centered on the center of the original target, which the forehead impact zone can contact at one or more combination of angles.

(c) If there is no point within the sphere specified in S10(b) which the forehead impact zone of the free motion headform can contact at one or more combination of horizontal and vertical angles specified in S8.13.4, the radius of the sphere is increased by 25 mm increments until the sphere contains at least one point that can be contacted at one or more combination of angles.

S10.1 *A-pillar targets*

(a) *A-pillar reference point and target AP1.* On the vehicle exterior, locate a transverse vertical plane (Plane 1) which contacts the rearmost point of the windshield trim. The intersection of Plane 1 and the vehicle exterior surface is Line 1. Measuring along the vehicle exterior surface, locate a point (Point 1) on Line 1 that is 125 mm inboard of the intersection of Line 1 and a vertical plane tangent to the vehicle at the outboardmost point on Line 1 with the vehicle side door open. Measuring along the vehicle exterior surface in a longitudinal vertical plane (Plane 2) passing through Point 1, locate a point (Point 2) 50 mm rearward of Point 1. Locate the A-pillar

reference point (Point APR) at the intersection of the interior roof surface and a line that is perpendicular to the vehicle exterior surface at Point 2. Target AP1 is located at point APR.

(b) *Target AP2.* Locate the horizontal plane (Plane 3) which intersects point APR. Locate the horizontal plane (Plane 4) which is 88 mm below Plane 3. Target AP2 is the point in Plane 4 and on the A-pillar which is closest to CG-F2 for the nearest seating position.

(c) *Target AP3.* Locate the horizontal plane (Plane 5) containing the highest point at the intersection of the dashboard and the A-pillar. Locate a horizontal plane (Plane 6) half-way between Plane 3 and Plane 5. Target AP3 is the point on Plane 6 and the A-pillar which is closest to CG-F1 for the nearest seating position.

S10.2 *B-pillar targets.*

(a) *B-pillar reference point and target BP1.* Locate the point (Point 3) on the vehicle interior at the intersection of the horizontal plane passing through the highest point of the forwardmost door opening and the centerline of the width of the B-pillar, as viewed laterally. Locate a transverse vertical plane (Plane 7) which passes through Point 3. Locate the point (Point 4) at the intersection of the interior roof surface, Plane 7, and the plane, described in S8.15(h), defining the nearest edge of the upper roof. The B-pillar reference point (Point BPR) is the point located at the middle of the line from Point 3 to Point 4 in Plane 7, measured along the vehicle interior surface. Target BP1 is located at Point BPR.

(b) *Target BP2.* If a seat belt anchorage is located on the B-pillar, Target BP2 is located at any point on the anchorage.

(c) *Target BP3.* Target BP3 is located in accordance with this paragraph. Locate a horizontal plane (Plane 8) which intersects Point BPR. Locate a horizontal plane (Plane 9) which passes through the lowest point of the daylight opening forward of the pillar. Locate a horizontal plane (Plane 10) half-way between Plane 8 and Plane 9. Target BP3 is the point located in Plane 10 and on the interior surface of the B-pillar, which is closest to CG-F(2) for the nearest seating position.

(d) *Target BP4.* Locate a horizontal plane (Plane 11) half-way between Plane 9 and Plane 10. Target BP4 is the point located in Plane 11 and on the interior surface of the B-pillar which is closest to CG-R for the nearest seating position.

S10.3 *Other pillar targets.*

(a) *Target OP1.*

(1) Except as provided in S10.3(a)(2), target OP1 is located in accordance with this paragraph. Locate the point (Point 5), on the vehicle interior, at the intersection of the horizontal plane through the highest point of the highest adjacent door opening or daylight opening (if no adjacent door opening) and the centerline of the width of the other pillar, as viewed laterally. Locate a transverse vertical plane (Plane 12) passing through Point 5. Locate the point (Point 6) at the

intersection of the interior roof surface, Plane 12 and the plane, described in S8.15(h), defining the nearest edge of the upper roof. The other pillar reference point (Point OPR) is the point located at the middle of the line between Point 5 and Point 6 in Plane 12, measured along the vehicle interior surface. Target OP1 is located at Point OPR.

(2) If a seat belt anchorage is located on the pillar, Target OP1 is any point on the anchorage.

(b) *Target OP2.* Locate the horizontal plane (Plane 13) intersecting Point OPR. Locate a horizontal plane (Plane 14) passing through the lowest point of the daylight opening forward of the pillar. Locate a horizontal plane (Plane 15) half-way between Plane 13 and Plane 14. Target OP2 is the point located on the interior surface of the pillar at the intersection of Plane 15 and the centerline of the width of the pillar, as viewed laterally.

S10.4 *Rearmost pillar targets*

(a) *Rearmost pillar reference point and target RP1.* Locate the point (Point 7) at the corner of the upper roof nearest to the pillar. The distance between Point M, as described in S8.15(g), and Point 7, as measured along the vehicle interior surface, is D. Extend the line from Point M to Point 7 along the vehicle interior surface in the same vertical plane by (3*D/7) beyond Point 7 or until the edge of a daylight opening, whichever comes first, to locate Point 8. The rearmost pillar reference point (Point RPR) is at the midpoint of the line between Point 7 and Point 8, measured along the vehicle interior. Target RP1 is located at Point RPR.

(b) *Target RP2.*

(1) Except as provided in S10.4(b)(2), target RP2 is located in accordance with this paragraph. Locate the horizontal plane (Plane 16) through Point RPR. Locate the horizontal plane (Plane 17) 150 mm below Plane 16. Target RP2 is located in Plane 17 and on the pillar at the location closest to CG-R for the nearest designated seating position.

(2) If a seat belt anchorage is located on the pillar, Target RP2 is any point on the anchorage.

S10.5 *Front header targets.*

(a) *Target FH1.* Locate the contour line (Line 2) on the vehicle interior trim which passes through the APR and is parallel to the contour line (Line 3) at the upper edge of the windshield on the vehicle interior. Locate the point (Point 9) on Line 2 that is 125 mm inboard of the APR, measured along that line. Locate a longitudinal vertical plane (Plane 18) that passes through Point 9. Target FH1 is located at the intersection of Plane 18 and the upper vehicle interior, halfway between a transverse vertical plane (Plane 19) through Point 9 and a transverse vertical plane (Plane 20) through the intersection of Plane 18 and Line 3.

(b) *Target FH2.*

(1) Except as provided in S10.5(b)(2), target FH2 is located in accordance with this paragraph. Locate a point (Point 10) 275 mm inboard of Point APR, along Line 2. Locate a longitudinal

vertical plane (Plane 21) that passes through Point 10. Target FH2 is located at the intersection of Plane 21 and the upper vehicle interior, halfway between a transverse vertical plane (Plane 22) through Point 10 and a transverse vertical plane (Plane 23) through the intersection of Plane 21 and Line 3.

(2) If a sun roof opening is located forward of the front edge of the upper roof and intersects the mid-sagittal plane of a dummy seated in either front outboard seating position, target FH2 is the nearest point that is forward of a transverse vertical plane (Plane 24) through CG-F(2) and on the intersection of the mid-sagittal plane and the interior sunroof opening.

S10.6 *Targets on the side rail between the A-pillar and the B-pillar or rearmost pillar in vehicles with only two pillars on each side of the vehicle.*

(a) *Target SR1.* Locate a transverse vertical plane (Plane 25) 150 mm rearward of Point APR. Locate the point (Point 11) at the intersection of Plane 25 and the upper edge of the forwardmost door opening. Locate the point (Point 12) at the intersection of the interior roof surface, Plane 25 and the plane, described in S8.15(h), defining the nearest edge of the upper roof. Target SR1 is located at the middle of the line between Point 11 and Point 12 in Plane 25, measured along the vehicle interior.

(b) *Target SR2.* Locate a transverse vertical plane (Plane 26) 300 mm rearward of the APR or 300 mm forward of the BPR (or the RPR in vehicles with no B-pillar). Locate the point (Point 13) at the intersection of Plane 26 and the upper edge of the forwardmost door opening. Locate the point (Point 14) at the intersection of the interior roof surface, Plane 26 and the plane, described in S8.15(h), defining the nearest edge of the upper roof. Target SR2 is located at the middle of the line between Point 13 and Point 14 in Plane 26, measured along the vehicle interior.

S10.7 *Other side rail target (target SR3).*

(a) Except as provided in S10.7(b), target SR3 is located in accordance with this paragraph. Locate a transverse vertical plane (Plane 27) 150 mm rearward of either Point BPR or Point OPR. Locate the point (Point 15) as provided in either S10.7(a)(1) or S10.7(a)(2), as appropriate. Locate the point (Point 16) at the intersection of the interior roof surface, Plane 27 and the plane, described in S8.15(h), defining the nearest edge of the upper roof. Target SR3 is located at the middle of the line between Point 15 and Point 16 in Plane 27, measured along the vehicle interior surface.

(1) If Plane 27 intersects a door or daylight opening, the Point 15 is located at the intersection of Plane 27 and the upper edge of the door opening or daylight opening.

(2) If Plane 27 does not intersect a door or daylight opening, the Point 15 is located on the vehicle interior at the intersection of Plane 27 and the horizontal plane through the highest point of the door or daylight opening nearest Plane 27. If the adjacent door(s) or daylight opening(s) are equidistant to Plane 27, Point 15 is located on the vehicle interior at the intersection of Plane 27 and either horizontal plane through the highest point of each door or daylight opening.

(b) Except as provided in S10.7(c), if a grab handle is located on the side rail, target SR3 is located at any point on the anchorage of the grab-handle. Folding grab-handles are in their stowed position for testing.

(c) If a seat belt anchorage is located on the side rail, target SR3 is located at any point on the anchorage.

S10.8 *Rear header target (target RH).* Locate the point (Point 17) at the intersection of the surface of the upper vehicle interior, the mid-sagittal plane (Plane 28) of the outboard rearmost dummy and the plane, described in S8.15(h), defining the rear edge of the upper roof. Locate the point (Point 18) as provided in S10.8(a) or S10.8(b), as appropriate. Except as provided in S10.8(c), Target RH is located at the mid-point of the line that is between Point 17 and Point 18 and is in Plane 28, as measured along the surface of the vehicle interior.

(a) If Plane 28 intersects a rear door opening or daylight opening, then Point 18 is located at the intersection of Plane 28 and the upper edge of the door opening or the daylight opening (if no door opening).

(b) If Plane 28 does not intersect a rear door opening or daylight opening, then Point 18 is located on the vehicle interior at the intersection of Plane 28 and a horizontal plane through the highest point of the door or daylight opening nearest to Plane 28. If the adjacent door(s) or daylight opening(s) are equidistant to Plane 28, Point 18 is located on the vehicle interior at the intersection of Plane 28 and either horizontal plane through the highest point of each door or daylight opening.

(c) If Target RH is more than 112 mm from Point 18 on the line that is between Point 17 and Point 18 and is in Plane 28, as measured along the surface of the vehicle interior, then Target RH is the point on that line which is 112 mm from Point 18.

S10.9 *Upper roof target (target UR).* Target UR is any point on the upper roof.

S10.10 *Sliding door track target (target SD).* Locate the transverse vertical plane (Plane 29) passing through the middle of the widest opening of the sliding door, measured horizontally and parallel to the vehicle longitudinal centerline. Locate the point (Point 19) at the intersection of the surface of the upper vehicle interior, Plane 29 and the plane, described in S8.15(h), defining the nearest edge of the upper roof. Locate the point (Point 20) at the intersection of Plane 29 and the upper edge of the sliding door opening. Target SD is located at the middle of the line between Point 19 and Point 20 in Plane 29, measured along the vehicle interior.

S10.11 *Roll-bar targets.*

(a) *Target RB1*. Locate a longitudinal vertical plane (Plane 30) at the mid-sagittal plane of a dummy seated in any outboard designated seating position. Target RB1 is located on the roll-bar and in Plane 30 at the location closest to either CG-F2 or CG-R, as appropriate, for the same dummy.

(b) *Target RB2.* If a seat belt anchorage is located on the roll-bar, Target RB2 is any point on the anchorage.

S10.12 *Stiffener targets.*

(a) *Target ST1.* Locate a transverse vertical plane (Plane 31) containing either CG-F2 or CG-R, as appropriate, for any outboard designated seating position. Target ST1 is located on the stiffener and in Plane 31 at the location closest to either CG-F2 or CG-R, as appropriate.

(b) *Target ST2.* If a seat belt anchorage is located on the stiffener, Target ST2 is any point on the anchorage.

S10.13 *Brace target (target BT)* Target BT is any point on the width of the brace as viewed laterally from inside the passenger compartment.

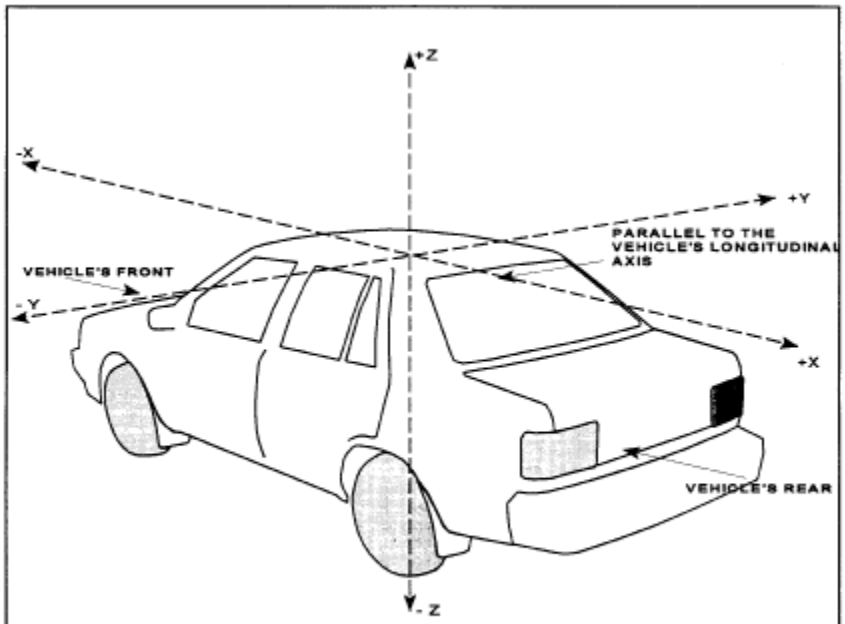

FIGURE 1 - ORTHOGONAL REFERENCE SYSTEM

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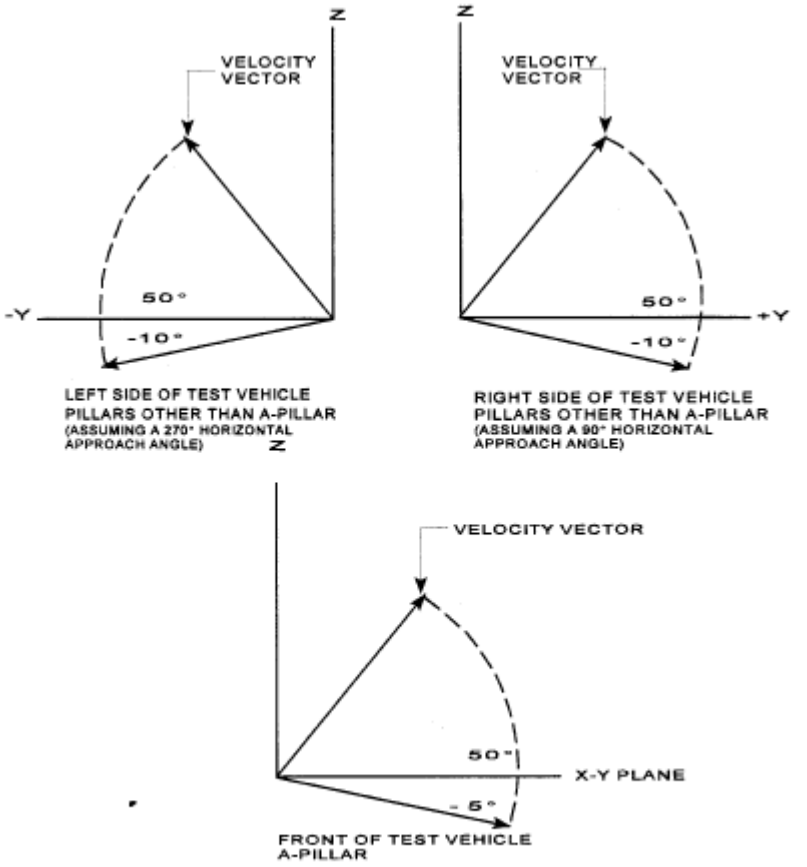


VERTICAL AND HORIZONTAL APPROACH ANGLE PLANE
FIGURE 2

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S10.14 *Door frame targets.*

(a) *Target DF 1.* Locate the point (Point 21) on the vehicle interior at the intersection of the horizontal plane passing through the highest point of the forward door opening and a transverse vertical plane (Plane 32 ) tangent to the rearmost edge of the forward door, as viewed laterally with the adjacent door open. Locate the point (Point 22) at the intersection of the interior roof surface, Plane 32, and the plane, described in S8.15(h), defining the nearest edge of the upper roof. The door frame reference point (Point DFR) is the point located at the middle of the line from Point 21 to Point 22 in Plane 32, measured along the vehicle interior surface. Target DF1 is located at Point DFR.

(b) *Target DF2.* If a seat belt anchorage is located on the door frame, Target DF2 is located at any point on the anchorage.

(c) *Target DF3.* Locate a horizontal plane (Plane 33) which intersects Point DFR. Locate a horizontal plane (Plane 34) that passes through the lowest point of the adjacent daylight opening forward of the door frame. Locate a horizontal plane (Plane 35) half-way between Plane 33 and

Plane 34. Target DF3 is the point located in Plane 35 and on the interior surface of the door frame, which is closest to CG-F2 for the nearest seating position.

(d) *Target DF4.* Locate a horizontal plane (Plane 36) half-way between Plane 34 and Plane 35. Target DF4 is the point located in Plane 36 and on the interior surface of the door frame that is closest to CG-R for the nearest seating position.

S10.15 *Other door frame targets.*

(a) *Target OD1.*

(1) Except as provided in S10.15(a)(2), target OD1 is located in accordance with this paragraph. Locate the point (Point 23) on the vehicle interior, at the intersection of the horizontal plane through the highest point of the highest adjacent door opening or daylight opening (if there is no adjacent door opening) and the center line of the width of the other door frame, as viewed laterally with the doors in the closed position. Locate a transverse vertical plane (Plane 37) passing through Point 23. Locate the point (Point 24) at the intersection of the interior roof surface, Plane 37 and the plane, described in S8.15(h), defining the nearest edge of the upper roof. The other door frame reference point (Point ODR) is the point located at the middle of the line between Point 23 and Point 24 in Plane 37, measured along the vehicle interior surface. Target OD1 is located at Point ODR.

(2) If a seat belt anchorage is located on the door frame, Target OD1 is any point on the anchorage.

(b) *Target OD2.* Locate the horizontal plane (Plane 38) intersecting Point ODR. Locate a horizontal plane (Plane 39) passing through the lowest point of the daylight opening forward of the door frame. Locate a horizontal plane (Plane 40) half-way between Plane 38 and Plane 39. Target OD2 is the point located on the interior surface of the door frame at the intersection of Plane 40 and the center line of the width of the door frames, as viewed laterally, with the doors in the closed position.

S10.16 *Seat belt mounting structure targets.*

(a) *Target SB1.* Target SB1 is located at any point on the seat belt anchorage mounted on the seat belt mounting structure.

(b) *Target SB2.* Locate a horizontal plane (Plane 41), containing either CG-F2 or CG-R, as appropriate, for any outboard designated seating position whose seating reference point, SgRP, is forward of and closest to, the vertical center line of the width of the seat belt mounting structure as viewed laterally. Target SB2 is located on the seat belt mounting structure and in Plane 41 at the location closest to either CG-F2 or CG-R, as appropriate.

(c) *Target SB3.* Locate a horizontal plane (Plane 42), containing CG-R for any outboard designated seating position rearward of the forwardmost designated seating position or positions whose seating reference point, SgRP, is rearward of and closest to, the vertical center line of the

width of the seat belt mounting structure, as viewed laterally. Locate a horizontal plane (Plane 43) 200 mm below Plane 42. Target SB3 is located on the seat belt mounting structure and in Plane 43 at the location closest to CG-R, as appropriate.

[62 FR 16725, Apr. 8, 1997]

# §571.203 Standard No. 203; Impact protection for the driver from the steering control system.

S1. *Purpose and scope.* This standard specifies requirements for steering control systems that will minimize chest, neck, and facial injuries to the driver as a result of impact.

S2. *Application.* This standard applies to passenger cars and to multipurpose passenger vehicles, trucks and buses with a gross vehicle weight rating of 4,536 kg or less. However, it does not apply to vehicles that conform to the frontal barrier crash requirements (S5.1) of Standard No. 208 (49 CFR 571.208) by means of other than seat belt assemblies. It also does not apply to walk-in vans **or vehicles without a steering control**.

S3. **[Reserved]** ~~*Definitions.* Steering control system means the basic steering mechanism and its associated trim hardware, including any portion of a steering column assembly that provides energy-absorption upon impact.~~

S4. *Requirements.* Each passenger car and each multipurpose passenger vehicle, truck and bus with a gross vehicle weight rating of 4,536 kg or less manufactured on or after September 1, 1981 shall meet the requirements of S5.1 and S5.2.

S5. *Impact protection requirements.*

S5.1 Except as provided in this paragraph, the steering control system of any vehicle to which this standard applies shall be impacted in accordance with S5.1(a).

(a) When the steering control system is impacted by a body block in accordance with SAE Recommended Practice J944 JUN80 (incorporated by reference, see §571.5), at a relative velocity of 24 km/h, the impact force developed on the chest of the body block transmitted to the steering control system shall not exceed 11,120 N, except for intervals whose cumulative duration is not more than 3 milliseconds.

(b) [Reserved]

S5.2 The steering control system shall be so constructed that no components or attachments, including horn actuating mechanisms and trim hardware, can catch the driver's clothing or jewelry during normal driving maneuvers.

NOTE: The term jewelry refers to watches, rings, and bracelets without loosely attached or dangling members.

[36 FR 22902, Dec. 2, 1971, as amended at 44 FR 68475, Nov. 29, 1979; 47 FR 47842, Oct. 28, 1982; 58 FR 26527, May 4, 1993; 58 FR 63304, Dec. 1, 1993; 63 FR 28935, May 27, 1998; 63 FR 51003, Sept. 24, 1998; 76 FR 762, Jan. 6, 2012]

# §571.204 Standard No. 204; Steering control rearward displacement.

S1. *Purpose and scope.* This standard specifies requirements limiting the rearward displacement of the steering control into the passenger compartment to reduce the likelihood of chest, neck, or head injury.

S2. *Application.* This standard applies to passenger cars and to multipurpose passenger vehicles, trucks, and buses. However, it does not apply to walk-in vans **or vehicles without steering controls**.

S3. *Definitions.*

*Steering column* means a structural housing that surrounds a steering shaft.

*Steering shaft* means a component that transmits steering torque from the steering wheel to the steering gear.

S4 *Requirements.*

S4.1 *Vehicles manufactured before September 1, 1991.* When a passenger car or a truck, bus, or multipurpose passenger vehicle with a gross vehicle weight rating of 10,000 pounds or less and an unloaded vehicle weight of 4,000 pounds or less is tested under the conditions of S5 in a 30 mile per hour perpendicular impact into a fixed collision barrier, the upper end of the steering column and shaft in the vehicle shall not be displaced more than 5 inches in a horizontal rearward direction parallel to the longitudinal axis of the vehicle. The amount of displacement shall be measured relative to an undisturbed point on the vehicle and shall represent the maximum dynamic movement of the upper end of the steering column and shaft during the crash test.

S4.2 *Vehicles manufactured on or after September 1, 1991.* When a passenger car or a truck, bus or multipurpose passenger vehicle with a gross vehicle weight rating of 4,536 kg or less and an unloaded vehicle weight of 2,495 kg or less is tested under the conditions of S5 in a 48 km/h perpendicular impact into a fixed collision barrier, the upper end of the steering column and shaft in the vehicle shall not be displaced more than 127 mm in a horizontal rearward direction parallel to the longitudinal axis of the vehicle. The amount of displacement shall be measured relative to an undisturbed point on the vehicle and shall represent the maximum dynamic movement of the upper end of the steering column and shaft during the crash test.

S5. *Test conditions.* The requirements of S4 shall be met when the vehicle is tested in accordance with the following conditions.

S5.1 The vehicle, including test devices and instrumentation, is loaded to its unloaded vehicle weight.

S5.2 Adjustable steering controls are adjusted so that a tilting steering wheel hub is at the geometric center of the locus it describes when it is moved through its full range of driving positions. A telescoping steering control is set at the adjustment position midway between the forwardmost and rearwardmost position.

S5.3 Convertibles and open-body type vehicles have the top, if any, in place in the closed passenger compartment configuration.

S5.4 Doors are fully closed and latched but not locked.

S5.5 The fuel tank is filled to any level from 90 to 95 percent of capacity.

S5.6 The parking brake is disengaged and the transmission is in neutral.

S5.7 Tires are inflated to the vehicle manufacturer's specifications.

[52 FR 44897, Nov. 23, 1987, as amended at 63 FR 28935, May 27, 1998; 63 FR 51003, Sept. 24, 1998]

# §571.205 Standard No. 205, Glazing materials.

S1. *Scope.* This standard specifies requirements for glazing materials for use in motor vehicles and motor vehicle equipment.

S2. *Purpose.* The purpose of this standard is to reduce injuries resulting from impact to glazing surfaces, to ensure a necessary degree of transparency in motor vehicle windows for driver visibility, and to minimize the possibility of occupants being thrown through the vehicle windows in collisions.

S3. *Application.*

(a) This standard applies to passenger cars, multipurpose passenger vehicles, trucks **with at least one designated seating position**, buses, motorcycles, slide-in campers, pickup covers designed to carry persons while in motion and low speed vehicles, and to glazing materials for use in those vehicles.

(b) For glazing materials manufactured before September 1, 2006, and for motor vehicles, slide-in campers and pickup covers designed to carry persons while in motion, manufactured before

November 1, 2006, the manufacturer may, at its option, comply with 49 CFR 571.205(a) of this section.

S4. *Definitions.*

*Bullet resistant shield* means a shield or barrier that is installed completely inside a motor vehicle behind and separate from glazing materials that independently comply with the requirements of this standard.

*Camper* means a structure designed to be mounted in the cargo area of a truck, or attached to an incomplete vehicle with motive power, for the purpose of providing shelter for persons.

*Glass-plastic glazing material* means a laminate of one or more layers of glass and one or more layers of plastic in which a plastic surface of the glazing faces inward when the glazing is installed in a vehicle.

*Pickup cover* means a camper having a roof and sides but without a floor, designed to be mounted on and removable from the cargo area of a truck by the user.

*Prime glazing manufacturer* means a manufacturer that fabricates, laminates, or tempers glazing materials.

*Slide-in camper* means a camper having a roof, floor, and sides, designed to be mounted on and removable from the cargo area of a truck by the user.

S5. *Requirements.*

S5.1 Glazing materials for use in motor vehicles must conform to ANSI/SAE Z26.1-1996 (incorporated by reference, see §571.5), unless this standard provides otherwise. SAE Recommended Practice J673 (1993) (incorporated by reference, see §571.5) is referenced in ANSI/SAE Z26.1-1996.

S5.1.1 *Multipurpose passenger vehicles.* Except as otherwise specifically provided by this standard, glazing for use in multipurpose passenger vehicles shall conform to the requirements for glazing for use in trucks as specified in ANSI/SAE Z26.1-1996 (incorporated by reference, see §571.5).

S5.1.2 *Aftermarket replacement glazing.* Glazing intended for aftermarket replacement is required to meet the requirements of this standard or the requirements of 49 CFR 571.205(a) applicable to the glazing being replaced.

S5.1.3 *Location of arrow within "AS" markings.* In ANSI/SAE Z26.1-1996 (incorporated by reference, see §571.5) Section 7. "Marking of Safety Glazing Materials," on page 33, in the right column, in the first complete sentence, the example markings "AS↓1", "AS↓14" and "AS↑2" are corrected to read "A↓S1", "A↓S14" and "A↑S2". Note that the arrow indicating the portion of the material that complies with Test 2 is placed with its base adjacent to a horizontal line.

S5.2 Each of the test specimens described in ANSI/SAE Z26.1-1996 (incorporated by reference, see §571.5) Section 5.7 (fracture test) must meet the fracture test requirements of that section when tested in accordance with the test procedure set forth in that section.

S5.3 *Shade Bands.* Shade band areas for windshields shall comply with the requirements of either S5.3.1 or S5.3.2.

S5.3.1 Shade bands for windshields shall comply with SAE Recommended Practice J100 (1995) (incorporated by reference, see §571.5).

S5.3.2 Except as provided in S5.3.2.1, the lower boundary of shade bands for windshields shall be a plane inclined upwards from the X axis of the vehicle at 7 degrees, passing through point $V_1$, and parallel to the Y axis. The coordinate system and point $V_1$ shall be as specified in Annexes 18 and 19 of European Commission for Europe (ECE) Regulation No. 43 Revision 2—Amendment 1.

S5.3.2.1 In the area 300 mm wide centered on the intersection of the windshield surface and longitudinal vertical median plane of the vehicle, the lower boundary of shade bands for windshields shall be a plane inclined upwards from the X axis of the vehicle at 3 degrees, passing through point $V_1$, and parallel to the Y axis.

S5.4 *Low speed vehicles.* Windshields of low speed vehicles must meet the ANSI/SAE Z26.1-1996 specifications for either AS-1 or AS-4 glazing.

S5.5 Item 4A Glazing. Item 4A glazing may be used in all areas in which Item 4 safety glazing may be used, and also for side windows rearward of the "C" pillar. I.e., Item 4A glazing may be used under Item 4A paragraph (b) of ANSI/SAE Z26.1-1996 only in side windows rearward of the "C" pillar.

S6. *Certification and marking.*

S6.1 A prime glazing material manufacturer must certify, in accordance with 49 U.S.C. 30115, each piece of glazing material to which this standard applies that is designed—

(a) As a component of any specific motor vehicle or camper; or

(b) To be cut into components for use in motor vehicles or items of motor vehicle equipment.

S6.2 A prime glazing manufacturer certifies its glazing by adding to the marks required by section 7 of ANSI/SAE Z26.1-1996, in letters and numerals of the same size, the symbol "DOT" and a manufacturer's code mark that NHTSA assigns to the manufacturer. NHTSA will assign a code mark to a manufacturer after the manufacturer submits a written request to the Office of Vehicle Safety Compliance, National Highway Traffic Safety Administration, 400 Seventh Street, SW., Washington, DC 20590. The request must include the company name, address, and a statement from the manufacturer certifying its status as a prime glazing manufacturer as defined in S4.

S6.3 A manufacturer or distributor who cuts a section of glazing material to which this standard applies, for use in a motor vehicle or camper, must—

(a) Mark that material in accordance with section 7 of ANSI/SAE Z26.1-1996; and

(b) Certify that its product complies with this standard in accordance with 49 U.S.C. 30115.

[37 FR 12239, June 21, 1972]

# §571.206 Standard No. 206; Door locks and door retention components.

S1. *Scope and Purpose.* This standard specifies requirements for vehicle door locks and door retention components, including latches, hinges, and other supporting means, to minimize the likelihood of occupants being ejected from a vehicle as a result of impact.

S2. *Application.* This standard applies to passenger cars, multipurpose passenger vehicles, and trucks **with at least one designated seating position**, and buses with a gross vehicle weight rating (GVWR) of 4,536 kg or less.

S3. *Definitions.*

*Auxiliary Door Latch* is a latch equipped with a fully latched position, with or without a secondary latched position, and fitted to a door or door system equipped with a primary door latch system.

*Auxiliary Door Latch System* consists of door latches and strikers other than those associated with the primary door latch system.

*Back Door* is a door or door system on the back end of a motor vehicle through which passengers can enter or depart the vehicle or cargo can be loaded or unloaded. It does not include:

(a) A trunk lid; or

(b) A door or window composed entirely of glazing material and whose latches and/or hinge systems are attached directly to the glazing material.

*Body Member* is that portion of the hinge normally affixed to the body structure.

*Door Closure Warning System* is a system that will activate a visual signal when a door latch system is not in its fully latched position and the vehicle ignition is activated.

*Door Hinge System* is one or more hinges used to support a door.

*Door Latch System* consists of latches and strikers installed on a door system.

*Door Member* is that portion of the hinge normally affixed to the door structure and constituting the swinging member.

*Door System* is the door, latch, striker, hinges, sliding track combinations and other door retention components on a door and its surrounding doorframe. The door system of a double door includes both doors.

*Double Door* is a system of two doors where the front door or wing door opens first and connects to the rear door or bolted door, which opens second.

*Folding Door* is a movable barrier, which will close off an entranceway to a bus, multipurpose passenger vehicle or truck, consisting of two or more hinge panels that swing, slide, or rotate; does not have a striker and latch assembly.

*Fork-bolt* is the part of the latch that engages and retains the striker when in a latched position.

*Fork-bolt Opening Direction* is the direction opposite to that in which the striker enters the latch to engage the fork-bolt.

*Fully Latched Position* is the coupling condition of the latch that retains the door in a completely closed position.

*Hinge* is a device system used to position the door relative to the body structure and control the path of the door swing for passenger ingress and egress.

*Hinge Pin* is that portion of the hinge normally interconnecting the body and door members and establishing the swing axis.

*Latch* is a device employed to maintain the door in a closed position relative to the vehicle body with provisions for deliberate release (or operation).

*Primary Door Latch* is a latch equipped with both a fully latched position and a secondary latched position and is designated as a “primary door latch” by the manufacturer.

*Primary Door Latch System* consists of a primary door latch(s) and a striker(s).

*Secondary Latched Position* refers to the coupling condition of the latch that retains the door in a partially closed position.

*Side Front Door* is a door that, in a side view, has 50 percent or more of its opening area forward of the rearmost point on the driver's seat back, when the seat back is adjusted to its most vertical and rearward position. **For vehicles without a driver’s designated seating positions it is a door that in a side view, has 50 percent or more of its opening area forward of the rearmost**

**point on the most rearward passengers seat back in the front row of seats, when the seat backs are adjusted to their most vertical and rearward position.**

*Side Rear Door* is a door that, in a side view, has 50 percent or more of its opening area to the rear of the rearmost point on the driver's seat back, when the driver's seat is adjusted to its most vertical and rearward position. **For vehicles without a driver's designated seating positions it is a door that in a side view, has 50 percent or more of its opening area rear of the rearmost point on the most rearward passengers seat back in the front row of seats, when the seat backs are adjusted to their most vertical and rearward position.**

*Striker* is a device with which the latch engages to maintain the door in the fully latched or secondary latched position.

*Trunk Lid* is a movable body panel that provides access from outside the vehicle to a space wholly partitioned from the occupant compartment by a permanently attached partition or fixed or fold-down seat back.

S4. *Requirements.* The requirements apply to all side and back doors, that lead directly into a compartment that contains one or more seating accommodations and the associated door components, except for those on folding doors, roll-up doors, detachable doors, bus doors used only for emergency egress purposes and labeled accordingly and on bus doors to accommodate a permanently attached wheelchair lift system that when the device is in the retracted position, the lift platform retracts to a vertical orientation parallel to and in close proximity with the interior surface of the lift door and in that position, the platform completely covers the doorway opening, has fixed attachments to the vehicle and provides a barricade to the doorway. The bus wheelchair lift door must be linked to an alarm system consisting of either a flashing visible signal located in the driver's compartment or an alarm audible to the driver that is activated when the door is not fully closed and the vehicle ignition is activated.

## S4.1 *Hinged Doors*

S4.1.1 *Primary and Auxiliary Door Latch Systems.* Each hinged door system shall be equipped with at least one primary door latch system. By the time a vehicle is certified a manufacturer shall designate the door latch system(s) that is the "primary door latch system(s)." Upon certification, a manufacturer may not thereafter alter the designation of a primary door latch system. Each manufacturer shall, upon request from the National Highway Traffic Safety Administration, provide information regarding such designation.

S4.1.1.1 *Load Test One.*

(a) Each primary door latch system and auxiliary door latch system, when in the fully latched position, shall not separate when a load of 11,000 N is applied in the direction perpendicular to the face of the latch such that the latch and the striker anchorage are not compressed against each other, when tested in accordance with S5.1.1.1.

(b) When in the secondary latched position, the primary door latch system shall not separate when a load of 4,500 N is applied in the same direction specified in paragraph (a) of this section when tested in accordance with S5.1.1.1.

S4.1.1.2 *Load Test Two.*

(a) Each primary door latch system and auxiliary door latch system, when in the fully latched position, shall not separate when a load of 9,000 N is applied in the fork-bolt opening direction and parallel to the face of the latch, when tested in accordance with S5.1.1.2.

(b) When in the secondary latched position, the primary door latch system shall not separate when a load of 4,500 N is applied in the same direction specified in paragraph (a) of this section when tested in accordance with S5.1.1.2.

S4.1.1.3 *Load Test Three.* (Applicable only to back doors that open in a vertical direction). Each primary door latch system on back doors, when in the fully latched position, shall not separate when a load of 9,000 N is applied in a direction orthogonal to the directions specified in S4.1.1.1 and S4.1.1.2 when tested in accordance with S5.1.1.3.

S4.1.1.4 *Inertial Load.* Each primary door latch system and auxiliary door latch system shall meet either the dynamic requirements specified in paragraphs (a) and (b) of S4.1.1.4 or the calculation of inertial load resistance specified in paragraph (c) of S4.1.1.4.

(a) Each primary door latch and auxiliary door latch on each hinged door shall not disengage from the fully latched position when an inertia load is applied to the door latch system, including the latch and its activation device, in the directions parallel to the vehicle's longitudinal and transverse axes with the locking device disengaged, when tested as specified in S5.1.1.4(b).

(b) Each primary door latch and auxiliary door latch on each hinged back door shall also not disengage from the fully latched position when an inertia load is applied to the door latch system, including the latch and its activation device, in the direction parallel to the vehicle's vertical axis with the locking device disengaged, when tested as specified in S5.1.1.4(b).

(c) Each component or subassembly is calculated for its minimum inertial load resistance in a particular direction. The combined resistance to the unlatching operation must assure that the door latch system, when properly assembled in the vehicle door, will remain latched when subjected to an inertial load of 30 g in the vehicle directions specified in paragraph (a) of this section or paragraph (b) of this section, as applicable, when calculated in accordance with S5.1.1.4 (a).

S4.1.2 *Door Hinges.*

S4.1.2.1 When tested in accordance with S5.1.2, each door hinge system shall:

(a) Support the door,

(b) Not separate when a longitudinal load of 11,000 N is applied,

(c) Not separate when a transverse load of 9,000 N is applied, and

(d) For back doors,

(1) Not separate when a load of 11,000 N is applied perpendicular to the hinge face plate (longitudinal load test) such that the hinge plates are not compressed against each other (Load Test One).

(2) Not separate when a load of 9,000 N is applied perpendicular to the axis of the hinge pin and parallel to the hinge face plate (transverse load test) such that the hinge plates are not compressed against each other (Load Test Two).

(3) Not separate when a load of 9,000 N is applied in the direction of the axis of the hinge pin (Load Test Three—only for back doors that open in a vertical direction).

S4.1.2.2 If a single hinge within the hinge system is tested instead of the entire hinge system, the hinge must bear a load proportional to the total number of hinges in the hinge system. (For example, an individual hinge in a two-hinge system must be capable of withstanding 50% of the load requirements of the total system.)

S4.1.2.3 On side doors with rear mounted hinges that can be operated independently of other doors,

(a) The interior door handle shall be inoperative when the speed of the vehicle is greater than or equal to 4 km/h, and

(b) A door closure warning system shall be provided for those doors. The door closure warning system shall be located where it can be clearly seen by the driver.

S4.1.3.2 *Side Rear Door Locks.* In passenger cars and multipurpose passenger vehicles, when the locking mechanism is engaged both the outside and inside door handles or other latch release controls shall be inoperative.

S4.2 *Sliding Side Doors.*

S4.2.1 *Latch System.* Each sliding door system shall be equipped with either:

(a) At least one primary door latch system, or

(b) A door latch system with a fully latched position and a door closure warning system. The door closure warning system shall be located where it can be clearly seen by the driver. Upon certification a manufacturer may not thereafter alter the designation of a primary latch. Each manufacturer shall, upon request from the National Highway Traffic Safety Administration, provide information regarding such designation.

S4.2.1.1 *Load Test One.*

(a) At least one door latch system, when in the fully latched position, shall not separate when a load of 11,000 N is applied in the direction perpendicular to the face of the latch such that the latch and the striker anchorage are not compressed against each other, when tested in accordance with S5.2.1.1.

(b) In the case of a primary door latch system, when in the secondary latched position, the door latch system shall not separate when a load of 4,500 N is applied in the same direction specified in paragraph (a) of this section when tested in accordance with S5.2.1.1.

S4.2.1.2 *Load Test Two.*

(a) At least one door latch system, when in the fully latched position, shall not separate when a load of 9,000 N is applied in the fork-bolt opening direction and parallel to the face of the latch when tested in accordance with S5.2.1.2.

(b) In the case of a primary door latch system, when in the secondary latched position, the door latch system shall not separate when a load of 4,500 N is applied in the same direction specified in paragraph (a) of this section when tested in accordance with S5.2.1.2.

S4.2.1.3 *Inertial Load.* Each door latch system certified as meeting the requirements of S4.2.1.1 and S4.2.1.2 shall meet either the dynamic requirements specified in paragraph (a) of this section or the calculation of inertial load resistance specified in paragraph (b) of this section.

(a) The door latch system shall not disengage from the fully latched position when an inertial load is applied to the door latch system, including the latch and its activation mechanism, in the directions parallel to the vehicle's longitudinal and transversal axes with the locking mechanism disengaged, and when tested in accordance with S5.1.1.4(b).

(b) The minimum inertial load resistance can be calculated for each component or subassembly. Their combined resistance to the unlatching operation must assure that the door latch system, when properly assembled in the vehicle door, will remain latched when subjected to an inertia load of 30 g in the vehicle directions specified in paragraph (a) of this section, when calculated in accordance with S5.1.1.4(a).

S4.2.2 *Door System.*

S4.2.2.1 The track and slide combination or other supporting means for each sliding door, while in the closed fully latched position, shall not separate from the door frame when a total force of 18,000 N along the vehicle transverse axis is applied to the door as specified in S5.2.2.

S4.3 *Door Locks.* Each door shall be equipped with at least one locking device which, when engaged, shall prevent operation of the exterior door handle or other exterior latch release control and which has an operating means and a lock release/engagement device located within the interior of the vehicle.

S4.2.2.2 When a sliding door system is tested in accordance with S5.2.2, the following conditions shall not occur:

(a) A separation which permits a sphere with a diameter of 100 mm to pass unobstructed between the exterior of the vehicle to the interior of the vehicle, while the required force is maintained as shown in Figure 1.

(b) Either force application device reaches a total displacement of 300 mm.

S4.2.2.3 This S4.2.2 applies to vehicles manufactured on or after September 1, 2010.

S4.3 *Door Locks.* Each door shall be equipped with at least one locking device which, when engaged, shall prevent operation of the exterior door handle or other exterior latch release control and which has an operating means and a lock release/engagement device located within the interior of the vehicle.

S4.3.1 *Rear side doors.* Each rear side door shall be equipped with at least one locking device which has a lock release/engagement mechanism located within the interior of the vehicle and readily accessible to the driver of the vehicle or an occupant seated adjacent to the door, and which, when engaged, prevents operation of the interior door handle or other interior latch release control and requires separate actions to unlock the door and operate the interior door handle or other interior latch release control.

S4.3.2 *Back doors.* Each back door equipped with an interior door handle or other interior latch release control, shall be equipped with at least one locking device that meets the requirements of S4.3.1.

S5 *Test Procedures.*

S5.1 *Hinged Doors.*

S5.1.1 *Primary and Auxiliary Door Latches.*

S5.1.1.1 *Load Test One Force Application.* The test procedures for S4.1.1.1 and S4.2.1.1 are as follows:

(a) *Fully latched position.*

(1) Attach the test fixture shown in Figure 2 to the mounting provisions of the latch and striker. Align the direction of engagement parallel to the linkage of the fixture. Mount the fixture with latch and striker in the fully latched position in the test machine so as to apply a load perpendicular to the face of the latch.

(2) Locate weights so as to apply a 900 N load tending to separate the latch and striker in the direction of the latch opening.

(3) Apply the test load, in the direction specified in S4.1.1.1 and Figure 5, at a rate not to exceed 5 mm/min until the required load has been achieved. Record the maximum load achieved.

(b) *Secondary Latched Position.*

(1) Attach the test fixture shown in Figure 2 to the mounting provisions of the latch and striker. Align the direction of engagement parallel to the linkage of the fixture. Mount the fixture with latch and striker in the secondary position in the test machine so as to apply a load perpendicular to the face of the latch.

(2) Locate weights so as to apply a 900 N load tending to separate the latch and striker in the direction of the latch opening.

(3) Apply the test load, in the direction specified in S4.1.1.1 and Figure 5, at a rate not to exceed 5 mm/min until the required load has been achieved. Record maximum load achieved.

(4) The test plate to which the door latch is mounted will have a striker cut-out configuration similar to the environment in which the door latch will be mounted on normal vehicle doors.

S5.1.1.2 *Load Test Two Force Application.* The test procedures for S4.1.1.2 and S4.2.1.2 are as follows:

(a) *Fully Latched Position.*

(1) Adapt the test fixture shown in Figure 3 to the mounting provisions of the latch and striker. Mount the fixture with latch and striker in the fully latched position in the test machine so to apply a load in the direction of latch opening.

(2) Apply the test load, in the direction specified in S4.1.1.2 and Figure 5, at a rate not to exceed 5 mm/min until the required load has been achieved. Record the maximum load achieved.

(b) *Secondary Latched Position.*

(1) Adapt the test fixture shown in Figure 3 to the mounting provisions of the latch and striker. Mount the fixture with latch and striker in the secondary latched position in the test machine so as to apply a load in the direction of latch opening.

(2) Apply the test load, in the direction specified in S4.1.1.2 and Figure 5, at a rate not to exceed 5 mm/min until the required load has been achieved. Record the maximum load achieved.

S5.1.1.3 *Load Test Three Force Application.* The test procedures for S4.1.1.3 are as follows:

(a) Adapt the test fixture shown in Figure 4 to the mounting provisions of the latch and striker. Mount the fixture with latch and striker in the fully latched position in the test machine so as to apply a load in the direction specified in S4.1.1.3 and Figure 5.

(b) Apply the test load, in the direction specified in S4.1.1.3 and Figure 5, at a rate not to exceed 5 mm/min until the required load has been achieved. Record the maximum load required.

S5.1.1.4 *Inertial Force Application.* The test procedures for S4.1.1.4 and S4.2.1.3 are as follows:

(a) *Calculation.* The calculation is performed in accordance with paragraph 6 of SAE Recommended Practice J839 (1991) (incorporated by reference, see §571.5).

(b) *Dynamic Test.* The dynamic inertial force application is tested according to the setup specified in paragraph (1) or (2) of this section.

(1) *Test Setup and Directions for Full Vehicle Test.*

(i) Test Setup.

(A) Rigidly secure the full vehicle to an acceleration device that, when accelerated together, will assure that all points on the crash pulse curve are within the corridor defined in Table 1 and Figure 6.

(B) Install the equipment used to record door opening (doors may be tethered to avoid damaging the recording equipment).

(C) Close the door(s) to be tested and ensure that the door latch(es) is in the fully-latched position, that the door(s) is unlocked, and that all windows, if provided, on the door(s) are closed.

(ii) Test Directions. (See Figure 7)

(A) Longitudinal Setup 1. Orient the vehicle so that its longitudinal axis is aligned with the axis of the acceleration device, simulating a frontal impact.

(B) Longitudinal Setup 2. Orient the vehicle so that its longitudinal axis is aligned with the axis of the acceleration device, simulating a rear impact.

(C) Transverse Setup 1. Orient the vehicle so that its transverse axis is aligned with the axis of the acceleration device, simulating a ~~driver~~**left**-side impact.

(D) Transverse Setup 2. (Only for vehicles having different door arrangements on each side.) Orient the vehicle so that its transverse axis is aligned with the axis of the acceleration device, simulating a side impact in the direction opposite to that described in b(1)(ii)(C) of this paragraph.

(2) *Test Setup and Directions for Door Test.*

(i) Test Setup.

(A) Mount the door assemblies, consisting of at least the door latch(es), exterior door handle(s) with mechanical latch operation, interior door opening lever(s), and locking device(s), either separately or combined to a test fixture. Each door and striker is mounted to the test fixture to correspond to its orientation on the vehicle and to the directions specified in b(1)(ii) of this paragraph.

(B) Mount the test fixture to the acceleration device, and install the equipment used to record door opening.

(C) Ensure that the door latch is in the fully-latched position, that the door is unlocked (doors may be tethered to avoid damaging the recording equipment), and that any windows, if provided, are closed.

(ii) Test Directions. (See Figure 7)

(A) Longitudinal Setup 1. Orient the door subsystem(s) on the acceleration device in the direction of a frontal impact.

(B) Longitudinal Setup 2. Orient the door subsystem(s) on the acceleration device in the direction of a rear impact.

(C) Transverse Setup 1. Orient the door subsystem(s) on the acceleration device in the direction of a ~~driver~~**left**-side impact.

(D) Transverse Setup 2. Orient the door subsystem(s) on the acceleration device in the direction opposite to that described in (b)(2)(ii)(C) of this paragraph.

(E) Vertical Setup 1 (applicable only to back doors that open in a vertical direction). Orient the door subsystem(s) on the acceleration device so that its vertical axis (when mounted in the vehicle) is aligned with the axis of the acceleration device, simulating a rollover impact where the force is applied in the direction from the top to the bottom of the door (when mounted in a vehicle).

(F) Vertical Setup 2 (applicable only to back doors that open in a vertical direction). Orient the door subsystem(s) on the acceleration device so that its vertical axis (when mounted in the vehicle) is aligned with the axis of the acceleration device, simulating a rollover impact where the force is applied in the direction opposite to that described in (b)(2)(ii)(E) of this paragraph.

(3) *Test Operation.*

(i) The acceleration device platform shall be instrumented with an accelerometer and data processing system that conforms to the requirements specified in SAE Recommended Practice J211-1 DEC2003 (incorporated by reference, see §571.5) Channel Class 60. The accelerometer sensitive axis is parallel to the direction of test platform travel.

(ii) Maintaining a minimum acceleration level of 30 g for a period of at least 30 ms, while keeping the recorded acceleration within the pulse corridor defined in Table 1 and Figure 6, accelerate the acceleration device in the following directions:

(A) For Full Vehicle Tests, in the directions specified in S5.1.1.4(b)(1)(ii)(A) through S5.1.1.4(b)(1)(ii)(D).

(B) For Door Tests, in the directions specified in S5.1.1.4(b)(2)(ii)(A) through S5.1.1.4(b)(2)(ii)(F).

(iii) Check recording device for door opening and/or closure during the test.

(iv) If at any point in time, the pulse exceeds 36 g and the test specifications are met, the test shall be considered valid.

S5.1.2 *Door Hinges.* The test procedures for S4.1.2 are as follows:

S5.1.2.1 Multiple Hinge Evaluation;

S5.1.2.1 Multiple Hinge Evaluation;

S5.1.2.1.1 *Longitudinal Load Test.*

(a) Attach the test fixture illustrated in Figure 8 to the mounting provisions of the hinge system. Hinge attitude is configured to simulate vehicle position (door fully closed) relative to the hinge centerline. For test purposes, the distance between the extreme end of one hinge in the system to the extreme end of another hinge in the system is to be set at 406 mm ±4 mm. The load is to be applied equidistant between the linear center of the engaged portions of the hinge pins and through the centerline of the hinge pin in the longitudinal vehicle direction (see Figure 8).

(b) Apply the test load at a rate not to exceed 5 mm/min until the required load has been achieved. Record maximum load achieved.

S5.1.2.1.2 *Transverse Load Test*

(a) Attach the test fixture shown in Figure 8 to the mounting provisions of the hinge system. Hinge attitude is configured to simulate vehicle position (door fully closed) relative to the hinge centerline. For test purposes, the distance between the extreme end of one hinge in the system to the extreme opposite end of another hinge in the system is to be set at 406 mm ±4 mm. The load is to be applied equidistant between the linear center of the engaged portions of the hinge pins and through the centerline of the hinge pin in the transverse vehicle direction (see Figure 8).

(b) Apply the test load at a rate not to exceed 5 mm/min until the required load has been achieved. Record maximum load achieved.

S5.1.2.2 *Back Door Hinge Load Test*

(a) Load Test One

(1) Attach the test fixture illustrated in Figure 8 to the mounting provisions of the hinge system. Hinge attitude is configured to simulate vehicle position (door fully closed) relative to the hinge centerline. For test purposes, the distance between the extreme end of one hinge system in the system to the extreme opposite end of another hinge system is to be set at 406 ±4 mm. The load is to be applied equidistant between the linear center of the engaged portions of the hinge pins and through the centerline of the hinge pin, and as specified in S4.1.2.1(d)(1). (See Figure 9).

(2) Apply the test load at a rate not to exceed 5 mm/min until the required load has been achieved. Failure consists of a separation of either hinge. Record the maximum load achieved.

(b) Load Test Two

(1) Attach the test fixture illustrated in Figure 8 to the mounting provisions of the hinge system. Hinge attitude is configured to simulate vehicle position (door fully closed) relative to the hinge centerline. For test purposes, the distance between the extreme end of one hinge system in the system to the extreme opposite end of another hinge system is to be set at 406 ±4 mm. The load is to be applied equidistant between the linear center of the engaged portions of the hinge pins and through the centerline of the hinge pin, and as specified in S4.1.2.1(d)(2). (See Figure 9).

(2) Apply the test load at a rate not to exceed 5 mm/min until the required load has been achieved. Failure consists of a separation of either hinge. Record the maximum load achieved.

(c) Load Test Three

(1) Attach the test fixture illustrated in Figure 8 to the mounting provisions of the hinge system. Hinge attitude is configured to simulate vehicle position (door fully closed) relative to the hinge centerline. For test purposes, the distance between the extreme end of one hinge system in the system to the extreme opposite end of another hinge system is to be set at 406 ±4 mm. The load is to be applied through the centerline of the hinge pin, and as specified in S4.1.2.1(d)(3). (See Figure 9).

(2) Apply the test load at a rate not to exceed 5 mm/min until the required load has been achieved. Failure consists of a separation of either hinge. Record the maximum load achieved.

S5.1.2.3 *Single Hinge Evaluation.* Individual hinges of a hinge system are tested in accordance with the procedures below:

(a) *Longitudinal Load.* Attach the test fixture illustrated in Figure 8 to the mounting provisions of the hinge. Hinge attitude is configured to simulate the vehicle position (door fully closed) relative to the hinge centerline. For test purposes, the load is to be applied equidistant between the linear center of the engaged portions of the hinge pin and through the centerline of the hinge pin in the longitudinal vehicle direction. Apply the test load at a rate not to exceed 5 mm/min until the required load has been achieved. Failure consists of a separation of either hinge. Record maximum load achieved.

(b) *Transverse Load.* Attach the test fixture illustrated in Figure 8 to the mounting provisions of the hinge. Hinge attitude is configured to simulate the vehicle position (door fully closed) relative to the hinge centerline. For test purposes, the load is to be applied equidistant between the linear center of the engaged portions of the hinge pin and through the centerline of the hinge pin in the transverse vehicle direction. Apply the test load at a rate not to exceed 5 mm/min until the required load has been achieved. Failure consists of a separation of either hinge. Record maximum load achieved.

(c) *Back Door Hinge Load Tests.*

(1) Load Test One. Attach the test fixture illustrated in Figure 8 to the mounting provisions of the hinge. Hinge attitude is configured to simulate the vehicle position (door fully closed) relative to the hinge centerline. For test purposes, the load is to be applied equidistant between the linear center of the engaged portions of the hinge pin and through the centerline of the hinge pin, and as specified in S4.1.2.1(d)(1). (See Figure 9). Apply the test load at a rate not to exceed 5 mm/min until the required load has been achieved. Failure consists of a separation of either hinge. Record maximum load achieved.

(2) Load Test Two. Attach the test fixture illustrated in Figure 8 to the mounting provisions of the hinge. Hinge attitude is configured to simulate the vehicle position (door fully closed) relative to the hinge centerline. For test purposes, the load is to be applied equidistant between the linear center of the engaged portions of the hinge pin and through the centerline of the hinge pin, and as specified in S4.1.2.1(d)(2). (See Figure 9). Apply the test load at a rate not to exceed 5 mm/min until the required load has been achieved. Failure consists of a separation of either hinge. Record maximum load achieved.

(3) Load Test Three. Attach the test fixture illustrated in Figure 8 to the mounting provisions of the hinge. Hinge attitude is configured to simulate the vehicle position (door fully closed) relative to the hinge centerline. For test purposes, the load is to be applied through the centerline of the hinge pin, and as specified in S4.1.2.1(d)(3). (See Figure 9). Apply the test load at a rate not to exceed 5 mm/min until the required load has been achieved. Failure consists of a separation of either hinge. Record maximum load achieved.

S5.1.2.4 For piano-type hinges, the hinge spacing requirements are not applicable and arrangement of the test fixture is altered so that the test forces are applied to the complete hinge.

S5.2 *Sliding Side Doors.*

S5.2.1 *Door Latches.*

S5.2.1.1 *Load Test One Force Application.* The requirements of S4.2.1.1 are tested in accordance with the procedures specified in S5.1.1.1.

S5.2.1.2 *Load Test Two Force Application.* The requirements of S4.2.1.2 are tested in accordance with the procedures specified in S5.1.1.2.

S5.2.1.3 [Reserved]

S5.2.1.4 [Reserved]

S5.2.2 *Door System.* The test procedures for S4.2.2 are as follows:

S5.2.2.1 Tests are conducted using a full vehicle with the sliding door and its retention components.

S5.2.2.1 Tests are conducted using a full vehicle with the sliding door and its retention components.

S5.2.2.2 The test is conducted using two force application devices capable of applying the outward transverse forces specified in S5.2.2.4. The test setup is shown in Figure 10. The force application system shall include the following:

(a) Two force application plates, (b) Two force application devices capable of applying the outward transverse load requirements for a minimum displacement of 300 mm.

(c) Two load cells of sufficient capacity to measure the applied loads specified in S5.2.2.4.

(d) Two linear displacement measurement devices required for measuring force application device displacement during the test.

(e) Equipment to measure for a 100 mm separation as specified in S4.2.2.2(a), while respecting all relevant safety and health requirements.

S5.2.2.3 *Test Setup.*

(a) Remove all interior trim and decorative components from the sliding door assembly.

(b) Remove seats and any interior components that may interfere with the mounting and operation of the test equipment and all pillar trim and any non-structural components that overlap the door and cause improper placement of the force application plates.

(c) Each force application device and associated support structure is rigidly fixed on a horizontal surface on the vehicle floor, while applying the loads.

(d) Determine the forward and aft edge of the sliding door, or its adjoining vehicle structure, that contains a latch/striker.

(e) Close the sliding door, ensuring that all door retention components are fully engaged.

(f) For any tested door edge that contains one latch/striker, the following set-up procedures are used:

(1)(i) The force application plate is 150 mm in length, 50 mm in width, and at least 15 mm in thickness. The plate edges are rounded to a radius of 6 mm ±1 mm.

(ii) The plates are fixed perpendicular to the force application devices and move in the transverse direction. For alignment purposes, each plate is attached to the application device in a manner that allows for rotation about the vehicle's y-axis. In this manner, the face of each plate remains parallel to the vertical plane which passes through the vehicle's longitudinal centerline.

(2) Place the force application device and force application plate against the door so that the applied force is perpendicular to the vertical longitudinal plane that passes through the vehicle's longitudinal centerline, and vertically centered on the door-mounted portion of the latch/striker.

(3) The force application plate is positioned such that the long edge of the plate is as close to the interior edge of the door as possible, but not such that the forward edge of forward plate and the rear edge of the rear plate are more than 12.5 mm from the respective interior edges.

(g) For any tested door edge that contains more than one latch/striker, the following setup procedures are used:

(1)(i) The force application plate is 300 mm in length, 50 mm in width, and at least 15 mm in thickness. The plate edges are rounded to a radius of 6 mm ±1 mm.

(ii) The plates are fixed perpendicular to the force application devices and move in the transverse direction. For alignment purposes, each plate is attached to the application device in a manner that allows for rotation about the vehicle's y-axis. In this manner, the face of each plate remains parallel to the vertical plane which passes through the vehicle's longitudinal centerline.

(2) Place the force application device and force application plate against the door so that the applied force is perpendicular to the vertical longitudinal plane that passes through the vehicle's longitudinal centerline, and vertically centered on a point mid-way between the outermost edges of the latch/striker assemblies.

(3) The force application plate is positioned such that the long edge of the plate is as close to the interior edge of the door as possible, but not such that the forward edge of forward plate and the rear edge of the rear plate are more than 12.5 mm from the respective interior edges.

(h) For any tested door edge that does not contain at least one latch/striker, the following set-up procedures are used:

(1)(i) The force application plate is 300 mm in length, 50 mm in width, and at least 15 mm in thickness. The plate edges are rounded to a radius of 6 mm ±1 mm.

(ii) The plates are fixed perpendicular to the force application devices and move in the transverse direction. For alignment purposes, each plate is attached to the application device in a manner that allows for rotation about the vehicle's y-axis. In this manner, the face of each plate remains parallel to the vertical plane which passes through the vehicle's longitudinal centerline.

(2) Place the force application device and force application plate against the door so that the applied force is perpendicular to the vertical longitudinal plane that passes through the vehicle's longitudinal centerline, and vertically centered on a point mid-way along the length of the door edge ensuring that the loading device avoids contact with the window glazing.

(3) The force application plate is positioned such that the long edge of the plate is as close to the interior edge of the door as possible, but not such that the forward edge of forward plate and the rear edge of the rear plate are more than 12.5 mm from the respective interior edges.

(i) The door is unlocked. No extra fixtures or components may be welded or affixed to the sliding door or any of its components.

(j) Place the load application structure so that the force application plates are in contact with the interior of the sliding door.

(k) Apply a preload of 500 N to each actuator and "zero" the displacement measuring device.

S5.2.2.4 *Test Procedure.*

(a) Increase the force on each force application device as linearly as practicable until a force of 9,000 N is achieved on each force application device in not less than 90 seconds and not more than 120 seconds, or until either force application device reaches a total displacement of 300 mm.

(b) If one of the force application devices reaches the target force of 9,000 N prior to the other, maintain the 9,000 N force with that force application device until the second force application device reaches the 9,000 N force.

(c) Once both force application devices have achieved 9,000 N each hold the resulting load.

(d) Maintain each force application device load as specified in paragraph (c) and within 30 seconds measure the separation between the exterior edge of the doorframe and the interior of the door along the perimeter of the door.

S5.3 *Sliding Side Doors.* Compliance with S4.3 shall be demonstrated by applying an outward transverse load of 8,900 Newtons (2,000 pounds) to the load-bearing members at the opposite edges of the door (17,800 Newtons (4,000 pounds) total). The demonstration may be performed either in the vehicle or with the door retention components in a bench test fixture.

**FIGURE 1. EVALUATION OF SLIDING DOOR GAP SEPARATION**

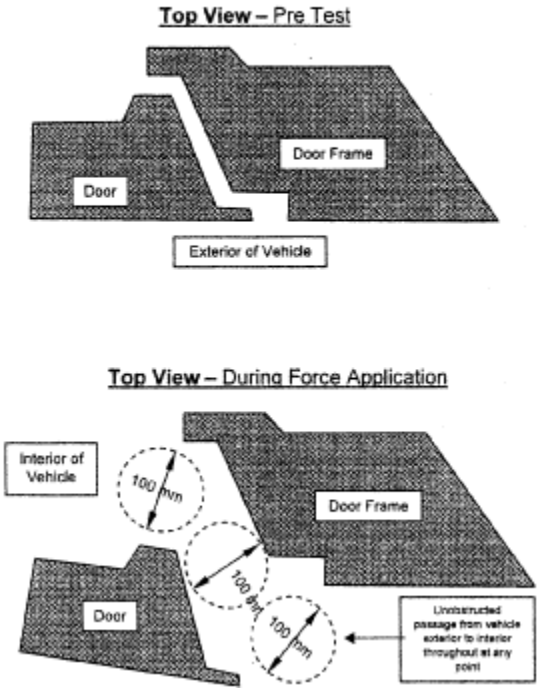


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FIGURE 2 - DOOR LATCH – TENSILE TESTING FIXTURE FOR LOAD TEST 1

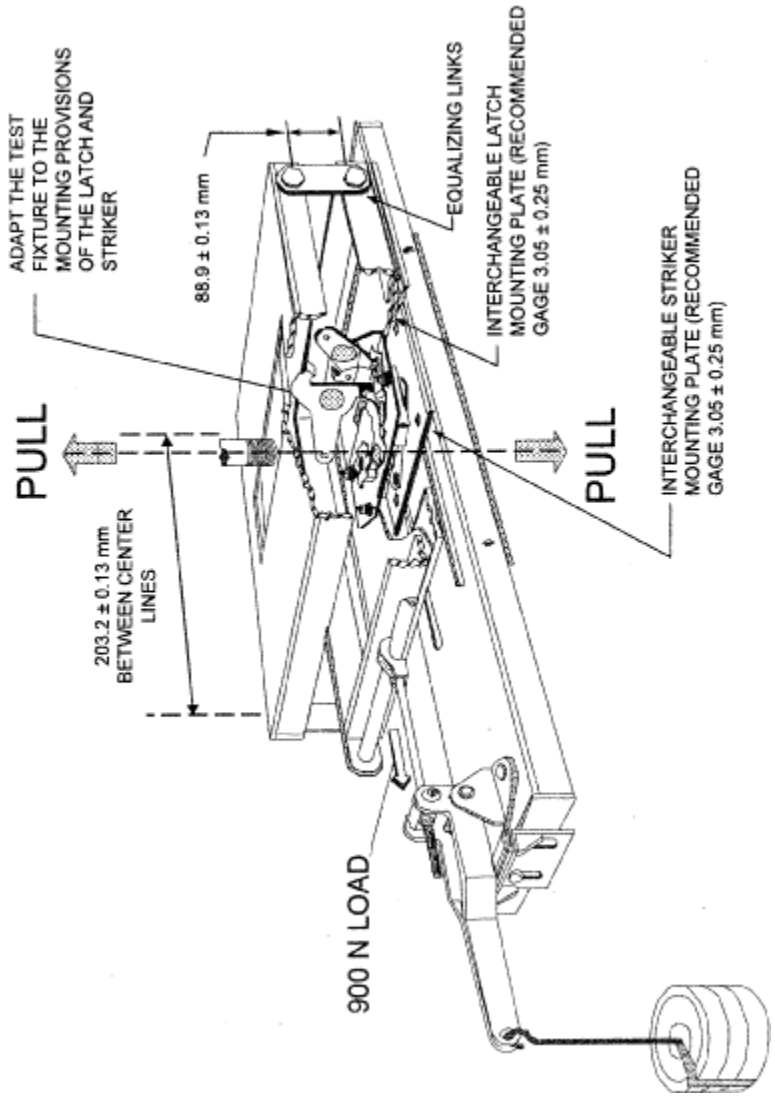


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**FIGURE 3 – DOOR LATCH – TENSILE TESTING FIXTURE FOR LOAD TEST 2**

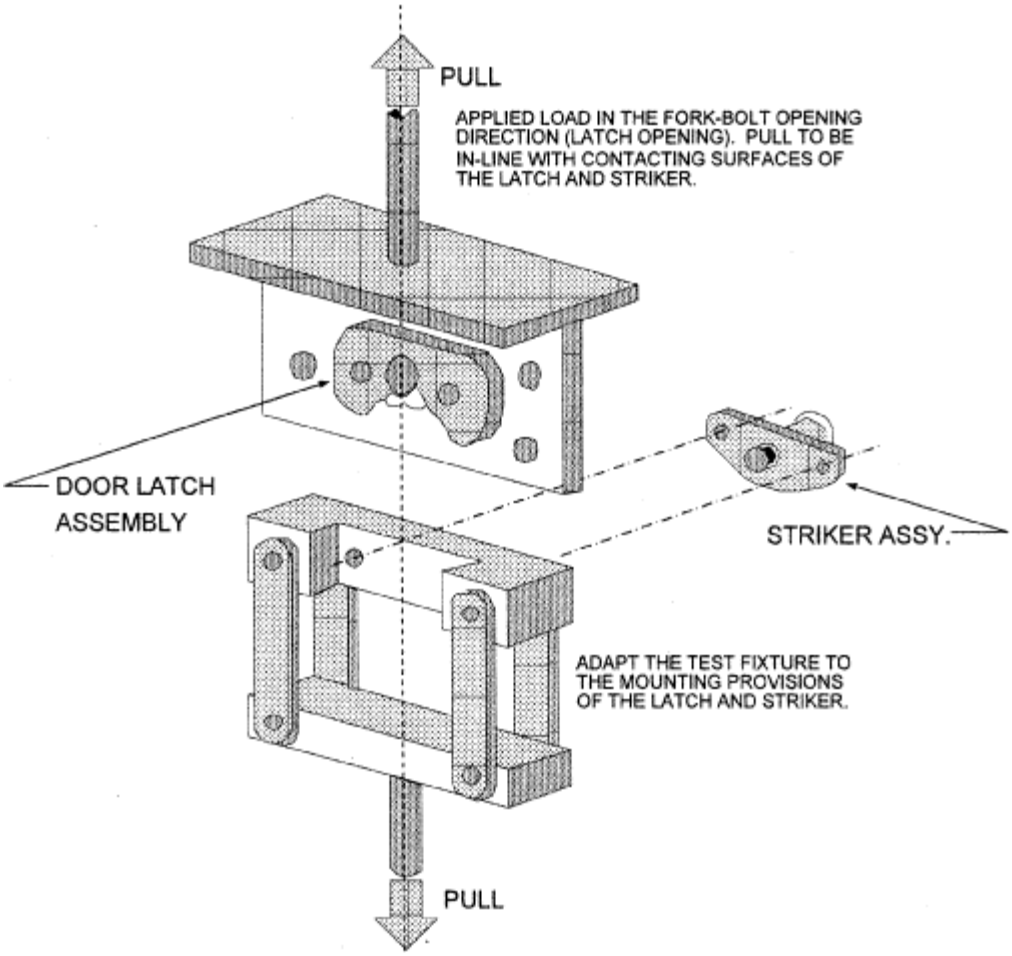


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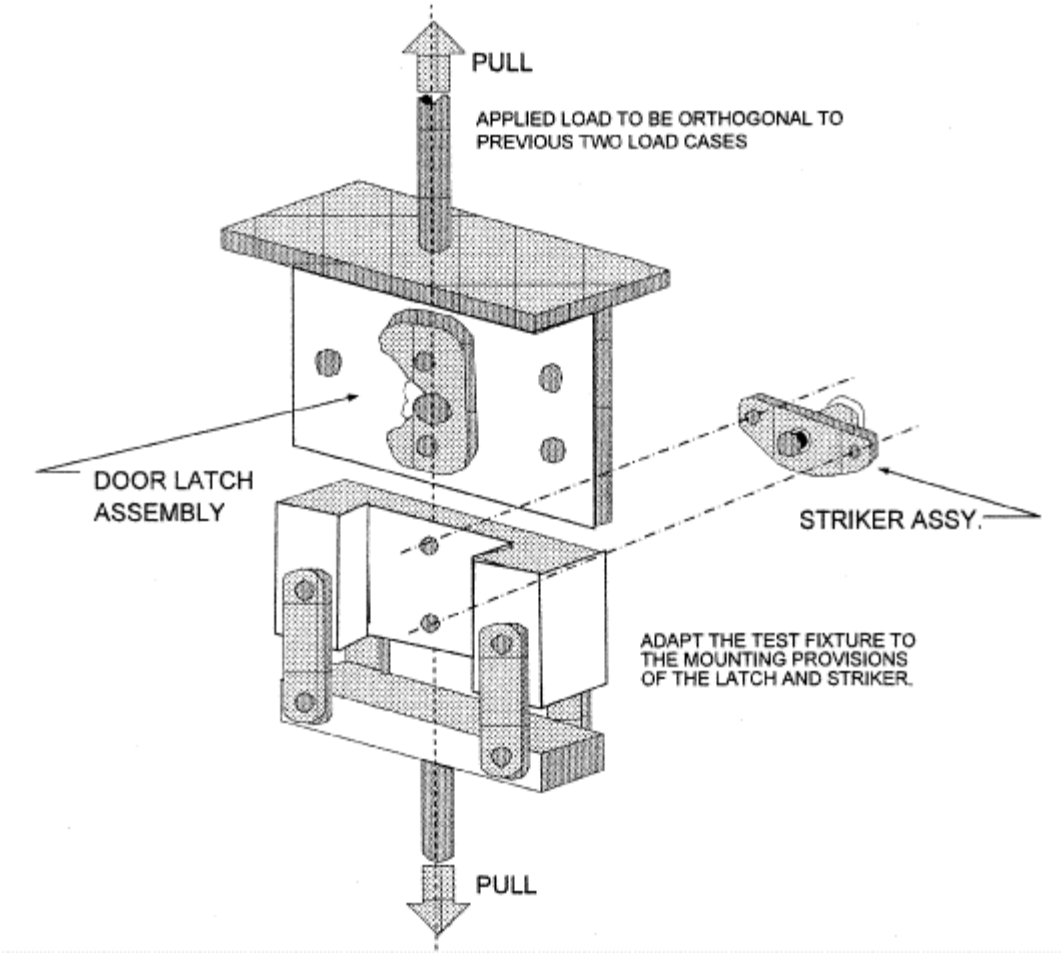
**FIGURE 4 – DOOR LATCH – TENSILE TESTING FIXTURE FOR LOAD TEST 3 (BACK DOORS ONLY)**

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| Upper Bound | | | Lower Bound | | |
|---|---|---|---|---|---|
| Point | Time (ms) | Acceleration (g) | Point | Time (ms) | Acceleration (g) |
| A | 0 | 6 | E | 5 | 0 |
| B | 20 | 36 | F | 25 | 30 |
| C | 60 | 36 | G | 55 | 30 |
| D | 100 | 0 | H | 70 | 0 |

**ACCELERATION PULSE CORRIDOR TABLE 1**

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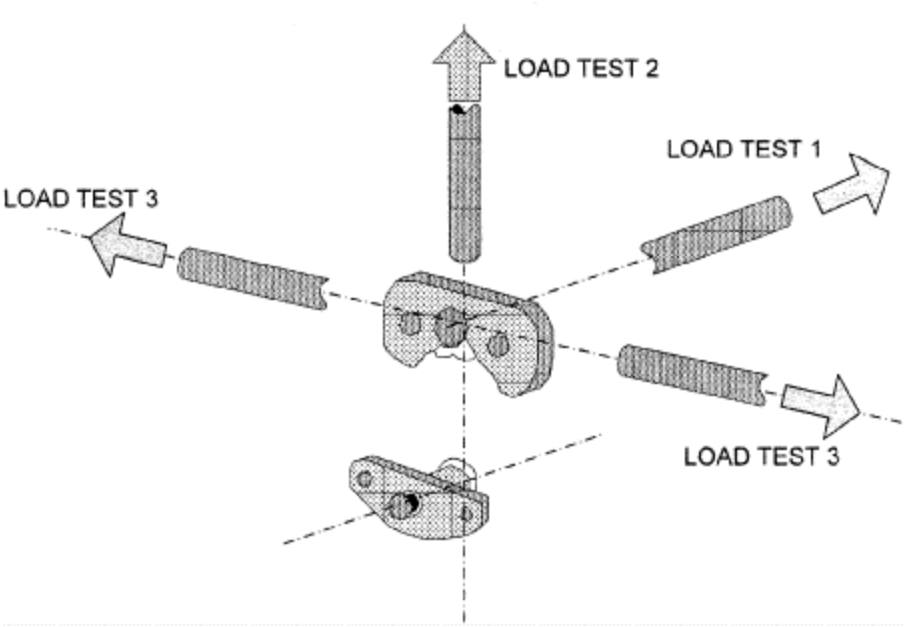
**FIGURE 5 – DOOR LATCH STATIC LOAD TEST DIRECTIONS**

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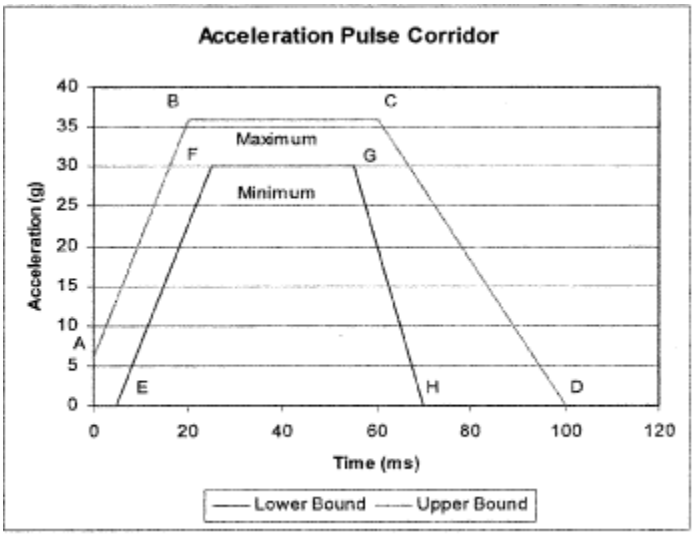


**FIGURE 6 – ACCELERATION PULSE**

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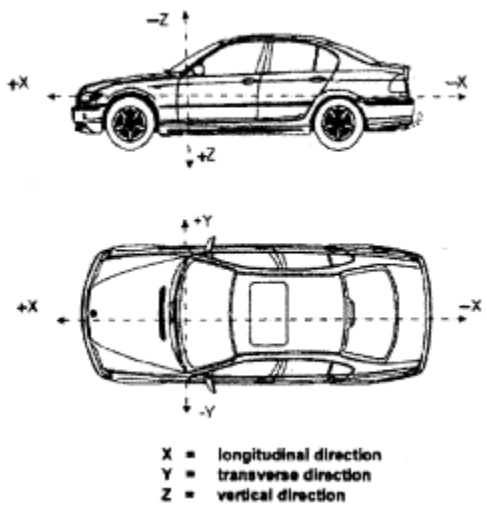
FIGURE 7 - VEHICLE COORDINATE REFERENCE SYSTEM FOR INERTIAL TESTING




X = longitudinal direction
Y = transverse direction
Z = vertical direction

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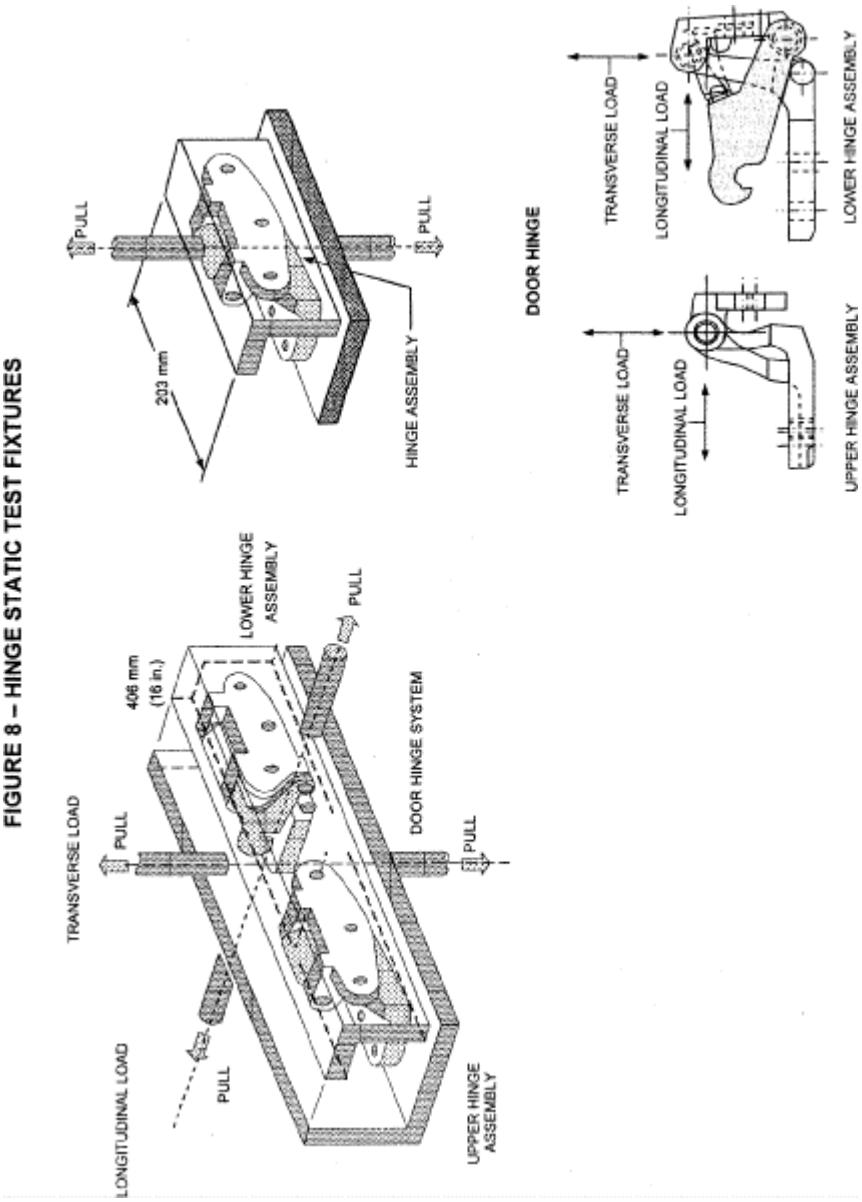


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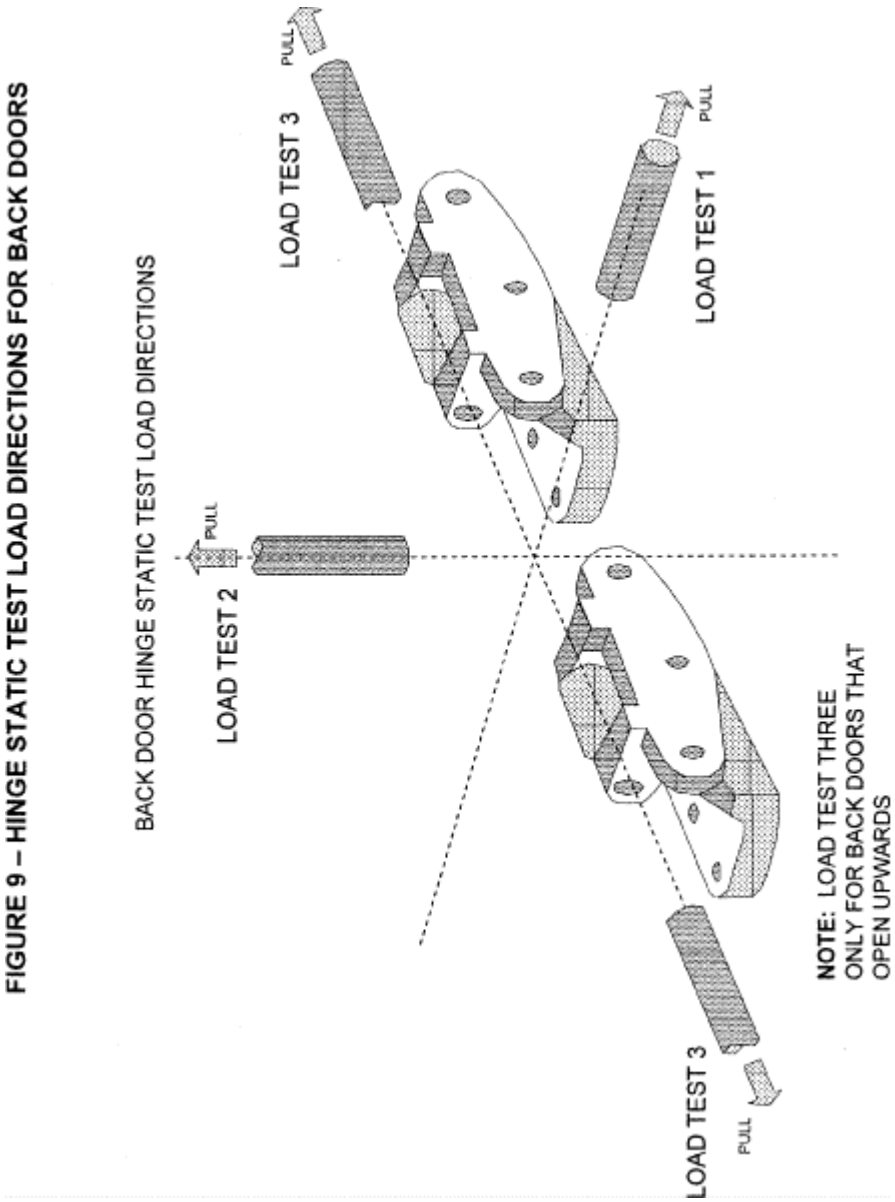


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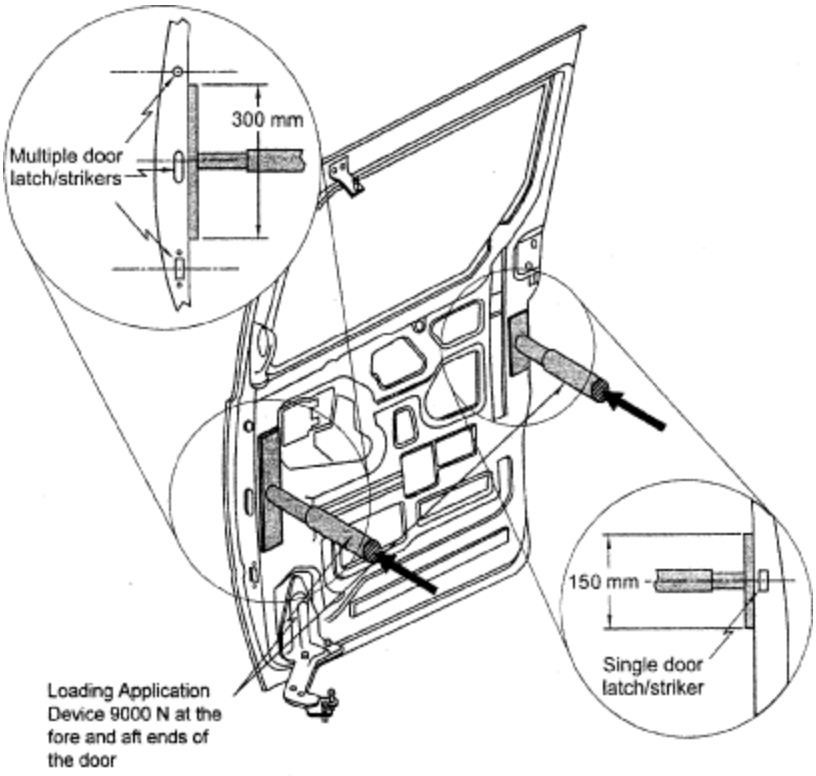


FIGURE 10 – Sliding Door Full Vehicle Test Procedure
(Note: Sliding door is shown separated from the vehicle)

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[36 FR 22902, Dec. 2, 1971, as amended at 37 FR 284, Jan. 8, 1972; 50 FR 12031, Mar. 27, 1985; 60 FR 13646, Mar. 14, 1995; 60 FR 50134, Sept. 28, 1995; 61 FR 39907, July 31, 1996; 72 FR 5399, June 27, 2007; 74 FR 35135, July 20, 2009; 74 FR 37176, July 28, 2009; 75 FR 7382, Feb. 19, 2010; 77 FR 764, Jan. 6, 2012]

EDITORIAL NOTE: At 72 FR 5399, June 27, 2007, §571.206 was amended by adding S.5.3; however, the amendment could not be incorporated because S.5.3 already exists.

# §571.207 Standard No. 207; Seating systems.

S1. *Purpose and scope.* This standard establishes requirements for seats, their attachment assemblies, and their installation to minimize the possibility of their failure by forces acting on them as a result of vehicle impact.

S2. *Application.* This standard applies to passenger cars, multipurpose passenger vehicles, trucks **with at least one designated seating position,** and buses.

S3. *Definitions. Occupant seat* means a seat that provides at least one designated seating position.

*Seat adjuster* means the part of the seat that provides forward and rearward positioning of the seat bench and back, and/or rotation around a vertical axis, including any fixed portion, such as a seat track. In the case of a seat equipped with seat adjusters at different levels, the term means the uppermost seat adjuster.

S4. *Requirements.*

S4.1 *Driver's seat.* Each vehicle **with a manually-operated driving control** shall have a ~~n occupant seat for the~~ driver**'s designated seating position**.

S4.2. *General performance requirements.* When tested in accordance with S5, each occupant seat shall withstand the following forces, in newtons, except for: a side-facing seat; a passenger seat on a bus other than a school bus; a passenger seat on a school bus with a GVWR greater than 4,536 kilograms (10,000 pounds); and, a passenger seat on a school bus with a GVWR less than or equal to 4,536 kg manufactured before October 21, 2011.

(a) In any position to which it can be adjusted—20 times the mass of the seat in kilograms multiplied by 9.8 applied in a forward longitudinal direction;

(b) In any position to which it can be adjusted—20 times the mass of the seat in kilograms multiplied by 9.8 applied in a rearward longitudinal direction;

(c) For a seat belt assembly attached to the seat—the force specified in paragraph (a), if it is a forward facing seat, or paragraph (b), if it is a rearward facing seat, in each case applied simultaneously with the forces imposed on the seat by the seat belt assembly when it is loaded in accordance with S4.2 of §571.210; and

(d) In its rearmost position—a force that produces a 373 newton meters moment about the seating reference point for each designated seating position that the seat provides, applied to the upper cross-member of the seat back or the upper seat back, in a rearward longitudinal direction for forward-facing seats and in a forward longitudinal direction for rearward-facing seats.

S4.2.1 *Seat adjustment.* Except for vertical movement of nonlocking suspension type occupant seats in trucks or buses, each seat shall remain in its adjusted position when tested in accordance with the test procedures specified in S5.

S4.3. *Restraining device for hinged or folding seats or seat backs.* Except for a passenger seat in a bus or a seat having a back that is adjustable only for the comfort of its occupants, a hinged or folding occupant seat or occupant seat back shall—

(a) Be equipped with a self-locking device for restraining the hinged or folding seat or seat back, and

(b) If there are any designated seating positions or auxiliary seating accommodations behind the seat, either immediately to the rear or to the sides, be equipped with a control for releasing that restraining device.

S4.3.1 *Accessibility of release control.* If there is a designated seating position immediately behind a seat equipped with a restraining device, the control for releasing the device shall be readily accessible to the occupant of the seat equipped with the device and, if access to the control is required in order to exit from the vehicle, to the occupant of the designated seating position immediately behind the seat.

S4.3.2 *Performance of restraining device.*

S4.3.2.1 *Static force.* (a) Once engaged, the restraining device for a forward-facing seat shall not release or fail when a forward longitudinal force, in newtons, equal to 20 times the mass of the hinged or folding portion of the seat in kilograms multiplied by 9.8 is applied through the center of gravity of that portion of the seat.

(b) Once engaged, the restraining device for a rearward-facing seat shall not release or fail when a rearward longitudinal force, in newtons, equal to 8 times the mass of the hinged or folding portion of the seat in kilograms multiplied by 9.8 is applied through the center of gravity of that portion of the seat.

S4.3.2.2 *Acceleration.* Once engaged, the restraining device shall not release or fail when the device is subjected to an acceleration of 20 g., in the longitudinal direction opposite to that in which the seat folds.

S4.4 *Labeling.* Seats not designated for occupancy while the vehicle is in motion shall be conspicuously labeled to that effect.

S5. *Test procedures.*

S5.1 Apply the forces specified in S4.2(a) and S4.2(b) as follows:

S5.1.1 *For a seat whose seat back and seat bench are attached to the vehicle by the same attachments.* (a) For a seat whose seat back and seat bench are attached to the vehicle by the same attachments and whose height is adjustable, the loads are applied when the seat is in its highest adjustment position in accordance with the procedure or procedures specified in S5.1.1(a)(1), S5.1.1(a)(2), or S5.1.1(a)(3), as appropriate.

(1) For a seat whose center of gravity is in a horizontal plane that is above the seat adjuster or that passes through any part of the adjuster, use, at the manufacturer's option, either S5.1.1(b) or, if physically possible, S5.1.1(c).

(2) For a seat specified in S5.1.1(a)(1) for which it is not physically possible to follow the procedure in S5.1.1(c), use S5.1.1(b).

(3) For a seat whose center of gravity is in a horizontal plane that is below the seat adjuster, use S5.1.1(c).

(4) For all other seats whose seat back and seat bench are attached to the vehicle by the same attachments, use S5.1.1(b).

(b) Secure a strut on each side of the seat from a point on the outside of the seat frame in the horizontal plane of the seat's center of gravity to a point on the frame as far forward as possible of the seat anchorages. Between the upper ends of the struts attach a rigid cross-member, in front of the seat back frame for rearward loading and behind the seat back frame for forward loading. Apply the force specified by S4.2(a) or S4.2(b) horizontally through the rigid cross-member as shown in Figure 1.

(c) Find "$cg_1$," the center of gravity of the portion of the seat that is above the lowest surface of the seat adjuster. On each side of the seat, secure a strut from a point on the outside of the seat frame in the horizontal plane of $cg_1$ to a point on the frame as far forward as possible of the seat adjusted position. Between the upper ends of the struts attach a rigid cross-member, in front of the seat back frame for rearward loading and behind the seat back frame for forward loading. Find "$cg_2$," the center of gravity of the portion of the seat that is below the seat adjuster. Apply a force horizontally through $cg_1$ equal to 20 times the weight of the portion of the seat represented by $cg_1$, and simultaneously apply a force horizontally through $cg_2$ equal to 20 times the weight of the portion of the seat represented by $cg_2$.

S5.1.2 If the seat back and the seat bench are attached to the vehicle by different attachments, attach to each component a fixture capable of transmitting a force to that component. Apply forces, in newtons, equal to 20 times the mass of the seat back in kilograms multiplied by 9.8 m/s2 horizontally through the center of gravity of the seat back, as shown in Figure 2 and apply forces, in newtons, equal to 20 times the mass of the seat bench in kilograms multiplied by 9.8 m/s2 horizontally through the center of gravity of the seat bench, as shown in Figure 3.

S5.2 Develop the moment specified in S4.2(d) as shown in Figure 4.

S5.3 Apply the forces specified in S4.3.2.1(a) and (b) to a hinged or folding seat as shown in Figure 1 and to a hinged or folding seat back as shown in Figure 5.

S5.4 Determine the center of gravity of a seat or seat component with all cushions and upholstery in place and with the head restraint in its fully extended design position.

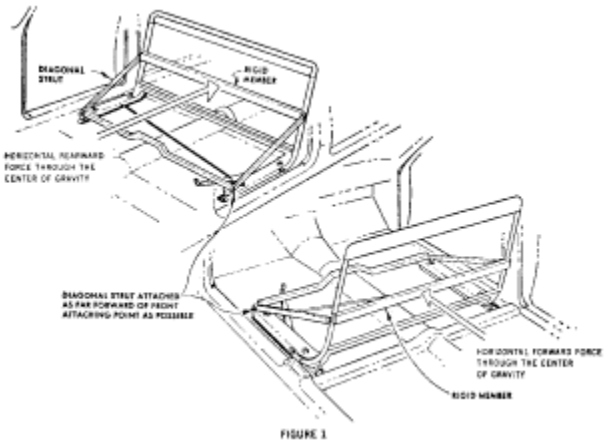

FIGURE 1

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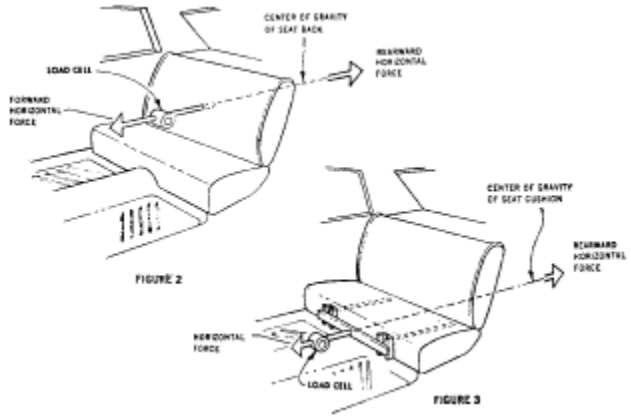

FIGURE 2
FIGURE 3

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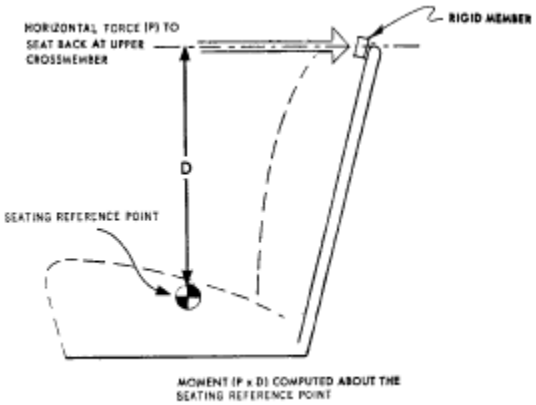

FIGURE 4

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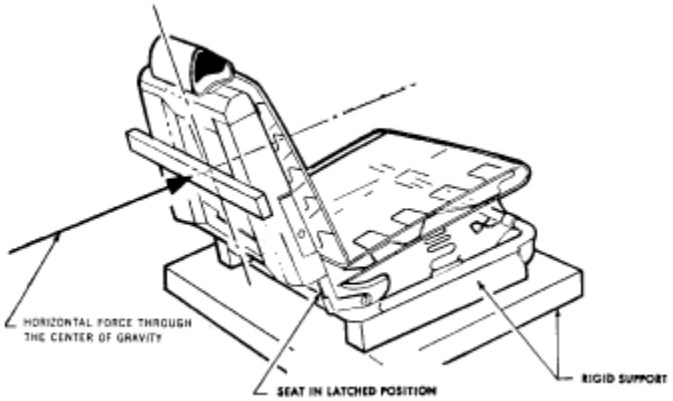

FIGURE 5

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[36 FR 22902, Dec. 2, 1971, as amended at 52 FR 7868, Mar. 13, 1987; 53 FR 30434, Aug. 12, 1988; 59 FR 37167, July 21, 1994; 60 FR 13647, Mar. 14, 1995; 63 FR 28935, May 27, 1998; 73 FR 62779, Oct. 21, 2008]

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# §571.208 Standard No. 208; Occupant crash protection.

S1. *Scope.* This standard specifies performance requirements for the protection of vehicle occupants in crashes.

S2. *Purpose.* The purpose of this standard is to reduce the number of deaths of vehicle occupants, and the severity of injuries, by specifying vehicle crashworthiness requirements in terms of forces and accelerations measured on anthropomorphic dummies in test crashes, and by specifying equipment requirements for active and passive restraint systems.

S3. *Application.* (a) This standard applies to passenger cars, multipurpose passenger vehicles, trucks **with at least one designated seating position**, and buses. In addition, S9, *Pressure vessels and explosive devices,* applies to vessels designed to contain a pressurized fluid or gas, and to explosive devices, for use in the above types of motor vehicles as part of a system designed to provide protection to occupants in the event of a crash.

(b) Notwithstanding any language to the contrary, any vehicle manufactured after March 19, 1997, and before September 1, 2006, that is subject to a dynamic crash test requirement conducted with unbelted dummies may meet the requirements specified in S5.1.2(a)(1), S5.1.2(a)(2), or S13 instead of the applicable unbelted requirement, unless the vehicle is certified to meet the requirements specified in S14.5, S15, S17, S19, S21, S23, and S25.

(c) For vehicles which are certified to meet the requirements specified in S13 instead of the otherwise applicable dynamic crash test requirement conducted with unbelted dummies,

compliance with S13 shall, for purposes of Standards No. 201, 203 and 209, be deemed as compliance with the unbelted frontal barrier requirements of S5.1.2.

S4. *General requirements.*

S4.1 *Passenger cars.*

S4.1.1 *Passenger cars manufactured from January 1, 1972, to August 31, 1973.* Each passenger car manufactured from January 1, 1972, to August 31, 1973, inclusive, shall meet the requirements of S4.1.1.1, S4.1.1.2, or S4.1.1.3. A protection system that meets the requirements of S4.1.1.1, or S4.1.1.2 may be installed at one or more designated seating positions of a vehicle that otherwise meets the requirements of S4.1.1.3.

S4.1.1.1 *First option—complete passive protection system.* The vehicle shall meet the crash protection requirements of S5. by means that require no action by vehicle occupants.

S4.1.1.2 *Second option—lap belt protection system with belt warning.* The vehicle shall—

(a) At each designated seating position have a Type 1 seatbelt assembly or a Type 2 seatbelt assembly with a detachable upper torso portion that conforms to S7.1 and S7.2 of this standard;

(b) At each front outboard designated seating position, have a seat belt warning system that conforms to S7.3; and

(c) Meet the frontal crash protection requirements of S5.1, in a perpendicular impact, with respect to anthropomorphic test devices in each front outboard designated seating position restrained only by Type 1 seat belt assemblies.

S4.1.1.3 *Third option—lap and shoulder belt protection system with belt warning.*

S4.1.1.3.1 Except for convertibles and open-body vehicles, the vehicle shall—

(a) At each front outboard designated seating position have a Type 2 seatbelt assembly that conforms to §571.209 and S7.1 and S7.2 of this standard, with either an integral or detachable upper torso portion, and a seatbelt warning system that conforms to S7.3;

(b) At each designated seating position other than the front outboard positions, have a Type 1 or Type 2 seat belt assembly that conforms to §571.209 and to S7.1 and S7.2 of this standard; and

(c) When it perpendicularly impacts a fixed collision barrier, while moving longitudinally forward at any speed up to and including 30 m.p.h., under the test conditions of S8.1 with anthropomorphic test devices at each front outboard position restrained by Type 2 seatbelt assemblies, experience no complete separation of any load-bearing element of a seatbelt assembly or anchorage.

S4.1.1.3.2 Convertibles and open-body type vehicles shall at each designated seating position have a Type 1 or Type 2 seatbelt assembly that conforms to §571.209 and to S7.1 and S7.2 of this standard, and at each front outboard designated seating position have a seatbelt warning system that conforms to S7.3.

S4.1.2 *Passenger cars manufactured on or after September 1, 1973, and before September 1, 1986.* Each passenger car manufactured on or after September 1, 1973, and before September 1, 1986, shall meet the requirements of S4.1.2.1, S4.1.2.2 or S4.1.2.3. A protection system that meets the requirements of S4.1.2.1 or S4.1.2.2 may be installed at one or more designated seating positions of a vehicle that otherwise meets the requirements of S4.1.2.3.

S4.1.2.1 *First option—frontal/angular automatic protection system.* The vehicle shall:

(a) At each front outboard designated seating position meet the frontal crash protection requirements of S5.1 by means that require no action by vehicle occupants;

(b) At the front center designated seating position and at each rear designated seating position have a Type 1 or Type 2 seat belt assembly that conforms to Standard No. 209 and to S7.1 and S7.2; and

(c) *Either.* (1) Meet the lateral crash protection requirements of S5.2 and the rollover crash protection requirements of S5.3 by means that require no action by vehicle occupants; or

(2) At each front outboard designated seating position have a Type 1 or Type 2 seat belt assembly that conforms to Standard No. 209 and S7.1 through S7.3, and that meets the requirements of S5.1 with front test dummies as required by S5.1, restrained by the Type 1 or Type 2 seat belt assembly (or the pelvic portion of any Type 2 seat belt assembly which has a detachable upper torso belt) in addition to the means that require no action by the vehicle occupant.

S4.1.2.2 *Second option—head-on automatic protection system.* The vehicle shall—

(a) At each designated seating position have a Type 1 seat belt assembly or Type 2 seat belt assembly with a detachable upper torso portion that conforms to S7.1 and S7.2 of this standard.

(b) At each front outboard designated seating position, meet the frontal crash protection requirements of S5.1, in a perpendicular impact, by means that require no action by vehicle occupants;

(c) At each front outboard designated seating position, meet the frontal crash protection requirements of S5.1, in a perpendicular impact, with a test device restrained by a Type 1 seat belt assembly; and

(d) At each front outboard designated seating position, have a seat belt warning system that conforms to S7.3.

S4.1.2.3 *Third option—lap and shoulder belt protection system with belt warning.*

S4.1.2.3.1 Except for convertibles and open-body vehicles, the vehicle shall—

(a) At each front outboard designated seating position have a seat belt assembly that conforms to S7.1 and S7.2 of this standard, and a seat belt warning system that conforms to S7.3. The belt assembly shall be either a Type 2 seat belt assembly with a nondetachable shoulder belt that conforms to Standard No. 209 (§571.209), or a Type 1 seat belt assembly such that with a test device restrained by the assembly the vehicle meets the frontal crash protection requirements of S5.1 in a perpendicular impact.

(b) At any center front designated seating position, have a Type 1 or Type 2 seat belt assembly that conforms to Standard No. 209 (§571.209) and to S7.1 and S7.2 of this standard, and a seat belt warning system that conforms to S7.3; and

(c) At each other designated seating position, have a Type 1 or Type 2 seat belt assembly that conforms to Standard No. 209 (§571.209) and S7.1 and S7.2 of this standard.

S4.1.2.3.2 Convertibles and open-body type vehicles shall at each designated seating position have a Type 1 or Type 2 seat belt assembly that conforms to Standard No. 209 (§571.209) and to S7.1 and S7.2 of this standard, and at each front designated seating position have a seat belt warning system that conforms to S7.3.

S4.1.3 *Passenger cars manufactured on or after September 1, 1986, and before September 1, 1989.*

S4.1.3.1 *Passenger cars manufactured on or after September 1, 1986, and before September 1, 1987.*

S4.1.3.1.1 Subject to S4.1.3.1.2 and S4.1.3.4, each passenger car manufactured on or after September 1, 1986, and before September 1, 1987, shall comply with the requirements of S4.1.2.1, S4.1.2.2 or S4.1.2.3. A vehicle shall not be deemed to be in noncompliance with this standard if its manufacturer establishes that it did not have reason to know in the exercise of due care that such vehicle is not in conformity with the requirement of this standard.

S4.1.3.1.2 Subject to S4.1.3.4 and S4.1.5, the amount of passenger cars, specified in S4.1.3.1.1 complying with the requirements of S4.1.2.1 shall be not less than 10 percent of:

(a) The average annual production of passenger cars manufactured on or after September 1, 1983, and before September 1, 1986, by each manufacturer, or

(b) The manufacturer's annual production of passenger cars during the period specified in S4.1.3.1.1.

S4.1.3.1.3 A manufacturer may exclude convertibles which do not comply with the requirements of S4.1.2.1, when it is calculating its average annual production under S4.1.3.1.2(a) or its annual production under S4.1.3.1.2(b).

S4.1.3.2 *Passenger cars manufactured on or after September 1, 1987, and before September 1, 1988.*

S4.1.3.2.1 Subject to S4.1.3.2.2 and S4.1.3.4, each passenger car manufactured on or after September 1, 1987, and before September 1, 1988, shall comply with the requirements of S4.1.2.1, S4.1.2.2 or S4.1.2.3. A vehicle shall not be deemed to be in noncompliance with this standard if its manufacturer establishes that it did not have reason to know in the exercise of due care that such vehicle is not in conformity with the requirement of this standard.

S4.1.3.2.2 Subject to S4.1.3.4 and S4.1.5, the amount of passenger cars specified in S4.1.3.2.1 complying with the requirements of S4.1.2.1. shall be not less than 25 percent of:

(a) The average annual production of passenger cars manufactured on or after September 1, 1984, and before September 1, 1987, by each manufacturer, or

(b) The manufacturer's annual production of passenger cars during the period specified in S4.1.3.2.1.

S4.1.3.2.3 A manufacturer may exclude convertibles which do not comply with the requirements of S4.1.2.1, when it is calculating its average annual production under S4.1.3.2.2(a) or its annual production under S4.1.3.2.2(b).

S4.1.3.3 *Passenger cars manufactured on or after September 1, 1988, and before September 1, 1989.*

S4.1.3.3.1 Subject to S4.1.3.3.2 and S4.1.3.4, each passenger car manufactured on or after September 1, 1988, and before September 1, 1989, shall comply with the requirements of S4.1.2.1, S4.1.2.2 or S4.1.2.3. A vehicle shall not be deemed to be in noncompliance with this standard if its manufacturer establishes that it did not have reason to know in the exercise of due care that such vehicle is not in conformity with the requirement of this standard.

S4.1.3.3.2 Subject to S4.1.3.4 and S4.1.5, the amount of passenger cars specified in S4.1.3.3.1 complying with the requirements of S4.1.2.1 shall be not less than 40 percent of:

(a) The average annual production of passenger cars manufactured on or after September 1, 1985, and before September 1, 1988, by each manufacturer or

(b) The manufacturer's annual production of passenger cars during the period specified in S4.1.3.3.1.

S4.1.3.3.3 A manufacturer may exclude convertibles which do not comply with the requirements of S4.1.2.1, when it is calculating its average annual production under S4.1.3.3.2(a) or its annual production under S4.1.3.3.2(b).

S4.1.3.4 *Calculation of complying passenger cars.* (a) For the purposes of calculating the numbers of cars manufactured under S4.1.3.1.2, S4.1.3.2.2, or S4.1.3.3.2 to comply with S4.1.2.1:

(1) Each car whose driver's seating position complies with the requirements of S4.1.2.1(a) by means not including any type of seat belt and whose front right seating position will comply with the requirements of S4.1.2.1(a) by any means is counted as 1.5 vehicles, and

(2) Each car whose driver's seating position complies with the requirements of S4.1.2.1(a) by means not including any type of seat belt and whose right front seat seating position is equipped with a manual Type 2 seat belt is counted as one vehicle.

(b) For the purposes of complying with S4.1.3.1.2, a passenger car may be counted if it:

(1) Is manufactured on or after September 1, 1985, but before September 1, 1986, and

(2) Complies with S4.1.2.1.

(c) For the purposes of complying with S4.1.3.2.2, a passenger car may be counted if it:

(1) Is manufactured on or after September 1, 1985, but before September 1, 1987,

(2) Complies with S4.1.2.1, and

(3) Is not counted toward compliance with S4.1.3.1.2

(d) For the purposes of complying with S4.1.3.3.2, a passenger car may be counted if it:

(1) Is manufactured on or after September 1, 1985, but before September 1, 1988,

(2) Complies with S4.1.2.1, and

(3) Is not counted toward compliance with S4.1.3.1.2 or S4.1.3.2.2.

S4.1.3.5 *Passenger cars produced by more than one manufacturer.*

S4.1.3.5.1 For the purposes of calculating average annual production of passenger cars for each manufacturer and the amount of passenger cars manufactured by each manufacturer under S4.1.3.1.2, S4.1.3.2.2 or S4.1.3.3.2, a passenger car produced by more than one manufacturer shall be attributed to a single manufacturer as follows, subject to S4.1.3.5.2:

(a) A passenger car which is imported shall be attributed to the importer.

(b) A passenger car manufactured in the United States by more than one manufacturer, one of which also markets the vehicle, shall be attributed to the manufacturer which markets the vehicle.

S4.1.3.5.2 A passenger car produced by more than one manufacturer shall be attributed to any one of the vehicle's manufacturers specified by an express written contract, reported to the National Highway Traffic Safety Administration under 49 CFR part 585, between the manufacturer so specified and the manufacturer to which the vehicle would otherwise be attributed under S4.1.3.5.1.

S4.1.4 Passenger cars manufactured on or after September 1, 1989, but before September 1, 1996.

S4.1.4.1 Except as provided in S4.1.4.2, each passenger car manufactured on or after September 1, 1989 shall comply with the requirements of S4.1.2.1. Any passenger car manufactured on or after September 1, 1989 and before September 1, 1993 whose driver's designated seating position complies with the requirements of S4.1.2.1(a) by means not including any type of seat belt and whose right front designated seating position is equipped with a manual Type 2 seat belt so that the seating position complies with the occupant crash protection requirements of S5.1, with the Type 2 seat belt assembly adjusted in accordance with S7.4.2, shall be counted as a vehicle complying with S4.1.2.1. A vehicle shall not be deemed to be in noncompliance with this standard if its manufacturer establishes that it did not know in the exercise of due care that such vehicle is not in conformity with this standard.

S4.1.4.2 (a) Each passenger car, other than a convertible, manufactured before December 11, 1989 may be equipped with, and each passenger car, other than a convertible, manufactured on or after December 11, 1989 and before September 1, 1990 shall be equipped with a Type 2 seat belt assembly at every forward-facing rear outboard designated seating position. Type 2 seat belt assemblies installed pursuant to this provision shall comply with Standard No. 209 (49 CFR 571.209) and with S7.1.1 of this standard.

(b) Except as provided in S4.1.4.2.1 and S4.1.4.2.2, each passenger car, other than a convertible, manufactured on or after September 1, 1990 and each convertible passenger car manufactured on or after September 1, 1991 shall be equipped with an integral Type 2 seat belt assembly at every forward-facing rear outboard designated seating position. Type 2 seat belt assemblies installed in compliance with this requirement shall comply with Standard No. 209 (49 CFR 571.209) and with S7.1 an S7.2 of this standard. If a Type 2 seat belt assembly installed in compliance with this requirement incorporates any webbing tension-relieving device, the vehicle owner's manual shall include the information specified in S7.4.2(b) of this standard for the tension relieving device, and the vehicle shall comply with S7.4.2(c) of this standard.

(c) As used in this section, “rear outboard designated seating position” means any “outboard designated seating position” (as that term is defined at 49 CFR 571.3) that is rearward of the front seat(s), except any designated seating position adjacent to a walkway that is located between the seat and the near side of the vehicle and is designed to allow access to more rearward seating positions.

S4.1.4.2.1 Any rear outboard designated seating position with a seat that can be adjusted to be forward-facing and to face some other direction shall either:

(i) Meet the requirements of S4.1.4.2 with the seat in any position in which it can be occupied while the vehicle is in motion; or

(ii) When the seat is in its forward-facing position, have a Type 2 seat belt assembly with an upper torso restraint that conforms to S7.1 and S7.2 of this standard and that adjusts by means of an emergency locking retractor that conforms with Standard No. 209 (49 CFR 571.209), which upper torso restraint may be detachable at the buckle, and, when the seat is in any position in which it can be occupied while the vehicle is in motion, have a Type 1 seat belt or the pelvic portion of a Type 2 seat belt assembly that conforms to S7.1 and S7.2 of this standard.

S4.1.4.2.2 Any rear outboard designated seating position on a readily removable seat (that is, a seat designed to be easily removed and replaced by means installed by the manufacturer for that purpose) in a vehicle manufactured on or after September 1, 1992 shall meet the requirements of S4.1.4.2 and may use an upper torso belt that detaches at either its upper or lower anchorage points, but *not* both anchorage points, to meet those requirements. The means for detaching the upper torso belt may use a pushbutton action.

S4.1.5 *Passenger cars manufactured on or after September 1, 1996.*

S4.1.5.1 *Frontal/angular automatic protection system.* (a) Each passenger car manufactured on or after September 1, 1996 shall:

(1) At each front outboard designated seating position meet the frontal crash protection requirements of S5.1 by means that require no action by vehicle occupants;

(2) At any front designated seating positions that are not "outboard designated seating positions," as that term is defined at 49 CFR 571.3, and at any rear designated seating positions that are not "rear outboard designated seating positions," as that term is defined at S4.1.4.2(c) of this standard, have a Type 1 or Type 2 seat belt assembly that conforms to Standard No. 209 and S7.1 and S7.2 of this standard; and

(3) At each front designated seating position that is an "outboard designated seating position," as that term is defined at 49 CFR 571.3, and at each forward-facing rear designated seating position that is a "rear outboard designated seating positions," as that term is defined at S4.1.4.2(c) of this standard, have a Type 2 seat belt assembly that conforms to Standard No. 209 and S7.1 through S7.3 of this standard, and, in the case of the Type 2 seat belt assemblies installed at the front outboard designated seating positions, meet the frontal crash protection requirements with the appropriate anthropomorphic test dummy restrained by the Type 2 seat belt assembly in addition to the means that requires no action by the vehicle occupant.

(b) For the purposes of sections S4.1.5 through S4.1.5.3 and S4.2.6 through S4.2.6.2 of this standard, an *inflatable restraint system* means an air bag that is activated in a crash.

S4.1.5.2 *Passenger cars manufactured on or after September 1, 1996 and before September 1, 1997.*

S4.1.5.2.1 The amount of passenger cars complying with the requirement of S4.1.5.1(a)(1) by means of an inflatable restraint system at the driver's and right front passenger's position shall be not less than 95 percent of the manufacturer's total production of passenger cars manufactured on or after September 1, 1996, and before September 1, 1997. A vehicle shall not be deemed to be in noncompliance with this standard if its manufacturer establishes that it did not have reason to know in the exercise of due care that such vehicle is not in conformity with the requirement of this standard.

S4.1.5.2.2 *Passenger cars produced by more than one manufacturer.*

S4.1.5.2.2.1 For the purpose of calculating the production of passenger cars by each manufacturer during the period specified in S4.1.5.2, a passenger car produced by more than one manufacturer shall be attributed to a single manufacturer as follows, subject to S4.1.5.2.2.2:

(a) A passenger car that is imported into the United States shall be attributed to the importer.

(b) A passenger car manufactured within the United States by more than one manufacturer, one of which also markets the vehicle, shall be attributed to the manufacturer that markets the vehicle.

S4.1.5.2.2.2 A passenger car produced by more than one manufacturer shall be attributed to any one of the vehicle's manufacturers, as specified in an express written contract, reported to the National Highway Traffic Safety Administration pursuant to part 585 of this chapter, between the manufacturer so specified and the manufacturer to which the vehicle otherwise would be attributed, pursuant to S4.1.5.2.2.1.

S4.1.5.3 *Passenger cars manufactured on or after September 1, 1997.* Each passenger car manufactured on or after September 1, 1997 shall comply with the requirement of S4.1.5.1(a)(1) by means of an inflatable restraint system at the driver's and right front passenger's position. A vehicle shall not be deemed to be in noncompliance with this standard if its manufacturer establishes that it did not have reason to know in the exercise of due care that such vehicle is not in conformity with the requirement of this standard.

S4.1.5.4 *Passenger cars certified to S14.* Each passenger car certified to S14 shall, at each front outboard designated seating position, meet the applicable frontal crash protection requirements of S5.1.2(b) by means of an inflatable restraint system that requires no action by vehicle occupants.

S4.1.5.5 *Passenger cars manufactured on or after September 1, 2007.*

S4.1.5.5.1 Except as provided in S4.1.5.5.2, each passenger car shall have a Type 2 seat belt assembly that conforms to Standard No. 209 and to S7.1 and S7.2 of this standard at each rear designated seating position, except that side-facing designated seating positions shall have a

Type 1 or Type 2 seat belt assembly that conforms to Standard No. 209 and to S7.1 and S7.2 of this standard.

S4.1.5.5.2 Any inboard designated seating position on a seat for which the entire seat back can be folded (including the head restraints and any other part of the vehicle attached to the seat back) such that no part of the seat back extends above a horizontal plane located 250 mm above the highest SRP located on the seat may meet the requirements of S4.1.5.5.1 by use of a belt incorporating a release mechanism that detaches both the lap and shoulder portion at either the upper or lower anchorage point, but not both. The means of detachment shall be a key or key-like object.

S4.2 *Trucks and multipurpose passenger vehicles with a GVWR of 10,000 pounds or less.* As used in this section, *vehicles manufactured for operation by persons with disabilities* means vehicles that incorporate a level change device (e.g., a wheelchair lift or a ramp) for onloading or offloading an occupant in a wheelchair, an interior element of design intended to provide the vertical clearance necessary to permit a person in a wheelchair to move between the lift or ramp and the driver's position or to occupy that position, and either an adaptive control or special driver**'s** seating accommodation to enable persons who have limited use of their arms or legs to operate a vehicle. For purposes of this definition, special driver**'s** seating accommodations include a driver's seat easily removable with means installed for that purpose or with simple tools, or a driver's seat with extended adjustment capability to allow a person to easily transfer from a wheelchair to the driver's seat.

S4.2.1 *Trucks and multipurpose passenger vehicles with a GVWR of 10,000 pounds or less, manufactured on or after January 1, 1976 and before September 1, 1991.* Each truck and multipurpose passenger vehicle, with a gross vehicle weight rating of 10,000 pounds or less, manufactured before September 1, 1991, shall meet the requirements of S4.1.2.1, or at the option of the manufacturer, S4.1.2.2 or S4.1.2.3 (as specified for passenger cars), except that forward control vehicles manufactured prior to September 1, 1981, convertibles, open-body type vehicles, walk-in van-type trucks, motor homes, vehicles designed to be exclusively sold to the U.S. Postal Service, and vehicles carrying chassis-mount campers may instead meet the requirements of S4.2.1.1 or S4.2.1.2.

S4.2.1.1 *First option—complete automatic protection system.* The vehicle shall meet the crash protection requirements of S5 by means that require no action by vehicle occupants.

S4.2.1.2 *Second option—belt system.* The vehicle shall have seat belt assemblies that conform to Standard 209 (49 CFR 571.209) installed as follows:

(a) A Type 1 or Type 2 seat belt assembly shall be installed for each designated seating position in convertibles, open-body type vehicles, and walk-in van-type trucks.

(b) In vehicles manufactured for operation by persons with disabilities, a Type 2 or Type 2A seat belt assembly shall be installed for the driver's seating position, a Type 2 seat belt assembly shall be installed for each other outboard designated seating position that includes the windshield

header within the head impact area, and a Type 1 or Type 2 seat belt assembly shall be installed for each other designated seating position.

(c) In all vehicles except those for which requirements are specified in S4.2.1.2 (a) or (b), a Type 2 seat belt assembly shall be installed for each outboard designated seating position that includes the windshield header within the head impact area, and a Type 1 or Type 2 seat belt assembly shall be installed for each other designated seating position.

S4.2.2 *Trucks and multipurpose passenger vehicles with a GVWR of 8,500 pounds or less and an unloaded vehicle weight of 5,500 pounds or less, manufactured on or after September 1, 1991 and before September 1, 1997.* Except as provided in S4.2.4, each truck and multipurpose passenger vehicle, with a gross vehicle weight rating of 8,500 pounds or less and an unloaded vehicle weight of 5,500 pounds or less, manufactured on or after September 1, 1991 and before September 1, 1997, shall meet the requirements of S4.1.2.1, or at the option of the manufacturer, S4.1.2.2 or S4.1.2.3 (as specified for passenger cars), except that convertibles, open-body type vehicles, walk-in van-type trucks, motor homes, vehicles designed to be exclusively sold to the U.S. Postal Service, vehicles carrying chassis-mount campers, and vehicles manufactured for operation by persons with disabilities may instead meet the requirements of S4.2.1.1 or S4.2.1.2. Each Type 2 seat belt assembly installed in a front outboard designated seating position in accordance with S4.1.2.3 shall meet the requirements of S4.6.

S4.2.3 *Trucks and multipurpose passenger vehicles manufactured on or after September 1, 1991 with either a GVWR or more than 8,500 pounds but not greater than 10,000 pounds or with an unloaded vehicle weight greater than 5,500 pounds and a GVWR of 10,000 pounds or less.* Except as provided in S4.2.4, each truck and multipurpose passenger vehicle manufactured on or after September 1, 1991, that has either a gross vehicle weight rating which is greater than 8,500 pounds, but not greater than 10,000 pounds, or has an unloaded vehicle weight greater than 5,500 pounds and a GVWR of 10,000 pounds or less, shall meet the requirements of S4.1.2.1, or at the option of the manufacturer, S4.1.2.2 or S4.1.2.3 (as specified for passenger cars), except that convertibles, open-body type vehicles, walk-in van-type trucks, motor homes, vehicles designed to be exclusively sold to the U.S. Postal Service, and vehicles carrying chassis-mount campers may instead meet the requirements of S4.2.1.1 or S4.2.1.2.

S4.2.4 *Rear outboard seating positions in trucks and multipurpose passenger vehicles manufactured on or after September 1, 1991 with a GVWR of 10,000 pounds or less.* Except as provided in S4.2.4.2 and S4.2.4.3, each truck and each multipurpose passenger vehicle, other than a motor home, manufactured on or after September 1, 1991 that has a gross vehicle weight rating of 10,000 pounds or less shall be equipped with an integral Type 2 seat belt assembly at every forward-facing rear outboard designated seating position. Type 2 seat belt assemblies installed in compliance with this requirement shall comply with Standard No. 209 (49 CFR 571.209) and with S7.1 and S7.2 of this standard. If a Type 2 seat belt assembly installed in compliance with this requirement incorporates any webbing tension-relieving device, the vehicle owner's manual shall include the information specified in S7.4.2(b) of this standard for the tension relieving device, and the vehicle shall comply with S7.4.2(c) of this standard.

S4.2.4.1 As used in this section—

(a) [Reserved]

(b) *Rear outboard designated seating position* means any "outboard designated seating position" (as that term is defined at 49 CFR 571.3) that is rearward of the front seat(s), except any designated seating positions adjacent to a walkway located between the seat and the side of the vehicle, which walkway is designed to allow access to more rearward seating positions.

S4.2.4.2 Any rear outboard designated seating position with a seat that can be adjusted to be forward-facing and to face some other direction shall either:

(i) Meet the requirements of S4.2.4 with the seat in any position in which it can be occupied while the vehicle is in motion; or

(ii) When the seat is in its forward-facing position, have a Type 2 seat belt assembly with an upper torso restraint that conforms to S7.1 and S7.2 of this standard and that adjusts by means of an emergency locking retractor that conforms with Standard No. 209 (49 CFR 571.209), which upper torso restraint may be detachable at the buckle, and, when the seat is in any position in which it can be occupied while the vehicle is in motion, have a Type 1 seat belt or the pelvic portion of a Type 2 seat belt assembly that conforms to S7.1 and S7.2 of this standard.

S4.2.4.3 Any rear outboard designated seating position on a readily removable seat (that is, a seat designed to be easily removed and replaced by means installed by the manufacturer for that purpose) in a vehicle manufactured on or after September 1, 1992 shall meet the requirements of S4.2.4 and may use an upper torso belt that detaches at either its upper or lower anchorage point, but not both anchorage points, to meet those requirements. The means for detaching the upper torso belt may use a pushbutton action.

S4.2.5 *Trucks, buses, and multipurpose passenger vehicles with a GVWR of 8,500 pounds or less and an unloaded vehicle weight of 5,500 pounds or less manufactured on or after September 1, 1994, and before September 1, 1997.*

S4.2.5.1 *Trucks, buses, and multipurpose passenger vehicles with a GVWR of 8,500 pounds or less and an unloaded vehicle weight of 5,500 pounds or less manufactured on or after September 1, 1994, and before September 1, 1995.*

S4.2.5.1.1 Subject to S4.2.5.1.2 and S4.2.5.5 and except as provided in S4.2.4, each truck, bus and multipurpose passenger vehicle, other than walk-in van-type trucks, vehicles designed to be exclusively sold to the U.S. Postal Service, and vehicles manufactured for operation by persons with disabilities, with a GVWR of 8,500 pounds or less and an unloaded vehicle weight of 5,500 pounds or less that is manufactured on or after September 1, 1994 and before September 1, 1995, shall comply with the requirements of S4.1.2.1, S4.1.2.2, or S4.1.2.3 (as specified for passenger cars). A vehicle shall not be deemed to be in noncompliance with this standard if its manufacturer establishes that it did not have reason to know in the exercise of due care that such vehicle is not in conformity with the requirement of standard.

S4.2.5.1.2 Subject to S4.2.5.5, the amount of trucks, buses, and multipurpose passenger vehicles specified in S4.2.5.1.1 complying with S4.1.2.1 (as specified for passenger cars) shall be not less than 20 percent of:

(a) The average annual production of trucks, buses, and multipurpose passenger vehicles with a GVWR of 8,500 pounds or less and an unloaded vehicle weight of 5,500 pounds or less manufactured on or after September 1, 1991, and before September 1, 1994, by each manufacturer that produced such vehicles during each of those annual production periods, or

(b) The manufacturer's total production of trucks, buses, and multipurpose passenger vehicle with a GVWR of 8,500 pounds or less and an unloaded vehicle weight of 5,500 pounds or less during the period specified in S4.2.5.1.1.

S4.2.5.2 *Trucks, buses, and multipurpose passenger vehicles with a GVWR of 8,500 pounds or less and an unloaded vehicle weight of 5,500 pounds or less manufactured on or after September 1, 1995 and before September 1, 1996.*

S4.2.5.2.1 Subject to S4.2.5.2.2 and S4.2.5.5 and except as provided in S4.2.4, each truck, bus, and multipurpose passenger vehicle, other than walk-in van-type trucks, vehicles designed to be exclusively sold to the U.S. Postal Service, and vehicles manufactured for operation by persons with disabilities, with a GVWR of 8,500 pounds or less and an unloaded vehicle weight of 5,500 pounds or less that is manufactured on or after September 1, 1995 and before September 1, 1996, shall comply with the requirements of S4.1.2.1, S4.1.2.2, or S4.1.2.3 (as specified for passenger cars). A vehicle shall not be deemed to be in noncompliance with this standard if its manufacturer establishes that it did not have reason to know in the exercise of due care that such vehicle is not in conformity with the requirement of this standard.

S4.2.5.2.2 Subject to S4.2.5.5, the amount of trucks, buses, and multipurpose passenger vehicles specified in S4.2.5.2.1 complying with S4.1.2.1 (as specified for passenger cars) shall be not less than 50 percent of:

(a) The average annual production of trucks, buses, and multipurpose passenger vehicles with a GVWR of 8,500 pounds or less and an unloaded vehicle weight of 5,500 pounds or less manufactured on or after September 1, 1992, and before September 1, 1995, by each manufacturer that produced such vehicles during each of those annual production periods, or

(b) The manufacturer's total production of trucks, buses, and multipurpose passenger vehicles with a GVWR of 8,500 pounds or less and an unloaded vehicle weight of 5,500 pounds or less during the period specified in S4.2.5.2.1.

S4.2.5.3 *Trucks, buses, and multipurpose passenger vehicles with a GVWR of 8,500 pounds or less and an unloaded vehicle weight of 5,500 pounds or less manufactured on or after September 1, 1996 and before September 1, 1997.*

S4.2.5.3.1 Subject to S4.2.5.3.2 and S4.2.5.5 and except as provided in S4.2.4, each truck, bus, and multipurpose passenger vehicle, other than walk-in van-type trucks, vehicles designed to be

exclusively sold to the U.S. Postal Service, and vehicles manufactured for operation by persons with disabilities, with a GVWR of 8,500 pounds or less and an unloaded vehicle weight of 5,500 pounds or less that is manufactured on or after September 1, 1996 and before September 1, 1997, shall comply with the requirements of S4.1.2.1, S4.1.2.2, or S4.1.2.3 (as specified for passenger cars). A vehicle shall not be deemed to be in noncompliance with this standard if its manufacturer establishes that it did not have reason to know in the exercise of due care that such vehicle is not in conformity with the requirement of this standard.

S4.2.5.3.2 Subject to S4.2.5.5, the amount of trucks, buses, and multipurpose passenger vehicles specified in S4.2.5.3.1 complying with S4.1.2.1 (as specified for passenger cars) shall be not less than 90 percent of:

(a) The average annual production of trucks, buses, and multipurpose passenger vehicles with a GVWR of 8,500 pounds or less and an unloaded vehicle weight of 5,500 pounds or less manufactured on or after September 1, 1993, and before September 1, 1996, by each manufacturer that produced such vehicles during each of those annual production periods, or

(b) The manufacturer's total production of trucks, buses, and multipurpose passenger vehicles with a GVWR of 8,500 pounds or less and an unloaded vehicle weight of 5,500 pounds or less during the period specified in S4.2.5.3.1.

S4.2.5.4 *Alternative phase-in schedule.* A manufacturer may, at its option, comply with the requirements of this section instead of complying with the requirements set forth in S4.2.5.1, S4.2.5.2, and S4.2.5.3.

(a) Except as provided in S4.2.4, each truck, bus, and multipurpose passenger vehicle, other than walk-in van-type trucks, vehicles designed to be exclusively sold to the U.S. Postal Service, and vehicles manufactured for operation by persons with disabilities, with a GVWR of 8,500 pounds or less and an unloaded vehicle weight of 5,500 pounds or less that is manufactured on or after September 1, 1994 and before September 1, 1995 shall comply with the requirements of S4.1.2.1, S4.1.2.2, or S4.1.2.3 (as specified for passenger cars).

(b) Except as provided in S4.2.4, each truck, bus, and multipurpose passenger vehicle, other than walk-in van-tape trucks, vehicles designed to be exclusively sold to the U.S. Postal Service, and vehicles manufactured for operation by persons with disabilities, with a GVWR of 8,500 pounds or less and an unloaded vehicle weight of 5,500 pounds or less that is manufactured on or after September 1, 1995 shall comply with the requirements of S4.1.2.1 (as specified for passenger cars) of this standard. A vehicle shall not be deemed to be in noncompliance with this standard if its manufacturer establishes that it did not have reason to know in the exercise of due care that such vehicle is not in conformity with the requirement of this standard.

(c) Each truck, bus, and multipurpose passenger vehicle with a GVWR of 8,500 pounds or less and an unloaded vehicle weight of 5,500 pounds or less manufactured on or after September 1, 1995, but before September 1, 1998, whose driver's seating position complies with the requirements of S4.1.2.1(a) of this standard by means not including any type of seat belt and whose right front passenger~~'s~~ seating position is equipped with a manual Type 2 seat belt that

complies with S5.1 of this standard, with the seat belt assembly adjusted in accordance with S7.4.2, shall be counted as a vehicle complying with S4.1.2.1.

S4.2.5.5 *Calculation of complying trucks, buses, and multipurpose passenger vehicles with a GVWR of 8,500 pounds or less and an unloaded vehicle weight of 5,500 pounds or less.*

(a) For the purposes of the calculations required in S4.2.5.1.2, S4.2.5.2.2, and S4.2.5.3.2 of the number of trucks, buses, and multipurpose passenger vehicles with a GVWR of 8,500 pounds or less and an unloaded vehicle weight of 5,500 pounds or less that comply with S4.1.2.1 (as specified for passenger cars):

(1) Each truck, bus, and multipurpose passenger vehicle with a GVWR of 8,500 pounds or less and an unloaded vehicle weight of 5,500 pounds or less whose driver's seating position complies with the requirements of S4.1.2.1(a) by means not including any type of seat belt and whose front right seating position complies with the requirements of S4.1.2.1(a) by any means is counted as 1.5 vehicles, and

(2) Each truck, bus, and multipurpose passenger vehicle with a GVWR of 8,500 pounds or less and an unloaded vehicle weight of 5,500 pounds or less whose driver's seating position complies with the requirements of S4.1.2.1(a) by means not including any type of seat belt and whose right front passenger~~'s~~ seating position is equipped with a manual Type 2 seat belt that complies with S5.1 of this standard, with the seat belt assembly adjusted in accordance with S7.4.2, is counted as one vehicle.

(3) Each truck, bus, and multipurpose passenger vehicle with a GVWR of 8,500 pounds or less and an unloaded vehicle weight of 5,500 pounds or less that is manufactured in two or more stages or that is altered (within the meaning of §567.7 of this chapter) after having previously been certified in accordance with part 567 of this chapter is not subject to the requirements of S4.2.5.1.2, S4.2.5.2.2, and S4.2.5.3.2. Such vehicles may be excluded from all calculations of compliance with S4.2.5.1.2, S4.2.5.2.2, and S4.2.5.3.2.

(b) For the purposes of complying with S4.2.5.1.2, a truck, bus, or multipurpose passenger vehicle with a GVWR of 8,500 pounds or less and an unloaded vehicle weight of 5,500 pounds or less may be counted if it:

(1) Is manufactured on or after September 1, 1992, but before September 1, 1994, and

(2) Is certified as complying with S4.1.2.1 (as specified for passenger cars).

(c) For the purposes of complying with S4.2.5.2.2, a truck, bus, or multipurpose passenger vehicle with a GVWR of 8,500 pounds or less and an unloaded vehicle weight of 5,500 pounds or less may be counted if it:

(1) Is manufactured on or after September 1, 1992, but before September 1, 1995,

(2) Is certified as complying with S4.1.2.1 (as specified for passenger cars), and

(3) Is not counted toward compliance with S4.2.5.1.2.

(d) For the purposes of complying with S4.2.5.3.2, a truck, bus, or multipurpose passenger vehicle with a GVWR of 8,500 pounds or less and an unloaded vehicle weight of 5,500 pounds or less may be counted if it:

(1) Is manufactured on or after September 1, 1992, but before September 1, 1996,

(2) Is certified as complying with S4.1.2.1 (as specified for passenger cars), and

(3) Is not counted toward compliance with S4.2.5.1.2 or S4.2.5.2.2.

S4.2.5.6 *Trucks, buses, and multipurpose passenger vehicles with a GVWR of 8,500 pounds or less and an unloaded vehicle weight of 5,500 pounds or less produced by more than one manufacturer.*

S4.2.5.6.1 For the purposes of calculating average annual production for each manufacturer and the amount of vehicles manufactured by each manufacturer under S4.2.5.1.2, S4.2.5.2.2, or S4.2.5.3.2, a truck, bus, or multipurpose passenger vehicle with a GVWR of 8,500 pounds or less and an unloaded vehicle weight of 5,500 pounds or less produced by more than one manufacturer shall be attributed to a single manufacturer as follows, subject to S4.2.5.6.2:

(a) A vehicle that is imported shall be attributed to the importer.

(b) A vehicle that is manufactured in the United States by more than one manufacturer, one of which also markets the vehicle, shall be attributed to the manufacturer that markets the vehicle.

S4.2.5.6.2 A truck, bus, or multipurpose passenger vehicle with, GVWR of 8,500 pounds or less and an unloaded vehicle weight of 5,500 pounds or less produced by more than one manufacturer shall be attributed to any one of the vehicle's manufacturers specified in an express written contract, reported to the National Highway Traffic Safety Administration under 49 CFR part 585, between the manufacturer so specified and the manufacturer to which the vehicle would otherwise be attributed under S4.2.5.6.1 of this standard.

S4.2.6 *Trucks, buses, and multipurpose passenger vehicles with a GVWR of 8,500 pounds or less and an unloaded vehicle weight of 5,500 pounds or less manufactured on or after September 1, 1997.* Each truck, bus, and multipurpose passenger vehicle with a GVWR of 8,500 pounds or less and an unloaded vehicle weight of 5,500 pounds or less, which is manufactured on or after September 1, 1997, shall comply with the requirements of S4.1.5.1 of this standard (as specified for passenger cars), except that walk-in van-type trucks and vehicles designed to be sold exclusively to the U.S. Postal Service may meet the requirements of S4.2.1.1 or S4.2.1.2 of this standard instead of the requirements of S4.1.5.1.

S4.2.6.1 *Trucks, buses, and multipurpose passenger vehicles with a GVWR of 8,500 pounds or less and an unloaded vehicle weight of 5,500 pounds or less manufactured on or after September 1, 1997 and before September 1, 1998.*

S4.2.6.1.1 The amount of trucks, buses, and multipurpose passenger vehicles complying with the requirements of S4.1.5.1(a)(1) of this standard by means of an inflatable restraint system shall be not less than 80 percent of the manufacturer's total combined production of subject vehicles manufactured on or after September 1, 1997 and before September 1, 1998. Each truck, bus, or multipurpose passenger vehicle with a GVWR of 8,500 pounds or less and an unloaded vehicle weight of 5,500 pounds or less manufactured on or after September 1, 1997 and before September 1, 1998, whose driver's seating position complies with S4.1.5.1(a)(1) by means of an inflatable restraint system and whose right front passenger~~'s~~ seating position is equipped with a manual Type 2 seat belt assembly that complies with S5.1 of this standard, with the seat belt assembly adjusted in accordance with S7.4.2 of this standard, shall be counted as a vehicle complying with S4.1.5.1(a)(1) by means of an inflatable restraint system. A vehicle shall not be deemed to be in noncompliance with this standard if its manufacturer establishes that it did not have reason to know in the exercise of due care that such vehicle is not in conformity with the requirement of this standard.

S4.2.6.1.2 *Trucks, buses, and multipurpose passenger vehicles with a GVWR of 8,500 pounds or less and an unloaded vehicle weight of 5,500 pounds or less produced by more than one manufacturer.*

S4.2.6.1.2.1 For the purpose of calculating the production by each manufacturer during the period specified in S4.2.6.1.1, a truck, bus, or multipurpose passenger vehicle with a GVWR of 8,500 pounds or less and an unloaded vehicle weight of 5,500 pounds or less produced by more than one manufacturer shall be attributed to a single manufacturer as follows, subject to S4.2.6.1.2.2:

(a) A vehicle that is imported into the United States shall be attributed to the importer.

(b) A vehicle manufactured within the United States by more than one manufacturer, one of which also markets the vehicle, shall be attributed to the manufacturer that markets the vehicle.

S4.2.6.1.2.2 A truck, bus, or multipurpose passenger vehicle produced by more than one manufacturer shall be attributed to any one of the vehicle's manufacturers, as specified in an express written contract, reported to the National Highway Traffic Safety Administration pursuant to part 585 of this chapter, between the manufacturer so specified and the manufacturer to which the vehicle otherwise would be attributed, pursuant to S4.2.6.1.2.1.

S4.2.6.2 *Trucks, buses, and multipurpose passenger vehicles with a GVWR of 8,500 pounds or less and an unloaded vehicle weight of 5,500 pounds or less manufactured on or after September 1, 1998.* Each truck, bus, or multipurpose vehicle with a GVWR of 8,500 pounds or less and an unloaded vehicle weight of 5,500 pounds or less manufactured on or after September 1, 1998 shall comply with the requirement of S4.1.5.1(a)(1) by means of an inflatable restraint system at the driver's and right front passenger's position. A vehicle shall not be deemed to be in noncompliance with this standard if its manufacturer establishes that it did not have reason to know in the exercise of due care that such vehicle is not in conformity with the requirement of this standard.

S4.2.6.3 *Trucks, buses, and multipurpose passenger vehicles certified to S14.* Each truck, bus, or multipurpose passenger vehicle with a GVWR of 3,855 kg (8,500 lb) or less and an unloaded vehicle weight of 2,495 kg (5,500 lb) or less certified to S14 shall, at each front outboard designated seating position, meet the applicable frontal crash protection requirements of S5.1.2(b) by means of an inflatable restraint system that requires no action by vehicle occupants.

S4.2.7 *Rear seating positions in trucks, and multipurpose passenger vehicles manufactured on or after September 1, 2007 with a GVWR of 10,000 lbs. (4,536 kg) or less.*

S4.2.7.1 Except as provided in S4.2.7.2, S4.2.7.3, S4.2.7.4, S4.2.7.5, and S4.2.7.6, each truck and each multipurpose passenger vehicle, other than a motor home, a walk-in van-type truck, or a vehicle designed to be sold exclusively to the U.S. Postal Service with a GVWR of 10,000 lbs. (4,536 kg) or less, or a vehicle carrying chassis-mount camper with a gross vehicle weight rating of 8,500-10,000 lbs. (3,855-4,536 kg), shall be equipped with a Type 2 seat belt assembly at every rear designated seating position other than a side-facing position, except that Type 2 seat belt assemblies installed in compliance with this requirement shall conform to Standard No. 209 (49 CFR 571.209) and with S7.1 and S7.2 of this standard. If a Type 2 seat belt assembly installed in conformity to this requirement incorporates any webbing tension-relieving device, the vehicle owner's manual shall include the information specified in S7.4.2(b) of this standard for the tension relieving device, and the vehicle shall conform to S7.4.2(c) of this standard. Side-facing designated seating positions shall be equipped, at the manufacturer's option, with a Type 1 or Type 2 seat belt assembly that conforms with S7.1 and S7.2 of this standard.

S4.2.7.2 Any rear designated seating position with a seat that can be adjusted to be forward-or rear-facing and to face some other direction shall either:

(a) Meet the requirements of S4.2.7.1 with the seat in any position in which it can be occupied while the vehicle is in motion; or

(b) When the seat is in its forward-facing and/or rear-facing position or within ±30 degrees of either position, have a Type 2 seat belt assembly with an upper torso restraint that conforms to S7.1 and S7.2 of this standard and that adjusts by means of an emergency locking retractor that conforms to Standard No. 209 (49 CFR 571.209), which upper torso restraint may be detachable at either the buckle or the upper anchorage, but not both, and, when the seat is in any other position in which it can be occupied while the vehicle is in motion, have a Type 1 seat belt or the pelvic portion of a Type 2 seat belt assembly that conforms to S7.1 and S7.2 of this standard.

S4.2.7.3 Any rear designated seating position on a readily removable seat (i.e., a seat designed to be easily removed and replaced by means installed by the manufacturer for that purpose) may meet the requirements of S4.2.7.1 by use of a belt incorporating a release mechanism that detaches both the lap and shoulder portion at either the upper or lower anchorage point, but not both. The means of detachment shall be a key or key-like object.

S4.2.7.4 Any inboard designated seating position on a seat for which the entire seat back can be folded such that no part of the seat back extends above a horizontal plane located 250 mm above the highest SRP located on the seat may meet the requirements of S4.2.7.1 by use of a belt

incorporating a release mechanism that detaches both the lap and shoulder portion at either the upper or lower anchorage point, but not both. The means of detachment shall be a key or key-like object.

S4.2.7.5 Any rear designated seating position adjacent to a walkway located between the seat and the side of the vehicle, which walkway is designed to allow access to more rearward designated seating positions may meet the requirements of S4.2.7.1 by use of a belt incorporating a release mechanism that detaches both the lap and shoulder portion at either the upper or lower anchorage point, but not both. The means of detachment shall be a key or key-like object.

S4.2.7.6 Any rear side-facing designated seating position shall have a Type 1 or Type 2 seat belt assembly that conforms to S7.1 and S7.2 of this standard.

S4.3 *Trucks and multipurpose passenger vehicles, with GVWR of more than 10,000 pounds.*

S4.3.1 *Trucks and multipurpose passenger vehicles with a GVWR of more than 10,000 pounds, manufactured in or after January 1, 1972 and before September 1, 1990.* Each truck and multipurpose passenger vehicle with a gross vehicle weight rating of more than 10,000 pounds, manufactured on or after January 1, 1972 and before September 1, 1990, shall meet the requirements of S4.3.1.1 or S4.3.1.2. A protection system that meets the requirements of S4.3.1.1 may be installed at one or more designated seating positions of a vehicle that otherwise meets the requirements of S4.3.1.2.

S4.3.1.1 *First option—complete passenger protection system.* The vehicle shall meet the crash protection requirements of S5 by means that require no action by vehicle occupants.

S4.3.1.2 *Second option—belt system.* The vehicle shall, at each designated seating position, have either a Type 1 or a Type 2 seat belt assembly that conforms to S571.209.

S4.3.2 *Trucks and multipurpose passenger vehicles with a GVWR of more than 10,000 pounds, manufactured on or after September 1, 1990.* Each truck and multipurpose passenger vehicle with a gross vehicle weight rating of more than 10,000 pounds, manufactured on or after September 1, 1990, shall meet the requirements of S4.3.2.1 or S4.3.2.2. A protection system that meets the requirements of S4.3.2.1 may be installed at one or more designated seating positions of a vehicle that otherwise meets the requirements of S4.3.2.2.

S4.3.2.1 *First option—complete passenger protection system.* The vehicle shall meet the crash protection requirements of S5 by means that require no action by vehicle occupants.

S4.3.2.2 *Second option—belt system.* The vehicle shall, at each designated seating position, have either a Type 1 or a Type 2 seat belt assembly that conforms to §571.209 of this part and S7.2 of this Standard. A Type 1 belt assembly or the pelvic portion of a dual retractor Type 2 belt assembly installed at a front outboard seating position shall include either an emergency locking retractor or an automatic locking retractor. If a seat belt assembly installed at a front outboard seating position includes an automatic locking retractor for the lap belt or the lap belt portion, that seat belt assembly shall comply with the following:

(a) An automatic locking retractor used at a front outboard seating position that has some type of suspension system for the seat shall be attached to the seat structure that moves as the suspension system functions.

(b) The lap belt or lap belt portion of a seat belt assembly equipped with an automatic locking retractor that is installed at a front outboard seating position must allow at least ¾ inch, but less than 3 inches, of webbing movement before retracting webbing to the next locking position.

(c) Compliance with S4.3.2.2(b) of this standard is determined as follows:

(1) The seat belt assembly is buckled and the retractor end of the seat belt assembly is anchored to a horizontal surface. The webbing for the lap belt or lap belt portion of the seat belt assembly is extended to 75 percent of its length and the retractor is locked after the initial adjustment.

(2) A load of 20 pounds is applied to the free end of the lap belt or the lap belt portion of the belt assembly (i.e., the end that is not anchored to the horizontal surface) in the direction away from the retractor. The position of the free end of the belt assembly is recorded.

(3) Within a 30 second period, the 20 pound load is slowly decreased, until the retractor moves to the next locking position. The position of the free end of the belt assembly is recorded again.

(4) The difference between the two positions recorded for the free end of the belt assembly shall be at least ¾ inch but less than 3 inches.

S4.4 Buses manufactured on or after November 28, 2016.

S4.4.1 *Definitions.* For purposes of S4.4, the following definitions apply:

*Over-the-road bus* means a bus characterized by an elevated passenger deck located over a baggage compartment, except a school bus.

*Perimeter-seating bus* means a bus**, which is not an over-the-road bus, that has**~~with~~ 7 or fewer designated seating positions **that are forward-facing or can convert to forward-facing without the use of tools, and are** rearward of the driver's **designated** seating position **or rearward of the outboard designated seating positions in the front row of seats, if there is no driver's designated seating position**~~that are forward-facing or can convert to forward-facing without the use of tools and is not an over-the-road bus~~.

*Prison bus* means a bus manufactured for the purpose of transporting persons subject to involuntary restraint or confinement and has design features consistent with that purpose.

*Stop-request system* means a vehicle-integrated system for passenger use to signal to a vehicle operator that they are requesting a stop.

*Transit bus* means a bus that is equipped with a stop-request system sold for public transportation provided by, or on behalf of, a State or local government and that is not an over-the-road bus.

S4.4.2 *Buses with a GVWR of 3,855 kg (8,500 lb) or less and an unloaded vehicle weight of 2,495 kg (5,500 lb) or less.*

S4.4.2.1 Each bus with a GVWR of 3,855 kg (8,500 lb) or less and an unloaded vehicle weight of 2,495 kg (5,500 lb) or less, except a school bus, shall comply with the requirements of S4.2.6 of this standard for front seating positions and with the requirements of S4.4.3.1 of this standard for all rear seating positions.

S4.4.2.2 Each school bus with a GVWR of 3,855 kg (8,500 lb) or less and an unloaded vehicle weight of 2,495 kg (5,500 lb) or less shall comply with the requirements of S4.2.6 of this standard for front seating positions and with the requirements of S4.4.3.2 of this standard for all rear seating positions.

S4.4.3 *Buses with a GVWR of 4,536 kg (10,000 lb) or less.*

S4.4.3.1 Except as provided in S4.4.3.1.1, S4.4.3.1.2, S4.4.3.1.3, S4.4.3.1.4 and S4.4.3.1.5, each bus with a gross vehicle weight rating of 4,536 kg (10,000 lb) or less, except a school bus or an over-the-road bus, shall be equipped with a Type 2 seat belt assembly at every designated seating position other than a side-facing position. Type 2 seat belt assemblies installed in compliance with this requirement shall conform to Standard No. 209 (49 CFR 571.209) and with S7.1 and S7.2 of this standard. If a Type 2 seat belt assembly installed in compliance with this requirement incorporates a webbing tension relieving device, the vehicle owner's manual shall include the information specified in S7.4.2(b) of this standard for the tension relieving device, and the vehicle shall conform to S7.4.2(c) of this standard. Side-facing designated seating positions shall be equipped, at the manufacturer's option, with a Type 1 or Type 2 seat belt assembly.

S4.4.3.1.1 Any rear designated seating position with a seat that can be adjusted to be forward- or rear-facing and to face some other direction shall either:

(a) Meet the requirements of S4.4.3.1 with the seat in any position in which it can be occupied while the vehicle is in motion, or meet S4.4.3.1.1(b)(1) and S4.4.3.1.1(b)(2).

(b)(1) When the seat is in its forward-facing and/or rear-facing position, or within ±30 degrees of either position, have a Type 2 seat belt assembly with an upper torso restraint that

(i) Conforms to S7.1 and S7.2 of this standard,

(ii) Adjusts by means of an emergency locking retractor conforming to Standard No. 209 (49 CFR 571.209), and

(iii) May be detachable at the buckle or upper anchorage, but not both.

(2) When the seat is in any position in which it can be occupied while the vehicle is in motion, have a Type 1 seat belt or the pelvic portion of a Type 2 seat belt assembly that conforms to S7.1 and S7.2 of this standard.

S4.4.3.1.2 Any rear designated seating position on a readily removable seat (that is, a seat designed to be easily removed and replaced by means installed by the manufacturer for that purpose) may meet the requirements of S4.4.3.1 by use of a belt incorporating a release mechanism that detaches both the lap and shoulder portion at either the upper or lower anchorage point, but not both. The means of detachment shall be a key or key-like object.

S4.4.3.1.3 Any inboard designated seating position on a seat for which the entire seat back can be folded such that no part of the seat back extends above a horizontal plane located 250 mm above the highest SRP located on the seat may meet the requirements of S4.4.3.1 by use of a belt incorporating a release mechanism that detaches both the lap and shoulder portion at either the upper or lower anchorage point, but not both. The means of detachment shall be a key or key-like object.

S4.4.3.1.4 Any rear designated seating position adjacent to a walkway located between the seat, which walkway is designed to allow access to more rearward designated seating positions, and not adjacent to the side of the vehicle may meet the requirements of S4.4.3.1 by use of a belt incorporating a release mechanism that detaches both the lap and shoulder portion at either the upper or lower anchorage point, but not both. The means of detachment shall be a key or key-like object.

S4.4.3.1.5 Any rear side-facing designated seating position shall be equipped with a Type 1 or Type 2 seat belt assembly that conforms to S7.1 and S7.2 of this standard.

S4.4.3.2 Each school bus with a gross vehicle weight rating of 4,536 kg (10,000 pounds) or less shall comply with the requirements of S4.4.3.2.1 and S4.4.3.2.2.

S4.4.3.2.1 The driver's designated seating position and any outboard designated seating position not rearward of the driver's seating position shall be equipped with a Type 2 seat belt assembly. **For a school bus without a driver's designated seating position, the outboard designated seating positions in the front row of seats shall be equipped with Type 2 seat belt assemblies.** The seat belt assembly shall comply with Standard No. 209 (49 CFR 571.209) and with S7.1 and S7.2 of this standard. The lap belt portion of the seat belt assembly shall include either an emergency locking retractor or an automatic locking retractor. An automatic locking retractor shall not retract webbing to the next locking position until at least ¾ ; inch of webbing has moved into the retractor. In determining whether an automatic locking retractor complies with this requirement, the webbing is extended to 75 percent of its length and the retractor is locked after the initial adjustment. If the seat belt assembly installed in compliance with this requirement incorporates any webbing tension-relieving device, the vehicle owner's manual shall include the information specified in S7.4.2(b) of this standard for the tension-relieving device, and the vehicle shall comply with S7.4.2(c) of this standard.

S4.4.3.2.2 Passenger seating positions, other than **those specified in S4.4.3.2.1**~~any outboard designated seating position not rearward of the driver's seating position~~, shall be equipped with Type 2 seat belt assemblies that comply with the requirements of S7.1.1.5, S7.1.5 and S7.2 of this standard.

S4.4.3.3 Each over-the-road-bus with a GVWR of 4,536 kg (10,000 lb) or less shall meet the requirements of S4.4.5.1 (as specified for buses with a GVWR or more than 11,793 kg (26,000 lb)).

S4.4.4 *Buses with a GVWR of more than 4,536 kg (10,000 lb) but not greater than 11,793 kg (26,000 lb).*

S4.4.4.1 Each bus with a GVWR of more than 4,536 kg (10,000 lb) but not greater than 11,793 kg (26,000 lb), except a school bus or an over-the-road bus, shall meet the requirements of S4.4.4.1.1 or S4.4.4.1.2.

S4.4.4.1.1 *First option—complete passenger protection system—driver only.* The vehicle shall meet the crash protection requirements of S5, with respect to an anthropomorphic test dummy in the driver's designated seating position, by means that require no action by vehicle occupants.

S4.4.4.1.2 *Second option—belt system~~—driver only~~.* The vehicle shall, at the driver's designated seating position **and all designated seating positions in the front row of seats, if there is no driver's designated seating position**, be equipped with either a Type 1 or a Type 2 seat belt assembly that conforms to §571.209 of this part and S7.2 of this Standard. A Type 1 belt assembly or the pelvic portion of a dual retractor Type 2 belt assembly installed at the**se** ~~driver's~~ seating position shall include either an emergency locking retractor or an automatic locking retractor. If a seat belt assembly ~~installed at the driver's seating position~~ includes an automatic locking retractor for the lap belt or the lap belt portion, that seat belt assembly shall comply with the following:

(a) An automatic locking retractor used at a driver's seating position that has some type of suspension system for the seat shall be attached to the seat structure that moves as the suspension system functions.

(b) The lap belt or lap belt portion of a seat belt assembly equipped with an automatic locking retractor that is installed at the driver's seating position must allow at least ¾ ; inch, but less than 3 inches, of webbing movement before retracting webbing to the next locking position.

(c) Compliance with S4.4.4.2.1(b) of this standard is determined as follows:

(1) The seat belt assembly is buckled and the retractor end of the seat belt assembly is anchored to a horizontal surface. The webbing for the lap belt or lap belt portion of the seat belt assembly is extended to 75 percent of its length and the retractor is locked after the initial adjustment.

(2) A load of 20 pounds is applied to the free end of the lap belt or the lap belt portion of the belt assembly (i.e., the end that is not anchored to the horizontal surface) in the direction away from the retractor. The position of the free end of the belt assembly is recorded.

(3) Within a 30 second period, the 20 pound load is slowly decreased, until the retractor moves to the next locking position. The position of the free end of the belt assembly is recorded again.

(4) The difference between the two positions recorded for the free end of the belt assembly shall be at least ¾ ; inch but less than 3 inches.

S4.4.4.2 Each school bus with a GVWR of more than 4,536 kg (10,000 lb) but not greater than 11,793 kg (26,000 lb) shall be equipped with a Type 2 seat belt assembly at the driver's designated seating position **and all designated seating positions in the front row of seats, if there is no driver's designated seating position**. The seat belt assembly shall comply with Standard No. 209 (49 CFR 571.209) and with S7.1 and S7.2 of this standard. If a seat belt assembly installed in compliance with this requirement includes an automatic locking retractor for the lap belt portion, that seat belt assembly shall comply with paragraphs (a) through (c) of S4.4.4.1.2 of this standard. If a seat belt assembly installed in compliance with this requirement incorporates any webbing tension-relieving device, the vehicle owner's manual shall include the information specified in S7.4.2(b) of this standard for the tension-relieving device, and the vehicle shall comply with S7.4.2(c) of this standard.

S4.4.4.3 Each over-the-road-bus with a GVWR of more than 4,536 kg (10,000 lb) but not greater than 11,793 kg (26,000 lb) shall meet the requirements of S4.4.5.1 (as specified for buses with a GVWR or more than 11,793 kg (26,000 lb)).

S4.4.5 *Buses with a GVWR of more than 11,793 kg (26,000 lb).*

S4.4.5.1 Each bus with a GVWR of more than 11,793 kg (26,000 lb), except a perimeter-seating bus, transit bus, or school bus, shall comply with the requirements of S4.4.5.1.1 and S4.4.5.1.2.

S4.4.5.1.1 The driver's designated seating position and any outboard designated seating position not rearward of the driver's seating position shall be equipped with a Type 2 seat belt assembly. The seat belt assembly shall comply with Standard No. 209 (49 CFR 571.209) and with S7.1 and S7.2 of this standard. **For a bus without a driver's designated seating position, any outboard designated seating positions in the front row of seats, shall be equipped with Type 2 seat belt assemblies.** If a seat belt assembly installed in compliance with this requirement includes an automatic locking retractor for the lap belt portion, that seat belt assembly shall comply with paragraphs (a) through (c) of S4.4.4.1.2 of this standard. If a seat belt assembly installed in compliance with this requirement incorporates any webbing tension-relieving device, the vehicle owner's manual shall include the information specified in S7.4.2(b) of this standard for the tension-relieving device, and the vehicle shall comply with S7.4.2(c) of this standard.

S4.4.5.1.2 Passenger seating positions, other than **those specified in S4.4.5.1.1**~~any outboard designated seating position not rearward of the driver's seating position~~ and seating positions on prison buses rearward of the driver's seating position, shall:

(a) Other than for over-the-road buses:

(i) Be equipped with a Type 2 seat belt assembly at any seating position that is not a side-facing position;

(ii) Be equipped with a Type 1 or Type 2 seat belt assembly at any seating position that is a side-facing position;

(c) For over-the-road buses, be equipped with a Type 2 seat belt assembly;

(d) Have the seat belt assembly attached to the seat structure at any seating position that has another seating position, wheelchair position, or side emergency door behind it; and

(e) Comply with the requirements of S7.1.1.5, **S7.1.1.6,** S7.1.3, ~~S7.1.6~~ and S7.2 of this standard.

S4.4.5.2 Each perimeter-seating bus and transit bus with a GVWR of more than 11,793 kg (26,000 lb) shall meet the requirements of S4.4.4.1.1 or S4.4.4.1.2 (as specified for buses with a GVWR of more than 4,536 kg (10,000 lb) but not greater than 11,793 kg (26,000 lb)).

S4.4.5.3 Each school bus with a GVWR of more than 11,793 kg (26,000 lb) shall be equipped with a Type 2 seat belt assembly at the driver's designated seating position **and all designated seating positions in the front row of seats, if there is no driver's designated seating position**. The seat belt assembly shall comply with Standard No. 209 (49 CFR 571.209) and with S7.1 and S7.2 of this standard. If a seat belt assembly installed in compliance with this requirement includes an automatic locking retractor for the lap belt portion, that seat belt assembly shall comply with paragraphs (a) through (c) of S4.4.4.1.2 of this standard. If a seat belt assembly installed in compliance with this requirement incorporates any webbing tension-relieving device, the vehicle owner's manual shall include the information specified in S7.4.2(b) of this standard for the tension-relieving device, and the vehicle shall comply with S7.4.2(c) of this standard.

S4.5 *Other general requirements.*

S4.5.1 *Labeling and owner's manual information.*

(a) *Air bag maintenance or replacement information.* If the vehicle manufacturer recommends periodic maintenance or replacement of an inflatable restraint system, as that term is defined in S4.1.5.1(b) of this standard, installed in a vehicle, that vehicle shall be labeled with the recommended schedule for maintenance or replacement. The schedule shall be specified by month and year, or in terms of vehicle mileage, or by intervals measured from the date appearing on the vehicle certification label provided pursuant to 49 CFR part 567. The label shall be permanently affixed to the vehicle within the passenger compartment and lettered in English in block capital and numerals not less than three thirty-seconds of an inch high. This label may be

combined with the label required by S4.5.1(b) of this standard to appear on the sun visor. If some regular maintenance or replacement of the inflatable restraint system(s) in a vehicle is recommended by the vehicle manufacturer, the owner's manual shall also set forth the recommended schedule for maintenance or replacement.

(b) *Sun visor air bag warning label.* (1) Except as provided in S4.5.1(b)(2), each vehicle shall have a label permanently affixed to either side of the sun visor, at the manufacturer's option, at each front outboard seating position that is equipped with an inflatable restraint. The label shall conform in content to the label shown in either Figure 6a or 6b of this standard, as appropriate, and shall comply with the requirements of S4.5.1(b)(1)(i) through S4.5.1(b)(1)(iv).

(i) The heading area shall be yellow with the word “WARNING” and the alert symbol in black.

(ii) The message area shall be white with black text. The message area shall be no less than 30 cm2 (4.7 in2).

(iii) The pictogram shall be black with a red circle and slash on a white background. The pictogram shall be no less than 30 mm (1.2 in) in diameter.

(iv) If the vehicle does not have a back seat, the label shown in Figure 6a or 6b may be modified by omitting the statements: “The BACK SEAT is the SAFEST place for children.”

(2) Vehicles certified to meet the requirements specified in S19, S21, or S23 before September 1, 2003 shall have a label permanently affixed to either side of the sun visor, at the manufacturer's option, at each front outboard seating position that is equipped with an inflatable restraint. The label shall conform in content to the label shown either in Figure 8 or Figure 11 of this standard, at the manufacturer's option, and shall comply with the requirements of S4.5.1(b)(2)(i) through S4.5.1(b)(2)(iv).

(i) The heading area shall be yellow with the word “WARNING” and the alert symbol in black.

(ii) The message area shall be white with black text. The message area shall be no less than 30 cm2 (4.7 in2).

(iii) The pictogram shall be black on a white background. The pictogram shall be no less than 30 mm (1.2 in) in length.

(iv) If the vehicle does not have a back seat, the label shown in the figure may be modified by omitting the statement: “The BACK SEAT is the SAFEST place for CHILDREN.”

(v) If the vehicle does not have a back seat or the back seat is too small to accommodate a rear-facing child restraint consistent with S4.5.4.1, the label shown in the figure may be modified by omitting the statement: “Never put a rear-facing child seat in the front.”

(3) Vehicles certified to meet the requirements specified in S19, S21, or S23 on or after September 1, 2003 shall have a label permanently affixed to either side of the sun visor, at the

manufacturer's option, at each front outboard seating position that is equipped with an inflatable restraint. The label shall conform in content to the label shown in Figure 11 of this standard and shall comply with the requirements of S4.5.1(b)(3)(i) through S4.5.1(b)(3)(iv).

(i) The heading area shall be yellow with the word "WARNING" and the alert symbol in black.

(ii) The message area shall be white with black text. The message area shall be no less than 30 cm2 (4.7 in2).

(iii) The pictogram shall be black on a white background. The pictogram shall be no less than 30 mm (1.2 in) in length.

(iv) If the vehicle does not have a back seat, the label shown in the figure may be modified by omitting the statement: "The BACK SEAT is the SAFEST place for CHILDREN."

(v) If the vehicle does not have a back seat or the back seat is too small to accommodate a rear-facing child restraint consistent with S4.5.4.1, the label shown in the figure may be modified by omitting the statement: "Never put a rear-facing child seat in the front."

(4) Design-specific information.

(i) A manufacturer may request in writing that the Administrator authorize additional design-specific information to be placed on the air bag sun visor label for vehicles certified to meet the requirements specified in S19, S21, or S23. The label shall conform in content to the label shown in Figure 11 of this standard and shall comply with the requirements of S4.5.1(b)(3)(i) through S4.5.1(b)(3)(iv), except that the label may contain additional, design-specific information, if authorized by the Administrator.

(ii) The request must meet the following criteria:

(A) The request must provide a mock-up of the label with the specific language or pictogram the manufacturer requests permission to add to the label.

(B) The additional information conveyed by the requested label must be specific to the design or technology of the air bag system in the vehicle and not applicable to all or most air bag systems.

(C) The additional information conveyed by the requested label must address a situation in which foreseeable occupant behavior can affect air bag performance.

(iii) The Administrator shall authorize or reject a request by a manufacturer submitted under S4.5.1(b)(4)(i) on the basis of whether the additional information could result in information overload or would otherwise make the label confusing or misleading. No determination will be made as to whether, in light of the above criteria, the particular information best prevents information overload or whether the information best addresses a particular air bag risk. Moreover, the Administrator will not verify or vouch for the accuracy of the information.

(5) Limitations on additional labels.

(i) Except for the information on an air bag maintenance label placed on the sun visor pursuant to S4.5.1(a) of this standard, or on a utility vehicle warning label placed on the sun visor that conforms in content, form, and sequence to the label shown in Figure 1 of 49 CFR 575.105, no other information shall appear on the same side of the sun visor to which the sun visor air bag warning label is affixed.

(ii) Except for the information in an air bag alert label placed on the sun visor pursuant to S4.5.1(c) of this standard, or on a utility vehicle warning label placed on the sun visor that conforms in content, form, and sequence to the label shown in Figure 1 of 49 CFR 575.105, no other information about air bags or the need to wear seat belts shall appear anywhere on the sun visor.

(c) *Air bag alert label.* If the label required by S4.5.1(b) is not visible when the sun visor is in the stowed position, an air bag alert label shall be permanently affixed to that visor so that the label is visible when the visor is in that position. The label shall conform in content to the sun visor label shown in Figure 6(c) of this standard, and shall comply with the requirements of S4.5.1(c)(1) through S4.5.1(c)(3).

(1) The message area shall be black with yellow text. The message area shall be no less than 20 square cm.

(2) The pictogram shall be black with a red circle and slash on a white background. The pictogram shall be no less than 20 mm in diameter.

(3) If a vehicle does not have an inflatable restraint at any front seating position other than that for the driver**'s designated seating position**, the pictogram may be omitted from the label shown in Figure 6c.

(d) At the option of the manufacturer, the requirements in S4.5.1(b) and S4.5.1(c) for labels that are permanently affixed to specified parts of the vehicle may instead be met by permanent marking or molding of the required information.

(e) *Label on the dashboard.* (1) Except as provided in S4.5.1(e)(2) or S4.5.1(e)(3), each vehicle that is equipped with an inflatable restraint for the passenger position shall have a label attached to a location on the dashboard or the steering ~~wheel~~**control** hub that is clearly visible from all front seating positions. The label need not be permanently affixed to the vehicle. This label shall conform in content to the label shown in Figure 7 of this standard, and shall comply with the requirements of S4.5.1(e)(1)(i) through S4.5.1(e)(1)(iii).

(i) The heading area shall be yellow with the word "WARNING" and the alert symbol in black.

(ii) The message area shall be white with black text. The message area shall be no less than 30 cm2 (4.7 in2).

(iii) If the vehicle does not have a back seat, the label shown in Figure 7 may be modified by omitting the statement: “The back seat is the safest place for children 12 and under.”

(2) Vehicles certified to meet the requirements specified in S19, S21, and S23 before December 1, 2003, that are equipped with an inflatable restraint for the passenger position shall have a label attached to a location on the dashboard or the steering ~~wheel~~**control** hub that is clearly visible from all front seating positions. The label need not be permanently affixed to the vehicle. This label shall conform in content to the label shown in either Figure 9 or Figure 12 of this standard, at manufacturer's option, and shall comply with the requirements of S4.5.1(e)(2)(i) through S4.5.1(e)(2)(iv).

(i) The heading area shall be yellow with black text.

(ii) The message area shall be white with black text. The message area shall be no less than 30 cm2 (4.7 in2).

(iii) If the vehicle does not have a back seat, the labels shown in Figures 9 and 12 may be modified by omitting the statement: “The back seat is the safest place for children.”

(iv) If the vehicle does not have a back seat or the back seat is too small to accommodate a rear-facing child restraint consistent with S4.5.4.1, the label shown in Figure 12 may be modified by omitting the statement: “Never put a rear-facing child seat in the front.”

(3) Vehicles certified to meet the requirements specified in S19, S21, and S23 on or after December 1, 2003, that are equipped with an inflatable restraint for the passenger position shall have a label attached to a location on the dashboard or the steering ~~wheel~~**control** hub that is clearly visible from all front seating positions. The label need not be permanently affixed to the vehicle. This label shall conform in content to the label shown in Figure 12 of this standard and shall comply with the requirements of S4.5.1(e)(3)(i) through S4.5.1(e)(3)(iv).

(i) The heading area shall be yellow with black text.

(ii) The message area shall be white with black text. The message area shall be no less than 30 cm2 (4.7 in2).

(iii) If the vehicle does not have a back seat, the label shown in Figure 12 may be modified by omitting the statement: “The back seat is the safest place for children.”

(iv) If the vehicle does not have a back seat or the back seat is too small to accommodate a rear-facing child restraint consistent with S4.5.4.1, the label shown in Figure 12 may be modified by omitting the statement: “Never put a rear-facing child seat in the front.”

(f) *Information to appear in owner's manual.* (1) The owner's manual for any vehicle equipped with an inflatable restraint system shall include an accurate description of the vehicle's air bag system in an easily understandable format. The owner's manual shall include a statement to the effect that the vehicle is equipped with an air bag and lap/shoulder belt at both front outboard

seating positions, and that the air bag is a supplemental restraint at those seating positions. The information shall emphasize that all occupants~~, including the driver,~~ should always wear their seat belts whether or not an air bag is also provided at their seating position to minimize the risk of severe injury or death in the event of a crash. The owner's manual shall also provide any necessary precautions regarding the proper positioning of occupants, including children, at seating positions equipped with air bags to ensure maximum safety protection for those occupants. The owner's manual shall also explain that no objects should be placed over or near the air bag on the instrument panel, because any such objects could cause harm if the vehicle is in a crash severe enough to cause the air bag to inflate.

(2) For any vehicle certified to meet the requirements specified in S14.5, S15, S17, S19, S21, S23, and S25, the manufacturer shall also include in the vehicle owner's manual a discussion of the advanced passenger air bag system installed in the vehicle. The discussion shall explain the proper functioning of the advanced air bag system and shall provide a summary of the actions that may affect the proper functioning of the system. The discussion shall include, at a minimum, accurate information on the following topics:

(i) A presentation and explanation of the main components of the advanced passenger air bag system.

(ii) An explanation of how the components function together as part of the advanced passenger air bag system.

(iii) The basic requirements for proper operation, including an explanation of the actions that may affect the proper functioning of the system.

(iv) For vehicles certified to meet the requirements of S19.2, S21.2 or S23.2, a complete description of the passenger air bag suppression system installed in the vehicle, including a discussion of any suppression zone.

(v) An explanation of the interaction of the advanced passenger air bag system with other vehicle components, such as seat belts, seats or other components.

(vi) A summary of the expected outcomes when child restraint systems, children and small teenagers or adults are both properly and improperly positioned in the passenger seat, including cautionary advice against improper placement of child restraint systems.

(vii) For vehicles certified to meet the requirements of S19.2, S21.2 or S23.2, a discussion of the telltale light, specifying its location in the vehicle and explaining when the light is illuminated.

(viii) Information on how to contact the vehicle manufacturer concerning modifications for persons with disabilities that may affect the advanced air bag system.

(g) *Additional labels placed elsewhere in the vehicle interior.* The language on additional air bag warning labels placed elsewhere in the vehicle interior shall not cause confusion or contradiction

of any of the statements required in the air bag sun visor label, and shall be expressed in symbols, words and abbreviations required by this standard.

S4.5.2 *Readiness indicator.* An occupant protection system that deploys in the event of a crash shall have a monitoring system with a readiness indicator. The indicator shall monitor its own readiness and shall be clearly visible from the driver's designated seating position. If the vehicle is equipped with a single readiness indicator for both a driver and passenger air bag, and if the vehicle is equipped with an on-off switch permitted by S4.5.4 of this standard, the readiness indicator shall monitor the readiness of the driver air bag when the passenger air bag has been deactivated by means of the on-off switch, and shall not illuminate solely because the passenger air bag has been deactivated by the manual on-off switch. A list of the elements of the system being monitored by the indicator shall be included with the information furnished in accordance with S4.5.1 but need not be included on the label.

S4.5.3 *Automatic belts.* Except as provided in S4.5.3.1, a seat belt assembly that requires no action by vehicle occupants (hereinafter referred to as an "automatic belt") may be used to meet the crash protection requirements of any option under S4. and in place of any seat belt assembly otherwise required by that option.

S4.5.3.1. An automatic belt that provides only pelvic restraint may not be used pursuant to S4.5.3 to meet the requirements of an option that requires a Type 2 seat belt assembly. An automatic belt may not be used pursuant to S4.5.3 to meet the requirements of S4.1.5.1(a)(3) for a Type 2 seat belt assembly at any seating position equipped with an inflatable restraint system pursuant to S4.1.5.2, S4.1.5.3, S4.2.6.1, or S4.2.6.2 of this standard.

S4.5.3.2 An automatic belt, furnished pursuant to S4.5.3, that provides both pelvic and upper torso restraint may have either a detachable or nondetachable upper torso portion, notwithstanding provisions of the option under which it is furnished.

S4.5.3.3 An automatic belt furnished pursuant to S4.5.3 shall:

(a) Conform to S7.1 and have a single emergency release mechanism whose components are readily accessible to a seated occupant.

(b) In place of a warning system that conforms to S7.3 of this standard, be equipped with the following warning system: At the left front designated seating position (driver's position), a warning system that activates a continuous or intermittent audible signal for a period of not less than 4 seconds and not more than 8 seconds and that activates a continuous or flashing warning light visible to the driver for not less than 60 seconds (beginning when the vehicle ignition switch is moved to the "on" or the "start" position) when condition (A) exists simultaneously with condition (B), and that activates a continuous or flashing warning light, visible to the driver, displaying the identifying symbol for the seat belt telltale shown in Table 2 of Standard No. 101 (49 CFR 571.101), or, at the option of the manufacturer if permitted by Standard No. 101, displaying the words "Fasten Seat Belts" or "Fasten Belts," for as long as condition (A) exists simultaneously with condition (C).

(A) The vehicle's ignition switch is moved to the “on” position or to the “start” position.

(B) The driver's automatic belt is not in use, as determined by the belt latch mechanism not being fastened, or, if the automatic belt is non-detachable, by the emergency release mechanism being in the released position. In the case of motorized automatic belts, the determination of use shall be made once the belt webbing is in its locked protective mode at the anchorage point.

(C) The belt webbing of a motorized automatic belt system is not in its locked, protective mode at the anchorage point.

S4.5.3.4 An automatic belt furnished pursuant to S4.5.3 that is not required to meet the perpendicular frontal crash protection requirements of S5.1 shall conform to the webbing, attachment hardware, and assembly performance requirements of Standard No. 209.

S4.5.3.5 A replacement automatic belt shall meet the requirements of S4.1(k) of Standard No. 209.

S4.5.4 *Passenger air bag manual cut-off device.* Passenger cars, trucks, buses, and multipurpose passenger vehicles manufactured before September 1, 2012 may be equipped with a device that deactivates the air bag installed at the right front outboard seating position in the vehicle, if all the conditions in S4.5.4.1 through S4.5.4.4 are satisfied.

S4.5.4.1 The vehicle complies with either S4.5.4.1(a) or S4.5.4.1(b).

(a) The vehicle has no forward-facing designated seating positions to the rear of the front seating positions.

(b) With the seats and seat backs adjusted as specified in S8.1.2 and S8.1.3, the distance, measured along a longitudinal horizontal line tangent to the highest point of the rear seat bottom in the longitudinal vertical plane described in either S4.5.4.1(b)(1) or S4.5.4.1(b)(2), between the rearward surface of the front seat back and the forward surface of the rear seat back is less than 720 millimeters.

(1) In a vehicle equipped with front bucket seats, the vertical plane at the centerline of the driver's seat cushion.

(2) In a vehicle equipped with front bench seating, the vertical plane which passes through the center of the steering wheel rim.

S4.5.4.2 The device is operable by means of the ignition key for the vehicle. The device shall be separate from the ignition switch for the vehicle, so that the driver must take some action with the ignition key other than inserting it or turning it in the ignition switch to deactivate the passenger air bag. Once deactivated, the passenger air bag shall remain deactivated until it is reactivated by means of the device.

S4.5.4.3 A telltale light in the interior of the vehicle shall be illuminated whenever the passenger air bag is turned off by means of the on-off switch. The telltale shall be clearly visible to occupants of all front seating positions. “Clearly visible” means within the normal range of vision throughout normal driving operations. The telltale:

(a) Shall be yellow;

(b) Shall have the identifying words “PASSENGER AIR BAG OFF” or “PASS AIR BAG OFF” on the telltale or within 25 millimeters of the telltale;

(c) Shall remain illuminated for the entire time that the air bag is “off”;

(d) Shall not be illuminated at any time when the air bag is “on”; and,

(e) Shall not be combined with the readiness indicator required by S4.5.2 of this standard.

S4.5.4.4 The vehicle owner's manual shall provide, in a readily understandable format:

(a) Complete instructions on the operation of the on-off switch;

(b) A statement that the on-off switch should only be used when a member of a passenger risk group identified in the request form in appendix B to part 595 of this chapter is occupying the right front passenger seating position; and,

(c) A warning about the safety consequences of using the on-off switch at other times.

S4.5.5 *Rear seat belt requirements for passenger cars and for trucks, buses, and multipurpose passenger vehicles with a GVWR of 4,536 kg (10,000 lbs.) or less.*

S4.5.5.1 *Vehicles manufactured on or after September 1, 2005 and before September 1, 2007.*

(a) For vehicles manufactured for sale in the United States on or after September 1, 2005, and before September 1, 2007, a percentage of the manufacturer's production as specified in S4.5.5.2, shall meet the requirements specified in either S4.1.5.5 for complying passenger cars, S4.2.7 for complying trucks and multipurpose passenger vehicles, or S4.4.3.1 for complying buses.

(b) A manufacturer that sells two or fewer carlines, as that term is defined at 49 CFR 583.4, in the United States may, at the option of the manufacturer, meet the requirements of this paragraph, instead of paragraph (a) of this section. Each vehicle manufactured on or after September 1, 2006, and before September 1, 2007, shall meet the requirements specified in S4.1.5.5 for complying passenger cars, S4.2.7 for complying trucks & multipurpose passenger vehicles, and S4.4.3.1 for complying buses. Credits for vehicles manufactured before September 1, 2006 are not to be applied to the requirements of this paragraph.

(c) Vehicles that are manufactured in two or more stages or that are altered (within the meaning of 49 CFR 567.7) after having previously been certified in accordance with part 567 of this chapter are not subject to the requirements of S4.5.5.1.

(d) Vehicles that are manufactured by a manufacturer that produces fewer than 5,000 vehicles annually for sale in the United States are not subject to the requirements of S4.5.5.1.

S4.5.5.2 *Phase-in schedule.*

(a) Vehicles manufactured on or after September 1, 2005, and before September 1, 2006. Subject to S4.5.5.3(a), for vehicles manufactured on or after September 1, 2005, and before September 1, 2006, the amount of vehicles complying with S4.1.5.5 for complying passenger cars, S4.2.7 for complying trucks and multipurpose passenger vehicles, or S4.4.3.1 for complying buses shall be not less than 50 percent of:

(1) If the manufacturer has manufactured vehicles for sale in the United States during both of the two production years immediately prior to September 1, 2005, the manufacturer's average annual production of vehicles manufactured on or after September 1, 2003, and before September 1, 2006, or

(2) The manufacturer's production on or after September 1, 2005, and before September 1, 2006.

(b) Vehicles manufactured on or after September 1, 2006, and before September 1, 2007. Subject to S4.5.5.3(b), for vehicles manufactured on or after September 1, 2006, and before September 1, 2007, the amount of vehicles complying with S4.1.5.5 for complying passenger cars, S4.2.7 for complying trucks and multipurpose passenger vehicles, or S4.4.3.1 for complying buses shall be not less than 80 percent of:

(1) If the manufacturer has manufactured vehicles for sale in the United States during both of the two production years immediately prior to September 1, 2006, the manufacturer's average annual production of vehicles manufactured on or after September 1, 2004, and before September 1, 2007, or

(2) The manufacturer's production on or after September 1, 2006, and before September 1, 2007.

S4.5.5.3 *Calculation of complying vehicles.*

(a) For the purposes of complying with S4.5.5.2(a), a manufacturer may count a vehicle if it is manufactured on or after February 7, 2005, but before September 1, 2006.

(b) For the purposes of complying with S4.5.5.2(b), a manufacturer may count a vehicle if it:

(1) Is manufactured on or after February 7, 2005, but before September 1, 2007, and

(2) Is not counted toward compliance with S4.5.5.2(a).

S4.5.5.4 *Vehicles produced by more than one manufacturer.*

(a) For the purpose of calculating average annual production of vehicles for each manufacturer and the number of vehicles manufactured by each manufacturer under S4.5.5.2, a vehicle produced by more than one manufacturer shall be attributed to a single manufacturer as follows, subject to paragraph (b) of this section.

(1) A vehicle that is imported shall be attributed to the importer.

(2) A vehicle manufactured in the United States by more than one manufacturer, one of which also markets the vehicle, shall be attributed to the manufacturer that markets the vehicle.

(b) A vehicle produced by more than one manufacturer shall be attributed to any one of the vehicle's manufacturers specified by an express written contract, reported to the National Highway Traffic Safety Administration under 49 CFR part 585, between the manufacturer so specified and the manufacturer to which the vehicle would otherwise be attributed under paragraph (a) of this section.

S4.6 *Dynamic testing of manual belt systems.*

S4.6.1 Each truck and multipurpose passenger vehicle with a GVWR of 8,500 pounds or less and an unloaded weight of less than 5,500 pounds that is manufactured on or after September 1, 1991, and is equipped with a Type 2 seat belt assembly at a front outboard designated seating position pursuant to S4.1.2.3 shall meet the frontal crash protection requirements of S5.1 at those designated seating positions with a test dummy restrained by a Type 2 seat belt assembly that has been adjusted in accordance with S7.4.2. A vehicle shall not be deemed to be in noncompliance with this standard if its manufacturer establishes that it did not have reason to know in the exercise of due care that such vehicle is not in conformity with the requirement of this standard.

S4.6.2 Any manual seat belt assembly subject to the requirements of S5.1 of this standard by virtue of any provision of this standard other than S4.1.2.1(c)(2) does not have to meet the requirements of S4.2(a)-(f) and S4.4 of Standard No. 209 (§571.209).

S4.6.3 Any manual seat belt assembly subject to the requirements of S5.1 of this standard by virtue of S4.1.2.1(c)(2) does not have to meet the elongation requirements of S4.2(c), S4.4(a)(2), S4.4(b)(4), and S4.4(b)(5) of Standard No. 209 (§571.209).

S4.7 [Reserved]

S4.8 *Selection of compliance options.* Where manufacturer options are specified, the manufacturer shall select the option by the time it certifies the vehicle and may not thereafter select a different option for the vehicle. Each manufacturer shall, upon request from the National Highway Traffic Safety Administration, provide information regarding which of the compliance options it has selected for a particular vehicle or make/model.

S4.9 *Values and tolerances.* Wherever a range of values or tolerances are specified, requirements shall be met at all values within the range of values or tolerances. With respect to the positioning of anthropomorphic dummies, torso and spine angle tolerances shall be ±2 degrees unless otherwise stated, and leg, thigh, foot, and arm angle tolerances shall be ±5 degrees unless otherwise stated.

S4.10 *Metric values.* Specifications and requirements are given in metric units with English units provided for reference. The metric values are controlling.

S4.11 *Test duration for purpose of measuring injury criteria.*

(a) For all barrier crashes, the injury criteria specified in this standard shall be met when calculated based on data recorded for 300 milliseconds after the vehicle strikes the barrier.

(b) For the 3-year-old and 6-year-old child dummy low risk deployment tests, the injury criteria specified in this standard shall be met when calculated on data recorded for 100 milliseconds after the initial deployment of the air bag.

(c) For 12-month-old infant dummy low risk deployment tests, the injury criteria specified in the standard shall be met when calculated on data recorded for 125 milliseconds after the initiation of the final stage of air bag deployment designed to deploy in any full frontal rigid barrier crash up to 64 km/h (40 mph).

(d) For driver ~~side~~ **dummy** low risk deployment tests, the injury criteria shall be met when calculated based on data recorded for 125 milliseconds after the initiation of the final stage of air bag deployment designed to deploy in any full frontal rigid barrier crash up to 26 km/h (16 mph).

(e) The requirements for dummy containment shall continue until both the vehicle and the dummies have ceased moving.

S4.12 *Suppression systems that do not detect dummies.* For vehicles with occupant sensing systems that recognize humans and not dummies, such that the air bag or bags would not function in crash tests, the manufacturer shall provide NHTSA with information and equipment necessary to circumvent the suppression system for the crash test such that the restraint system operates as if 5th percentile adult female humans and 50th percentile adult male humans are seated in the vehicle.

S4.13 *Data channels.* For vehicles manufactured on or after September 1, 2001, all data channels used in injury criteria calculations shall be filtered using a phaseless digital filter, such as the Butterworth four-pole phaseless digital filter specified in appendix C of SAE Recommended Practice J211/1 MAR95 (incorporated by reference, see §571.5).

S5 *Occupant crash protection requirements for the 50th percentile adult male dummy.*

S5.1 *Frontal barrier crash test.*

S5.1.1 *Belted test.* (a) *Vehicles not certified to S14.* Impact a vehicle traveling longitudinally forward at any speed, up to and including 48 km/h (30 mph), into a fixed rigid barrier that is perpendicular to the line of travel of the vehicle, and at any angle up to 30 degrees in either direction from the perpendicular to the line of travel of the vehicle, under the applicable conditions of S8 and S10. The test dummy specified in S8.1.8 placed in each front outboard designated seating position shall meet the injury criteria of S6.1, S6.2(a), S6.3, S6.4(a), and S6.5 of this standard.

(b) *Vehicles certified to S14*—(1) *Vehicles certified to S14.1 or S14.2.* Impact a vehicle traveling longitudinally forward at any speed, up to and including 48 km/h (30 mph), into a fixed rigid barrier that is perpendicular to the line of travel of the vehicle under the applicable conditions of S8 and S10. The test dummy specified in S8.1.8 placed in each front outboard designated seating position shall meet the injury criteria of S6.1, S6.2(b), S6.3, S6.4(b), S6.5, and S6.6 of this standard.

(2) *Vehicles certified to S14.3 or S14.4.* Impact a vehicle traveling longitudinally forward at any speed, up to and including 56 km/h (35 mph), into a fixed rigid barrier that is perpendicular to the line of travel of the vehicle under the applicable conditions of S8 and S10. The test dummy specified in S8.1.8 placed in each front outboard designated seating position shall meet the injury criteria of S6.1, S6.2(b), S6.3, S6.4(b), S6.5, and S6.6 of this standard.

S5.1.2 *Unbelted test.* (a) *Vehicles not certified to the requirements of S13 or S14.* At the manufacturer's option, either one of the following unbelted tests shall be met:

(1) Impact a vehicle traveling longitudinally forward at any speed up to and including 48 km/h (30 mph), into a fixed rigid barrier that is perpendicular to the line of travel of the vehicle, and at any angle up to 30 degrees in either direction from the perpendicular to the line of travel of the vehicle, under the applicable conditions of S8 and S10, excluding S10.7, S10.8, and S10.9. The test dummy specified in S8.1.8 placed in each front outboard designated seating position shall meet the injury criteria of S6.1, S6.2(a), S6.3, S6.4(a), and S6.5 of this standard.

(2) Impact a vehicle traveling longitudinally forward at any speed between 32 km/h (20 mph) and 40 km/h (25 mph), inclusive, into a fixed rigid barrier that is perpendicular to the line of travel of the vehicle, and at any angle up to 30 degrees in either direction from the perpendicular to the line of travel of the vehicle, under the applicable conditions of S8 and S10, excluding S10.7, S10.8, and S10.9. The test dummy specified in S8.1.8 placed in each front outboard designated seating position shall meet the injury criteria of S6.1, S6.2(b), S6.3, S6.4(b), S6.5, and S6.6 of this standard.

(b) *Vehicles certified to the requirements of S14.* Impact a vehicle traveling longitudinally forward at any speed between 32 km/h (20 mph) and 40 km/h (25 mph), inclusive, into a fixed rigid barrier that is perpendicular to the line of travel of the vehicle, and at any angle up to 30 degrees in either direction from the perpendicular to the line of travel of the vehicle, under the applicable conditions of S8 and S10, excluding S10.7, S10.8, and S10.9. The test dummy specified in S8.1.8 placed in each front outboard designated seating position shall meet the injury criteria of S6.1, S6.2(b), S6.3, S6.4(b), S6.5, and S6.6 of this standard.

S5.2 *Lateral moving barrier crash test.* Impact a vehicle laterally on either side by a barrier moving at 20 mph under the applicable conditions of S8. The test dummy specified in S8.1.8 positioned in the front outboard designated seating position adjacent to the impacted side shall meet the injury criteria of S6.2 and S6.3 of this standard.

S5.3 *Rollover.* Subject a vehicle to a rollover test in either lateral direction at 30 mph under the applicable conditions of S8 of this standard with a test dummy specified in S8.1.8 placed in the front outboard designated seating position on the vehicle's lower side as mounted on the test platform. The test dummy shall meet the injury criteria of S6.1 of this standard.

S6 *Injury criteria for the part 572, subpart E, Hybrid III test dummy.*

S6.1 All portions of the test dummy shall be contained within the outer surfaces of the vehicle passenger compartment.

S6.2 *Head injury criteria.* (a)(1) For any two points in time, $t_1$ and $t_2$, during the event which are separated by not more than a 36 millisecond time interval and where $t_1$ is less than $t_2$, the head injury criterion ($HIC_{36}$) shall be determined using the resultant head acceleration at the center of gravity of the dummy head, $a_r$, expressed as a multiple of g (the acceleration of gravity) and shall be calculated using the expression:

$$\left[\frac{1}{(t_2 - t_1)}\int_{t_1}^{t_2} a_r dt\right]^{2.5}(t_2 - t_1)$$

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(2) The maximum calculated $HIC_{36}$ value shall not exceed 1,000.

(b)(1) For any two points in time, $t_1$ and $t_2$, during the event which are separated by not more than a 15 millisecond time interval and where $t_1$ is less than $t_2$, the head injury criterion ($HIC_{15}$) shall be determined using the resultant head acceleration at the center of gravity of the dummy head, $a_r$, expressed as a multiple of g (the acceleration of gravity) and shall be calculated using the expression:

$$\left[\frac{1}{(t_2 - t_1)}\int_{t_1}^{t_2} a_r dt\right]^{2.5}(t_2 - t_1)$$

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(2) The maximum calculated $HIC_{15}$ value shall not exceed 700.

S6.3 The resultant acceleration calculated from the output of the thoracic instrumentation shown in drawing 78051.218, revision R incorporated by reference in part 572, subpart E of this

chapter shall not exceed 60 g's, except for intervals whose cumulative duration is not more than 3 milliseconds.

S6.4 *Chest deflection.* (a) Compressive deflection of the sternum relative to the spine shall not exceed 76 mm (3.0 in).

(b) Compressive deflection of the sternum relative to the spine shall not exceed 63 mm (2.5 in).

S6.5 The force transmitted axially through each upper leg shall not exceed 2250 pounds.

S6.6 *Neck injury.* When measuring neck injury, each of the following injury criteria shall be met.

(a) *Nij.*

(1) The shear force (Fx), axial force (Fz), and bending moment (My) shall be measured by the dummy upper neck load cell for the duration of the crash event as specified in S4.11. Shear force, axial force, and bending moment shall be filtered for Nij purposes at SAE Recommended Practice J211/1 MAR95 (incorporated by reference, see §571.5) Channel Frequency Class 600.

(2) During the event, the axial force (Fz) can be either in tension or compression while the occipital condyle bending moment (Mocy) can be in either flexion or extension. This results in four possible loading conditions for Nij: tension-extension (Nte), tension-flexion (Ntf), compression-extension (Nce), or compression-flexion (Ncf).

(3) When calculating Nij using equation S6.6(a)(4), the critical values, Fzc and Myc, are:

(i) Fzc = 6806 N (1530 lbf) when Fz is in tension

(ii) Fzc = 6160 N (1385 lbf) when Fz is in compression

(iii) Myc = 310 Nm (229 lbf-ft) when a flexion moment exists at the occipital condyle

(iv) Myc = 135 Nm (100 lbf-ft) when an extension moment exists at the occipital condyle.

(4) At each point in time, only one of the four loading conditions occurs and the Nij value corresponding to that loading condition is computed and the three remaining loading modes shall be considered a value of zero. The expression for calculating each Nij loading condition is given by:

$$Nij = (Fz/Fzc) + (Mocy/Myc)$$

(5) None of the four Nij values shall exceed 1.0 at any time during the event.

(b) *Peak tension.* Tension force (Fz), measured at the upper neck load cell, shall not exceed 4170 N (937 lbf) at any time.

(c) *Peak compression.* Compression force (Fz), measured at the upper neck load cell, shall not exceed 4000 N (899 lbf) at any time.

S6.7 Unless otherwise indicated, instrumentation for data acquisition, data channel frequency class, and moment calculations are the same as given for the 49 CFR Part 572, Subpart E Hybrid III test dummy.

S7. *Seat belt assembly requirements.* As used in this section, a law enforcement vehicle means any vehicle manufactured primarily for use by the United States or by a State or local government for police or other law enforcement purposes.

S7.1 *Adjustment.*

S7.1.1 Except as specified in S7.1.1.1 and S7.1.1.2, the lap belt of any seat belt assembly furnished in accordance with S4.1.2 shall adjust by means of any emergency-locking or automatic-locking retractor that conforms to §571.209 to fit persons whose dimensions range from those of a 50th percentile 6-year-old child to those of a 95th percentile adult male and the upper torso restraint shall adjust by means of an emergency-locking retractor or a manual adjusting device that conforms to §571.209 to fit persons whose dimensions range from those of a 5th percentile adult female to those of a 95th percentile adult male, with the seat in any position, the seat back in the manufacturer's nominal design riding position, and any adjustable anchorages adjusted to the manufacturer's nominal design position for a 50th percentile adult male occupant. However, an upper torso restraint furnished in accordance with S4.1.2.3.1(a) shall adjust by means of an emergency-locking retractor that conforms to §571.209.

S7.1.1.1 A seat belt assembly installed at the driver's seating position shall adjust to fit persons whose dimensions range from those of a 5th-percentile adult female to those of a 95th-percentile adult male.

S7.1.1.2 (a) A seat belt assembly installed in a motor vehicle other than a forward control vehicle at any designated seating position other than the outboard positions of the front and second seats shall adjust either by a retractor as specified in S7.1.1 or by a manual adjusting device that conforms to §571.209.

(b) A seat belt assembly installed in a forward control vehicle at any designated seating position other than the front outboard seating positions shall adjust either by a retractor as specified in S7.1.1 or by a manual adjusting device that conforms to §571.209.

(c) A seat belt assembly installed in a forward-facing rear outboard seating position in a law enforcement vehicle shall adjust either by a retractor as specified in S7.1.1 or by a manual adjusting device that conforms to §571.209.

S7.1.1.3 A Type 1 lap belt or the lap belt portion of any Type 2 seat belt assembly installed at any forward-facing outboard designated seating position of a vehicle with a gross vehicle weight rating of 10,000 pounds or less to comply with a requirement of this standard, except walk-in van-type vehicles and school buses, and except in rear seating positions in law enforcement

vehicles, shall meet the requirements of S7.1 by means of an emergency locking retractor that conforms to Standard No. 209 (49 CFR 571.209).

S7.1.1.4 Notwithstanding the other provisions of S7.1—S7.1.1.3, emergency-locking retractors on belt assemblies located in positions other than front outboard designated seating pos**i**tions may be equipped with a manual webbing adjustment device capable of causing the retractor that adjusts the lap belt to lock when the belt is buckled.

S7.1.1.5 Passenger cars, and trucks, buses, and multipurpose passenger vehicles with a GVWR of 4,536 kg (10,000 lb) or less manufactured on or after September 1, 1995 and buses with a GVWR of more than 11,793 kg (26,000 pounds) manufactured on or after November 28, 2016, except a perimeter-seating bus, prison bus, school bus, or transit bus, shall meet the requirements of S7.1.1.5(a), S7.1.1.5(b) and S7.1.1.5(c).

(a) Each designated seating position, except the driver's **designated seating** position, and except any right front seating position that is equipped with an automatic belt, that is in any motor vehicle, except walk-in van-type vehicles and vehicles manufactured to be sold exclusively to the U.S. Postal Service, and that is forward-facing or can be adjusted to be forward-facing, shall have a seat belt assembly whose lap belt portion is lockable so that the seat belt assembly can be used to tightly secure a child restraint system. The means provided to lock the lap belt or lap belt portion of the seat belt assembly shall not consist of any device that must be attached by the vehicle user to the seat belt webbing, retractor, or any other part of the vehicle. Additionally, the means provided to lock the lap belt or lap belt portion of the seat belt assembly shall not require any inverting, twisting or otherwise deforming of the belt webbing.

(b) If the means provided pursuant to S7.1.1.5(a) to lock the lap belt or lap belt portion of any seat belt assembly makes it necessary for the vehicle user to take some action to activate the locking feature, the vehicle owner's manual shall include a description in words and/or diagrams describing how to activate the locking feature so that the seat belt assembly can tightly secure a child restraint system and how to deactivate the locking feature to remove the child restraint system.

(c) Except for seat belt assemblies that have no retractor or that are equipped with an automatic locking retractor, compliance with S7.1.1.5(a) is demonstrated by the following procedure:

(1) With the seat in any adjustment position, buckle the seat belt assembly. Complete any procedures recommended in the vehicle owner's manual, pursuant to S7.1.1.5(b), to activate any locking feature for the seat belt assembly.

(2) Locate a reference point A on the safety belt buckle. Locate a reference point B on the attachment hardware or retractor assembly at the other end of the lap belt or lap belt portion of the seat belt assembly. Adjust the lap belt or lap belt portion of the seat belt assembly pursuant to S7.1.1.5(c)(1) as necessary so that the webbing between points A and B is at the maximum length allowed by the belt system. Measure and record the distance between points A and B along the longitudinal centerline of the webbing for the lap belt or lap belt portion of the seat belt assembly.

(3) Readjust the belt system so that the webbing between points A and B is at any length that is 5 inches or more shorter than the maximum length of the webbing.

(4) Apply a pre-load of 10 pounds, using the webbing tension pull device described in Figure 5 of this standard, to the lap belt or lap belt portion of the seat belt assembly in a vertical plane parallel to the longitudinal axis of the vehicle and passing through the seating reference point of the designated seating position whose belt system is being tested. Apply the pre-load in a horizontal direction toward the front of the vehicle with a force application angle of not less than 5 degrees nor more than 15 degrees above the horizontal. Measure and record the length of belt between points A and B along the longitudinal centerline of the webbing for the lap belt or lap belt portion of the seat belt assembly while the pre-load is being applied.

(5) Apply a load of 50 pounds, using the webbing tension pull device described in Figure 5 of this standard, to the lap belt or lap belt portion of the seat belt assembly in a vertical plane parallel to the longitudinal axis of the vehicle and passing through the seating reference point of the designated seating position whose belt system is being tested. The load is applied in a horizontal direction toward the front of the vehicle with a force application angle of not less than 5 degrees nor more than 15 degrees above the horizontal at an onset rate of not more than 50 pounds per second. Attain the 50 pound load in not more than 5 seconds. If webbing sensitive emergency locking retroactive are installed as part of the lap belt assembly or lap belt portion of the seat belt assembly, apply the load at a rate less than the threshold value for lock-up specified by the manufacturer. Maintain the 50 pound load for at least 5 seconds before the measurements specified in S7.1.1.5(c)(6) are obtained and recorded.

(6) Measure and record the length of belt between points A and B along the longitudinal centerline of the webbing for the lap belt or lap belt portion of the seat belt assembly.

(7) The difference between the measurements recorded under S7.1.1.5(c) (6) and (4) shall not exceed 2 inches.

(8) The difference between the measurements recorded under S7.1.1.5(c) (6) and (2) shall be 3 inches or more.

S7.1.**1**.6 **[Redesignated]** *Passenger seats, other than any outboard designated seating position not rearward of the driver's seating position, in buses with a GVWR of more than 11,793 kg (26,000 lb) manufactured on or after* November 28, 2016. The lap belt of any seat belt assembly on any passenger seat in each bus with a GVWR of more than 11,793 kg (26,000 lb), except a perimeter-seating bus, prison bus, school bus, or transit bus, shall adjust by means of any emergency-locking retractor that conforms to 49 CFR 571.209 to fit persons whose dimensions range from those of a 50th percentile 6-year-old child to those of a 95th percentile adult male and the upper torso restraint shall adjust by means of an emergency-locking retractor that conforms to 49 CFR 571.209 to fit persons whose dimensions range from those of a 5th percentile adult female to those of a 95th percentile adult male, with the seat in any position, the seat back in the manufacturer's nominal design riding position, and any adjustable anchorages adjusted to the manufacturer's nominal design position for a 50th percentile adult male occupant.

S7.1.2 Except as provided in S7.1.2.1, S7.1.2.2, and S7.1.2.3, for each Type 2 seat belt assembly which is required by Standard No. 208 (49 CFR 571.208), the upper anchorage, or the lower anchorage nearest the intersection of the torso belt and the lap belt, shall include a movable component which has a minimum of two adjustment positions. The distance between the geometric center of the movable component at the two extreme adjustment positions shall be not less than five centimeters, measured linearly. If the component required by this paragraph must be manually moved between adjustment positions, information shall be provided in the owner's manual to explain how to adjust the seat belt and warn that misadjustment could reduce the effectiveness of the safety belt in a crash.

S7.1.2.1 As an alternative to meeting the requirement of S7.1.2, a Type 2 seat belt assembly shall provide a means of automatically moving the webbing in relation to either the upper anchorage, or the lower anchorage nearest the intersection of the torso belt and the lap belt. The distance between the midpoint of the webbing at the contact point of the webbing and the anchorage at the extreme adjustment positions shall be not less than five centimeters, measured linearly.

S7.1.2.2 The requirements of S7.1.2 do not apply the anchorages of a Type 2 seat belt assembly installed:

(a) At a seat which is adjustable fore and aft while the vehicle is in motion and whose seat frame above the fore-and-aft adjuster is part of each of the assembly's seat belt anchorages, as defined in S3 of Standard No. 210 (49 CFR 571.210).

(b) At a seat that is not adjustable fore and aft while the vehicle is in motion.

S7.1.2.3 The requirements of S7.1.2 do not apply to any truck with a gross vehicle weight rating of more than 8,500 pounds manufactured before January 1, 1998.

S7.1.3 The intersection of the upper torso belt with the lap belt in any Type 2 seat belt assembly furnished in accordance with S4.1.1 or S4.1.2, with the upper torso manual adjusting device, if provided, adjusted in accordance with the manufacturer's instructions, shall be at least 6 inches from the front vertical centerline of a 50th-percentile adult male occupant, measured along the centerline of the lap belt, with the seat in its rearmost and lowest adjustable position and with the seat back in the manufacturer's nominal design riding position.

S7.1.4 The weights and dimensions of the vehicle occupants referred to in this standard are as follows:

| | **50th-percentile 6-year-old child** | **50th-percentile 10-year-old child** | **5th-percentile adult female** | **50th-percentile adult male** | **95th-percentile adult male** |
|---|---|---|---|---|---|
| Weight | 47.3 pounds | 82.1 pounds | 102 pounds | 164 pounds ±3 | 215 pounds. |

| | | | | | |
|---|---|---|---|---|---|
| Erect sitting height | 25.4 inches | 28.9 inches | 30.9 inches | 35.7 inches ±.1 | 38 inches. |
| Hip breadth (sitting) | 8.4 inches | 10.1 inches | 12.8 inches | 14.7 inches ±.7 | 16.5 inches. |
| Hip circumference (sitting) | 23.9 inches | 27.4 inches (standing) | 36.4 inches | 42 inches | 47.2 inches. |
| Waist circumference (sitting) | 20.8 inches | 25.7 inches (standing) | 23.6 inches | 32 inches ±.6 | 42.5 inches. |
| Chest depth | 6.0 inches | 7.5 inches | 9.3 inches ±.2 | 10.5 inches. | |
| Chest circumference: | | | | | |
| (nipple) | 30.5 inches | | | | |
| (upper) | 26.3 inches | 29.8 inches | 37.4 inches ±.6 | 44.5 inches. | |
| (lower) | 26.6 inches | | | | |

S7.1.5 *School bus bench seats.* The seat belt assemblies on school bus bench seats will operate by means of any emergency-locking retractor that conforms to 49 CFR 571.209 to restrain persons whose dimensions range from those of a 50th percentile 6-year-old child to those of a 50th percentile 10-year-old, for small occupant seating positions, as defined in 49 CFR 571.222, and to those of a 50th percentile adult male for all other seating positions. The seat back may be in any position.

S7.2 *Latch mechanism.* Except as provided in S7.2(e), each seat belt assembly installed in any vehicle shall have a latch mechanism that complies with the requirements specified in S7.2(a) through (d).

(a) The components of the latch mechanism shall be accessible to a seated occupant in both the stowed and operational positions;

(b) The latch mechanism shall release both the upper torso restraint and the lap belt simultaneously, if the assembly has a lap belt and an upper torso restraint that require unlatching for release of the occupant;

(c) The latch mechanism shall release at a single point; and;

(d) The latch mechanism shall release by a pushbutton action.

(e) The requirements of S7.2 do not apply to any automatic belt assembly. The requirements specified in S7.2(a) through (c) do not apply to any safety belt assembly installed at a forward-facing rear outboard seating position in a law enforcement vehicle.

S7.3 (a) A seat belt assembly provided at the driver's seating position shall be equipped with a warning system that, at the option of the manufacturer, either—

(1) Activates a continuous or intermittent audible signal for a period of not less than 4 seconds and not more than 8 seconds and that activates a continuous or flashing warning light visible to the driver displaying the identifying symbol for the seat belt telltale shown in Table 2 of FMVSS 101 or, at the option of the manufacturer if permitted by FMVSS 101, displaying the words "Fasten Seat Belts" or "Fasten Belts", for not less than 60 seconds (beginning when the vehicle ignition switch is moved to the "on" or the "start" position) when condition (b) exists simultaneously with condition (c), or that

(2) Activates, for a period of not less than 4 seconds and not more than 8 seconds (beginning when the vehicle ignition switch is moved to the "on" or the "start" position), a continuous or flashing warning light visible to the driver, displaying the identifying symbol of the seat belt telltale shown in Table 2 of FMVSS 101 or, at the option of the manufacturer if permitted by FMVSS 101, displaying the words "Fasten Seat Belts" or "Fasten Belts", when condition (b) exists, and a continuous or intermittent audible signal when condition (b) exists simultaneously with condition (c).

(b) The vehicle's ignition switch is moved to the "on" position or to the "start" position.

(c) The driver's lap belt is not in use, as determined, at the option of the manufacturer, either by the belt latch mechanism not being fastened, or by the belt not being extended at least 4 inches from its stowed position.

S7.4 *Seat belt comfort and convenience.*

(a) *Automatic seat belts.* Automatic seat belts installed in any vehicle, other than walk-in van-type vehicles, which has a gross vehicle weight rating of 10,000 pounds or less, and which is manufactured on or after September 1, 1986, shall meet the requirements of S7.4.1, S7.4.2, and S7.4.3.

(b) *Manual seat belts.*

(1) *Vehicles manufactured after September 1, 1986.* Manual seat belts installed in any vehicle, other than manual Type 2 belt systems installed in the front outboard seating positions in passenger cars or manual belts in walk-in van-type vehicles, which have a gross vehicle weight rating of 10,000 pounds or less, shall meet the requirements of S7.4.3, S7.4.4, S7.4.5, and S7.4.6.

(2) *Vehicles manufactured after September 1, 1989.*

(i) If the automatic restraint requirement of S4.1.4 is rescinded pursuant to S4.1.5, then manual seat belts installed in a passenger car shall meet the requirements of S7.1.1.3(a), S7.4.2, S7.4.3, S7.4.4, S7.4.5, and S7.4.6.

(ii) Manual seat belts installed in a bus, multipurpose passenger vehicle and truck with a gross vehicle weight rating of 10,000 pounds or less, except for walk-in van-type vehicles, shall meet the requirements of S7.4.3, S7.4.4, S7.4.5, and S7.4.6.

S7.4.1 *Convenience hooks.* Any manual convenience hook or other device that is provided to stow seat belt webbing to facilitate entering or exiting the vehicle shall automatically release the webbing when the automatic belt system is otherwise operational and shall remain in the released mode for as long as (a) exists simultaneously with (b), or, at the manufacturer's option, for as long as (a) exists simultaneously with (c)—

(a) The vehicle ignition switch is moved to the "on" or "start" position;

(b) The vehicle's drive train is engaged;

(c) The vehicle's parking brake is in the released mode (nonengaged).

S7.4.2 *Webbing tension-relieving device.* Each vehicle with an automatic seat belt assembly or with a Type 2 manual seat belt assembly that must meet the occupant crash protection requirements of S5.1 of this standard installed at a front outboard designated seating position, and each vehicle with a Type 2 manual seat belt assembly installed at a rear outboard designated seating position in compliance with a requirement of this standard, that has either automatic or manual tension-relieving devices permitting the introduction of slack in the webbing of the shoulder belt (e.g., "comfort clips" or "window-shade" devices) shall:

(a) Comply with the requirements of S5.1 with the shoulder belt webbing adjusted to introduce the maximum amount of slack recommended by the vehicle manufacturer pursuant to S7.4.2(b).

(b) Have a section in the vehicle owner's manual that explains how the tension-relieving device works and specifies the maximum amount of slack (in inches) recommended by the vehicle manufacturer to be introduced into the shoulder belt under normal use conditions. The explanation shall also warn that introducing slack beyond the amount specified by the manufacturer could significantly reduce the effectiveness of the shoulder belt in a crash; and

(c) Have, except for open-body vehicles with no doors, an automatic means to cancel any shoulder belt slack introduced into the belt system by a tension-relieving device. In the case of an automatic safety belt system, cancellation of the tension-relieving device shall occur each time the adjacent vehicle door is opened. In the case of a manual seat belt required to meet S5.1, cancellation of the tension-relieving device shall occur, at the manufacturer's option, either each time the adjacent door is opened or each time the latchplate is released from the buckle. In the case of a Type 2 manual seat belt assembly installed at a rear outboard designated seating position, cancellation of the tension-relieving device shall occur, at the manufacturer's option either each time the door designed to allow the occupant of that seating position entry and egress of the vehicle is opened or each time the latchplate is released from the buckle. In the case of open-body vehicles with no doors, cancellation of the tension-relieving device may be done by a manual means.

S7.4.3 *Belt contact force.* Except for manual or automatic seat belt assemblies that incorporate a webbing tension-relieving device, the upper torso webbing of any seat belt assembly shall not exert more than 0.7 pounds of contact force when measured normal to and one inch from the chest of an anthropomorphic test dummy, positioned in accordance with S10 of this standard in

the seating position for which that seat belt assembly is provided, at the point where the centerline of the torso belt crosses the midsagittal line on the dummy's chest.

S7.4.4 *Latchplate access.* Any seat belt assembly latchplate that is located outboard of a front outboard seating position in accordance with S4.1.2 shall also be located within the outboard reach envelope of either the outboard arm or the inboard arm described in S10.7 and Figure 3 of this standard, when the latchplate is in its normal stowed position and any adjustable anchorages are adjusted to the manufacturer's nominal design position for a 50th percentile adult male occupant. There shall be sufficient clearance between the vehicle seat and the side of the vehicle interior to allow the test block defined in Figure 4 of this standard unhindered transit to the latchplate or buckle.

S7.4.5 *Retraction.* When tested under the conditions of S8.1.2 and S8.1.3, with anthropomorphic dummies whose arms have been removed and which are positioned in accordance with S10 of this standard in the front outboard seating positions and restrained by the belt systems for those positions, the torso and lap belt webbing of any of those seat belt systems shall automatically retract to a stowed position either when the adjacent vehicle door is in the open position and the seat belt latchplate is released, or, at the option of the manufacturer, when the latchplate is released. That stowed position shall prevent any part of the webbing or hardware from being pinched when the adjacent vehicle door is closed. A belt system with a tension-relieving device in an open-bodied vehicle with no doors shall fully retract when the tension-relieving device is deactivated. For the purposes of these retraction requirements, outboard armrests, which are capable of being stowed, on vehicle seats shall be placed in their stowed position.

S7.4.6 *Seat belt guides and hardware.*

S7.4.6.1 (a) Any manual seat belt assembly whose webbing is designed to pass through the seat cushion or between the seat cushion and seat back shall be designed to maintain one of the following three seat belt parts (the seat belt latchplate, the buckle, or the seat belt webbing) on top of or above the seat cushion under normal conditions (i.e., conditions other than when belt hardware is intentionally pushed behind the seat by a vehicle occupant). In addition, the remaining two seat belt parts must be accessible under normal conditions.

(b) The requirements of S7.4.6.1(a) do not apply to: (1) seats whose seat cushions are movable so that the seat back serves a function other than seating, (2) seats which are removable, or (3) seats which are movable so that the space formerly occupied by the seat can be used for a secondary function.

S7.4.6.2 The buckle and latchplate of a manual seat belt assembly subject to S7.4.6.1 shall not pass through the guides or conduits provided for in S7.4.6.1 and fall behind the seat when the events listed below occur in the order specified: (a) The belt is completely retracted or, if the belt is nonretractable, the belt is unlatched; (b) the seat is moved to any position to which it is designed to be adjusted; and (c) the seat back, if foldable, is folded forward as far as possible and then moved backward into position. The inboard receptacle end of a seat belt assembly installed

at a front outboard designated seating position shall be accessible with the center arm rest in any position to which it can be adjusted (without having to move the armrest).

S8. *Test conditions.*

S8.1 *General conditions.* The following conditions apply to the frontal, lateral, and rollover tests. Except for S8.1.1(d), the following conditions apply to the alternative unbelted sled test set forth in S13 from March 19, 1997 until September 1, 2001.

S8.1.1 Except as provided in paragraph (c) of S8.1.1, the vehicle, including test devices and instrumentation, is loaded as follows:

(a) *Passenger cars.* A passenger car is loaded to its unloaded vehicle weight plus its rated cargo and luggage capacity weight, secured in the luggage area, plus the weight of the necessary anthropomorphic test devices.

(b) *Multipurpose passenger vehicles, trucks, and buses.* A multipurpose passenger vehicle, truck, or bus is loaded to its unloaded vehicle weight plus 300 pounds or its rated cargo and luggage capacity weight, whichever is less, secured in the load carrying area and distributed as nearly as possible in proportion to its gross axle weight ratings, plus the weight of the necessary anthropomorphic test devices. For the purposes of §8.1.1, unloaded vehicle weight does not include the weight of work-performing accessories. Vehicles are tested to a maximum unloaded vehicle weight of 5,500 pounds.

(c) *Fuel system capacity.* With the test vehicle on a level surface, pump the fuel from the vehicle's fuel tank and then operate the engine until it stops. Then, add Stoddard solvent to the test vehicle's fuel tank in an amount which is equal to not less than 92 and not more than 94 percent of the fuel tank's usable capacity stated by the vehicle's manufacturer. In addition, add the amount of Stoddard solvent needed to fill the entire fuel system from the fuel tank through the engine's induction system.

(d) *Vehicle test attitude.* Determine the distance between a level surface and a standard reference point on the test vehicle's body, directly above each wheel opening, when the vehicle is in its “as delivered” condition. The “as delivered” condition is the vehicle as received at the test site, with 100 percent of all fluid capacities and all tires inflated to the manufacturer's specifications as listed on the vehicle's tire placard. Determine the distance between the same level surface and the same standard reference points in the vehicle's “fully loaded condition.” The “fully loaded condition” is the test vehicle loaded in accordance with S8.1.1 (a) or (b), as applicable. The load placed in the cargo area shall be center over the longitudinal centerline of the vehicle. The pretest vehicle attitude shall be equal to either the as delivered or fully loaded attitude or between the as delivered attitude and the fully loaded attitude.

S8.1.2 Adjustable seats are in the adjustment position midway between the forwardmost and rearmost positions, and if separately adjustable in a vertical direction, are at the lowest position. If an adjustment position does not exist midway between the forwardmost and rearmost positions, the closest adjustment position to the rear of the midpoint is used.

S8.1.3 Place adjustable seat backs in the manufacturer's nominal design riding position in the manner specified by the manufacturer. Place any adjustable anchorages at the manufacturer's nominal design position for a 50th percentile adult male occupant. Place each adjustable head restraint in its highest adjustment position. Adjustable lumbar supports are positioned so that the lumbar support is in its lowest adjustment position.

S8.1.4 Adjustable steering controls are adjusted so that the steering ~~wheel~~**control** hub is at the geometric center of the locus it describes when it is moved through its full range of driving positions.

S8.1.5 Movable vehicle windows and vents are placed in the fully closed position, unless the vehicle manufacturer chooses to specify a different adjustment position prior to the time it certifies the vehicle.

S8.1.6 Convertibles and open-body type vehicles have the top, if any, in place in the closed passenger compartment configuration.

S8.1.7 Doors are fully closed and latched but not locked.

S8.1.8 *Anthropomorphic test dummies.*

S8.1.8.1 The anthropomorphic test dummies used for evaluation of occupant protection systems manufactured pursuant to applicable portions of S4.1.2, S4.1.3, and S4.1.4 of this standard shall conform to the requirements of subpart E of part 572 of this chapter.

S8.1.8.2 Each test dummy is clothed in a form fitting cotton stretch short sleeve shirt with above-the-elbow sleeves and above-the-knee length pants. The weight of the shirt or pants shall not exceed 0.25 pounds each. Each foot of the test dummy is equipped with a size 11XW shoe which meets the configuration size, sole, and heel thickness specifications of MIL-S-13192P (incorporated by reference, see §571.5) change "P" and whose weight is 1.25 ±0.2 pounds.

S8.1.8.3 Limb joints are set at 1g, barely restraining the weight of the limb when extended horizontally. Leg joints are adjusted with the torso in the supine position.

S8.1.8.4 Instrumentation does not affect the motion of the dummies during impact or rollover.

S8.1.8.5 The stabilized test temperature of the test dummy is at any temperature level between 69 degrees F and 72 degrees F, inclusive.

S8.2 *Lateral moving barrier crash test conditions.* The following conditions apply to the lateral moving barrier crash test.

S8.2.1 The moving barrier, including the impact surface, supporting structure, and carriage, weighs 4,000 pounds.

S8.2.2 The impact surface of the barrier is a vertical, rigid, flat rectangle, 78 inches wide and 60 inches high, perpendicular to its direction of movement, with its lower edge horizontal and 5 inches above the ground surface.

S8.2.3 During the entire impact sequence the barrier undergoes no significant amount of dynamic or static deformation, and absorbs no significant portion of the energy resulting from the impact, except for energy that results in translational rebound movement of the barrier.

S8.2.4 During the entire impact sequence the barrier is guided so that it travels in a straight line, with no significant lateral, vertical or rotational movement.

S8.2.5 The concrete surface upon which the vehicle is tested is level, rigid and of uniform construction, with a skid number of 75 when measured in accordance with ASTM E274-65T (incorporated by reference, see §571.5) at 40 m.p.h., omitting water delivery as specified in paragraph 7.1 of that method.

S8.2.6 The tested vehicle's brakes are disengaged and the transmission is in neutral.

S8.2.7 The barrier and the test vehicle are positioned so that at impact—

(a) The vehicle is at rest in its normal attitude;

(b) The barrier is traveling in a direction perpendicular to the longitudinal axis of the vehicle at 20 m.p.h.; and

(c) A vertical plane through the geometric center of the barrier impact surface and perpendicular to that surface passes through the driver's seating **position seating** reference point in the tested vehicle.

S8.3 *Rollover test conditions.* The following conditions apply to the rollover test.

S8.3.1 The tested vehicle's brakes are disengaged and the transmission is in neutral.

S8.3.2 The concrete surface on which the test is conducted is level, rigid, of uniform construction, and of a sufficient size that the vehicle remains on it throughout the entire rollover cycle. It has a skid number of 75 when measured in accordance with ASTM E274-65T (incorporated by reference, see §571.5) at 40 m.p.h. omitting water delivery as specified in paragraph 7.1 of that method.

S8.3.3 The vehicle is placed on a device, similar to that illustrated in Figure 2, having a platform in the form of a flat, rigid plane at an angle of 23° from the horizontal. At the lower edge of the platform is an unyielding flange, perpendicular to the platform with a height of 4 inches and a length sufficient to hold in place the tires that rest against it. The intersection of the inner face of the flange with the upper face of the platform is 9 inches above the rollover surface. No other restraints are used to hold the vehicle in position during the deceleration of the platform and the departure of the vehicle.

S8.3.4 With the vehicle on the test platform, the test devices remain as nearly as possible in the posture specified in S8.1.

S8.3.5 Before the deceleration pulse, the platform is moving horizontally, and perpendicularly to the longitudinal axis of the vehicle, at a constant speed of 30 m.p.h. for a sufficient period of time for the vehicle to become motionless relative to the platform.

S8.3.6 The platform is decelerated from 30 to 0 m.p.h. in a distance of not more than 3 feet, without change of direction and without transverse or rotational movement during the deceleration of the platform and the departure of the vehicle. The deceleration rate is at least 20g for a minimum of 0.04 seconds.

S8.4 *Frontal test condition.* If the vehicle is equipped with a cutoff device permitted by S4.5.4 of this standard, the device is deactivated.

S9. *Pressure vessels and explosive devices.*

S9.1 *Pressure vessels.* A pressure vessel that is continuously pressurized shall conform to the requirements of §§178.65(a), 178.65(c)(2), 178.65(d), 178.65(e)(1), and 178.65(e)(2) of this title; and to the pressure relief device requirements of §§173.301(a)(2), 173.301(a)(3) and 173.301(f) of this title. It shall not leak or evidence visible distortion when tested in accordance with §178.65(f)(1) of this title and shall not fail in any of the ways enumerated in §178.65(f)(2) of this title when hydrostatically tested to destruction. It shall not crack when flattened in accordance with §178.65(g) of this title to the limit specified in §178.65(g)(4) of this title.

S9.2 *Explosive devices.* An explosive device shall not exhibit any of the characteristics prohibited by §173.54 of this title. All explosive material shall be enclosed in a structure that is capable of containing the explosive energy without sudden release of pressure except through overpressure relief devices or parts designed to release the pressure during actuation.

S10. *Test dummy positioning procedures.*

S10.1 *Head.* The transverse instrumentation platform of the head shall be level within ½ degree. To level the head of the test dummy, the following sequences must be followed. First, adjust the position of the H point within the limits set forth in S10.4.2.1 to level the transverse instrumentation platform of the head of the test dummy. If the transverse instrumentation platform of the head is still not level, then adjust the pelvic angle of the test dummy within the limits specified in S10.4.2.2 of this standard. If the transverse instrumentation platform of the head is still not level, then adjust the neck bracket of the dummy the minimum amount necessary from the non-adjusted "0" setting to ensure that the transverse instrumentation platform of the head is horizontal within ½ degree. The test dummy shall remain within the limits specified in S10.4.2.1 and S10.4.2.2. after any adjustment of the neck bracket.

S10.2 *Upper Arms.*

S10.2.1 The driver~~'s~~ **dummy's** upper arms shall be adjacent to the torso with the centerlines as close to a vertical plane as possible.

S10.2.2 ~~The~~**Any front outboard** passenger **dummy**'s upper arms shall be in contact with the seat back and the sides of the torso.

S10.3 *Hands.*

S10.3.1 The palms of the driver~~s test~~ dummy shall be in contact with the outer part of the steering ~~wheel~~**control** rim at the rim's horizontal centerline. The thumbs shall be over the steering ~~wheel~~**control** rim and shall be lightly taped to the steering ~~wheel~~**control** rim so that if the hand of the test dummy is pushed upward by a force of not less than 2 pounds and not more than 5 pounds, the tape shall release the hand from the steering ~~wheel~~**control** rim.

S10.3.2 The palms of ~~the~~**any** passenger test dummy shall be in contact with the outside of the thigh. The little finger shall be in contact with the seat cushion.

S10.4 *Torso.*

S10.4.1 *Upper Torso.*

S10.4.1.1 In vehicles equipped with bench seats, the upper torso of the driver and **front outboard** passenger ~~test~~ dummies shall rest against the seat back. The midsagittal plane of the driver dummy shall be vertical and parallel to the vehicle's longitudinal centerline, and pass through the center of **rotation of** the steering ~~wheel rim~~**control**. The midsagittal plane of ~~the~~**any** passenger dummy shall be vertical and parallel to the vehicle's longitudinal centerline and the same distance from the vehicle's longitudinal centerline as the midsagittal plane of the driver dummy**, if there is a driver's seating position. If there is no driver's seating position, the midsagittal plane of any front outboard passenger dummy shall be vertical and parallel to the vehicle's longitudinal centerline, and pass through the seating reference point of the seat that it occupies.**

S10.4.1.2 In vehicles equipped with bucket seats, the upper torso of the driver and passenger ~~test~~ dummies shall rest against the seat back. The midsagittal plane of the driver and ~~the~~**any front outboard** passenger dummy shall be vertical and shall coincide with the longitudinal centerline of the bucket seat.

S10.4.2 *Lower Torso.*

S10.4.2.1 *H-point.* The H-points of the driver and **any front outboard** passenger test dummies shall coincide within ½ inch in the vertical dimension and ½ inch in the horizontal dimension of a point ¼ inch below the position of the H-point determined by using the equipment and procedures specified in SAE Standard J826-1980 (incorporated by reference, see §571.5), except that the length of the lower leg and thigh segments of the H-point machine shall be adjusted to 16.3 and 15.8 inches, respectively, instead of the 50th percentile values specified in Table 1 of SAE Standard J826-1980.

S10.4.2.2 *Pelvic angle.* As determined using the pelvic angle gage (GM drawing 78051-532, incorporated by reference in part 572, subpart E of this chapter) which is inserted into the H-point gaging hole of the dummy, the angle measured from the horizontal on the three inch flat surface of the gage shall be 22½ degrees plus or minus 2½ degrees.

S10.5 *Legs.* The upper legs of the driver and **any front outboard** passenger test dummies shall rest against the seat cushion to the extent permitted by placement of the feet. The initial distance between the outboard knee clevis flange surfaces shall be 10.6 inches. To the extent practicable, the left leg of the driver dummy and both legs of ~~the~~**any front outboard** passenger dummy shall be in vertical longitudinal planes. To the extent practicable, the right leg of the driver dummy shall be in a vertical plane. Final adjustment to accommodate the placement of feet in accordance with S10.6 for various passenger compartment configurations is permitted.

S10.6 *Feet.*

S10.6.1 *Driver~~'s~~ **dummy** position.*

S10.6.1.1 If the vehicle has an adjustable accelerator pedal, adjust it to the full forward position. Rest the right foot of the test dummy on the undepressed accelerator pedal with the rearmost point of the heel on the floor pan in the plane of the pedal. If the foot cannot be placed on the accelerator pedal, set it initially perpendicular to the lower leg and then place it as far forward as possible in the direction of the pedal centerline with the rearmost point of the heel resting on the floor pan. If the vehicle has an adjustable accelerator pedal and the right foot is not touching the accelerator pedal when positioned as above, move the pedal rearward until it touches the right foot. If the accelerator pedal still does not touch the foot in the full rearward position, leave the pedal in that position.

S10.6.1.2 Place the left foot on the toeboard with the rearmost point of the heel resting on the floor pan as close as possible to the point of intersection of the planes described by the toeboard and the floor pan and not on the wheelwell projection. If the foot cannot be positioned on the toeboard, set it initially perpendicular to the lower leg and place it as far forward as possible with the heel resting on the floor pan. If necessary to avoid contact with the vehicle's brake or clutch pedal, rotate the test dummy's left foot about the lower leg. If there is still pedal interference, rotate the left leg outboard about the hip the minimum distance necessary to avoid the pedal interference. For vehicles with a foot rest that does not elevate the left foot above the level of the right foot, place the left foot on the foot rest so that the upper and lower leg centerlines fall in a vertical plane.

S10.6.2 **Front outboard** ~~P~~***p****assenger~~'s~~* ***dummy*** *position.*

S10.6.2.1 *Vehicles with a flat floor pan/toeboard.* Place the right and left feet on the vehicle's toeboard with the heels resting on the floor pan as close as possible to the intersection point with the toeboard. If the feet cannot be placed flat on the toeboard, set them perpendicular to the lower leg centerlines and place them as far forward as possible with the heels resting on the floor pan.

S10.6.2.2 *Vehicles with wheelhouse projections in passenger compartment.* Place the right and left feet in the well of the floor pan/toeboard and not on the wheelhouse projection. If the feet cannot be placed flat on the toeboard, initially set them perpendicular to the lower leg centerlines and then place them as far forward as possible with the heels resting on the floor pan.

S10.7 *Test dummy positioning for latchplate access.* The reach envelopes specified in S7.4.4 of this standard are obtained by positioning a test dummy in the driver's or **front outboard** passenger~~'s~~ seating position and adjusting that seating position to its forwardmost adjustment position. Attach the lines for the inboard and outboard arms to the test dummy as described in Figure 3 of this standard. Extend each line backward and outboard to generate the compliance arcs of the outboard reach envelope of the test dummy's arms.

S10.8 *Test dummy positioning for belt contact force.* To determine compliance with S7.4.3 of this standard, position the test dummy in the vehicle in accordance with S10.1 through S10.6 of this standard and adjust the seating position in accordance with S8.1.2 and S8.1.3 of this standard. Pull the belt webbing three inches from the test dummy's chest and release until the webbing is within one inch of the test dummy's chest and measure the belt contact force.

S10.9 *Manual belt adjustment for dynamic testing.* With the test dummy positioned in accordance with S10.1 through S10.6 of this standard and the seating position adjusted in accordance with S8.1.2 and S8.1.3 of this standard, place the Type 2 manual belt around the test dummy and fasten the latch. Remove all slack from the lap belt portion. Pull the upper torso webbing out of the retractor and allow it to retract; repeat this four times. Apply a 2 to 4 pound tension load to the lap belt. If the belt system is equipped with a tension-relieving device, introduce the maximum amount of slack into the upper torso belt that is recommended by the vehicle manufacturer in the vehicle's owner's manual. If the belt system is not equipped with a tension-relieving device, allow the excess webbing in the upper torso belt to be retracted by the retractive force of the retractor.

S11. [Reserved]

S12. *Temporary Exemption from Requirement for Inflatable Restraint System.*

S12.1 *Scope.* This section establishes procedures for filing and processing applications for temporary exemption from the requirements in this standard that vehicles be equipped with inflatable restraint systems.

S12.2 *Definitions.*

*Line* means a name that a manufacturer applies to a group of motor vehicles of the same make which have the same body or chassis, or otherwise are similar in construction or design. A *line* may, for example, include 2-door, 4-door, station wagon, and hatchback vehicles of the same make.

S12.3 *Standard of review.* In order to receive a temporary exemption from the inflatable restraint requirement, a vehicle manufacturer must demonstrate in its application that there has

been a disruption in the supply of one or more inflatable restraint system components, or a disruption in the use and installation by the manufacturer of any such component due to unavoidable events not under the control of the manufacturer, which will prevent a manufacturer from meeting its anticipated production volume of vehicles with inflatable restraint systems.

S12.4 *Exemption applications—General requirements.* Each application for a temporary exemption from the inflatable restraint requirements must—

(a) Be written in the English language;

(b) Be submitted in three copies to: Administrator, National Highway Traffic Safety Administration, 400 Seventh Street, SW., Washington, DC 20590;

(c) State the full name and address of the manufacturer, the nature of its organization (individual, partnership, corporation, etc.), and the name of the State or country under the laws of which it is organized;

(d) Identify the motor vehicle line or lines for which the temporary exemption is being sought;

(e) Set forth in full the data, views, and arguments of the manufacturer that would support granting the temporary exemption, including the specific information required by S12.5; and

(f) Specify and segregate any part of the information and data submitted in the application that should be withheld from public disclosure in accordance with part 512 of this chapter.

S12.5 *Exemption applications—Specific content requirements.* Each application for a temporary exemption from the inflatable restraint requirement must include:

(a) A clear and specific identification of any component in the inflatable restraint system that has become unavailable due to circumstances beyond the manufacturer's control, and a diagram showing the location of such component within the restraint system and within the vehicle;

(b) A clear and specific explanation of the cause or causes of the disruption in the supply of the component, and a showing that such disruption is beyond the control of the manufacturer;

(c) An estimate of the length of time that will be needed to correct the disruption and again incorporate the subject components into current production, or an explanation of why it is not possible to provide such an estimate;

(d) A complete statement of the bases for the manufacturer's belief that NHTSA should grant a temporary exemption in response to this application;

(e) An unconditional statement by the manufacturer that it will recall every vehicle for which a temporary exemption is requested in the application, to install all missing inflatable restraint systems;

(f) A plan setting forth steps the manufacturer will take to ensure that as many exempted vehicles as possible will be returned for installation of missing inflatable restraint systems;

(g) A proposed reasonable period of time after the disruption in the supply of inflatable restraint system components is corrected that the manufacturer estimates will ensure a sufficient quantity of components for both anticipated production and retrofit of those vehicles for which a temporary exemption is requested in the application, so that the vehicle manufacturer can recall those vehicles for which a temporary exemption is requested and install inflatable restraint systems in them, together with a demonstration of why the manufacturer believes this proposed period of time is reasonable for completing this recall, or an explanation of why it is not possible to provide such an estimate;

(h) A proposed date for termination of the exemption;

(i) A proposed date by which all exempted vehicles will have been recalled and had inflatable restraints installed (assuming owners returned their vehicles in a timely matter in response to a first notice by the manufacturer), or an explanation of why it is not possible to provide such an estimate.

S12.6 *Processing an application for a temporary exemption.* (a) NHTSA will process any application for temporary exemption that contains the information specified in S12.4 and S12.5. If an application fails to provide the information specified in S12.4 and S12.5, NHTSA will not process the application, but will advise the manufacturer of the information that must be provided if the agency is to process the application.

(b) Notice of each application for temporary exemption shall be published in the FEDERAL REGISTER.

(c) NHTSA will issue its decision to grant or deny the requested temporary exemption not later than 15 days after the agency receives a complete petition, as defined in paragraph (a). However, a failure to issue a decision within this time does not result in a grant of the petition.

(d) Notice of each decision to grant or deny a temporary exemption, and the reasons for granting or denying it, will be published in the FEDERAL REGISTER.

(e) The Administrator may attach such conditions as he or she deems appropriate to a temporary exemption, including but not limited to requiring manufacturers to provide progress reports at specified times (including, as appropriate and to the extent possible, estimate of dates and times concerning when a supply disruption will be corrected and when recall will take place) and requiring manufacturers to take specific steps to ensure that as many exempted vehicles as possible will be returned for installation of missing inflatable restraint systems.

(f) Unless a later effective date is specified in a notice announcing an agency decision to grant a temporary exemption, a temporary exemption from the inflatable restraint requirement will become effective upon the date the decision is issued.

S12.7 *Labels and written notice announcing temporary exemption.*

S12.7.1 It shall be a condition of every temporary exemption from the inflatable restraint requirement that the manufacturer of exempted vehicles comply with the provisions of S12.7.2 and S12.7.3.

S12.7.2 (a) The manufacturer of any vehicle granted a temporary exemption from the inflatable restraint requirement shall affix a label within the passenger compartment of such vehicle. The label shall set forth the following information in block capital letters and numerals not less than three thirty-seconds of an inch high:

THIS VEHICLE DOES NOT CONTAIN AN AIR BAG IN CONFORMANCE WITH THE FEDERAL MOTOR VEHICLE SAFETY STANDARD FOR OCCUPANT CRASH PROTECTION. IT WAS EXEMPTED PURSUANT TO NHTSA EXEMPTION NO. (insert number assigned by NHTSA).

(b) This label shall not be removed until after the vehicle manufacturer has recalled the vehicle and installed an inflatable restraint system at those seating positions for which it was granted an exemption.

S12.7.3 The manufacturer of any vehicle that is delivered without an inflatable restraint system, pursuant to a temporary exemption granted under this section, shall, at the time of delivery of the vehicle, provide a written notice to the dealer to whom the vehicle is delivered. The manufacturer shall also provide a written notice by registered mail to the first purchaser of the vehicle for purposes other than resale, within two weeks after purchase. Unless otherwise provided for by the Administrator in the exemption, such notice shall provide the following information:

(a) This vehicle does not conform to Federal Motor Vehicle Safety Standard No. 208, because it is not equipped with an inflatable restraint at (insert the affected seating positions).

(b) The vehicle was allowed to be sold pursuant to NHTSA Exemption No. (insert appropriate exemption number).

(c) The reason this vehicle was exempted from the requirement for an inflatable restraint was because of factors beyond the manufacturer's control.

(d) The manufacturer will recall this vehicle not later than (insert the time set forth in the exemption) and install the missing inflatable restraint at no charge.

(e) If the reader has any questions or would like some further information, he or she may contact the manufacturer at (insert an address and telephone number).

S13 *Alternative unbelted test available, under S3(b) of this standard, for certain vehicles manufactured before September 1, 2006.*

S13.1 *Instrumentation for Impact Test—Part 1—Electronic Instrumentation.* Under the applicable conditions of S8, mount the vehicle on a dynamic test platform at the vehicle attitude set forth in S13.3, so that the longitudinal center line of the vehicle is parallel to the direction of the test platform travel and so that movement between the base of the vehicle and the test platform is prevented. The test platform is instrumented with an accelerometer and data processing system having a frequency response of 60 channel class as specified in SAE Recommended Practice J211/1 MAR95 (incorporated by reference, see §571.5). The accelerometer sensitive axis is parallel to the direction of test platform travel. The test is conducted at a velocity change approximating 48 km/h (30 mph) with acceleration of the test platform such that all points on the crash pulse curve within the corridor identified in Figure 6 are covered. An inflatable restraint is to be activated at 20 ms ±2 ms from the time that 0.5 g is measured on the dynamic test platform. The test dummy specified in S8.1.8, placed in each front outboard designated seating position as specified in S10, excluding S10.7, S10.8, and S10.9, shall meet the injury criteria of S6.1, S6.2(a), S6.3, S6.4(a), S6.5, and S13.2 of this standard.

S13.2 *Neck injury criteria.* A vehicle certified to this alternative test requirement shall, in addition to meeting the criteria specified in S13.1, meet the following injury criteria for the neck, measured with the six axis load cell (ref. Denton drawing C-1709) that is mounted between the bottom of the skull and the top of the neck as shown in Drawing 78051-218, in the unbelted sled test:

(a) Flexion Bending Moment (calculated at the occipital condyle)—190 Nm. SAE Class 600.

(b) Extension Bending Moment (calculated at the occipital condyle)—57 Nm. SAE Class 600.

(c) Axial Tension—3300 peak N. SAE Class 1000.

(d) Axial Compression—4000 peak N. SAE Class 1000.

(e) Fore-and-Aft Shear—3100 peak N. SAE Class 1000.

S13.3 *Vehicle test attitude.* When the vehicle is in its "as delivered" condition, measure the angle between the ~~driver's's~~**left side** door sill and the horizontal. Mark where the angle is taken on the door sill. The "as delivered" condition is the vehicle as received at the test site, with 100 percent of all fluid capacities and all tires inflated to the manufacturer's specifications as listed on the vehicle's tire placard. When the vehicle is in its "fully loaded" condition, measure the angle between the ~~driver's's~~**left side** door sill and the horizontal, at the same place the "as delivered" angle was measured. The "fully loaded" condition is the test vehicle loaded in accordance with S8.1.1(a) or (b) of Standard No. 208, as applicable. The load placed in the cargo area shall be centered over the longitudinal centerline of the vehicle. The pretest door sill angle, when the vehicle is on the sled, (measured at the same location as the as delivered and fully loaded condition) shall be equal to or between the as delivered and fully loaded door sill angle measurements.

S13.4 *Tires and wheels.* Remove the tires and wheels.

S13.5. *Vehicle Securing.* The engine, transmissions, axles, exhaust, vehicle frame, and vehicle body may be rigidly secured to the vehicle and/or the sled, and fluids, batteries and unsecured components may be removed, in order to assure that all points on the crash pulse curve are within the corridor defined in Figure 6.

S14 *Advanced air bag requirements for passenger cars and for trucks, buses, and multipurpose passenger vehicles with a GVWR of 3,855 kg (8500 pounds) or less and an unloaded vehicle weight of 2,495 kg (5500 pounds) or less, except for walk-in van-type trucks or vehicles designed to be sold exclusively to the U.S. Postal Service.*

S14.1 *Vehicles manufactured on or after September 1, 2003, and before September 1, 2006.* (a) For vehicles manufactured for sale in the United States on or after September 1, 2003, and before September 1, 2006, a percentage of the manufacturer's production, as specified in S14.1.1, shall meet the requirements specified in S14.5.1(a), S14.5.2, S15.1, S15.2, S17, S19, S21, S23, and S25 (in addition to the other requirements specified in this standard).

(b) Manufacturers that sell three or fewer carlines, as that term is defined at 49 CFR 585.4, in the United States may, at the option of the manufacturer, meet the requirements of this paragraph instead of paragraph (a) of this section. At least 95 percent of the vehicles manufactured by the manufacturer on or after September 1, 2005 and before September 1, 2006 shall meet the requirements specified in S14.5.1(a), S14.5.2, S15.1, S15.2, S17, S19, S21, S23, and S25 (in addition to the other requirements specified in this standard).

(c) Vehicles that are manufactured in two or more stages or that are altered (within the meaning of 49 CFR 567.7) after having previously been certified in accordance with part 567 of this chapter are not subject to the requirements of S14.1.

(d) Vehicles that are manufactured by an original vehicle manufacturer that produces or assembles fewer than 5,000 vehicles annually for sale in the United States are not subject to the requirements of S14.1.

S14.1.1 *Phase-in schedule.*

S14.1.1.1 *Vehicles manufactured on or after September 1, 2003, and before September 1, 2004.* Subject to S14.1.2(a), for vehicles manufactured by a manufacturer on or after September 1, 2003, and before September 1, 2004, the amount of vehicles complying with S14.5.1(a), S14.5.2, S15.1, S15.2, S17, S19, S21, S23, and S25, shall be not less than 20 percent of:

(a) If the manufacturer has manufactured vehicles for sale in the United States during both of the two production years prior to September 1, 2003, the manufacturer's average annual production of vehicles manufactured on or after September 1, 2001, and before September 1, 2004, or

(b) The manufacturer's production on or after September 1, 2003, and before September 1, 2004.

S14.1.1.2 *Vehicles manufactured on or after September 1, 2004, and before September 1, 2005.* Subject to S14.1.2(b), for vehicles manufactured by a manufacturer on or after September 1,

2004, and before September 1, 2005, the amount of vehicles complying with S14.5.1(a), S14.5.2, S15.1, S15.2, S17, S19, S21, S23, and S25 shall be not less than 65 percent of:

(a) If the manufacturer has manufactured vehicles for sale in the United States during both of the two production years prior to September 1, 2004, the manufacturer's average annual production of vehicles manufactured on or after September 1, 2002, and before September 1, 2005, or

(b) The manufacturer's production on or after September 1, 2004, and before September 1, 2005.

S14.1.1.3 *Vehicles manufactured on or after September 1, 2005, and before September 1, 2006.* Subject to S14.1.2(c), for vehicles manufactured by a manufacturer on or after September 1, 2005, and before September 1, 2006, the amount of vehicles complying with S14.5.1(a), S14.5.2, S15.1, S15.2, S17, S19, S21, S23, and S25 shall be 100 percent of the manufacturer's production during that period.

S14.1.2 Calculation of complying vehicles.

(a) For the purposes of complying with S14.1.1.1, a manufacturer may count a vehicle if it is manufactured on or after June 12, 2000, but before September 1, 2004.

(b) For purposes of complying with S14.1.1.2, a manufacturer may count a vehicle if it:

(1) Is manufactured on or after June 12, 2000, but before September 1, 2005, and

(2) Is not counted toward compliance with S14.1.1.1.

(c) For purposes of complying with S14.1.1.3, a manufacturer may count a vehicle if it:

(1) Is manufactured on or after June 12, 2000, but before September 1, 2006, and (2) Is not counted toward compliance with S14.1.1.1 or S14.1.1.2.

S14.1.3 *Vehicles produced by more than one manufacturer.*

S14.1.3.1 For the purpose of calculating average annual production of vehicles for each manufacturer and the number of vehicles manufactured by each manufacturer under S14.1.1, a vehicle produced by more than one manufacturer shall be attributed to a single manufacturer as follows, subject to S14.1.3.2.

(a) A vehicle that is imported shall be attributed to the importer.

(b) A vehicle manufactured in the United States by more than one manufacturer, one of which also markets the vehicle, shall be attributed to the manufacturer that markets the vehicle.

S14.1.3.2 A vehicle produced by more than one manufacturer shall be attributed to any one of the vehicle's manufacturers specified by an express written contract, reported to the National Highway Traffic Safety Administration under 49 CFR part 585, between the manufacturer so

specified and the manufacturer to which the vehicle would otherwise be attributed under S14.1.3.1.

S14.2 *Vehicles manufactured on or after September 1, 2006.* Each vehicle shall meet the requirements specified in S14.5.1(a), S14.5.2, S15.1, S15.2, S17, S19, S21, S23, and S25 (in addition to the other requirements specified in this standard).

S14.3 *Vehicles manufactured on or after September 1, 2007, and before September 1, 2010.*

(a) For vehicles manufactured for sale in the United States on or after September 1, 2007, and before September 1, 2010, a percentage of the manufacturer's production, as specified in S14.3.1, shall meet the requirements specified in S14.5.1(b) (in addition to the other requirements of this standard).

(b) Manufacturers that sell two or fewer carlines, as that term is defined at 49 CFR 583.4, in the United States may, at the option of the manufacturer, meet the requirements of this paragraph instead of paragraph (a) of this section. Each vehicle manufactured on or after September 1, 2008, and before September 1, 2010, shall meet the requirements specified in S14.5.1(b) (in addition to the other requirements specified in this standard).

(c) Vehicles that are manufactured in two or more stages or that are altered (within the meaning of 49 CFR 567.7) after having been previously certified in accordance with part 567 of this chapter are not subject to the requirements of S14.3.

(d) Vehicles that are manufactured by an original vehicle manufacturer that produces or assembles fewer than 5,000 vehicles annually for sale in the United States are not subject to the requirements of S14.3.

S14.3.1 *Phase-in schedule.*

S14.3.1.1 *Vehicles manufactured on or after September 1, 2007, and before September 1, 2008.* Subject to S14.3.2(a), for vehicles manufactured by a manufacturer on or after September 1, 2007, and before September 1, 2008, the amount of vehicles complying with S14.5.1(b), S14.5.2, S15.1, S15.2, S17, S19, S21, S23, and S25, shall be not less than 35 percent of:

(a) If the manufacturer has manufactured vehicles for sale in the United States during both of the two production years prior to September 1, 2007, the manufacturer's average annual production of vehicles manufactured on or after September 1, 2005, and before September 1, 2008, or

(b) The manufacturer's production on or after September 1, 2007, and before September 1, 2008.

S14.3.1.2 *Vehicles manufactured on or after September 1, 2008, and before September 1, 2009.* Subject to S14.3.2(b), for vehicles manufactured by a manufacturer on or after September 1, 2008, and before September 1, 2009, the amount of vehicles complying with S14.5.1(b), S14.5.2, S15.1, S15.2, S17, S19, S21, S23, and S25 shall be not less than 65 percent of:

(a) If the manufacturer has manufactured vehicles for sale in the United States during both of the two production years prior to September 1, 2008, the manufacturer's average annual production of vehicles manufactured on or after September 1, 2006 and before September 1, 2009, or

(b) The manufacturer's production on or after September 1, 2008, and before September 1, 2009.

S14.3.1.3 *Vehicles manufactured on or after September 1, 2009, and before September 1, 2010.* Subject to S14.3.2(c), for vehicles manufactured by a manufacturer on or after September 1, 2009, and before September 1, 2010, the amount of vehicles complying with S14.5.1(b), S14.5.2, S15.1, S15.2, S17, S19, S21, S23, and S25 shall be 100 percent of the manufacturer's production during that period.

S14.3.2 *Calculation of complying vehicles.*

(a) For the purposes of complying with S14.3.1.1, a manufacturer may count a vehicle if it is manufactured on or after September 1, 2006, but before September 1, 2008.

(b) For purposes of complying with S14.3.1.2, a manufacturer may count a vehicle if it:

(1) Is manufactured on or after September 1, 2006, but before September 1, 2009, and

(2) Is not counted toward compliance with S14.3.1.1.

(c) For purposes of complying with S14.3.1.3, a manufacturer may count a vehicle if it:

(1) Is manufactured on or after September 1, 2006, but before September 1, 2010, and

(2) Is not counted toward compliance with S14.3.1.1 or S14.3.1.2.

S14.3.3 *Vehicles produced by more than one manufacturer.*

S14.3.3.1 For the purpose of calculating average annual production of vehicles for each manufacturer and the number of vehicles manufactured by each manufacturer under S14.3.1, a vehicle produced by more than one manufacturer shall be attributed to a single manufacturer as follows, subject to S14.3.3.2.

(a) A vehicle that is imported shall be attributed to the importer.

(b) A vehicle manufactured in the United States by more than one manufacturer, one of which also markets the vehicle, shall be attributed to the manufacturer that markets the vehicle.

S14.3.3.2 A vehicle produced by more than one manufacturer shall be attributed to any one of the vehicle's manufacturers specified by an express written contract, reported to the National Highway Traffic Safety Administration under 49 CFR part 585, between the manufacturer so specified and the manufacturer to which the vehicle would otherwise be attributed under S14.3.3.1.

S14.4 *Vehicles manufactured on or after September 1, 2010.* Each vehicle shall meet the requirements specified in S14.5.1(b), S14.5.2, S15.1, S15.2, S17, S19, S21, S23, and S25 (in addition to the other requirements specified in this standard).

S14.5 *Barrier test requirements using 50th percentile adult male dummies.*

S14.5.1 *Rigid barrier belted test.* (a) Each vehicle that is certified as complying with S14.1 or S14.2 shall, at each front outboard designated seating position, meet the injury criteria specified in S6.1, S6.2(b), S6.3, S6.4(b), S6.5, and S6.6 when tested under S5.1.1(b)(1).

(b) Each vehicle that is certified as complying with S14.3 or S14.4 shall, at each front outboard designated seating position, meet the injury criteria specified in S6.1, S6.2(b), S6.3, S6.4(b), S6.5, and S6.6 when tested under S5.1.1(b)(2).

S14.5.2 *Rigid barrier unbelted test.* Each vehicle that is certified as complying with S14 shall, at each front outboard designated seating position, meet the injury criteria specified in S6.1, S6.2(b), S6.3, S6.4(b), S6.5, and S6.6 when tested under S5.1.2(b).

S14.6 *Vehicles manufactured on or after September 1, 2009, and before September 1, 2012 (Phase-in of higher maximum speed (56 km/h (35 mph)) belted test requirement using 5th percentile adult female dummies).*

(a) For vehicles manufactured for sale in the United States on or after September 1, 2009, and before September 1, 2012, a percentage of the manufacturer's production, as specified in S14.6.1, shall meet the requirements specified in S15.1(b) (in addition to the other requirements specified in this standard).

(b) Manufacturers that sell two or fewer carlines, as that term is defined at 49 CFR 583.4, in the United States may, at the option of the manufacturer, meet the requirements of this paragraph instead of paragraph (a) of this section. Each vehicle manufactured on or after September 1, 2010, and before September 1, 2012, shall meet the requirements specified in S15.1(b) (in addition to the other requirements specified in this standard).

(c) Vehicles that are manufactured in two or more stages or that are altered (within the meaning of 49 CFR 567.7) after having previously been certified in accordance with part 567 of this chapter are not subject to the requirements of S14.6.

(d) Vehicles that are manufactured by an original vehicle manufacturer that produces or assembles fewer than 5,000 vehicles annually for sale in the United States are not subject to the requirements of S14.6.

S14.6.1 *Phase-in schedule.*

S14.6.1.1 *Vehicles manufactured on or after September 1, 2009, and before September 1, 2010.* Subject to S14.6.2(a), for vehicles manufactured by a manufacturer on or after September 1,

2009, and before September 1, 2010, the amount of vehicles complying with S15.1(b) shall be not less than 35 percent of:

(a) If the manufacturer has manufactured vehicles for sale in the United States during both of the two production years prior to September 1, 2009, the manufacturer's average annual production of vehicles manufactured on or after September 1, 2007, and before September 1, 2010, or

(b) The manufacturer's production on or after September 1, 2009, and before September 1, 2010.

S14.6.1.2 *Vehicles manufactured on or after September 1, 2010, and before September 1, 2011.* Subject to S14.6.2(b), for vehicles manufactured by a manufacturer on or after September 1, 2010, and before September 1, 2011, the amount of vehicles complying with S15.1(b) shall be not less than 65 percent of:

(a) If the manufacturer has manufactured vehicles for sale in the United States during both of the two production years prior to September 1, 2010, the manufacturer's average annual production of vehicles manufactured on or after September 1, 2008 and before September 1, 2011, or

(b) The manufacturer's production on or after September 1, 2010, and before September 1, 2011.

S14.6.1.3 *Vehicles manufactured on or after September 1, 2011, and before September 1, 2012.* Subject to S14.6.2(c), for vehicles manufactured by a manufacturer on or after September 1, 2011, and before September 1, 2012, the amount of vehicles complying with S15.1(b) shall be 100 percent of the manufacturer's production during that period.

S14.6.2 *Calculation of complying vehicles.*

(a) For the purposes of complying with S14.6.1.1, a manufacturer may count a vehicle if it is manufactured on or after September 1, 2008, but before September 1, 2010.

(b) For purposes of complying with S14.6.1.2, a manufacturer may count a vehicle if it:

(1) Is manufactured on or after September 1, 2008, but before September 1, 2011, and

(2) Is not counted toward compliance with S14.6.1.1.

(c) For purposes of complying with S14.6.1.3, a manufacturer may count a vehicle if it:

(1) Is manufactured on or after September 1, 2008, but before September 1, 2012, and

(2) Is not counted toward compliance with S14.6.1.1 or S14.6.1.2.

S14.6.3 *Vehicles produced by more than one manufacturer.*

S14.6.3.1 For the purpose of calculating average annual production of vehicles for each manufacturer and the number of vehicles manufactured by each manufacturer under S14.6.1, a

vehicle produced by more than one manufacturer shall be attributed to a single manufacturer as follows, subject to S14.6.3.2.

(a) A vehicle that is imported shall be attributed to the importer.

(b) A vehicle manufactured in the United States by more than one manufacturer, one of which also markets the vehicle, shall be attributed to the manufacturer that markets the vehicle.

S14.6.3.2 A vehicle produced by more than one manufacturer shall be attributed to any one of the vehicle's manufacturers specified by an express written contract, reported to the National Highway Traffic Safety Administration under 49 CFR part 585, between the manufacturer so specified and the manufacturer to which the vehicle would otherwise be attributed under S14.6.3.1.

S14.7 *Vehicles manufactured on or after September 1, 2012. (Higher maximum speed (56km/h (35 mph)) belted test requirement using 5th percentile adult female dummies*). Each vehicle shall meet the requirements specified in S15.1(b) (in addition to the other requirements specified in this standard). However, vehicles that are manufactured in two or more stages or that are altered (within the meaning of 49 CFR 567.7) after having been previously certified in accordance with part 567 of this chapter may comply with the requirements specified in S15.1(a) instead of S15.1(b), if they are manufactured before September 1, 2013.

S14.8 *Vehicles manufactured on or after September 1, 2009 and before September 1, 2010.* Vehicles manufactured on or after September 1, 2009 and before September 1, 2010, shall comply with S14.8.1 through S14.8.4. At any time during the production year ending August 31, 2010, each manufacturer shall, upon request from the Office of Vehicle Safety Compliance, provide information identifying the vehicles by make, model and vehicle identification number that have been certified as complying with S19, S21, and S23 (in addition to the other requirements specified in this standard) when using the child restraint systems specified in appendix A-1 of this standard. The manufacturer's designation of a vehicle as meeting the requirements when using the child restraint systems in appendix A-1 of this standard is irrevocable.

S14.8.1 Subject to S14.8.2, for vehicles manufactured on or after September 1, 2009, the number of vehicles certified as complying with S19, S21, and S23 when using the child restraint systems specified in appendix A-1 of this standard shall be not less than 50 percent of:

(a) The manufacturer's average annual production of vehicles subject to S19, S21, and S23 of this standard manufactured on or after September 1, 2006 and before September 1, 2009; or

(b) The manufacturer's production of vehicles subject to S19, S21, and S23 manufactured on or after September 1, 2009 and before September 1, 2010.

S14.8.2 For the purpose of calculating average annual production of vehicles for each manufacturer and the number of vehicles manufactured by each manufacturer under S14.8.1, a

vehicle produced by more than one manufacturer shall be attributed to a single manufacturer as provided in S14.8.2(a) through (c), subject to S14.8.3.

(a) A vehicle which is imported shall be attributed to the importer.

(b) A vehicle manufactured in the United States by more than one manufacturer, one of which also markets the vehicle, shall be attributed to the manufacturer which markets the vehicle.

(c) A vehicle produced by more than one manufacturer shall be attributed to any one of the vehicle's manufacturers specified by an express written contract, reported to the National Highway Traffic Safety Administration under 49 CFR part 585, between the manufacturer so specified and the manufacturer to which the vehicle would otherwise be attributed under S14.8.2(a) or (b).

S14.8.3 For the purposes of calculating average annual production of vehicle for each manufacturer and the number of vehicles by each manufacturer under S14.8.1, each vehicle that is excluded from the requirement to test with child restraints listed in appendix A or A-1 of this standard is not counted.

S14.8.4 Until September 1, 2011, vehicles manufactured by a final-stage manufacturer or alterer could be certified as complying with S19, S21, and S23 when using the child restraint systems specified in appendix A. Vehicles manufactured on or after September 1, 2011 by these manufacturers must be certified as complying with S19, S21, and S23 when using the child restraint systems specified in appendix A-1.

S14.8.5 Until September 1, 2011, manufacturers selling fewer than 5,000 vehicles per year in the U.S. may certify their vehicles as complying with S19, S21, and S23 when using the child restraint systems specified in Appendix A. Vehicles manufactured on or after September 1, 2011 by these manufacturers must be certified as complying with S19, S21, and S23 when using the child restraint systems specified in Appendix A-1.

S15 *Rigid barrier test requirements using 5th percentile adult female dummies.*

S15.1 *Belted Test.* (a) Each vehicle that is certified as complying with S14.1 or S14.2 shall, at each front outboard designated seating position, meet the injury criteria specified in S15.3 when tested under S16.1(a)(1).

(b) Each vehicle that is certified as complying with S14.6 or S14.7 shall, at each front outboard designated seating position, meet the injury criteria specified in S15.3 when tested under S16.1(a)(2).

S15.2 *Unbelted test.* Each vehicle that is certified as complying with S14 shall, at each front outboard designated seating position, meet the injury criteria specified in S15.3 of this standard when the vehicle is crash tested in accordance with the procedures specified in S16.1(b) of this standard with the anthropomorphic test devices unbelted.

S15.3 *Injury criteria for the 49 CFR part 572, subpart O Hybrid III 5th percentile female test dummy.*

S15.3.1 All portions of the test dummy shall be contained within the outer surfaces of the vehicle passenger compartment.

S15.3.2 *Head injury criteria.* (a) For any two points in time, $t_1$ and $t_2$, during the event which are separated by not more than a 15 millisecond time interval and where $t_1$ is less than $t_2$, the head injury criterion ($HIC_{15}$) shall be determined using the resultant head acceleration at the center of gravity of the dummy head, $a_r$, expressed as a multiple of g (the acceleration of gravity) and shall be calculated using the expression:

$$\left[\frac{1}{(t_2 - t_1)}\int_{t_1}^{t_2} a_r dt\right]^{2.5}(t_2 - t_1)$$

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(b) The maximum calculated $HIC_{15}$ value shall not exceed 700.

S15.3.3 The resultant acceleration calculated from the output of the thoracic instrumentation shall not exceed 60 g's, except for intervals whose cumulative duration is not more than 3 milliseconds.

S15.3.4 Compression deflection of the sternum relative to the spine, as determined by instrumentation, shown shall not exceed 52 mm (2.0 in).

S15.3.5 The force transmitted axially through each femur shall not exceed 6805 N (1530 lb).

S15.3.6 *Neck injury.* When measuring neck injury, each of the following injury criteria shall be met.

(a) *Nij.*

(1) The shear force (Fx), axial force (Fz), and bending moment (My) shall be measured by the dummy upper neck load cell for the duration of the crash event as specified in S4.11. Shear force, axial force, and bending moment shall be filtered for Nij purposes at SAE Recommended Practice J211/1 MAR95 (incorporated by reference, see §571.5) Channel Frequency Class 600.

(2) During the event, the axial force (Fz) can be either in tension or compression while the occipital condyle bending moment (Mocy) can be in either flexion or extension. This results in four possible loading conditions for Nij: Tension-extension (Nte), tension-flexion (Ntf), compression-extension (Nce), or compression-flexion (Ncf).

(3) When calculating Nij using equation S15.3.6(a)(4), the critical values, Fzc and Myc, are:

(i) Fzc = 4287 N (964 lbf) when Fz is in tension

(ii) Fzc = 3880 N (872 lbf) when Fz is in compression

(iii) Myc = 155 Nm (114 lbf-ft) when a flexion moment exists at the occipital condyle

(iv) Myc = 67 Nm (49 lbf-ft) when an extension moment exists at the occipital condyle.

(4) At each point in time, only one of the four loading conditions occurs and the Nij value corresponding to that loading condition is computed and the three remaining loading modes shall be considered a value of zero. The expression for calculating each Nij loading condition is given by:

Nij = (Fz/Fzc) + (Mocy/Myc)

(5) None of the four Nij values shall exceed 1.0 at any time during the event.

(b) *Peak tension.* Tension force (Fz), measured at the upper neck load cell, shall not exceed 2620 N (589 lbf) at any time.

(c) *Peak compression.* Compression force (Fz), measured at the upper neck load cell, shall not exceed 2520 N (566 lbf) at any time.

S15.3.7 Unless otherwise indicated, instrumentation for data acquisition, data channel frequency class, and moment calculations are the same as given for the 49 CFR part 572, subpart O Hybrid III 5th percentile female test dummy.

S16. *Test procedures for rigid barrier test requirements using 5th percentile adult female dummies.*

S16.1 *General provisions.* Crash testing to determine compliance with the requirements of S15 of this standard is conducted as specified in the following paragraphs (a) and (b).

(a) *Belted test*—(1) *Vehicles certified to S14.1 or S14.2.* Place a 49 CFR Part 572 Subpart O 5th percentile adult female test dummy at each front outboard seating position of a vehicle, in accordance with the procedures specified in S16.3 of this standard. Impact the vehicle traveling longitudinally forward at any speed, up to and including 48 km/h (30 mph), into a fixed rigid barrier that is perpendicular within a tolerance of ±5 degrees to the line of travel of the vehicle under the applicable conditions of S16.2 of this standard.

(2) *Vehicles certified to S14.6 or S14.7.* Place a 49 CFR Part 572 Subpart O 5th percentile adult female test dummy at each front outboard seating position of a vehicle, in accordance with the procedures specified in S16.3 of this standard. Impact the vehicle traveling longitudinally forward at any speed, up to and including 56km/h (35 mph), into a fixed rigid barrier that is perpendicular within a tolerance of ±5 degrees to the line of travel of the vehicle under the applicable conditions of S16.2 of this standard.

(b) *Unbelted test.* Place a 49 CFR Part 572 Subpart O 5th percentile adult female test dummy at each front outboard seating position of a vehicle, in accordance with the procedures specified in S16.3 of this standard, except S16.3.5. Impact the vehicle traveling longitudinally forward at any speed, from 32 km/h (20 mph) to 40 km/h (25 mph), inclusive, into a fixed rigid barrier that is perpendicular within a tolerance of ±5 degrees to the line of travel of the vehicle under the applicable conditions of S16.2 of this standard.

S16.2 *Test conditions.*

S16.2.1 The vehicle, including test devices and instrumentation, is loaded as in S8.1.1.

S16.2.2 Movable vehicle windows and vents are placed in the fully closed position, unless the vehicle manufacturer chooses to specify a different adjustment position prior to the time the vehicle is certified.

S16.2.3 Convertibles and open-body type vehicles have the top, if any, in place in the closed passenger compartment configuration.

S16.2.4 Doors are fully closed and latched but not locked.

S16.2.5 The dummy is clothed in form fitting cotton stretch garments with short sleeves and above the knee length pants. A size 7½ W shoe which meets the configuration and size specifications of MIL-S-21711E (incorporated by reference, see §571.5) or its equivalent is placed on each foot of the test dummy.

S16.2.6 Limb joints are set at one g, barely restraining the weight of the limb when extended horizontally. Leg joints are adjusted with the torso in the supine position.

S16.2.7 Instrumentation shall not affect the motion of dummies during impact.

S16.2.8 The stabilized temperature of the dummy is at any level between 20.6 °C and 22.2 °C (69 °F to 72 °F).

S16.2.9 *Steering ~~wheel~~**control** adjustment.*

S16.2.9.1 Adjust a tiltable steering ~~wheel~~**control**, if possible, so that the steering ~~wheel~~**control** hub is at the geometric center of its full range of driving positions.

S16.2.9.2 If there is no setting detent at the mid-position, lower the steering ~~wheel~~**control** to the detent just below the mid-position.

S16.2.9.3 If the steering column is telescoping, place the steering column in the mid-position. If there is no mid-position, move the steering ~~wheel~~**control** rearward one position from the mid-position.

S16.2.10 ~~Driver and~~ ***Front outboard*** *passenger seat set-up.*

S16.2.10.1 *Lumbar support adjustment.* Position adjustable lumbar supports so that the lumbar support is in its lowest, retracted or deflated adjustment position.

S16.2.10.2 *Other seat adjustments.* Position any adjustable parts of the seat that provide additional support so that they are in the lowest or most open adjustment position. Position any adjustable head restraint in the lowest and most forward position.

S16.2.10.3 *Seat position adjustment.* If the **front right outboard** passenger seat does not adjust independently of the ~~driver seat~~**front left outboard seat**, the ~~driver seat~~ **front left outboard seat** shall control the final position of the **front right outboard** passenger seat.

S16.2.10.3.1 Using only the controls that primarily move the seat and seat cushion independent of the seat back in the fore and aft directions, move the seat cushion reference point (SCRP) to the rearmost position. Using any part of any control, other than those just used, determine the full range of angles of the seat cushion reference line and set the seat cushion reference line to the middle of the range. Using any part of any control other than those that primarily move the seat or seat cushion fore and aft, while maintaining the seat cushion reference line angle, place the SCRP to its lowest position.

S16.2.10.3.2 Using only the control that primarily moves the seat fore and aft, move the SCRP to the full forward position.

S16.2.10.3.3 If the seat or seat cushion height is adjustable, other than by the controls that primarily move the seat or seat cushion fore and aft, determine the maximum and minimum heights of the SCRP, while maintaining, as closely as possible, the angle determined in S16.2.10.3.1. Set the SCRP at the midpoint height with the seat cushion reference line angle set as closely as possible to the angle determined in S16.2.10.3.1. Mark location of the seat for future reference.

S16.3 *Dummy seating positioning procedures.* The 49 CFR Part 572 Subpart O 5th percentile adult female test dummy is positioned as follows:

S16.3.1 *General provisions and definitions.*

S16.3.1.1 All angles are measured with respect to the horizontal plane unless otherwise stated.

S16.3.1.2 The dummy's neck bracket is adjusted to align the zero degree index marks.

S16.3.1.3 The term “midsagittal plane” refers to the vertical plane that separates the dummy into equal left and right halves.

S16.3.1.4 The term “vertical longitudinal plane” refers to a vertical plane parallel to the vehicle's longitudinal centerline.

S16.3.1.5 The term “vertical plane” refers to a vertical plane, not necessarily parallel to the vehicle's longitudinal centerline.

S16.3.1.6 The term “transverse instrumentation platform” refers to the transverse instrumentation surface inside the dummy's skull casting to which the neck load cell mounts. This surface is perpendicular to the skull cap's machined inferior-superior mounting surface.

S16.3.1.7 The term “thigh” refers to the femur between, but not including, the knee and the pelvis.

S16.3.1.8 The term “leg” refers to the lower part of the entire leg, including the knee.

S16.3.1.9 The term “foot” refers to the foot, including the ankle.

S16.3.1.10 The longitudinal centerline of a bucket seat cushion is defined by a vertical plane that passes through the SgRP and is parallel to the longitudinal centerline of the vehicle.

S16.3.1.11 For leg and thigh angles, use the following references:

S16.3.1.11.1 *Thigh*—a straight line on the thigh skin between the center of the 1/2-13 UNC-2B tapped hole in the upper leg femur clamp (see drawings 880105-504 (left thigh) and 880105-505 (right thigh), upper leg femur clamp) and the knee pivot shoulder bolt (part 880105-527 in drawing 880105-528R & 528L, sliding knee assembly without potentiometer).

S16.3.1.11.2 *Leg*—a straight line on the leg skin between the center of the ankle shell (parts 880105-609 & 633 in drawing 880105-660, ankle assembly) and the knee pivot shoulder bolt (part 880105-527 in drawing 880105-528R & 528L, sliding knee assembly without potentiometer).

S16.3.1.12 The term “seat cushion reference point” (SCRP) means a point placed on the outboard side of the seat cushion at a horizontal distance between 150 mm (5.9 in) and 250 mm (9.8 in) from the front edge of the seat used as a guide in positioning the seat.

S16.3.1.13 The term “seat cushion reference line” means a line on the side of the seat cushion, passing through the seat cushion reference point, whose projection in the vehicle vertical longitudinal plane is straight and has a known angle with respect to the horizontal.

S16.3.2 *Driver dummy positioning.*

S16.3.2.1 *Driver torso/head/seat back angle positioning.*

S16.3.2.1.1 With the seat in the position determined in S16.2.10.3.3, use only the control that primarily moves the seat fore and aft to place the seat in the rearmost position. If the seat cushion reference line angle automatically changes as the seat is moved from the full forward position, maintain, as closely as possible, the seat cushion reference line angle determined in S16.2.10.3.1, for the final forward position when measuring the pelvic angle as specified in S16.3.2.1.11. The seat cushion reference angle position may be achieved through the use of any seat or seat cushion adjustments other than that which primarily moves the seat or seat cushion fore-aft.

S16.3.2.1.2 Fully recline the seat back, if adjustable. Install the dummy into the driver's seat, such that when the legs are positioned 120 degrees to the thighs, the calves of the legs are not touching the seat cushion.

S16.3.2.1.3 *Bucket seats.* Place the dummy on the seat cushion so that its midsagittal plane is vertical and coincides with the vertical longitudinal plane through the center of the seat cushion, within ±10 mm (±0.4 in).

S16.3.2.1.4 *Bench seats.* Position the midsagittal plane of the dummy vertical and parallel to the vehicle's longitudinal centerline and aligned within ±10 mm (±0.4 in) of the center of the steering ~~wheel~~**control** ~~rim~~.

S16.3.2.1.5 Hold the dummy's thighs down and push rearward on the upper torso to maximize the dummy's pelvic angle.

S16.3.2.1.6 Place the legs at 120 degrees to the thighs. Set the initial transverse distance between the longitudinal centerlines at the front of the dummy's knees at 160 to 170 mm (6.3 to 6.7 in), with the thighs and legs of the dummy in vertical planes. Push rearward on the dummy's knees to force the pelvis into the seat so there is no gap between the pelvis and the seat back or until contact occurs between the back of the dummy's calves and the front of the seat cushion.

S16.3.2.1.7 Gently rock the upper torso laterally in a side to side motion three times through a ±5 degree arc (approximately 51 mm (2 in) side to side).

S16.3.2.1.8 If needed, extend the legs slightly so that the feet are not in contact with the floor pan. Let the thighs rest on the seat cushion to the extent permitted by the foot movement. Keeping the leg and the thigh in a vertical plane, place the foot in the vertical longitudinal plane that passes through the centerline of the accelerator pedal. Rotate the left thigh outboard about the hip until the center of the knee is the same distance from the midsagittal plane of the dummy as the right knee ±5 mm (±0.2 in). Using only the control that primarily moves the seat fore and aft, attempt to return the seat to the full forward position. If either of the dummy's legs first contacts the steering ~~wheel~~**control**, then adjust the steering ~~wheel~~**control**, if adjustable, upward until contact with the steering ~~wheel~~**control** is avoided. If the steering ~~wheel~~**control** is not adjustable, separate the knees enough to avoid steering ~~wheel~~**control** contact. Proceed with moving the seat forward until either the leg contacts the vehicle interior or the seat reaches the full forward position. (The right foot may contact and depress the accelerator and/or change the angle of the foot with respect to the leg during seat movement.) If necessary to avoid contact with the vehicles brake or clutch pedal, rotate the test dummy's left foot about the leg. If there is still interference, rotate the left thigh outboard about the hip the minimum distance necessary to avoid pedal interference. If a dummy leg contacts the vehicle interior before the full forward position is attained, position the seat at the next detent where there is no contact. If the seat is a power seat, move the seat fore and aft to avoid contact while assuring that there is a maximum of 5 mm (0.2 in) distance between the vehicle interior and the point on the dummy that would first contact the vehicle interior. If the steering ~~wheel~~**control** was moved, return it to the position described in S16.2.9. If the steering ~~wheel~~**control** contacts the dummy's leg(s) prior to attaining

this position, adjust it to the next higher detent, or if infinitely adjustable, until there is 5 mm (0.2 in) clearance between the ~~wheel~~**control** and the dummy's leg(s).

S16.3.2.1.9 For vehicles without adjustable seat backs, adjust the lower neck bracket to level the head as much as possible. For vehicles with adjustable seat backs, while holding the thighs in place, rotate the seat back forward until the transverse instrumentation platform of the head is level to within ±0.5 degree, making sure that the pelvis does not interfere with the seat bight. Inspect the abdomen to ensure that it is properly installed. If the torso contacts the steering ~~wheel~~**control**, adjust the steering ~~wheel~~**control** in the following order until there is no contact: telescoping adjustment, lowering adjustment, raising adjustment. If the vehicle has no adjustments, or contact with the steering ~~wheel~~**control** cannot be eliminated by adjustment, position the seat at the next detent where there is no contact with the steering ~~wheel~~**control** as adjusted in S16.2.9. If the seat is a power seat, position the seat to avoid contact while assuring that there is a maximum of 5 mm (0.2 in) distance between the steering ~~wheel~~**control** as adjusted in S16.2.9 and the point of contact on the dummy.

S16.3.2.1.10 If it is not possible to achieve the head level within ±0.5 degrees, minimize the angle.

S16.3.2.1.11 Measure and set the dummy's pelvic angle using the pelvic angle gauge (drawing TE-2504, incorporated by reference in 49 CFR part 572, subpart O of this chapter). The angle shall be set to 20.0 degrees ±2.5 degrees. If this is not possible, adjust the pelvic angle as close to 20.0 degrees as possible while keeping the transverse instrumentation platform of the head as level as possible by adjustments specified in S16.3.2.1.9 and S16.3.2.1.10.

S16.3.2.1.12 If the dummy is contacting the vehicle interior after these adjustments, using only the control that primarily moves the seat fore and aft, move the seat rearward until there is a maximum of 5 mm (0.2 in) between the contact point of the dummy and the interior of the vehicle or if it has a manual seat adjustment, to the next rearward detent position. If after these adjustments, the dummy contact point is more than 5 mm (0.2 in) from the vehicle interior and the seat is still not in its forwardmost position, move the seat forward until the contact point is a maximum of 5 mm (0.2 in) from the vehicle interior, or if it has a manual seat adjustment, move the seat to the closest detent position that causes no contact, or until the seat reaches its forwardmost position, whichever occurs first.

S16.3.2.2 *Driver foot positioning.*

S16.3.2.2.1 If the vehicle has an adjustable accelerator pedal, adjust it to the full forward position. If the heel of the right foot can contact the floor pan, follow the positioning procedure in (a). If not, follow the positioning procedure in (b).

(a) Rest the right foot of the test dummy on the undepressed accelerator pedal with the rearmost point of the heel on the floor pan in the plane of the pedal. If the foot cannot be placed on the accelerator pedal, set it initially perpendicular to the leg and then place it as far forward as possible in the direction of the pedal centerline with the rearmost point of the heel resting on the floor pan. If the vehicle has an adjustable accelerator pedal and the right foot is not touching the

accelerator pedal when positioned as above, move the pedal rearward until it touches the right foot. If the accelerator pedal in the full rearward position still does not touch the foot, leave the pedal in that position. Extend the foot and lower leg by decreasing the knee flexion angle until any part of the foot contacts the undepressed accelerator pedal. If the foot does not contact the pedal, place the highest part of the foot at the same height as the highest part of the pedal.

(b) Extend the foot and lower leg by decreasing the knee flexion angle until any part of the foot contacts the undepressed accelerator pedal or the highest part of the foot is at the same height as the highest part of the pedal. If the vehicle has an adjustable accelerator pedal and the right foot is not touching the accelerator pedal when positioned as above, move the pedal rearward until it touches the right foot.

S16.3.2.2.2 If the ball of the right foot does not contact the pedal, increase the ankle plantar flexion angle such that the toe of the foot contacts or is as close as possible to contact with the undepressed accelerator pedal.

S16.3.2.2.3 If, in its final position, the heel is off of the vehicle floor, a spacer block must be used under the heel to support the final foot position (see figure 13). The surface of the block in contact with the heel must have an inclination of 30 degrees, measured from the horizontal, with the highest surface towards the rear of the vehicle.

S16.3.2.2.4 Place the left foot on the toe-board with the rearmost point of the heel resting on the floor pan as close as possible to the point of intersection of the planes described by the toe-board and floor pan.

S16.3.2.2.5 If the left foot cannot be positioned on the toe board, place the foot perpendicular to the lower leg centerline as far forward as possible with the heel resting on the floor pan.

S16.3.2.2.6 If the left foot does not contact the floor pan, place the foot parallel to the floor and place the lower leg as perpendicular to the thigh as possible.

S16.3.2.2.7 When positioning the test dummy under S16.3.2.2.4, S16.3.2.2.5, and S16.2.2.6, avoid contact between the left foot of the test dummy and the vehicle's brake pedal, clutch pedal, wheel well projection, and foot rest. To avoid this contact, use the three foot position adjustments listed in paragraphs (a) through (c). The adjustment options are listed in priority order, with each subsequent option incorporating the previous. In making each adjustment, move the foot the minimum distance necessary to avoid contact. If it is not possible to avoid all prohibited foot contact, give priority to avoiding brake or clutch pedal contact.

(a) Rotate (abduction/adduction) the test dummy's left foot about the lower leg,

(b) Plantar flex the foot,

(c) Rotate the left leg about the hip in either an outboard or inboard direction.

S16.3.2.3 *Driver arm/hand positioning.*

S16.3.2.3.1 Place the dummy's upper arms adjacent to the torso with the arm centerlines as close to a vertical longitudinal plane as possible.

S16.3.2.3.2 Place the palms of the dummy in contact with the outer part of the steering ~~wheel~~**control** rim at its horizontal centerline with the thumbs over the steering ~~wheel~~**control** rim.

S16.3.2.3.3 If it is not possible to position the thumbs inside the steering ~~wheel~~**control** rim at its horizontal centerline, then position them above and as close to the horizontal centerline of the steering ~~wheel~~**control** rim as possible.

S16.3.2.3.4 Lightly tape the hands to the steering ~~wheel~~**control** rim so that if the hand of the test dummy is pushed upward by a force of not less than 9 N (2 lb) and not more than 22 N (5 lb), the tape releases the hand from the steering ~~wheel~~**control** rim.

S16.3.3 **Front outboard** ~~P~~***p****assenger dummy positioning.*

S16.3.3.1 **Front outboard** ~~P~~***p****assenger torso/head/seat back angle positioning.*

S16.3.3.1.1 With the seat at the mid-height in the full forward position determined in S16.2.10.3.3, use only the control that primarily moves the seat fore and aft to place the seat in the rearmost position, without adjusting independent height controls. If the seat cushion reference line angle automatically changes as the seat is moved from the full forward position, maintain as closely as possible the seat cushion reference line angle in S16.2.10.3.1, for the final forward position when measuring the pelvic angle as specified in S16.3.3.1.11. The seat cushion reference line angle position may be achieved through the use of any seat or seat cushion adjustments other than that which primarily moves the seat or seat cushion fore-aft.

S16.3.3.1.2 Fully recline the seat back, if adjustable. Install the dummy into ~~the~~**any front outboard** passenger seat, such that when the legs are 120 degrees to the thighs, the calves of the legs are not touching the seat cushion.

S16.3.3.1.3 *Bucket seats.* Place the dummy on the seat cushion so that its midsagittal plane is vertical and coincides with the vertical longitudinal plane through the center of the seat cushion, within ±10 mm (±0.4 mm).

S16.3.3.1.4 *Bench seats.* Position the midsagittal plane of the dummy vertical and parallel to the vehicle's longitudinal centerline and the same distance from the vehicle's longitudinal centerline, within ±10 mm (±0.4 in), as the midsagittal plane of the driver dummy**, if there is a driver's seating position. Otherwise, the midsagittal plane of any front outboard passenger dummy shall be vertical, parallel to the vehicle's longitudinal centerline, and pass, within ±10 mm (±0.4 in), through the seating reference point of the seat that it occupies.**

S16.3.3.1.5 Hold the dummy's thighs down and push rearward on the upper torso to maximize the dummy's pelvic angle.

S16.3.3.1.6 Place the legs at 120 degrees to the thighs. Set the initial transverse distance between the longitudinal centerlines at the front of the dummy's knees at 160 to 170 mm (6.3 to 6.7 in), with the thighs and legs of the dummy in vertical planes. Push rearward on the dummy's knees to force the pelvis into the seat so there is no gap between the pelvis and the seat back or until contact occurs between the back of the dummy's calves and the front of the seat cushion.

S16.3.3.1.7 Gently rock the upper torso laterally side to side three times through a ±5 degree arc (approximately 51 mm (2 in) side to side).

S16.3.3.1.8 If needed, extend the legs slightly so that the feet are not in contact with the floor pan. Let the thighs rest on the seat cushion to the extent permitted by the foot movement. With the feet perpendicular to the legs, place the heels on the floor pan. If a heel will not contact the floor pan, place it as close to the floor pan as possible. Using only the control that primarily moves the seat fore and aft, attempt to return the seat to the full forward position. If a dummy leg contacts the vehicle interior before the full forward position is attained, position the seat at the next detent where there is no contact. If the seats are power seats, position the seat to avoid contact while assuring that there is a maximum of 5 mm (0.2 in) distance between the vehicle interior and the point on the dummy that would first contact the vehicle interior.

S16.3.3.1.9 For vehicles without adjustable seat backs, adjust the lower neck bracket to level the head as much as possible. For vehicles with adjustable seat backs, while holding the thighs in place, rotate the seat back forward until the transverse instrumentation platform of the head is level to within ±0.5 degrees, making sure that the pelvis does not interfere with the seat bight. Inspect the abdomen to insure that it is properly installed.

S16.3.3.1.10 If it is not possible to orient the head level within ±0.5 degrees, minimize the angle.

S16.3.3.1.11 Measure and set the dummy's pelvic angle using the pelvic angle gauge (drawing TE-2504, incorporated by reference in 49 CFR Part 572, Subpart O, of this chapter). The angle shall be set to 20.0 degrees ±2.5 degrees. If this is not possible, adjust the pelvic angle as close to 20.0 degrees as possible while keeping the transverse instrumentation platform of the head as level as possible, as specified in S16.3.3.1.9 and S16.3.3.1.10.

S16.3.3.1.12 If the dummy is contacting the vehicle interior after these adjustments, using only the control that primarily moves the seat fore and aft, move the seat rearward until there is a maximum of 5 mm (0.2 in) between the contact point of the dummy and the interior of the vehicle or if it has a manual seat adjustment, to the next rearward detent position. If after these adjustments, the dummy contact point is more than 5 mm (0.2 in) from the vehicle interior and the seat is still not in its forwardmost position, move the seat forward until the contact point is a maximum of 5 mm (0.2 in) from the vehicle interior, or if it has a manual seat adjustment, move the seat to the closest detent position that causes no contact, or until the seat reaches its forwardmost position, whichever occurs first.

S16.3.3.2 **Front outboard** ~~P~~*p**assenger foot positioning.***

S16.3.3.2.1 Place the passenger's feet flat on the toe board.

S16.3.3.2.2 If the feet cannot be placed flat on the toe board, set them perpendicular to the leg centerlines and place them as far forward as possible with the heels resting on the floor pan. If either foot does not contact the floor pan, place the foot parallel to the floor pan and place the lower leg as perpendicular to the thigh as possible.

S16.3.3.3 **Front outboard** ~~P~~*passenger arm/hand positioning.*

S16.3.3.3.1 Place the dummy's upper arms in contact with the seat back and the torso.

S16.3.3.3.2 Place the palms of the dummy in contact with the outside of the thighs.

S16.3.3.3.3 Place the little fingers in contact with the seat cushion.

S16.3.4 *Driver and* ***front outboard*** *passenger adjustable head restraints.*

S16.3.4.1 If the head restraint has an automatic adjustment, leave it where the system positions the restraint after the dummy is placed in the seat.

S16.3.4.2 Adjust each head restraint to its lowest position.

S16.3.4.3 Measure the vertical distance from the top most point of the head restraint to the bottom most point. Locate a horizontal plane through the midpoint of this distance. Adjust each head restraint vertically so that this horizontal plane is aligned with the center of gravity (CG) of the dummy head.

S16.3.4.3 If the above position is not attainable, move the vertical center of the head restraint to the closest detent below the center of the head CG.

S16.3.4.4 If the head restraint has a fore and aft adjustment, place the restraint in the forwardmost position or until contact with the head is made, whichever occurs first.

S16.3.5 *Driver and* ***front outboard*** *passenger manual belt adjustment (for tests conducted with a belted dummy)*

S16.3.5.1 If an adjustable seat belt D-ring anchorage exists, place it in the manufacturer's design position for a 5th percentile adult female with the seat in the position specified in S16.2.10.3.

S16.3.5.2 Place the Type 2 manual belt around the test dummy and fasten the latch.

S16.3.5.3 Ensure that the dummy's head remains as level as possible, as specified in S16.3.2.1.9 and S16.3.2.1.10 and S16.3.3.1.9 and S16.3.3.1.10.

S16.3.5.4 Remove all slack from the lap belt. Pull the upper torso webbing out of the retractor and allow it to retract; repeat this operation four times. Apply a 9 N (2 lbf) to 18 N (4 lbf) tension load to the lap belt. If the belt system is equipped with a tension-relieving device, introduce the maximum amount of slack into the upper torso belt that is recommended by the manufacturer. If

the belt system is not equipped with a tension-relieving device, allow the excess webbing in the shoulder belt to be retracted by the retractive force of the retractor.

S17 *Offset frontal deformable barrier requirements using 5th percentile adult female test dummies.* Each vehicle that is certified as complying with S14 shall, at each front outboard designated seating position, meet the injury criteria specified in S15.3 of this standard when the vehicle is crash tested in accordance with the procedures specified in S18 of this standard with the anthropomorphic test devices restrained by a Type 2 seat belt assembly.

S18 *Test procedure for offset frontal deformable barrier requirements using 5th percentile adult female dummies.*

S18.1 *General provisions.* Place a 49 CFR Part 572 Subpart O 5th percentile adult female test dummy at each front outboard seating position of a vehicle, in accordance with the procedures specified in S16.3 of this standard. Impact the vehicle traveling longitudinally forward at any speed, up to and including 40 km/h (25 mph), into a fixed offset deformable barrier under the conditions and procedures specified in S18.2 of this standard, impacting only the left side of the vehicle.

S18.2 *Test conditions.*

S18.2.1 *Offset frontal deformable barrier.* The offset frontal deformable barrier shall conform to the specifications set forth in Subpart C of part 587 of this chapter.

S18.2.2 *General test conditions.* All of the test conditions specified in S16.2 of this standard apply.

S18.2.3 *Dummy seating procedures.* Position the anthropomorphic test dummies as specified in S16.3 of this standard.

S18.2.4 *Impact configuration.* The test vehicle shall impact the barrier with the longitudinal centerline of the vehicle parallel to the line of travel and perpendicular to the barrier face within a tolerance of ±5 degrees. The test vehicle shall be aligned so that the vehicle strikes the barrier with 40 percent overlap on the left side of the vehicle, with the vehicle's front engaging the barrier face such that the vehicle's longitudinal centerline is offset outboard of the edge of the barrier face by 10 percent of the vehicle's width ±50 mm (2.0 in) as illustrated in Figure 10. The vehicle width is defined as the maximum dimension measured across the widest part of the vehicle, including bumpers and molding but excluding such components as exterior mirrors, flexible mud flaps, marker lamps, and dual rear wheel configurations.

S19 *Requirements to provide protection for infants in rear facing and convertible child restraints and car beds.*

S19.1 Each vehicle certified as complying with S14 shall, at the option of the manufacturer, meet the requirements specified in S19.2 or S19.3, under the test procedures specified in S20.

S19.2 *Option 1—Automatic suppression feature.* Each vehicle shall meet the requirements specified in S19.2.1 through S19.2.3.

S19.2.1 The vehicle shall be equipped with an automatic suppression feature for ~~the~~**any front outboard** passenger air bag which results in deactivation of the air bag during each of the static tests specified in S20.2 (using the 49 CFR part 572 Subpart R 12-month-old CRABI child dummy in any of the child restraints identified in sections B and C of appendix A or A-1 of this standard, as appropriate and the 49 CFR part 572 subpart K Newborn Infant dummy in any of the car beds identified in section A of appendix A or A-1, as appropriate), and activation of the air bag system during each of the static tests specified in S20.3 (using the 49 CFR part 572 Subpart O 5th percentile adult female dummy).

S19.2.2 The vehicle shall be equipped with ~~at least one~~ telltale**s for each front outboard passenger seat** which emit~~s~~ light whenever the **associated front outboard** passenger air bag system is deactivated and does not emit light whenever the **associated front outboard** passenger air bag system is activated, except that the telltale(s) need not illuminate when the **associated front outboard** passenger seat is unoccupied. Each telltale:

(a) Shall emit yellow light;

(b) Shall have the identifying words “PASSENGER AIR BAG OFF” or “PASS AIR BAG OFF” on the telltale or within 25 mm (1.0 in) of the telltale; and

(c) Shall not be combined with the readiness indicator required by S4.5.2 of this standard.

(d) Shall be located within the interior of the vehicle and forward of and above the design H-point of both the driver's and **any**~~the right~~ front **outboard** passenger's seat in their forwardmost seating positions and shall not be located on or adjacent to a surface that can be used for temporary or permanent storage of objects that could obscure the telltale from either the driver's or **any**~~right~~ front **outboard** passenger's view, or located where the telltale would be obscured from the driver's view **or the adjacent front outboard passenger’s view** if a rear-facing child restraint listed in appendix A or A-1, as appropriate, is installed in **any**~~the right~~ front **outboard** passenger's seat.

(e) Shall be visible and recognizable to a driver and right front passenger during night and day when the occupants have adapted to the ambient light roadway conditions.

(f) Telltales need not be visible or recognizable when not activated.

(g) Means shall be provided for making telltales visible and recognizable to the driver and **any**~~right~~ front **outboard** passenger under all driving conditions. The means for providing the required visibility may be adjustable manually or automatically, except that the telltales may not be adjustable under any driving conditions to a level that they become invisible or not recognizable to the driver and **any**~~right~~ front **outboard** passenger.

(h) The telltale must not emit light except when ~~the~~**any** passenger air bag is turned off or during a bulb check upon vehicle starting.

S19.2.3 The vehicle shall be equipped with a mechanism that indicates whether the air bag system is suppressed, regardless of whether ~~the~~**any front outboard** passenger seat is occupied. The mechanism need not be located in the occupant compartment unless it is the telltale described in S19.2.2.

S19.3 *Option 2—Low risk deployment.* Each vehicle shall meet the injury criteria specified in S19.4 of this standard when ~~the~~**any front outboard** passenger air bag is deployed in accordance with the procedures specified in S20.4.

S19.4 *Injury criteria for the 49 CFR part 572, Subpart R 12-month-old CRABI test dummy.*

S19.4.1 All portions of the test dummy and child restraint shall be contained within the outer surfaces of the vehicle passenger compartment.

S19.4.2 Head injury criteria.

(a) For any two points in time, $t_1$ and $t_2$, during the event which are separated by not more than a 15 millisecond time interval and where $t_1$ is less than $t_2$, the head injury criterion ($HIC_{15}$) shall be determined using the resultant head acceleration at the center of gravity of the dummy head, $a_r$, expressed as a multiple of g (the acceleration of gravity) and shall be calculated using the expression:

$$\left[\frac{1}{(t_2-t_1)}\int_{t_1}^{t_2} a_r\,dt\right]^{2.5}(t_2-t_1)$$

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(b) The maximum calculated $HIC_{15}$ value shall not exceed 390.

S19.4.3 The resultant acceleration calculated from the output of the thoracic instrumentation shall not exceed 50 g's, except for intervals whose cumulative duration is not more than 3 milliseconds.

S19.4.4 *Neck injury.* When measuring neck injury, each of the following injury criteria shall be met.

(a) *Nij.*

(1) The shear force (Fx), axial force (Fz), and bending moment (My) shall be measured by the dummy upper neck load cell for the duration of the crash event as specified in S4.11. Shear force, axial force, and bending moment shall be filtered for Nij purposes at SAE Recommended Practice J211/1 MAR95 (incorporated by reference, see §571.5) Channel Frequency Class 600.

(2) During the event, the axial force (Fz) can be either in tension or compression while the occipital condyle bending moment (Mocy) can be in either flexion or extension. This results in four possible loading conditions for Nij: tension-extension (Nte), tension-flexion (Ntf), compression-extension (Nce), or compression-flexion (Ncf).

(3) When calculating Nij using equation S19.4.4(a)(4), the critical values, Fzc and Myc, are:

(i) Fzc = 1460 N (328 lbf) when Fz is in tension

(ii) Fzc = 1460 N (328 lbf) when Fz is in compression

(iii) Myc = 43 Nm (32 lbf-ft) when a flexion moment exists at the occipital condyle

(iv) Myc = 17 Nm (13 lbf-ft) when an extension moment exists at the occipital condyle.

(4) At each point in time, only one of the four loading conditions occurs and the Nij value corresponding to that loading condition is computed and the three remaining loading modes shall be considered a value of zero. The expression for calculating each Nij loading condition is given by:

Nij ' (Fz / Fzc) + (Mocy / Myc)

(5) None of the four Nij values shall exceed 1.0 at any time during the event.

(b) *Peak tension.* Tension force (Fz), measured at the upper neck load cell, shall not exceed 780 N (175 lbf) at any time.

(c) *Peak compression.* Compression force (Fz), measured at the upper neck load cell, shall not exceed 960 N (216 lbf) at any time.

S19.4.5 Unless otherwise indicated, instrumentation for data acquisition, data channel frequency class, and moment calculations are the same as given for the 49 CFR part 572 Subpart R 12-month-old CRABI test dummy.

**S19.5 *Motion suppression for vehicles with manually-operated driving controls that do not require a driver.* Each vehicle that is certified as complying with S14 shall not be capable of motion when a 12-month-old CRABI dummy is placed at the driver's seating position and the vehicle is in an operational state that does not require a driver.**

**S19.5.1 Motion suppression shall be assessed under the test procedures specified in S20.1 through S20.2, except that the 12-month-old CRABI dummy is placed in the driver's seating position and the result shall be an inability of engage vehicle motion.**

S20 *Test procedure for S19.*

S20.1 *General provisions.*

S20.1.1 Tests specifying the use of a car bed, a rear facing child restraint, or a convertible child restraint may be conducted using any such restraint listed in sections A, B, and C, respectively, of appendix A or A-1 of this standard, as appropriate. The car bed, rear facing child restraint, or convertible child restraint may be unused or have been previously used only for automatic suppression tests. If it has been used, there shall not be any visible damage prior to the test.

S20.1.2 Unless otherwise specified, each vehicle certified to this option shall comply in tests conducted with ~~the~~**any** front outboard passenger seating position, if adjustable fore and aft, at full rearward, middle, and full forward positions. If the child restraint or dummy contacts the vehicle interior, move the seat rearward to the next detent that provides clearance, or if the seat is a power seat, using only the control that primarily moves the seat fore and aft, move the seat rearward while assuring that there is a maximum of 5 mm (0.2 in) clearance between the dummy or child restraint and the vehicle interior.

S20.1.3 If the car bed, rear facing child restraint, or convertible child restraint is equipped with a handle, the vehicle shall comply in tests conducted with the handle at both the child restraint manufacturer's recommended position for use in vehicles and in the upright position.

S20.1.4 If the car bed, rear facing child restraint, or convertible child restraint is equipped with a sunshield, the vehicle shall comply in tests conducted with the sunshield both fully open and fully closed.

S20.1.5 The vehicle shall comply in tests with the car bed, rear facing child restraint, or convertible child restraint uncovered and in tests with a towel or blanket weighing up to 1.0 kg (2.2 lb) placed on or over the restraint in any of the following positions:

(a) with the blanket covering the top and sides of the restraint, and

(b) with the blanket placed from the top of the vehicle's seat back to the forwardmost edge of the restraint.

S20.1.6 Except as otherwise specified, if the car bed, rear facing child restraint, or convertible child restraint has an anchorage system as specified in S5.9 of FMVSS No. 213 and is tested in a vehicle with a front outboard passenger vehicle seat that has an anchorage system as specified in FMVSS No. 225, the vehicle shall comply in the belted tests with the restraint anchorage system attached to the vehicle seat anchorage system and the vehicle seat belt unattached. It shall also comply in the belted test requirements with the restraint anchorage system unattached to the vehicle seat anchorage system and the vehicle seat belt attached. The vehicle shall comply in the unbelted tests with the restraint anchorage system unattached to the vehicle seat anchorage system.

S20.1.7 If the car bed, rear facing child restraint, or convertible child restraint comes equipped with a detachable base, the vehicle shall comply in tests conducted with the detachable base attached to the child restraint and with the detachable base unattached to the child restraint.

S20.1.8 Do not attach any tethers.

S20.1.9 *Seat set-up.* Unless otherwise stated.

S20.1.9.1 *Lumbar support adjustment.* Position adjustable lumbar supports so that the lumbar support is in its lowest, retracted or deflated adjustment position.

S20.1.9.2 *Other seat adjustments.* Position any adjustable parts of the seat that provide additional support so that they are in the lowest or most open adjustment position.

S20.1.9.3 Set the seat and seat cushion in the position determined in S16.2.10.3.1.

S20.1.9.4 Using only the control that primarily moves the seat in the fore and aft direction, determine the full rearward, middle, and full forward positions of the SCRP. Using any part of any seat or seat cushion adjustments, other than that which primarily moves the seat or seat cushion fore-aft, determine the SCRP mid-point height for each of the three fore-aft test positions, while maintaining, as closely as possible, the seat cushion reference line middle angle determined in S16.2.10.3.1.

S20.1.9.5 The seat back angle, if adjustable, is set at the manufacturer's nominal design seat back angle for a 50th percentile adult male as specified in S8.1.3.

S20.1.9.6 If adjustable, set the head restraint at the full down and full forward position.

S20.1.10 The longitudinal centerline of a bucket seat cushion is defined by a vertical plane that passes through the SgRP and is parallel to the longitudinal centerline of the vehicle.

S20.2 *Static tests of automatic suppression feature which shall result in deactivation of ~~the~~**any front outboard** passenger air bag.* Each vehicle that is certified as complying with S19.2 shall meet the following test requirements.

S20.2.1 *Belted rear facing and convertible child restraints.*

S20.2.1.1 The vehicle shall comply in tests using any child restraint specified in section B and section C of appendix A or A-1 of this standard, as appropriate, installed in ~~the~~**any** front outboard passenger vehicle seat in the following orientations:

(a) With the section B and section C child restraints facing rearward as appropriate; and

(b) With the section C child restraints facing forward.

S20.2.1.2 The vehicle shall comply with the child restraint attached to the vehicle in the following manner:

(a) Using the vehicle safety belts as specified in S20.2.1.5; and

(b) If the child restraint is certified to S5.9 of §571.213, and the vehicle seat has an anchorage system as specified in §571.225, using only the mechanism provided by the child restraint manufacturer for attachment to the lower anchorages as specified in S20.2.1.6.

S20.2.1.3 Locate a vertical plane through the longitudinal centerline of the child restraint. This will be referred to as "Plane A."

S20.2.1.4 For bucket seats, "Plane B" refers to a vertical plane parallel to the vehicle longitudinal centerline through the longitudinal centerline of ~~the~~**any** front outboard passenger vehicle seat cushion. For bench seats **in vehicles with manually-operated driving controls**, "Plane B" refers to a vertical plane through ~~the~~**any** front outboard passenger vehicle seat parallel to the vehicle longitudinal centerline the same distance from the longitudinal centerline of the vehicle as the center of the steering ~~wheel~~**control**. **For bench seats in vehicles without manually-operated driving controls, "Plane B" refers to the vertical plane parallel to the vehicle longitudinal centerline, through any front outboard passenger seat's SgRP.**

S20.2.1.5 *Installation with vehicle safety belts.*

(a) Place any adjustable seat belt anchorages at the vehicle manufacturer's nominal design position for a 50th percentile adult male occupant.

(b) Without attaching the child restraint anchorage system components specified in S5.9 of §571.213 to a vehicle child restraint anchorage system specified in §571.225, align the child restraint system facing rearward or forward, depending on the orientation being tested, such that Plane A is aligned with Plane B.

(c) While maintaining the child restraint positions achieved in S20.2.1.5(b), secure the child restraint by following, to the extent possible, the child restraint manufacturer's directions regarding proper installation of the restraint for the orientation being tested. Cinch the vehicle belts to any tension from zero up to 134 N to secure the child restraint. Measure belt tension in a flat, straight section of the lap belt between the child restraint belt path and the contact point with the belt anchor or vehicle seat, on the side away from the buckle (to avoid interference from the shoulder portion of the belt).

(d) Position the 49 CFR part 572 subpart R 12-month-old CRABI dummy in the child restraint by following, to the extent possible, the manufacturer's instructions provided with the child restraint for seating infants.

(e) Start the vehicle engine or place the ignition in the "on" position, whichever will turn on the suppression system, and close all vehicle doors. Wait 10 seconds, then check whether the air bag is deactivated.

S20.2.1.6 *Installation using the lower anchor bars and the child restraint manufacturer provided attachment mechanism.*

S20.2.1.6.1 If the attachment mechanism provided by the manufacturer incorporates a strap(s), use the following procedure:

(a) Place the child restraint on the vehicle seat facing rearward or forward, depending on the orientation being tested, with Plane A of the child restraint aligned within ±10 mm with a longitudinal vertical plane passing though a point midway between the centers of the two lower anchor bars.

(b) Position any adjustments on the child restraint, to the extent possible according to the child restraint manufacturer's instructions.

(c) Connect the lower anchor straps of the restraint to the lower anchor bars of the seat and remove the slack, but do not apply any load using these straps.

(d) Move the child restraint rearward until it contacts the seat back.

(e) Use the loading device equipped with the loading foot shown in Figure A1 and position it as shown in Figure A2 of appendix A and appendix A-1 of this section. The 15±3 degree angle of the loading device illustrated in Figure A2 is determined with an initial preload of 75±25N.

(f) Over a period of 90±30 seconds, increase the load to 875N±25 N.

(g) After achieving the 875 N load in step (f) of this section, hold the bar length at present position and allow the load to settle for 60 seconds.

(h) Following the one-minute settling period specified in step (g) of this section, increase the load to 875±25 N such that the 875±25 N load is achieved within 10 seconds of the settling period.

(i) Hold the bar length at present position and allow the load to settle for 120 seconds after achieving the load in step (f) of this section.

(j) Following the settling period specified in step (i) of this section, increase the load to 875±25 N such that the 875±25 N load is achieved within 10 seconds of the settling period.

(k) Observe the settling of the load and tighten the lower anchor straps when the load is 850±5N or 180 seconds has elapsed since achieving the 875±25 N load in step (f) of this section, whichever comes first. Tighten the lower anchor straps at the same time such that the load is reduced 15±10 N and the change occurs within 2 seconds.

(l) Remove the loading device and position the 49 CFR part 572 subpart R 12-month-old CRABI dummy in the child restraint by following, to the extent possible, the manufacturer's instructions provided with the child restraint for seating infants.

(m) Start the vehicle engine or place the ignition in the "on" position, whichever will turn on the suppression system, and close all vehicle doors. Wait 10 seconds, then check whether the air bag is deactivated.

S20.2.1.6.2 If the mechanism provided by the manufacturer does not incorporate a strap(s), use the following procedure:

(a) Place the vehicle seat in the rearmost and mid-height position.

(b) Place the child restraint on the vehicle seat facing rearward or forward, depending on the orientation being tested, with Plane A of the child restraint aligned within ±10 mm with a longitudinal vertical plane passing though a point midway between the centers of the two lower anchor bars.

(c) Position any adjustments on the child restraint, to the extent possible, according to the child restraint manufacturer's instructions.

(d) Connect the lower anchor attachments to the lower anchor bars following, to the extent possible, the child restraint manufacturer's instructions.

(e) Move the child restraint rearward until it contacts the seat back.

(f) If the child restraint does not use a linear sliding or ratcheting mechanism that requires the application of force to securely install the child restraint, follow, to the extent possible, the CRS manufacturer's instructions for installing the child restraint onto the seat. Do not load the seat as provided in S20.2.1.6.2(g).

(g) If the child restraint uses a linear sliding or ratcheting mechanism that requires the application of force to securely install the child restraint, within 25±5 seconds, apply a 475±25N force, that has no lateral component, aligned angularly ±10 degrees with a parallel plane located within ±100 mm of the plane formed by the linear mechanism. Release the force.

(h) Position the 49 CFR part 572 subpart R 12-month-old CRABI dummy in the child restraint by following, to the extent possible, the manufacturer's instructions provided with the child restraint for seating infants.

(i) Move the vehicle seat to the seat position being tested (full rear, mid, full forward).

(j) Start the vehicle engine or place the ignition in the "on" position, whichever will turn on the suppression system, and close all vehicle doors. Wait 10 seconds, then check whether the air bag is deactivated.

S20.2.2 *Unbelted rear facing and convertible child restraints.*

S20.2.2.1 The vehicle shall comply in tests using any child restraint specified in section B and section C of appendix A or A-1 of this standard, as appropriate.

S20.2.2.2 Locate a vertical plane through the longitudinal centerline of the child restraint. This will be referred to as "Plane A".

S20.2.2.3 For bucket seats, "Plane B" refers to a vertical plane parallel to the vehicle longitudinal centerline through the longitudinal centerline of ~~the~~**any** front outboard passenger vehicle seat cushion. For bench seats **in vehicles with manually-operated driving controls**, "Plane B" refers to a vertical plane through ~~the~~**any** front outboard passenger seat parallel to the vehicle longitudinal centerline the same distance from the longitudinal centerline of the vehicle as the center of the steering ~~wheel~~**control**. **For bench seats in vehicles without manually-operated driving controls, "Plane B" refers to the vertical plane parallel to the vehicle longitudinal centerline, through any front outboard passenger seat's SgRP.**

S20.2.2.4 *Facing rear.*

(a) Align the child restraint system facing rearward such that Plane A is aligned with Plane B and the child restraint is in contact with the seat back.

(b) Position the 49 CFR part 572 subpart R 12-month-old CRABI dummy in the child restraint by following, to the extent possible, the manufacturer's instructions provided with the child restraint for seating infants.

(c) Start the vehicle engine or place the ignition in the "on" position, whichever will turn on the suppression system, and close all vehicle doors. Wait 10 seconds, then check whether the air bag is deactivated.

S20.2.2.5 *Facing forward.*

(a) Align the child restraint system facing forward such that Plane A is aligned with Plane B and the child restraint is in contact with the seat back.

(b) Position the 49 CFR part 572 subpart R 12-month-old CRABI dummy in the child restraint by following, to the extent possible, the manufacturer's instructions provided with the child restraint for seating infants.

(c) Start the vehicle engine or place the ignition in the "on" position, whichever will turn on the suppression system, and close all vehicle doors. Wait 10 seconds, then check whether the air bag is deactivated.

S20.2.3 *Tests with a belted car bed.*

S20.2.3.1 The vehicle shall comply in tests using any car bed specified in section A of appendix A or A-1 of this standard, as appropriate.

S20.2.3.2 (a) Install the car bed following, to the extent possible, the car bed manufacturer's directions regarding proper installation of the car bed. If the seat belt cannot be secured around the car bed, move the seat rearward to the next detent that allows the belt to be secured around

the car bed, or if the seat is a power seat, using only the control that primarily moves the seat fore and aft, move the seat rearward the minimum distance necessary for the seat belt to be secured around the car bed.

(b) Place any adjustable seat belt anchorages at the vehicle manufacturer's nominal design position for a 50th percentile adult male occupant. Cinch the vehicle belts to secure the car bed.

(c) Position the 49 CFR part 572 subpart K Newborn Infant dummy in the car bed by following, to the extent possible, the car bed manufacturer's instructions provided with the car bed for positioning infants.

(d) Start the vehicle engine or place the ignition in the "on" position, whichever will turn on the suppression system, and close all vehicle doors. Wait 10 seconds, then check whether the air bag is deactivated.

S20.3 *Static tests of automatic suppression feature which shall result in activation of ~~the~~**any front outboard** passenger air bag system.*

S20.3.1 Each vehicle certified to this option shall comply in tests conducted with ~~the~~**any** front outboard passenger seating position, if adjustable fore and aft, at the mid-height, in the full rearward and middle positions determined in S20.1.9.4, and the forward position determined in S16.3.3.1.8.

S20.3.2 Place a 49 CFR part 572 subpart O 5th percentile adult female test dummy at ~~the~~**any** front outboard passenger seating position of the vehicle, in accordance with procedures specified in S16.3.3 of this standard, except as specified in S20.3.1, subject to the fore-aft seat positions in S20.3.1. Do not fasten the seat belt.

S20.3.3 Start the vehicle engine or place the ignition in the "on" position, whichever will turn on the suppression system, and then close all vehicle doors.

S20.3.4 Wait 10 seconds, then check whether the air bag system is activated.

S20.4 *Low risk deployment test.* Each vehicle that is certified as complying with S19.3 shall meet the following test requirements.

S20.4.1 Position ~~the~~**any** front outboard passenger vehicle seat at the mid-height in the full forward position determined in S20.1.9.4, and adjust the seat back (if adjustable independent of the seat) to the nominal design position for a 50th percentile adult male as specified in S8.1.3. Position adjustable lumbar supports so that the lumbar support is in its lowest, retracted or deflated adjustment position. Position any adjustable parts of the seat that provide additional support so that they are in the lowest or most open adjustment position. If adjustable, set the head restraint at the full down and most forward position. If the child restraint or dummy contacts the vehicle interior, do the following: using only the control that primarily moves the seat in the fore and aft direction, move the seat rearward to the next detent that provides clearance; or if the seat

is a power seat, move the seat rearward while assuring that there is a maximum of 5 mm (0.2 in) clearance.

S20.4.2 The vehicle shall comply in tests using any child restraint specified in section B and section C of appendix A or A-1 of this standard, as appropriate.

S20.4.3 Locate a vertical plane through the longitudinal centerline of the child restraint. This will be referred to as "Plane A".

S20.4.4 For bucket seats, "Plane B" refers to a vertical plane parallel to the vehicle longitudinal centerline through the longitudinal centerline of ~~the~~**any** front outboard passenger seat cushion. For bench seats **in vehicles with manually-operated driving controls**, "Plane B" refers to a vertical plane through ~~the~~**any** front outboard passenger seat parallel to the vehicle longitudinal centerline that is the same distance from the longitudinal centerline of the vehicle as the center of the steering ~~wheel~~**control**. **For bench seats in vehicles without manually-operated driving controls, "Plane B" refers to the vertical plane parallel to the vehicle longitudinal centerline, through any front outboard passenger seat's SgRP.**

S20.4.5 Align the child restraint system facing rearward such that Plane A is aligned with Plane B.

S20.4.6 If the child restraint is certified to S5.9 of §571.213, and the vehicle seat has an anchorage system as specified in §571.225, attach the child restraint to the vehicle seat anchorage as specified in S20.2.1.6. Do not attach the top tether of the child restraint system. Do not attach the vehicle safety belt.

S20.4.7 While maintaining the child restraint position achieved in S20.4.5, secure the child restraint by following, to the extent possible, the child restraint manufacturer's directions regarding proper installation of the restraint in the rear facing mode. Place any adjustable seat belt anchorages at the manufacturer's nominal design position for a 50th percentile adult male occupant. Cinch the vehicle belts to any tension from zero up to 134 N (30 lb) to secure the child restraint. Measure belt tension in a flat, straight section of the lap belt between the child restraint belt path and the contact point with the belt anchor or vehicle seat, on the side away from the buckle (to avoid interference from the shoulder portion of the belt).

S20.4.8 Position the 49 CFR part 572 subpart R 12-month-old CRABI dummy in the child restraint by following, to the extent possible, the manufacturer's instructions provided with the child restraint for seating infants.

S20.4.9 Deploy ~~the~~**any** front outboard passenger frontal air bag system. If the air bag system contains a multistage inflator, the vehicle shall be able to comply at any stage or combination of stages or time delay between successive stages that could occur in the presence of an infant in a rear facing child restraint and a 49 CFR part 572, subpart R 12-month-old CRABI dummy positioned according to S20.4, and also with the seat at the mid-height, in the middle and full rearward positions determined in S20.1.9.4, in a rigid barrier crash test at speeds up to 64 km/h (40 mph).

S21 *Requirements using 3-year-old child dummies.*

S21.1 Each vehicle that is certified as complying with S14 shall, at the option of the manufacturer, meet the requirements specified in S21.2, S21.3, S21.4 or S21.5, under the test procedures specified in S22 or S28, as applicable.

S21.2 *Option 1—Automatic suppression feature.* Each vehicle shall meet the requirements specified in S21.2.1 through S21.2.3.

S21.2.1 The vehicle shall be equipped with an automatic suppression feature for ~~the~~**any front outboard** passenger air bag which results in deactivation of the air bag during each of the static tests specified in S22.2 (using the 49 CFR part 572 subpart P 3-year-old child dummy and, as applicable, any child restraint specified in section C and section D of appendix A or A-1 of this standard, as appropriate), and activation of the air bag system during each of the static tests specified in S22.3 (using the 49 CFR part 572 subpart O 5th percentile adult female dummy).

S21.2.2 The vehicle shall be equipped with a telltale light meeting the requirements specified in S19.2.2.

S21.2.3 The vehicle shall be equipped with a mechanism that indicates whether the air bag is suppressed, regardless of whether ~~the~~**any front outboard** passenger seat is occupied. The mechanism need not be located in the occupant compartment unless it is the telltale described in S21.2.2.

S21.3 *Option 2—Dynamic automatic suppression system that suppresses the air bag when an occupant is out of position.* (This option is available under the conditions set forth in S27.1.) The vehicle shall be equipped with a dynamic automatic suppression system for ~~the~~**any front outboard** passenger air bag system which meets the requirements specified in S27.

S21.4 *Option 3—Low risk deployment.* Each vehicle shall meet the injury criteria specified in S21.5 of this standard when ~~the~~**any front outboard** passenger air bag is deployed in accordance with both of the low risk deployment test procedures specified in S22.4.

S21.5 *Injury criteria for the 49 CFR part 572, subpart P 3-year-old child test dummy.*

S21.5.1 All portions of the test dummy shall be contained within the outer surfaces of the vehicle passenger compartment.

S21.5.2 *Head injury criteria.*

(a) For any two points in time, $t_1$ and $t_2$, during the event which are separated by not more than a 15 millisecond time interval and where $t_1$ is less than $t_2$, the head injury criterion ($HIC_{15}$) shall be determined using the resultant head acceleration at the center of gravity of the dummy head, $a_r$, expressed as a multiple of g (the acceleration of gravity) and shall be calculated using the expression:

$$\left[\frac{1}{(t_2-t_1)}\int_{t_1}^{t_2} a_r\,dt\right]^{2.5}(t_2-t_1)$$

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(b) The maximum calculated $HIC_{15}$ value shall not exceed 570.

S21.5.3 The resultant acceleration calculated from the output of the thoracic instrumentation shall not exceed 55 g's, except for intervals whose cumulative duration is not more than 3 milliseconds.

S21.5.4 Compression deflection of the sternum relative to the spine, as determined by instrumentation, shall not exceed 34 millimeters (1.3 in).

S21.5.5 *Neck injury.* When measuring neck injury, each of the following injury criteria shall be met.

(a) *Nij.*

(1) The shear force (Fx), axial force (Fz), and bending moment (My) shall be measured by the dummy upper neck load cell for the duration of the crash event as specified in S4.11. Shear force, axial force, and bending moment shall be filtered for Nij purposes at SAE Recommended Practice J211/1 MAR95 (incorporated by reference, see §571.5) Channel Frequency Class 600.

(2) During the event, the axial force (Fz) can be either in tension or compression while the occipital condyle bending moment (Mocy) can be in either flexion or extension. This results in four possible loading conditions for Nij: Tension-extension (Nte), tension-flexion (Ntf), compression-extension (Nce), or compression-flexion (Ncf).

(3) When calculating Nij using equation S21.5.5(a)(4), the critical values, Fzc and Myc, are:

(i) Fzc = 2120 N (477 lbf) when Fz is in tension

(ii) Fzc = 2120 N (477 lbf) when Fz is in compression

(iii) Myc = 68 Nm (50 lbf-ft) when a flexion moment exists at the occipital condyle

(iv) Myc = 27 Nm (20 lbf-ft) when an extension moment exists at the occipital condyle.

(4) At each point in time, only one of the four loading conditions occurs and the Nij value corresponding to that loading condition is computed and the three remaining loading modes shall be considered a value of zero. The expression for calculating each Nij loading condition is given by:

Nij = (Fz / Fzc) + (Mocy / Myc)

(5) None of the four Nij values shall exceed 1.0 at any time during the event.

(b) *Peak tension.* Tension force (Fz), measured at the upper neck load cell, shall not exceed 1130 N (254 lbf) at any time.

(c) *Peak compression.* Compression force (Fz), measured at the upper neck load cell, shall not exceed 1380 N (310 lbf) at any time.

S21.5.6 Unless otherwise indicated, instrumentation for data acquisition, data channel frequency class, and moment calculations are the same as given in 49 CFR part 572 subpart P 3-year-old child test dummy.

**S21.6 *Motion suppression for vehicles with manually-operated driving controls that do not require a driver.* Each vehicle that is certified as complying with S14 shall not be capable of motion when a 3-year-old dummy is placed at the driver's seating position and the vehicle is in an operational state that does not require a driver.**

**S21.6.1 Motion suppression shall be assessed under the test procedures specified in S22.1 through S22.2, except that the 3-year-old dummy is placed in the driver's seating position and the result shall be an inability of engage vehicle motion.**

S22 *Test procedure for S21.*

S22.1 *General provisions and definitions.*

S22.1.1 Tests specifying the use of a forward facing child restraint, including a booster seat where applicable, may be conducted using any such restraint listed in section C and section D of appendix A or A-1 of this standard, as appropriate. The child restraint may be unused or have been previously used only for automatic suppression tests. If it has been used, there shall not be any visible damage prior to the test. Booster seats are to be used in the manner appropriate for a 3-year-old child of the same height and weight as the 3-year-old child dummy.

S22.1.2 Unless otherwise specified, each vehicle certified to this option shall comply in tests conducted with ~~the~~**any** front outboard passenger seating position at the mid-height, in the full rearward, middle, and the full forward positions determined in S22.1.7.4. If the dummy contacts the vehicle interior, using only the control that primarily moves the seat fore and aft, move the seat rearward to the next detent that provides clearance. If the seat is a power seat, move the seat rearward while assuring that there is a maximum of 5 mm (0.2 in) clearance.

S22.1.3 Except as otherwise specified, if the child restraint has an anchorage system as specified in S5.9 of FMVSS No. 213 and is tested in a vehicle with a**ny** front outboard passenger vehicle seat that has an anchorage system as specified in FMVSS No. 225, the vehicle shall comply with the belted test conditions with the restraint anchorage system attached to the vehicle seat anchorage system and the vehicle seat belt unattached. It shall also comply with the belted test

conditions with the restraint anchorage system unattached to the vehicle seat anchorage system and the vehicle seat belt attached.

S22.1.4 Do not attach any tethers.

S22.1.5 The definitions provided in S16.3.1 through S16.3.10 apply to the tests specified in S22.

S22.1.6 For leg and thigh angles use the following references:

(a) *Thigh*—a straight line on the thigh skin between the center of the 5/16 × ½ in. screw (part 9001024, item 10 in drawing 210-0000 sheet 2 of 7, complete assembly (HYB III 3 YR OLD)) and the knee bolt (part 210-5301 in drawing 210-5000-1 & -1, leg assembly).

(b) *Leg*—a straight line on the leg skin between the center of the ankle bolt (part 210-5701 in drawing 210-5000-1 & -2, leg assembly) and the knee bolt (part 210-5301 in drawing 210-5000-1 & -2, leg assembly).

S22.1.7 *Seat set-up.* Unless otherwise stated,

S22.1.7.1 *Lumbar support adjustment.* Position adjustable lumbar supports so that the lumbar support is in its lowest, retracted or deflated adjustment position.

S22.1.7.2 *Other seat adjustments.* Position any adjustable parts of the seat that provide additional support so that they are in the lowest or most open adjustment position.

S22.1.7.3 Set the seat and seat cushion in the position determined in S16.2.10.3.1.

S22.1.7.4 Using only the control that primarily moves the seat in the fore and aft direction, determine the full rearward, middle, and full forward positions of the SCRP. Using any part of any seat or seat cushion adjustments other than that which primarily moves the seat or seat cushion fore-aft, determine the SCRP mid-point height for each of the three fore-aft test positions, while maintaining, as closely as possible, the seat cushion reference line angle determined in S16.2.10.3.1.

S22.1.7.5 The seat back angle, if adjustable, is set at the manufacturer's nominal design seat back angle for a 50th percentile adult male as specified in S8.1.3.

S22.1.7.6 If adjustable, set the head restraint at the full down and full forward position.

S22.2 *Static tests of automatic suppression feature which shall result in deactivation of ~~the~~**any front outboard** passenger air bag.* Each vehicle that is certified as complying with S21.2 shall meet the following test requirements:

22.2.1 *Belted test with forward facing or booster seat child restraint*

S22.2.1.1 Install the restraint in **any**~~the~~ front outboard passenger vehicle seat in accordance, to the extent possible, with the child restraint manufacturer's instructions provided with the seat for use by children with the same height and weight as the 3-year-old child dummy.

S22.2.1.2 Locate a vertical plane through the longitudinal centerline of the child restraint. This will be referred to as "Plane A".

S22.2.1.3 For bucket seats, "Plane B" refers to a vertical longitudinal plane through the longitudinal centerline of the seat cushion of ~~the~~**any** front outboard passenger vehicle seat. For bench seats **in vehicles with manually-operated driving controls**, "Plane B" refers to a vertical plane through ~~the~~**any** front outboard passenger vehicle seat parallel to the vehicle longitudinal centerline the same distance from the longitudinal centerline of the vehicle as the center of the steering ~~wheel~~**control**. **For bench seats in vehicles without manually-operated driving controls, "Plane B" refers to the vertical plane parallel to the vehicle longitudinal centerline, through any front outboard passenger seat's SgRP.**

S22.2.1.4 The vehicle shall comply with the child restraint belted to the vehicle in the following manner:

(a) Using the vehicle safety belts as specified in S22.2.1.5 with section C and section D child restraints of appendix A or A-1, as appropriate, of this section designed to be secured to the vehicle seat even when empty; and

(b) If the child restraint is certified to S5.9 of §571.213, and the vehicle seat has an anchorage system as specified in §571.225, using only the mechanism provided by the child restraint manufacturer for attachment to the lower anchorage as specified in S22.2.1.6.

S22.2.1.5 *Installation with vehicle safety belts.*

(a) Place any adjustable safety belt anchorages at the vehicle manufacturer's nominal design position for a 50th percentile adult male occupant.

(b) Without attaching the child restraint anchorage system components specified in S5.9 of §571.213 to a vehicle child restraint anchorage system specified in §571.225, align the child restraint system facing forward, such that Plane A is aligned with Plane B.

(c) While maintaining the child restraint positions achieved in S22.2.1.5(b), secure the child restraint by following, to the extent possible, the child restraint manufacturer's directions regarding proper installation of the restraint. Cinch the vehicle belts to any tension from zero up to 134 N to secure the child restraint. Measure belt tension in a flat, straight section of the lap belt between the child restraint belt path and the contact point with the belt anchor or vehicle seat, on the side away from the buckle (to avoid interference from the shoulder portion of the belt).

S22.2.1.6 *Installation using the lower anchor bars and the attachment mechanism provided by the child restraint manufacturer.*

S22.2.1.6.1 If the mechanism provided by the manufacturer incorporates a strap(s), use the following procedure.

(a) Place the child restraint on the vehicle seat facing forward, with Plane A of the child restraint aligned within ±10 mm with a longitudinal vertical plane passing through a point midway between the centers of the two lower anchor bars.

(b) Position any adjustments on the child restraint, to the extent possible, according to the child restraint manufacturer's instructions.

(c) Connect the lower anchor straps to the lower anchor bars and remove most of the slack, but do not apply any load using these straps.

(d) Move the child restraint rearward until it contacts the seat back.

(e) Do not attach any top tethers.

(f) Use the loading device equipped with the loading foot shown in Figure A1 and position it as shown in Figure A2 of appendix A and appendix A-1 of this standard. The 15±3 degree angle of the loading device is determined with an initial preload of 75±25 N.

(g) Over a period of 90±30 seconds, increase the load to 875±25 N.

(h) After achieving the 875 N load in step (g) of this section, hold the bar length at the present position and allow the load to settle for 60 seconds.

(i) Following the one-minute settling period specified in step (h) of this section, increase the load to 875±25 N such that the 875±25 N load is achieved within 10 seconds of the settling period.

(j) Hold the bar length at present position and allow the load to settle for 120 seconds after achieving the load in step (g) of this section.

(k) Following the settling period specified in step (j) of this section, increase the load to 875±25 N such that the 875±25 N load is achieved within 10 seconds of the settling period.

(l) Observe the settling of the load and tighten the lower anchor straps when the load is 850±5N or 180 seconds has elapsed since achieving the 875±25 N load in step (g) of this section, whichever comes first. Tighten the lower anchor straps at the same time such that the load is reduced 15±10 N and the change occurs within 2 seconds.

(m) Remove the loading device.

S22.2.1.6.2 If the mechanism provided by the manufacturer does not incorporate a strap(s), use the following procedure.

(a) Place the vehicle seat in the rear-most and mid-height position.

(b) Place the child restraint on the vehicle seat facing forward with Plane A of the child restraint aligned within ±10 mm with a longitudinal vertical plane passing through a point midway between the centers of the two lower anchor bars.

(c) Position any adjustments on the child restraint, to the extent possible, according to the child restraint manufacturer's instructions.

(d) Connect the lower anchor attachments to the lower anchor bars following, to the extent possible, the child restraint manufacturer's instructions.

(e) Move the child restraint rearward until it contacts the seat back.

(f) Do not attach any top tethers.

(g) If the child restraint does not use a linear sliding or ratcheting mechanism that requires the application of force to securely install the child restraint, follow, to the extent possible, the manufacturer's instructions for installing the child restraint onto the seat. Do not load the seat as provided in S22.2.1.6.2(h).

(h) If the child restraint uses a linear sliding or ratcheting mechanism that requires the application of force to securely install the child restraint, within 25±5 seconds, apply a 475±25N force, that has no lateral component, aligned angularly ±10 degrees with a parallel plane located within ±100 mm of the plane formed by the linear mechanism. Release the force.

(i) Move the vehicle seat to the seat position being tested (full rear, mid, full forward).

S22.2.1.7 *Forward facing child restraint.*

S22.2.1.7.1 After installation of a forward facing child restraint, position the 49 CFR part 572 subpart P 3-year-old child dummy in the child restraint such that the dummy's lower torso is centered on the child restraint and the dummy's spine is against the seat back of the child restraint. Place the arms at the dummy's sides.

S22.2.1.7.2 Attach all belts that come with the child restraint that are appropriate for a child of the same height and weight as the 3-year-old child dummy, if any, by following, to the extent possible, the manufacturer's instructions provided with the child restraint for seating children.

S22.2.1.7.3 Start the vehicle engine or place the ignition in the “on” position, whichever will turn on the suppression system, and close all vehicle doors. Wait 10 seconds, then check whether the air bag is deactivated.

S22.2.1.8 *Booster seat child restraint.*

S22.2.1.8.1 After installation of a booster seat child restraint, position the 49 CFR part 572 subpart P 3-year-old child dummy in the booster seat such that the dummy's lower torso is centered on the booster seat cushion and the dummy's back is parallel to and in contact with the

booster seat back or, if there is no booster seat back, the vehicle seat back. Place the arms at the dummy's sides.

S22.2.1.8.2 If applicable, attach all belts that come with the child restraint that are appropriate for a child of the same height and weight as the 3-year-old child dummy, if any, by following, to the extent possible, the manufacturer's instructions provided with the child restraint for seating children.

S22.2.1.8.3 If applicable, place the Type 2 manual belt around the test dummy and fasten the latch. Remove all slack from the lap belt portion. Pull the upper torso webbing out of the retractor and allow it to retract; repeat this four times. Apply a 9 to 18 N (2 to 4 lb) tension load to the lap belt. Allow the excess webbing in the upper torso belt to be retracted by the retractive force of the retractor.

S22.2.1.8.4 Start the vehicle engine or place the ignition in the "on" position, whichever will turn on the suppression system, and then close all vehicle doors. Wait 10 seconds, then check whether the air bag is deactivated.

S22.2.2 *Unbelted tests with dummies.* Place the 49 CFR part 572 subpart P 3-year-old child dummy on ~~the~~**any** front outboard passenger vehicle seat in any of the following positions (without using a child restraint or booster seat or the vehicle's seat belts):

S22.2.2.1 *Sitting on seat with back against seat back.*

(a) Place the dummy on ~~the~~**any** front outboard passenger seat.

(b) In the case of vehicles equipped with bench seats **and with manually-operated driving controls**, position the midsagittal plane of the dummy vertically and parallel to the vehicle's longitudinal centerline and the same distance from the vehicle's longitudinal centerline, within ±10 mm (±0.4 in), as the center of the steering ~~wheel~~**control**. **For bench seats in vehicles without manually-operated driving controls, position the midsagittal plane of any front outboard dummy vertically and parallel to the vehicle's longitudinal centerline, within ±10 mm (±0.4 in) of the seating reference point of the seat that it occupies.** In the case of vehicles equipped with bucket seats, position the midsagittal plane of ~~the~~**any front outboard** dummy vertically such that it coincides with the longitudinal centerline of the seat cushion, within ±10 mm (±0.4 in). Position the torso of the dummy against the seat back. Position the dummy's thighs against the seat cushion.

(c) Allow the legs of the dummy to extend off the surface of the seat.

(d) Rotate the dummy's upper arms down until they contact the seat back.

(e) Rotate the dummy's lower arms until the dummy's hands contact the seat cushion.

(f) Start the vehicle engine or place the ignition in the "on" position, whichever will turn on the suppression system, and then close all vehicle doors.

(g) Wait 10 seconds, then check whether the air bag is deactivated.

S22.2.2.2 *Sitting on seat with back against reclined seat back.* Repeat the test sequence in S22.2.2.1 with the seat back angle 25 degrees rearward of the manufacturer's nominal design position for the 50th percentile adult male. If the seat will not recline 25 degrees rearward of the nominal design position, use the closest position that does not exceed 25 degrees.

S22.2.2.3 *Sitting on seat with back not against seat back.*

(a) Place the dummy on ~~the~~**any** front outboard passenger seat.

(b) In the case of vehicles equipped with bench seats **and with manually-operated driving controls**, position the midsagittal plane of the dummy vertically and parallel to the vehicle's longitudinal centerline and the same distance from the vehicle's longitudinal centerline, within ±10 mm (±0.4 in), as the center of the steering ~~wheel~~**control**. **For bench seats in vehicles without manually-operated driving controls, position the midsagittal plane of any front outboard dummy vertically and parallel to the vehicle's longitudinal centerline, within ±10 mm (±0.4 in) of the seating reference point of the seat that it occupies.** In the case of vehicles equipped with bucket seats, position the midsagittal plane of ~~the~~**any front outboard** dummy vertically such that it coincides with the longitudinal centerline of the seat cushion, within ±10 mm (±0.4 in). Position the dummy with the spine vertical so that the horizontal distance from the dummy's back to the seat back is no less than 25 mm (1.0 in) and no more than 150 mm (6.0 in), as measured along the dummy's midsagittal plane at the mid-sternum level. To keep the dummy in position, a material with a maximum breaking strength of 311 N (70 lb) may be used to hold the dummy.

(c) Position the dummy's thighs against the seat cushion.

(d) Allow the legs of the dummy to extend off the surface of the seat.

(e) Position the upper arms parallel to the spine and rotate the dummy's lower arms until the dummy's hands contact the seat cushion.

(f) Start the vehicle engine or place the ignition in the "on" position, whichever will turn on the suppression system, and then close all vehicle doors.

(g) Wait 10 seconds, then check whether the air bag is deactivated.

S22.2.2.4 *Sitting on seat edge, spine vertical, hands by the dummy's sides.*

(a) In the case of vehicles equipped with bench seats **and with manually-operated driving controls**, position the midsagittal plane of the dummy vertically and parallel to the vehicle's longitudinal centerline and the same distance from the vehicle's longitudinal centerline, within ±10 mm (±0.4 in), as the center of the steering ~~wheel~~**control**. **For bench seats in vehicles without manually-operated driving controls, position the midsagittal plane of any front outboard dummy vertically and parallel to the vehicle's longitudinal centerline, within ±10**

**mm (±0.4 in) of the seating reference point of the seat that it occupies.** In the case of vehicles equipped with bucket seats, position the midsagittal plane of ~~the~~**any front outboard** dummy vertically such that it coincides with the longitudinal centerline of the seat cushion, within ±10 mm (±0.4 in).

(b) Position the dummy in the seated position forward in the seat such that the legs are vertical and the back of the legs rest against the front of the seat with the spine vertical. If the dummy's feet contact the floor pan, rotate the legs forward until the dummy is resting on the seat with the feet positioned flat on the floor pan and the dummy spine vertical. To keep the dummy in position, a material with a maximum breaking strength of 311 N (70 lb) may be used to hold the dummy.

(c) Place the upper arms parallel to the spine.

(d) Lower the dummy's lower arms such that they contact the seat cushion.

(e) Start the vehicle engine or place the ignition in the "on" position, whichever will turn on the suppression system, and then close all vehicle doors.

(f) Wait 10 seconds, then check whether the air bag is deactivated.

S22.2.2.5 *Standing on seat, facing forward.*

(a) In the case of vehicles equipped with bench seats **and with manually-operated driving controls**, position the midsagittal plane of the dummy vertically and parallel to the vehicle's longitudinal centerline and the same distance from the vehicle's longitudinal centerline, within ±10 mm (±0.4 in), as the center of the steering ~~wheel~~**control** rim. **For bench seats in vehicles without manually-operated driving controls, position the midsagittal plane of any front outboard dummy vertically and parallel to the vehicle's longitudinal centerline, within ±10 mm (±0.4 in) of the seating reference point of the seat that it occupies.** In the case of vehicles equipped with bucket seats, position the midsagittal plane of ~~the~~**any front outboard** dummy vertically such that it coincides with the longitudinal centerline of the seat cushion, within ±10 mm (±0.4 in). Position the dummy in a standing position on ~~the~~**any** front outboard passenger seat cushion facing the front of the vehicle while placing the heels of the dummy's feet in contact with the seat back.

(b) Rest the dummy against the seat back, with the arms parallel to the spine.

(c) If the head contacts the vehicle roof, recline the seat so that the head is no longer in contact with the vehicle roof, but allow no more than 5 mm (0.2 in) distance between the head and the roof. If the seat does not sufficiently recline to allow clearance, omit the test.

(d) If necessary use a material with a maximum breaking strength of 311 N (70 lb) or spacer blocks to keep the dummy in position.

(e) Start the vehicle engine or place the ignition in the "on" position, whichever will turn on the suppression system, and then close all vehicle doors.

(f) Wait 10 seconds, then check whether the air bag is deactivated.

S22.2.2.6 *Kneeling on seat, facing forward.*

(a) In the case of vehicles equipped with bench seats **and manually-operated driving controls**, position the midsagittal plane of the dummy vertically and parallel to the vehicle's longitudinal centerline and the same distance from the vehicle's longitudinal centerline, within ±10 mm (±0.4 in), as the center of the steering ~~wheel~~**control**. **For bench seats in vehicles without manually-operated driving controls, position the midsagittal plane of any front outboard dummy vertically and parallel to the vehicle's longitudinal centerline, within ±10 mm (±0.4 in) of the seating reference point of the seat that it occupies.** In the case of vehicles equipped with bucket seats, position the midsagittal plane of ~~the~~**any front outboard** dummy vertically such that it coincides with the longitudinal centerline of the seat cushion, within ±10 mm (±0.4 in).

(b) Position the dummy in a kneeling position in ~~the~~**any** front outboard passenger vehicle seat with the dummy facing the front of the vehicle with its toes at the intersection of the seat back and seat cushion. Position the dummy so that the spine is vertical. Push down on the legs so that they contact the seat as much as possible and then release. Place the arms parallel to the spine.

(c) If necessary use a material with a maximum breaking strength of 311 N (70 lb) or spacer blocks to keep the dummy in position.

(d) Start the vehicle engine or place the ignition in the "on" position, whichever will turn on the suppression system, and then close all vehicle doors.

(e) Wait 10 seconds, then check whether the air bag is deactivated.

S22.2.2.7 *Kneeling on seat, facing rearward.*

(a) In the case of vehicles equipped with bench seats **and manually-operated driving controls**, position the midsagittal plane of the dummy vertically and parallel to the vehicle's longitudinal centerline and the same distance from the vehicle's longitudinal centerline, within ±10 mm (±0.4 in), as the center of the steering ~~wheel~~**control**. **For bench seats in vehicles without manually-operated driving controls, position the midsagittal plane of any front outboard dummy vertically and parallel to the vehicle's longitudinal centerline, within ±10 mm (±0.4 in) of the seating reference point of the seat that it occupies.** In the case of vehicles equipped with bucket seats, position the midsagittal plane of ~~the~~**any front outboard** dummy vertically such that it coincides with the longitudinal centerline of the seat cushion, within ±10 mm (±0.4 in).

(b) Position the dummy in a kneeling position in ~~the~~**any** front outboard passenger vehicle seat with the dummy facing the rear of the vehicle. Position the dummy such that the dummy's head and torso are in contact with the seat back. Push down on the legs so that they contact the seat as much as possible and then release. Place the arms parallel to the spine.

(c) Start the vehicle engine or place the ignition in the "on" position, whichever will turn on the suppression system, and then close all vehicle doors.

(d) Wait 10 seconds, then check whether the air bag is deactivated.

S22.2.2.8 *Lying on seat.* This test is performed only in vehicles with 3 designated front seating positions.

(a) Lay the dummy on ~~the~~**any** front outboard passenger vehicle seat such that the following criteria are met:

(1) The midsagittal plane of the dummy is horizontal,

(2) The dummy's spine is perpendicular to the vehicle's longitudinal axis,

(3) The dummy's arms are parallel to its spine,

(4) A plane passing through the two shoulder joints of the dummy is vertical,

(5) The anterior of the dummy is facing the vehicle front,

(6) The head of the dummy is positioned towards the **nearest** passenger door, and

(7) The horizontal distance from the topmost point of the dummy's head to the vehicle door is 50 to 100 mm (2-4 in).

(8) The dummy is as far back in the seat as possible.

(b) Rotate the thighs as much as possible toward the chest of the dummy and rotate the legs as much as possible against the thighs.

(c) Move the dummy's upper left arm parallel to the vehicle's transverse plane and the lower left arm 90 degrees to the upper arm. Rotate the lower left arm about the elbow joint and toward the dummy's head until movement is obstructed.

(d) Start the vehicle engine or place the ignition in the "on" position, whichever will turn on the suppression system, and then close all vehicle doors.

(e) Wait 10 seconds, then check whether the air bag is deactivated.

S22.3 *Static tests of automatic suppression feature which shall result in activation of ~~the~~**any front outboard** passenger air bag system.*

S22.3.1 Each vehicle certified to this option shall comply in tests conducted with ~~the~~**any** front outboard passenger seating position at the mid-height, in the full rearward, and middle positions determined in S22.1.7.4, and the forward position determined in S16.3.3.1.8.

S22.3.2 Place a 49 CFR part 572 subpart O 5th percentile adult female test dummy at ~~the~~**any** front outboard passenger seating position of the vehicle, in accordance with procedures specified in S16.3.3 of this standard, except as specified in S22.3.1. Do not fasten the seat belt.

S22.3.3 Start the vehicle engine or place the ignition in the "on" position, whichever will turn on the suppression system, and then close all vehicle doors.

S22.3.4 Wait 10 seconds, then check whether the air bag system is activated.

S22.4 *Low risk deployment tests.*

S22.4.1 Each vehicle that is certified as complying with S21.4 shall meet the following test requirements with the 49 CFR part 572, subpart P 3-year-old child dummy in both of the following positions: Position 1 (S22.4.2) and Position 2 (S22.4.3).

S22.4.1.1 Locate and mark a point on the front of the dummy's chest jacket on the midsagittal plane that is 114 mm (4.5 in) ±3 mm (±0.1 in) along the surface of the skin from the top of the skin at the neck line. This is referred to as "Point 1."

S22.4.1.2 Mark a point on the instrument panel that is longitudinally and transversely, as measured along the surface of the instrument panel, within ±6 mm (±0.2 in) of the point that is defined by the intersection of the instrument panel and a line between the volumetric center of the smallest volume that can encompass the folded undeployed air bag and the volumetric center of the static fully inflated air bag.

S22.4.1.3 Locate the vertical plane parallel to the vehicle longitudinal centerline through the point located in S22.4.1.2. This is referred to as "Plane D."

S22.4.1.4 Locate the horizontal plane through the point located in S22.4.1.2. This is referred to as "Plane C."

S22.4.2 *Position 1 (chest on instrument panel).*

S22.4.2.1 Set the seat and seat cushion in the positions determined in S16.2.10.3.1. If the seat back is adjustable independent of the seat, place the seat back at the manufacturer's nominal design seat back angle for a 50th percentile adult male as specified in S8.1.3. Position any adjustable parts of the seat that provide additional support so that they are in the lowest or most open adjustment position. If adjustable, set the head restraint in the lowest and most forward position.

S22.4.2.2 Place the dummy in ~~the~~**any** front outboard passenger seat such that:

S22.4.2.2.1 The midsagittal plane is coincident with Plane D within ±10 mm (±0.4 in).

S22.4.2.2.2 The legs are initially vertical to the floor pan. The legs and thighs shall be adjusted to the extent necessary for the head/torso to contact the instrument panel as specified in S22.4.2.3.

S22.4.2.2.3 The upper arms are parallel to the torso and the hands are in contact with the thighs.

S22.4.2.3 Without changing the seat position and with the dummy's thorax instrument cavity rear face vertical, move the dummy forward until the dummy head/torso contacts the instrument panel. If the dummy loses contact with the seat cushion because of the forward movement, maintain the height of the dummy and the angle of the thigh with respect to the torso. Once contact is made, raise the dummy vertically until Point 1 lies in Plane C within ±10 mm (±0.4 in). If the dummy's head contacts the windshield and keeps Point 1 from reaching Plane C, lower the dummy until there is no more than 5 mm (0.2 in) clearance between the head and the windshield. (The dummy shall remain in contact with the instrument panel while being raised or lowered, which may change the dummy's fore-aft position.)

S22.4.2.4 If possible, position the legs of the dummy so that the legs are vertical and the feet rest flat on the floor pan of the vehicle. If the positioning against the instrument panel does not allow the feet to be on the floor pan, the feet shall be parallel to the floor pan.

S22.4.2.5 If necessary, material with a maximum breaking strength of 311 N (70 lb) and spacer blocks may be used to support the dummy in position. The material should support the torso rather than the head. Support the dummy so that there is minimum interference with the full rotational and translational freedom for the upper torso of the dummy and the material does not interfere with the air bag.

S22.4.3 *Position 2 (head on instrument panel).*

S22.4.3.1 Place ~~the~~**any** front outboard passenger seat at the mid-height, in full rearward seating position determined in S22.1.7.4. Place the seat back, if adjustable independent of the seat, at the manufacturer's nominal design seat back angle for a 50th percentile adult male as specified in S8.1.3. Position any adjustable parts of the seat that provide additional support so that they are in the lowest or most open adjustment position. If adjustable, set the head restraint in the lowest and most forward position.

S22.4.3.2 Place the dummy in ~~the~~**any** front outboard passenger seat such that:

S22.4.3.2.1 The midsagittal plane is coincident with Plane D within ±10 mm (±0.4 in).

S22.4.3.2.2 The legs are vertical to the floor pan, the back of the legs are in contact with the seat cushion, and the dummy's thorax instrument cavity rear face is vertical. If it is not possible to position the dummy with the legs in the prescribed position, rotate the legs forward until the dummy is resting on the seat with the feet positioned flat on the floor pan, and the back of the legs are in contact with the front of the seat cushion. Set the transverse distance between the longitudinal centerlines at the front of the dummy's knees at 86 to 91 mm (3.4 to 3.6 in), with the thighs and the legs of the dummy in vertical planes.

S22.4.3.2.3 The upper arms are parallel to the torso and the hands are in contact with the thighs.

S22.4.3.3 Using only the control that primarily moves the seat in the fore and aft direction, move the seat forward, while maintaining the thorax instrument cavity rear face orientation until any part of the dummy contacts the vehicle's instrument panel.

S22.4.3.4 If dummy contact has not been made with the vehicle's instrument panel at the full forward seating position of the seat, slide the dummy forward until contact is made. Maintain the thorax instrument cavity rear face vertical orientation. If the dummy loses contact with the seat, from that point forward, maintain the height of the dummy. Except as provided in S22.4.3.5, maintain the angle of the thigh with respect to the horizontal.

S22.4.3.5 If head/torso contact with the instrument panel has not been made, maintain the angle of the thighs with respect to the horizontal while applying a force towards the front of the vehicle on the spine of the dummy between the shoulder joints, perpendicular to the thorax instrument cavity rear face, until the head or torso comes into contact with the vehicle's instrument panel or until a maximum force of 222 N (50 lb) is achieved. If the head/torso is still not in contact with the instrument panel, hold the femurs and release the 222 N (50 lb) force. While maintaining the relative angle between the torso and the femurs, roll the dummy forward on the seat cushion, without sliding, until head/torso contact with the instrument panel is achieved. If seat contact is lost prior to or during femur rotation out of the horizontal plane, constrain the dummy to rotate about the dummy H-point. If the dummy cannot be rolled forward on the seat due to contact of the dummy feet with the floor pan, extend the lower legs forward, at the knees, until floor pan contact is avoided.

S22.4.3.6 If necessary, material with a maximum breaking strength of 311 N (70 lb) and spacer blocks may be used to support the dummy in position. The material should support the torso rather than the head. Support the dummy so that there is minimum interference with the full rotational and translational freedom for the upper torso of the dummy and the material does not interfere with the air bag.

S22.4.4 Deploy ~~the~~**any** front outboard passenger frontal air bag system. If the frontal air bag system contains a multistage inflator, the vehicle shall be able to comply with the injury criteria at any stage or combination of stages or time delay between successive stages that could occur in a rigid barrier crash test at or below 26 km/h (16 mph), under the test procedure specified in S22.5.

S22.5 *Test procedure for determining stages of air bag systems subject to low risk deployment (low speed crashes) test requirement.*

S22.5.1 The test described in S22.5.2 shall be conducted with an unbelted 50th percentile adult male test dummy in the driver**'s** seating position according to S8 as it applies to that seating position and an unbelted 5th percentile adult female test dummy either in ~~the~~**any** front outboard passenger vehicle seating position according to S16 as it applies to that seating position or at any fore-aft seat position on ~~the~~**any** passenger side.

S22.5.2 Impact the vehicle traveling longitudinally forward at any speed, up to and including 26 km/h (16 mph) into a fixed rigid barrier that is perpendicular ±5 degrees to the line of travel of

the vehicle under the applicable conditions of S8, S10, and S16 excluding S10.7, S10.8, S10.9, and S16.3.5.

S22.5.3 Determine which inflation stage or combination of stages are fired and determine the time delay between successive stages. That stage or combination of stages, with time delay between successive stages, shall be used in deploying the air bag when conducting the low risk deployment tests described in S22.4, S24.4, and S26.

S22.5.4 If the air bag does not deploy in the impact described in S22.5.2, the low risk deployment tests described in S22.4, S24.4, and S26 shall be conducted with all stages using the maximum time delay between stages.

S23 *Requirements using 6-year-old child dummies.*

S23.1 Each vehicle that is certified as complying with S14 shall, at the option of the manufacturer, meet the requirements specified in S23.2, S23.3, or S23.4, under the test procedures specified in S24 or S28, as applicable.

S23.2 *Option 1—Automatic suppression feature.* Each vehicle shall meet the requirements specified in S23.2.1 through S23.2.3.

S23.2.1 The vehicle shall be equipped with an automatic suppression feature for ~~the~~**any front outboard** passenger frontal air bag system which results in deactivation of the air bag during each of the static tests specified in S24.2 (using the 49 CFR part 572 subpart N 6-year-old child dummy in any of the child restraints specified in section D of appendix A or A-1 of this standard, as appropriate), and activation of the air bag system during each of the static tests specified in S24.3 (using the 49 CFR part 572 subpart O 5th percentile adult female dummy).

S23.2.2 The vehicle shall be equipped with a telltale light meeting the requirements specified in S19.2.2.

S23.2.3 The vehicle shall be equipped with a mechanism that indicates whether the air bag is suppressed, regardless of whether ~~the~~**any front outboard** passenger seat is occupied. The mechanism need not be located in the occupant compartment unless it is the telltale described in S23.2.2.

S23.3 *Option 2—Dynamic automatic suppression system that suppresses the air bag when an occupant is out of position.* (This option is available under the conditions set forth in S27.1.) The vehicle shall be equipped with a dynamic automatic suppression system for ~~the~~**any front outboard** passenger frontal air bag system which meets the requirements specified in S27.

S23.4 *Option 3—Low risk deployment.* Each vehicle shall meet the injury criteria specified in S23.5 of this standard when ~~the~~**any front outboard** passenger air bag is statically deployed in accordance with both of the low risk deployment test procedures specified in S24.4.

S23.5 *Injury criteria for the 49 CFR part 572 subpart N 6-year-old child dummy.*

S23.5.1 All portions of the test dummy shall be contained within the outer surfaces of the vehicle passenger compartment.

S23.5.2 *Head injury criteria.*

(a) For any two points in time, $t_1$ and $t_2$, during the event which are separated by not more than a 15 millisecond time interval and where $t_1$ is less than $t_2$, the head injury criterion ($HIC_{15}$) shall be determined using the resultant head acceleration at the center of gravity of the dummy head, $a_r$, expressed as a multiple of g (the acceleration of gravity) and shall be calculated using the expression:

$$\left[\frac{1}{(t_2-t_1)}\int_{t_1}^{t_2} a_r\,dt\right]^{2.5}(t_2-t_1)$$

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(b) The maximum calculated $HIC_{15}$ value shall not exceed 700.

S23.5.3 The resultant acceleration calculated from the output of the thoracic instrumentation shall not exceed 60 g's, except for intervals whose cumulative duration is not more than 3 milliseconds.

S23.5.4 Compression deflection of the sternum relative to the spine, as determined by instrumentation, shall not exceed 40 mm (l.6 in).

S23.5.5 *Neck injury.* When measuring neck injury, each of the following injury criteria shall be met.

(a) *Nij.*

(1) The shear force (Fx), axial force (Fz), and bending moment (My) shall be measured by the dummy upper neck load cell for the duration of the crash event as specified in S4.11. Shear force, axial force, and bending moment shall be filtered for Nij purposes at SAE Recommended Practice J211/1 MAR95 (incorporated by reference, see §571.5) Channel Frequency Class 600.

(2) During the event, the axial force (Fz) can be either in tension or compression while the occipital condyle bending moment (Mocy) can be in either flexion or extension. This results in four possible loading conditions for Nij: tension-extension (Nte), tension-flexion (Ntf), compression-extension (Nce), or compression-flexion (Ncf).

(3) When calculating Nij using equation S23.5.5(a)(4), the critical values, Fzc and Myc, are:

(i) Fzc = 2800 N (629 lbf) when Fz is in tension

(ii) Fzc = 2800 N (629 lbf) when Fz is in compression

(iii) Myc = 93 Nm (69 lbf-ft) when a flexion moment exists at the occipital condyle

(iv) Myc = 37 Nm (27 lbf-ft) when an extension moment exists at the occipital condyle.

(4) At each point in time, only one of the four loading conditions occurs and the Nij value corresponding to that loading condition is computed and the three remaining loading modes shall be considered a value of zero. The expression for calculating each Nij loading condition is given by:

Nij = (Fz / Fzc) + (Mocy / Myc)

(5) None of the four Nij values shall exceed 1.0 at any time during the event.

(b) *Peak tension.* Tension force (Fz), measured at the upper neck load cell, shall not exceed 1490 N (335 lbf) at any time.

(c) *Peak compression.* Compression force (Fz), measured at the upper neck load cell, shall not exceed 1820 N (409 lbf) at any time.

S23.5.6 Unless otherwise indicated, instrumentation for data acquisition, data channel frequency class, and moment calculations are the same as given for the 49 CFR part 572 subpart N 6-year-old child test dummy.

**S23.6 *Motion suppression for vehicles with manually-operated driving controls that do not require a driver.* Each vehicle that is certified as complying with S14 shall not be capable of motion when a 6-year-old dummy is placed at the driver's seating position and the vehicle is in an operational state that does not require a driver.**

**S23.6.1 Motion suppression shall be assessed under the test procedures specified in S24.1 through S24.3, except that the 6-year-old dummy is placed in the driver's seating position and the result shall be an inability of engage vehicle motion.**

S24 *Test procedure for S23.*

S24.1 *General provisions and definitions.*

S24.1.1 Tests specifying the use of a booster seat may be conducted using any such restraint listed in section D of appendix A or A-1 of this standard, as appropriate. The booster seat may be unused or have been previously used only for automatic suppression tests. If it has been used, there shall not be any visible damage prior to the test. Booster seats are to be used in the manner appropriate for a 6-year-old child of the same height and weight as the 6-year-old child dummy.

S24.1.2 Unless otherwise specified, each vehicle certified to this option shall comply in tests conducted with ~~the~~**any** front outboard passenger seating position at the mid-height, in the full

rearward seat track position, the middle seat track position, and the full forward seat track position as determined in this section. Using only the control that primarily moves the seat in the fore and aft direction, determine the full rearward, middle, and full forward positions of the SCRP. Using any seat or seat cushion adjustments other than that which primarily moves the seat fore-aft, determine the SCRP mid-point height for each of the three fore-aft test positions, while maintaining as closely as possible, the seat cushion angle determined in S16.2.10.3.1. Set the seat back angle, if adjustable independent of the seat, at the manufacturer's nominal design seat back angle for a 50th percentile adult male as specified in S8.1.3. If the dummy contacts the vehicle interior, move the seat rearward to the next detent that provides clearance. If the seat is a power seat, move the seat rearward while assuring that there is a maximum of 5 mm (0.2 in) distance between the vehicle interior and the point on the dummy that would first contact the vehicle interior.

S24.1.3 Except as otherwise specified, if the booster seat has an anchorage system as specified in S5.9 of FMVSS No. 213 and is used under this standard in testing a vehicle with ~~a~~**any** front outboard passenger vehicle seat that has an anchorage system as specified in FMVSS No. 225, the vehicle shall comply with the belted test conditions with the restraint anchorage system attached to the FMVSS No. 225 vehicle seat anchorage system and the vehicle seat belt unattached. It shall also comply with the belted test conditions with the restraint anchorage system unattached to the FMVSS No. 225 vehicle seat anchorage system and the vehicle seat belt attached. The vehicle shall comply with the unbelted test conditions with the restraint anchorage system unattached to the FMVSS No. 225 vehicle seat anchorage system.

S24.1.4 Do not attach any tethers.

S24.1.5 The definitions provided in S16.3.1 through S16.3.10 apply to the tests specified in S24.

S24.1.6 For leg and thigh angles, use the following references:

S24.1.6.1 *Thigh*—a straight line on the thigh skin between the center of the 5/16-18 UNC-2B threaded access hole in the upper leg clamp (drawing 127-4004, 6 YR H3—upper leg clamp) and the knee screw (part 9000248 in drawing 127-4000-1 & -2, leg assembly).

S24.1.6.2 *Leg*—a straight line on the leg skin between the center of the lower leg screw (part 9001170 in drawing 127-4000-1 & -2, leg assembly) and the knee screw (part 9000248 in drawing 127-4000-1 & -2, leg assembly).

S24.2 *Static tests of automatic suppression feature which shall result in deactivation of ~~the~~**any** passenger air bag.* Each vehicle that is certified as complying with S23.2 of FMVSS No. 208 shall meet the following test requirements with the child restraint in ~~the~~**any** front outboard passenger vehicle seat under the following conditions:

(a) Using the vehicle safety belts as specified in S22.2.1.5 with section D child restraints designed to be secured to the vehicle seat even when empty;

(b) If the child restraint is certified to S5.9 of §571.213, and the vehicle seat has an anchorage system as specified in §571.225, using only the mechanism provided by the child restraint manufacturer for attachment to the lower anchorage as specified in S22.2.1.6; and

(c) Without securing the child restraint with either the vehicle safety belts or any mechanism provided with a child restraint certified to S5.9 of §571.213.

S24.2.1 Except as provided in S24.2.2, conduct all tests as specified in S22.2, except that the 49 CFR part 572 subpart N 6-year-old child dummy shall be used.

S24.2.2 *Exceptions.* The tests specified in the following paragraphs of S22.2 need not be conducted: S22.2.1.7, S22.2.2.3, S22.2.2.5, S22.2.2.6, S22.2.2.7, and S22.2.2.8.

S24.2.3 *Sitting back in the seat and leaning on ~~the~~**any** front outboard passenger door.*

(a) Place the dummy in the seated position in ~~the~~**any** front outboard passenger vehicle seat. For bucket seats, position the midsagittal plane of the dummy vertically such that it coincides with the longitudinal centerline of the seat cushion, within ±10 mm (±0.4 in). For bench seats **in vehicles with manually-operated driving controls**, position the midsagittal plane of the dummy vertically and parallel to the vehicle's longitudinal centerline and the same distance from the longitudinal centerline of the vehicle, within ±10 mm (±0.4 in), as the center **of rotation** of the steering ~~wheel~~**control**. **For bench seats in vehicles without manually-operated driving controls, position the midsagittal plane of any front outboard dummy vertically and parallel to the vehicle's longitudinal centerline, within ±10 mm (±0.4 in) of the seating reference point of the seat that it occupies.**

(b) Place the dummy's back against the seat back and rest the dummy's thighs on the seat cushion.

(c) Allow the legs and feet of the dummy to extend off the surface of the seat. If this positioning of the dummy's legs is prevented by contact with the instrument panel, using only the control that primarily moves the seat fore and aft, move the seat rearward to the next detent that provides clearance. If the seat is a power seat, move the seat rearward, while assuring that there is a maximum of 5 mm (0.2 in) distance between the vehicle interior and the part of the dummy that was in contact with the vehicle interior.

(d) Rotate the dummy's upper arms toward the seat back until they make contact.

(e) Rotate the dummy's lower arms down until they contact the seat.

(f) Close the vehicle's passenger-side door**s** and then start the vehicle engine or place the ignition in the "on" position, whichever will turn on the suppression system.

(g) Push against the dummy's left shoulder to lean the dummy against the door; close all remaining doors.

(h) Wait ten seconds, then check whether the air bag is deactivated.

S24.3 *Static tests of automatic suppression feature which shall result in activation of ~~the~~**any front outboard** passenger air bag system.*

S24.3.1 Each vehicle certified to this option shall comply in tests conducted with ~~the~~**any** front outboard passenger seating position at the mid-height, in the full rearward and middle positions determined in S24.1.2, and the forward position determined in S16.3.3.1.8.

S24.3.2 Place a 49 CFR part 572 subpart O 5th percentile adult female test dummy at ~~the~~**any** front outboard passenger seating position of the vehicle, in accordance with procedures specified in S16.3.3 of this standard, except as specified in S24.3.1. Do not fasten the seat belt.

S24.3.3 Start the vehicle engine or place the ignition in the "on" position, whichever will turn on the suppression system, and then close all vehicle doors.

S24.3.4 Wait 10 seconds, then check whether the air bag system is activated.

S24.4 *Low risk deployment tests.*

S24.4.1 Each vehicle that is certified as complying with S23.4 shall meet the following test requirements with the 49 CFR part 572, subpart N 6-year-old child dummy in both of the following positions: Position 1 (S24.4.2) or Position 2 (S24.4.3).

S24.4.1.1 Locate and mark a point on the front of the dummy's chest jacket on the midsagittal plane that is 139 mm (5.5 in) ±3 mm (±0.1in) along the surface of the skin from the top of the skin at the neckline. This is referred to as "Point 1."

S24.4.1.2 Mark a point on the instrument panel that is longitudinally and transversely, as measured along the surface of the instrument panel, within ±6 mm (±0.2 in) of the point that is defined by the intersection of the instrument panel and a line between the volumetric center of the smallest volume that can encompass the folded undeployed air bag and the volumetric center of the static fully inflated air bag.

S22.4.1.3 Locate the vertical plane parallel to the vehicle longitudinal centerline through the point located in S24.4.1.2. This is referred to as "Plane D."

S24.4.1.4 Locate the horizontal plane through the point located in S24.4.1.2. This is referred to as "Plane C."

S24.4.2 *Position 1 (chest on instrument panel).*

S24.4.2.1 Set the seat and seat cushion in the positions determined in S16.2.10.3.1. If the seat back is adjustable independent of the seat, place the seat back at the manufacturer's nominal design seat back angle for a 50th percentile adult male as specified in S8.1.3. Position any adjustable parts of the seat that provide additional support so that they are in the lowest or most

open adjustment position. If adjustable, set the head restraint in the lowest and most forward position.

S24.4.2.2 Remove the legs of the dummy at the pelvic interface.

S24.4.2.3 Place the dummy in ~~the~~**any** front outboard passenger seat such that:

(a) The midsagittal plane is coincident with Plane D within ±10 mm (±0.4 in).

(b) The upper arms are parallel to the torso and the hands are next to where the thighs would be.

(c) Without changing the seat position and with the dummy's thorax instrument cavity rear face 6 degrees forward of the vertical, move the dummy forward until the dummy head/torso contacts the instrument panel. If the dummy loses contact with the seat cushion because of the forward movement, maintain the height of the dummy while moving the dummy forward. If the head contacts the windshield before head/torso contact with the instrument panel, maintain the thorax instrument cavity angle and move the dummy forward such that the head is following the angle of the windshield until there is head/torso contact with the instrument panel. Once contact is made, raise or lower the dummy vertically until Point 1 lies in Plane C within ±10 mm (±0.4 in). If the dummy's head contacts the windshield and keeps Point 1 from reaching Plane C, lower the dummy until there is no more than 5 mm (0.2 in) clearance between the head and the windshield. (The dummy shall remain in contact with the instrument panel while being raised or lowered which may change the dummy's fore-aft position.)

S24.4.2.4 If necessary, material with a maximum breaking strength of 311 N (70 lb) and spacer blocks may be used to support the dummy in position. The material should support the torso rather than the head. Support the dummy so that there is minimum interference with the full rotational and translational freedom for the upper torso of the dummy and the material does not interfere with the air bag.

S24.4.3 *Position 2 (head on instrument panel).*

S24.4.3.1 Place ~~the~~**any** front outboard passenger seat at the mid-height full rearward seating position determined in S24.1.2. Place the seat back, if adjustable independent of the seat, at the manufacturer's nominal design seat back angle for a 50th percentile adult male as specified in S8.1.3. Position any adjustable parts of the seat that provide additional support so that they are in the lowest or most open adjustment position. Position an adjustable head restraint in the lowest and most forward position.

S24.4.3.2 Place the dummy in ~~the~~**any** front outboard passenger seat such that:

(a) The midsagittal plane is coincident with Plane D within ±10 mm (±0.4 in).

(b) The legs are perpendicular to the floor pan, the back of the legs are in contact with the seat cushion, and the dummy's thorax instrument cavity rear face is 6 degrees forward of vertical. If it is not possible to position the dummy with the legs in the prescribed position, rotate the legs

forward until the dummy is resting on the seat with the feet positioned flat on the floor pan and the back of the legs are in contact with the front of the seat cushion. Set the transverse distance between the longitudinal centerlines at the front of the dummy's knees at 112 to 117 mm (4.4 to 4.6 in), with the thighs and the legs of the dummy in vertical planes.

(c) The upper arms are parallel to the torso and the hands are in contact with the thighs.

S24.4.3.3 Using only the control that primarily moves the seat in the fore and aft direction, move the seat forward, while maintaining the thorax instrument cavity rear face orientation until any part of the dummy contacts the vehicle's instrument panel.

S24.4.3.4 If dummy contact has not been made with the vehicle's instrument panel at the full forward seating position of the seat, slide the dummy forward on the seat until contact is made. Maintain the thorax instrument cavity rear face orientation. If the dummy loses contact with the seat, from that point forward maintain the height of the dummy. Except as provided in S24.4.3.5, maintain the angle of the thigh with respect to the horizontal.

S24.4.3.5 If head/torso contact with the instrument panel has not been made, maintain the angle of the thighs with respect to the horizontal while applying a force towards the front of the vehicle on the spine of the dummy between the shoulder joints, perpendicular to the thorax instrument cavity rear face, until the head or torso comes into contact with the vehicle's instrument panel or until a maximum force of 222 N (50 lb) is achieved. If the head/torso is still not in contact with the instrument panel, hold the femurs and release the 222 N (50 lb) force. While maintaining the relative angle between the torso and the femurs, roll the dummy forward on the seat cushion, without sliding, until head/torso contact with the instrument panel is achieved. If seat contact is lost prior to or during femur rotation out of the horizontal plane, constrain the dummy to rotate about the dummy H-point. If the dummy cannot be rolled forward on the seat due to contact of the dummy feet with the floor pan, extend the lower legs forward, at the knees, until floor pan contact is avoided.

S24.4.3.6 If necessary, material with a maximum breaking strength of 311 N (70 lb) and spacer blocks may be used to support the dummy in position. The material should support the torso rather than the head. Support the dummy so that there is minimum interference with the full rotational and translational freedom for the upper torso of the dummy and the material does not interfere with the air bag.

S24.4.4 Deploy ~~the~~**any** front outboard passenger frontal air bag system. If the frontal air bag system contains a multistage inflator, the vehicle shall be able to comply with the injury criteria at any stage or combination of stages or time delay between successive stages that could occur in a rigid barrier crash test at or below 26 km/h (16 mph), under the test procedure specified in S22.5.

S25 *Requirements using an out-of-position 5th percentile adult female dummy at the driver position.*

S25.1 Each vehicle certified as complying with S14 shall, at the option of the manufacturer, meet the requirements specified in S25.2 or S25.3 under the test procedures specified in S26 or S28, as appropriate.

S25.2 *Option 1—Dynamic automatic suppression system that suppresses the air bag when the driver is out of position.* (This option is available under the conditions set forth in S27.1.) The vehicle shall be equipped with a dynamic automatic suppression system for the driver air bag which meets the requirements specified in S27.

S25.3 *Option 2—Low risk deployment.* Each vehicle shall meet the injury criteria specified by S15.3 of this standard, except as modified in S25.4, when the driver air bag is statically deployed in accordance with both of the low risk deployment test procedures specified in S26.

S25.4 *Neck injury criteria driver low risk deployment tests.* When measuring neck injury in low risk deployment tests for the driver position, each of the following neck injury criteria shall be met.

(a) *Nij*.

(1) The shear force (Fx), axial force (Fz), and bending moment (My) shall be measured by the dummy upper neck load cell for the duration of the crash event as specified in S4.11. Shear force, axial force, and bending moment shall be filtered for Nij purposes at SAE Recommended Practice J211/1 MAR95 (incorporated by reference, see §571.5) Channel Frequency Class 600.

(2) During the event, the axial force (Fz) can be either in tension or compression while the occipital condyle bending moment (Mocy) can be in either flexion or extension. This results in four possible loading conditions for Nij: tension-extension (Nte), tension-flexion (Ntf), compression-extension (Nce), or compression-flexion (Ncf).

(3) When calculating Nij using equation S25.4(a)(4), the critical values, Fzc and Myc, are:

(i) Fzc = 3880 N (872 lbf) when Fz is in tension

(ii) Fzc = 3880 N (872 lbf) when Fz is in compression

(iii) Myc = 155 Nm (114 lbf-ft) when a flexion moment exists at the occipital condyle

(iv) Myc = 61 Nm (45 lbf-ft) when an extension moment exists at the occipital condyle.

(4) At each point in time, only one of the four loading conditions occurs and the Nij value corresponding to that loading condition is computed and the three remaining loading modes shall be considered a value of zero. The expression for calculating each Nij loading condition is given by:

$$Nij = (Fz / Fzc) + (Mocy / Myc)$$

(5) None of the four Nij values shall exceed 1.0 at any time during the event.

(b) *Peak tension.* Tension force (Fz), measured at the upper neck load cell, shall not exceed 2070 N (465 lbf) at any time.

(c) *Peak compression.* Compression force (Fz), measured at the upper neck load cell, shall not exceed 2520 N (566 lbf) at any time.

(d) Unless otherwise indicated, instrumentation for data acquisition, data channel frequency class, and moment calculations are the same as given in 49 CFR part 572 subpart O 5th percentile female test dummy.

S26 *Procedure for low risk deployment tests of driver air bag.*

S26.1 Each vehicle that is certified as complying with S25.3 shall meet the requirements of S25.3 and S25.4 with the 49 CFR part 572 subpart O 5th percentile adult female dummy in both of the following positions: Driver position 1 (S26.2) and Driver position 2 (S26.3).

S26.2 *Driver position 1 (chin on module).*

S26.2.1 Adjust the steering controls so that the steering ~~wheel~~**control** hub is at the geometric center of the locus it describes when it is moved through its full range of driving positions. If there is no setting at the geometric center, position it one setting lower than the geometric center. Set the rotation of the steering ~~wheel~~**control** so that the vehicle wheels are pointed straight ahead.

S26.2.2 Mark a point on the steering ~~wheel~~**control** cover that is longitudinally and transversely, as measured along the surface of the steering ~~wheel~~**control** cover, within ±6 mm (±0.2 in) of the point that is defined by the intersection of the steering ~~wheel~~**control** cover and a line between the volumetric center of the smallest volume that can encompass the folded undeployed air bag and the volumetric center of the static fully inflated air bag. Locate the vertical plane parallel to the vehicle longitudinal centerline through the point located on the steering ~~wheel~~**control** cover. This is referred to as “Plane E.”

S26.2.3 Place the seat and seat cushion in the position achieved in S16.2.10.3.1. If the seat or seat cushion is adjustable in the vertical direction by adjustments other than that which primarily moves the seat or seat cushion fore-aft, determine the maximum and minimum heights of the SCRP at this position, while maintaining the seat cushion reference line angle as closely as possible. Place the SCRP in the mid-height position. If the seat back is adjustable independent of the seat, place the seat back at the manufacturer's nominal design seat back angle for a 50th percentile adult male as specified in S8.1.3. Position any adjustable parts of the seat that provide additional support so that they are in the lowest or most open adjustment position. Position an adjustable head restraint in the lowest and most forward position.

S26.2.4 Place the dummy in the driver's seat such that:

S26.2.4.1 The midsagittal plane is coincident with Plane E within ±10 mm (±0.4 in).

S26.2.4.2 The legs are perpendicular to the floor pan and the back of the legs are in contact with the seat cushion. The legs may be adjusted if necessary to achieve the final head position.

S26.2.4.3 The dummy's thorax instrument cavity rear face is 6 degrees forward (toward the front of the vehicle) of the steering ~~wheel~~**control** angle (i.e., if the steering ~~wheel~~**control** angle is 25 degrees from vertical, the thorax instrument cavity rear face angle is 31 degrees).

S26.2.4.4 The initial transverse distance between the longitudinal centerlines at the front of the dummy's knees is 160 to 170 mm (6.3 to 6.7 in), with the thighs and legs of the dummy in vertical planes.

S26.2.4.5 The upper arms are parallel to the torso and the hands are in contact with the thighs.

S26.2.5 Maintaining the spine angle, slide the dummy forward until the head/torso contacts the steering ~~wheel~~**control**.

S26.2.6 While maintaining the spine angle, adjust the height of the dummy so that the bottom of the chin is in the same horizontal plane as the highest point of the air bag module cover (dummy height can be adjusted using the seat height adjustments and/or spacer blocks). If the seat prevents the bottom of the chin from being in the same horizontal plane as the module cover, adjust the dummy height to as close to the prescribed position as possible.

S26.2.7 If necessary, material with a maximum breaking strength of 311 N (70 lb) and spacer blocks may be used to support the dummy in position. The material should support the torso rather than the head. Support the dummy so that there is minimum interference with the full rotational and translational freedom for the upper torso of the dummy and the material does not interfere with the air bag.

S26.3 *Driver position 2 (chin on rim).*

S26.3.1 Place the seat and seat cushion in the position achieved in S16.2.10.3.1. If the seat or seat cushion is adjustable in the vertical direction by adjustments other than that which primarily moves the seat or seat cushion fore-aft, determine the maximum and minimum heights of the SCRP at this position, while maintaining the seat cushion reference line angle as closely as possible. Place the SCRP in the mid-height position. If the seat back is adjustable independent of the seat, place the seat back at the manufacturer's nominal design seat back angle for a 50th percentile adult male as specified in S8.1.3. Position any adjustable parts of the seat that provide additional support so that they are in the lowest or most open adjustment position. Position an adjustable head restraint in the lowest position.

S26.3.2 Adjust the steering controls so that the steering ~~wheel~~**control** hub is at the geometric center of the locus it describes when it is moved through its full range of driving positions. If there is no setting at the geometric center, position it one setting lower than the geometric center.

Set the rotation of the steering ~~wheel~~**control** so that the vehicle wheels are pointed straight ahead.

S26.3.3 Mark a point on the steering ~~wheel~~**control** cover that is longitudinally and transversely, as measured along the surface of the steering ~~wheel~~**control** cover, within ±6 mm (±0.2 in) of the point that is defined by the intersection of the steering ~~wheel~~**control** cover and a line between the volumetric center of the smallest volume that can encompass the folded undeployed air bag and the volumetric center of the static fully inflated air bag. Locate the vertical plane parallel to the vehicle longitudinal centerline through the point located on the steering ~~wheel~~**control** cover. This is referred to as "Plane E."

S26.3.4 Place the dummy in the driver's seat position such that:

S26.3.4.1 The midsagittal plane is coincident with Plane E within ±10 mm (±0.4 in).

S26.3.4.2 The legs are perpendicular to the floor pan and the back of the legs are in contact with the seat cushion. The legs may be adjusted if necessary to achieve the final head position.

S26.3.4.3 The dummy's thorax instrument cavity rear face is 6 degrees forward (toward the front of the vehicle) of the steering ~~wheel~~**control** angle (i.e., if the steering ~~wheel~~**control** angle is 25 degrees from vertical, the thorax instrument cavity rear face angle is 31 degrees).

S26.3.4.4 The initial transverse distance between the longitudinal centerlines at the front of the dummy's knees is 160 to 170 mm (6.3 to 6.7 in), with the thighs and legs of the dummy in vertical planes.

S26.3.4.5 The upper arms are parallel to the torso and the hands are in contact with the thighs.

S26.3.5 Maintaining the spine angle, slide the dummy forward until the head/torso contacts the steering ~~wheel~~**control**.

S26.3.6 While maintaining the spine angle, position the dummy so that a point on the chin 40 mm (1.6 in) ±3 mm (±0.1 in) below the center of the mouth (chin point) is, within ±10 mm (±0.4 in), in contact with a point on the steering ~~wheel~~**control** rim surface closest to the dummy that is 10 mm (0.4 in) vertically below the highest point on the rim in Plane E. If the dummy's head contacts the vehicle windshield or upper interior before the prescribed position can be obtained, lower the dummy until there is no more than 5 mm (0.2 in) clearance between the vehicle's windshield or upper interior, as applicable.

S26.3.7 If the steering ~~wheel~~**control** can be adjusted so that the chin point can be in contact with the rim of the uppermost portion of the steering ~~wheel~~**control**, adjust the steering ~~wheel~~**control** to that position. If the steering ~~wheel~~**control** contacts the dummy's leg(s) prior to attaining this position, adjust it to the next highest detent, or if infinitely adjustable, until there is a maximum of 5 mm (0.2 in) clearance between the ~~wheel~~**control** and the dummy's leg(s). Readjust the dummy's torso such that the thorax instrument cavity rear face is 6 degrees forward of the steering ~~wheel~~**control** angle. Position the dummy so that the chin point is in contact, or if contact

is not achieved, as close as possible to contact with the rim of the uppermost portion of the steering ~~wheel~~**control**.

S26.3.8 If necessary, material with a maximum breaking strength of 311 N (70 lb) and spacer blocks may be used to support the dummy in position. The material should support the torso rather than the head. Support the dummy so that there is minimum interference with the full rotational and translational freedom for the upper torso of the dummy and the material does not interfere with the air bag.

S26.4 Deploy the driver frontal air bag system. If the frontal air bag system contains a multistage inflator, the vehicle shall be able to comply with the injury criteria at any stage or combination of stages or time delay between successive stages that could occur in a rigid barrier crash test at or below 26 km/h (16 mph), under the test procedure specified in S22.5.

S27 *Option for dynamic automatic suppression system that suppresses the air bag when an occupant is out-of-position.*

S27.1 *Availability of option.* This option is available for either air bag, singly or in conjunction, subject to the requirements of S27, if:

(a) A petition for rulemaking to establish dynamic automatic suppression system test procedures is submitted pursuant to subpart B of part 552 and a test procedure applicable to the vehicle is added to S28 pursuant to the procedures specified by that subpart, or

(b) A test procedure applicable to the vehicle is otherwise added to S28.

S27.2 *Definitions.* For purposes of S27 and S28, the following definitions apply:

*Automatic suppression zone or ASZ* means a three-dimensional zone adjacent to the air bag cover, specified by the vehicle manufacturer, where the deployment of the air bag will be suppressed by the DASS if a vehicle occupant enters the zone under specified conditions.

*Dynamic automatic suppression system or DASS* means a portion of an air bag system that automatically controls whether or not the air bag deploys during a crash by:

(1) Sensing the location of an occupant, moving or still, in relation to the air bag;

(2) Interpreting the occupant characteristics and location information to determine whether or not the air bag should deploy; and

(3) Activating or suppressing the air bag system based on the interpretation of occupant characteristics and location information.

S27.3 *Requirements.* Each vehicle shall, at each applicable front outboard designated seating position, when tested under the conditions of S28 of this standard, comply with the requirements specified in S27.4 through S27.6.

S27.4 Each vehicle shall be equipped with a DASS.

S27.5 *Static test requirement (low risk deployment for occupants outside the ASZ).*

S27.5.1 *Driver (49 CFR part 572 subpart O 5th percentile female dummy).* Each vehicle shall meet the injury criteria specified in S15.3 of this standard when the driver air bag is deployed in accordance with the procedures specified in S28.1.

S27.5.2 **Front outboard** ~~P~~**p***assenger (49 CFR part 572 subpart P 3-year-old child dummy and 49 CFR part 572 subpart N 6-year-old child dummy).* Each vehicle shall meet the injury criteria specified in S21.5 and S23.5, as appropriate, when ~~the~~**any front outboard** passenger air bag is deployed in accordance with the procedures specified in S28.2.

S27.6 *Dynamic test requirement (suppression of air bag for occupants inside the ASZ).*

S27.6.1 *Driver.* The DASS shall suppress the driver air bag before the head, neck, or torso of the specified test device enters the ASZ when the vehicle is tested under the procedures specified in S28.3.

S27.6.2 **Front outboard** ~~P~~**p***assenger.* The DASS shall suppress ~~the~~**any front outboard** passenger air bag before head, neck, or torso of the specified test device enters the ASZ when the vehicle is tested under the procedures specified in S28.4.

S28 *Test procedure for S27 of this standard.* [Reserved]

S28.1 *Driver suppression zone verification test (49 CFR part 572 Subpart O 5th percentile female dummy).* [Reserved]

S28.2 **Front outboard** ~~P~~**p***assenger suppression zone verification test (49 CFR part 572 subpart P 3-year-old child dummy and 49 CFR part 572 subpart N 6-year-old child dummies).* [Reserved]

S28.3 *Driver dynamic test procedure for DASS requirements.* [Reserved]

S28.4 **Front outboard** ~~P~~**p***assenger dynamic test procedure for DASS requirements.* [Reserved]

S29 *Manufacturer option to certify vehicles to certain static suppression test requirements using human beings rather than test dummies.*

S29.1 At the option of the manufacturer, instead of using test dummies in conducting the tests for the following automatic suppression and occupant recognition parts of the low risk deployment test requirements, human beings may be used as specified. If human beings are used, they shall assume, to the extent possible, the final physical position specified for the corresponding dummies for each test.

(a) If a manufacturer decides to certify a vehicle using a human being for a test of the passenger automatic suppression, it shall use humans for the entire series of tests, e.g., 3-year-old children for each test of the system involving 3-year-old test dummies. If a manufacturer decides to certify a vehicle using a test dummy for a test of the system, it shall use test dummies for the entire series of tests, e.g., a Hybrid III 3-year-old child dummy for each test of the system involving 3-year-old child test dummies.

(b) For S19.2, instead of using the 49 CFR part 572 subpart R 12-month-old child dummy, a human child who weighs between 8.2 and 9.1 kg (18 and 20 lb), and who is between 61 and 66 cm (24 and 26 in) tall may be used.

(c) For S19.2, instead of using the 49 CFR part 572 subpart K newborn infant dummy, a human child who weighs between 8.2 and 9.1 kg (18 and 20 lb), and who is between 61 and 66 cm (24 and 26 in) tall may be used.

(d) For S21.2 and S21.5.1, instead of using the 49 CFR part 572 subpart P 3-year-old child dummy, a human child who weighs between 13.4 and 18 kg (29.5 and 39.5 lb), and who is between 89 and 99 cm (35 and 39 in) tall may be used.

(e) For S23.2 and S23.5.1, instead of using the 49 CFR part 572 subpart N 6-year-old child dummy, a human child who weighs between 21 and 25.6 kg (46.5 and 56.5 lb), and who is between 114 and 124.5 cm (45 and 49 in) tall may be used.

(f) For S19.2, S21.2, and S23.2, instead of using the 49 CFR part 572 subpart O 5th percentile adult female test dummy, a female who weighs between 46.7 and 51.25 kg (103 and 113 lb), and who is between 139.7 and 150 cm (55 and 59 in) tall may be used.

S29.2 Human beings shall be dressed in a cotton T-shirt, full length cotton trousers, and sneakers. Specified weights and heights include clothing.

S29.3 A manufacturer exercising this option shall upon request:

(a) Provide NHTSA with a method to deactivate the air bag during compliance testing under S20.2, S20.3, S22.2, S22.3, S24.2, and S24.3, and identify any parts or equipment necessary for deactivation; such assurance may be made by removing the air bag; and

(b) Provide NHTSA with a method to assure that the same test results would be obtained if the air bag were not deactivated.

**FMVSS No. 209 No Changes**

**FMVSS No 210 No Changes**

**FMVSS No. 212 No Changes**

**FMVSS No. 213 No Changes**

# §571.214 Standard No. 214; Side impact protection.

S1 *Scope and purpose.*

(a) *Scope.* This standard specifies performance requirements for protection of occupants in side impacts.

(b) *Purpose.* The purpose of this standard is to reduce the risk of serious and fatal injury to occupants of passenger cars, multipurpose passenger vehicles, trucks and buses in side impacts by specifying strength requirements for side doors, limiting the forces, deflections and accelerations measured on anthropomorphic dummies in test crashes, and by other means.

S2 *Applicability.* This standard applies to passenger cars, and to multipurpose passenger vehicles, trucks **with at least one designated seating position** and buses with a gross vehicle weight rating (GVWR) of 4,536 kilograms (kg) (10,000 pounds (lb)) or less, except for walk-in vans, or otherwise specified.

S3 *Definitions.*

*Contoured* means, with respect to a door, that the lower portion of its front or rear edge is curved upward, typically to conform to a wheel well.

*Double side doors* means a pair of hinged doors with the lock and latch mechanisms located where the door lips overlap.

*Limited line manufacturer* means a manufacturer that sells three or fewer carlines, as that term is defined in 49 CFR 583.4, in the United States during a production year.

*Lowered floor* means the replacement floor on a motor vehicle whose original floor has been removed, in part or in total, and replaced by a floor that is lower than the original floor.

*Modified roof* means the replacement roof on a motor vehicle whose original roof has been removed, in part or in total.

*Raised roof* is used as defined in paragraph S4 of 49 CFR 571.216.

*Walk-in van* means a special cargo/mail delivery vehicle that has only one designated seating position. That designated seating position must be forward facing and for use only by the driver. The vehicle usually has a thin and light sliding (or folding) side door for easy operation and a high roof clearance that a person of medium stature can enter the passenger compartment area in an up-right position.

S4 *Requirements.* Subject to the exceptions of S5—

(a) *Passenger cars.* Passenger cars must meet the requirements set forth in S6 (door crush resistance), S7 (moving deformable barrier test), and S9 (vehicle-to-pole test), subject to the phased-in application of S7 and S9.

(b) *Multipurpose passenger vehicles, trucks and buses with a GVWR of 2,722 kg or less (6,000 lb or less).* Multipurpose passenger vehicles, trucks and buses with a GVWR of 2,722 kg or less (6,000 lb or less) must meet the requirements set forth in S6 (door crush resistance), S7 (moving deformable barrier test), and S9 (vehicle-to-pole test), subject to the phased-in application of S7 and S9.

(c) *Multipurpose passenger vehicles, trucks and buses with a GVWR greater than 2,722 kg (6,000 lb).* Multipurpose passenger vehicles, trucks and buses with a GVWR greater than 2,722 kg (6,000 lb) must meet the requirements set forth in S6 (door crush resistance) and S9 (vehicle-to-pole test), subject to the phased-in application of S9.

S5 *General exclusions.*

(a) *Exclusions from S6 (door crush resistance).* A vehicle need not meet the requirements of S6 (door crush resistance) for—

(1) Any side door located so that no point on a ten-inch horizontal longitudinal line passing through and bisected by the H-point of a manikin placed in any seat, with the seat adjusted to any position and the seat back adjusted as specified in S8.3, falls within the transverse, horizontal projection of the door's opening,

(2) Any side door located so that no point on a ten-inch horizontal longitudinal line passing through and bisected by the H-point of a manikin placed in any seat recommended by the manufacturer for installation in a location for which seat anchorage hardware is provided, with the seat adjusted to any position and the seat back adjusted as specified in S8.3, falls within the transverse, horizontal projection of the door's opening,

(3) Any side door located so that a portion of a seat, with the seat adjusted to any position and the seat back adjusted as specified in S8.3, falls within the transverse, horizontal projection of the door's opening, but a longitudinal vertical plane tangent to the outboard side of the seat cushion is more than 254 mm (10 inches) from the innermost point on the inside surface of the door at a height between the H-point and shoulder reference point (as shown in Figure 1 of Federal Motor Vehicle Safety Standard No. 210 (49 CFR 571.210)) and longitudinally between the front edge of the cushion with the seat adjusted to its forwardmost position and the rear edge of the cushion with the seat adjusted to its rearmost position.

(4) Any side door that is designed to be easily attached to or removed (e.g., using simple hand tools such as pliers and/or a screwdriver) from a motor vehicle manufactured for operation without doors.

(b) *Exclusions from S7 (moving deformable barrier test).* The following vehicles are excluded from S7 (moving deformable barrier test):

(1) Motor homes, ambulances and other emergency rescue/medical vehicles (including vehicles with fire-fighting equipment), vehicles equipped with wheelchair lifts, and vehicles which have no doors or exclusively have doors that are designed to be easily attached or removed so the vehicle can be operated without doors.

(2) Passenger cars with a wheelbase greater than 130 inches need not meet the requirements of S7 as applied to the rear seat.

(3) Passenger cars, multipurpose passenger vehicles, trucks and buses need not meet the requirements of S7 (moving deformable barrier test) as applied to the rear seat for side-facing rear seats and for rear seating areas that are so small that a Part 572 Subpart V dummy representing a 5th percentile adult female cannot be accommodated according to the positioning procedure specified in S12.3.4 of this standard. Vehicles that are manufactured before September 1, 2010, and vehicles that manufactured on or after September 1, 2010, that are not part of the percentage of a manufacturer's production meeting the moving deformable barrier test requirements with advanced test dummies (S7.2 of this section) or are otherwise excluded from the phase-in requirements of S7.2, need not meet the requirements of the moving deformable barrier test as applied to the rear seat for rear seating areas that are so small that a Subpart F dummy (SID) cannot be accommodated according to the positioning procedure specified in S12.1 of this standard.

(4) Multipurpose passenger vehicles, trucks and buses with a GVWR of more than 2,722 kg (6,000 lb) need not meet the requirements of S7 (moving deformable barrier test).

(c) *Exclusions from S9 (vehicle-to-pole test).* The following vehicles are excluded from S9 (vehicle-to-pole test) (wholly or in limited part, as set forth below):

(1) Motor homes;

(2) Ambulances and other emergency rescue/medical vehicles (including vehicles with fire-fighting equipment) except police cars;

(3) Vehicles with a lowered floor or raised or modified roof and vehicles that have had the original roof rails removed and not replaced;

(4) Vehicles in which the seat for the driver or **any** ~~**right**~~ front **outboard** passenger has been removed and wheelchair restraints installed in place of the seat are excluded from meeting the vehicle-to-pole test at that position; and

(5) Vehicles that have no doors, or exclusively have doors that are designed to be easily attached or removed so that the vehicle can be operated without doors.

S6 *Door Crush Resistance Requirements.* Except as provided in section S5, each vehicle shall be able to meet the requirements of either, at the manufacturer's option, S6.1 or S6.2, when any of its side doors that can be used for occupant egress is tested according to procedures described in S6.3 of this standard (49 CFR 571.214).

S6.1 With any seats that may affect load upon or deflection of the side of the vehicle removed from the vehicle, each vehicle must be able to meet the requirements of S6.1.1 through S6.1.3.

S6.1.1 Initial crush resistance. The initial crush resistance shall not be less than 10,000 N (2,250 lb).

S6.1.2 Intermediate crush resistance. The intermediate crush resistance shall not be less than 15,569 N (3,500 lb).

S6.1.3 Peak crush resistance. The peak crush resistance shall not be less than two times the curb weight of the vehicle or 31,138 N (7,000 lb),

S6.2 With seats installed in the vehicle, and located in any horizontal or vertical position to which they can be adjusted and at any seat back angle to which they can be adjusted, each vehicle must be able to meet the requirements of S6.2.1 through S6.2.3.

S6.2.1 Initial crush resistance. The initial crush resistance shall not be less than 10,000 N (2,250 lb).

S6.2.2 Intermediate crush resistance. The intermediate crush resistance shall not be less than 19,460 N (4,375 lb).

S6.2.3 Peak crush resistance. The peak crush resistance shall not be less than three and one half times the curb weight of the vehicle or 53,378 N (12,000 lb), whichever is less.

S6.3 *Test procedures for door crush resistance.* The following procedures apply to determining compliance with S6.1 and S6.2 of S6, *Door crush resistance requirements.*

(a) Place side windows in their uppermost position and all doors in locked position. Place the sill of the side of the vehicle opposite to the side being tested against a rigid unyielding vertical surface. Fix the vehicle rigidly in position by means of tiedown attachments located at or forward of the front wheel centerline and at or rearward of the rear wheel centerline.

(b) Prepare a loading device consisting of a rigid steel cylinder or semi-cylinder 305 mm (12 inches) in diameter with an edge radius of 13 mm ( ½ inch). The length of the loading device shall be such that—

(1) For doors with windows, the top surface of the loading device is at least 13 mm ( ½ inch) above the bottom edge of the door window opening but not of a length that will cause contact with any structure above the bottom edge of the door window opening during the test.

(2) For doors without windows, the top surface of the loading device is at the same height above the ground as when the loading device is positioned in accordance with paragraph (b)(1) of this section for purposes of testing a front door with windows on the same vehicle.

(c) Locate the loading device as shown in Figure 1 (side view) of this section so that—

(1) Its longitudinal axis is vertical.

(2) Except as provided in paragraphs (c)(2)(i) and (ii) of this section, its longitudinal axis is laterally opposite the midpoint of a horizontal line drawn across the outer surface of the door 127 mm (5 inches) above the lowest point of the door, exclusive of any decorative or protective molding that is not permanently affixed to the door panel.

(i) For contoured doors on trucks, buses, and multipurpose passenger vehicles with a GVWR of 4,536 kg (10,000 lb) or less, if the length of the horizontal line specified in this paragraph (c)(2) is not equal to or greater than 559 mm (22 inches), the line is moved vertically up the side of the door to the point at which the line is 559 mm (22 inches) long. The longitudinal axis of the loading device is then located laterally opposite the midpoint of that line.

(ii) For double side doors on trucks, buses, and multipurpose passenger vehicles with a GVWR of 4,536 kg (10,000 lb) or less, its longitudinal axis is laterally opposite the midpoint of a horizontal line drawn across the outer surface of the double door span, 127 mm (5 inches) above the lowest point on the doors, exclusive of any decorative or protective molding that is not permanently affixed to the door panel.

(3) Except as provided in paragraphs (c)(3)(i) and (ii) of this section, its bottom surface is in the same horizontal plane as the horizontal line drawn across the outer surface of the door 127 mm (5 inches) above the lowest point of the door, exclusive of any decorative or protective molding that is not permanently affixed to the door panel.

(i) For contoured doors on trucks, buses, and multipurpose passenger vehicles with a GVWR of 4,536 kg (10,000 lb) or less, its bottom surface is in the lowest horizontal plane such that every point on the lateral projection of the bottom surface of the device on the door is at least 127 mm (5 inches), horizontally and vertically, from any edge of the door panel, exclusive of any decorative or protective molding that is not permanently affixed to the door panel.

(ii) For double side doors, its bottom surface is in the same horizontal plane as a horizontal line drawn across the outer surface of the double door span, 127 mm (5 inches) above the lowest point of the doors, exclusive of any decorative or protective molding that is not permanently affixed to the door panel.

(d) Using the loading device, apply a load to the outer surface of the door in an inboard direction normal to a vertical plane along the vehicle's longitudinal centerline. Apply the load continuously such that the loading device travel rate does not exceed 12.7 mm (0.5 inch) per second until the loading device travels 457 mm (18 inches). Guide the loading device to prevent it from being rotated or displaced from its direction of travel. The test is completed within 120 seconds.

(e) Record applied load versus displacement of the loading device, either continuously or in increments of not more than 25.4 mm (1 inch) or 91 kg (200 pounds) for the entire crush distance of 457 mm (18 inches).

(f) Determine the initial crush resistance, intermediate crush resistance, and peak crush resistance as follows:

(1) From the results recorded in paragraph (e) of this section, plot a curve of load versus displacement and obtain the integral of the applied load with respect to the crush distances specified in paragraphs (f)(2) and (3) of this section. These quantities, expressed in mm-kN (inch-pounds) and divided by the specified crush distances, represent the average forces in kN (pounds) required to deflect the door those distances.

(2) The initial crush resistance is the average force required to deform the door over the initial 152 mm (6 inches) of crush.

(3) The intermediate crush resistance is the average force required to deform the door over the initial 305 mm (12 inches) of crush.

(4) The peak crush resistance is the largest force recorded over the entire 457 mm (18-inch) crush distance.

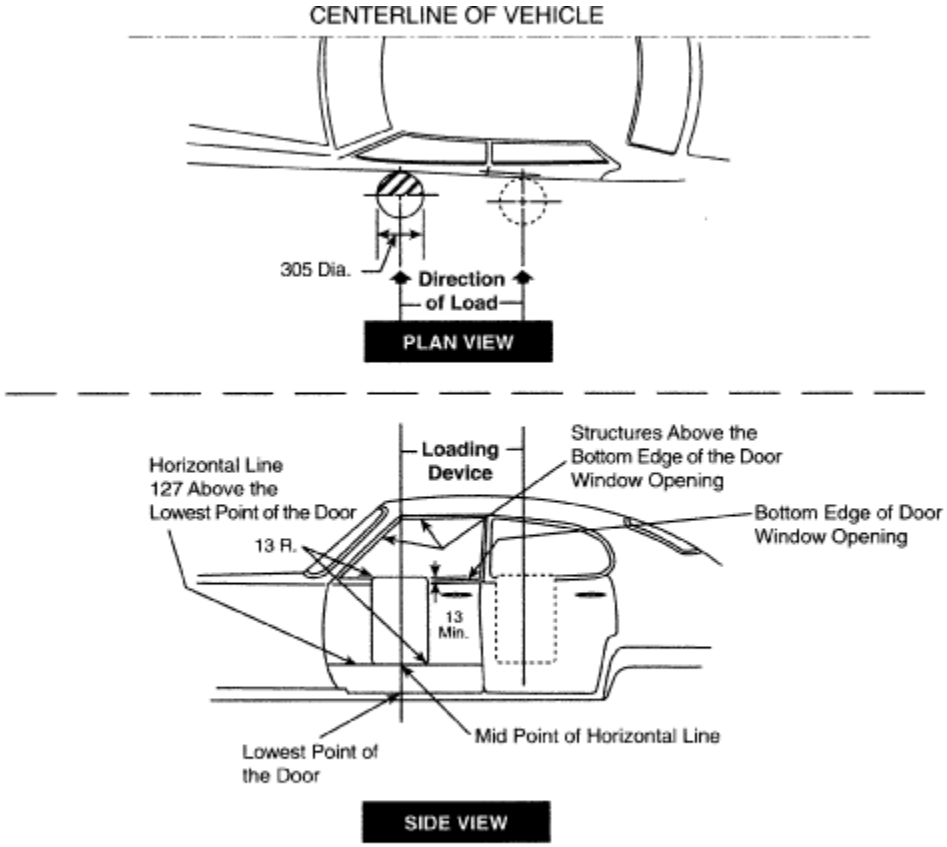


**Figure 1—LOADING DEVICE LOCATION AND APPLICATION TO THE DOOR**
**All dimensions in millimeters (mm)**

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S7 *Moving Deformable Barrier (MDB) Requirements.* Except as provided in section S5, when tested under the conditions of S8 each vehicle shall meet S7.3 and the following requirements in a 53 ±1.0 km/h (33.5 mph) impact in which the vehicle is struck on either side by a moving deformable barrier.

S7.1 *MDB test with SID.* For vehicles manufactured before September 1, 2010, the following requirements must be met. The following requirements also apply to vehicles manufactured on or after September 1, 2010 that are not part of the percentage of a manufacturer's production meeting the MDB test with advanced test dummies (S7.2 of this section) or are otherwise excluded from the phase-in requirements of S7.2. (Vehicles manufactured before September 1, 2010 may meet S7.2, at the manufacturer's option.)

S7.1.1 The test dummy specified in 49 CFR Part 572 Subpart F (SID) is placed in the front and rear outboard seating positions on the struck side of the vehicle, as specified in S11 and S12 of this standard (49 CFR 571.214).

S7.1.2 When using the Part 572 Subpart F dummy (SID), the following performance requirements must be met.

(a) *Thorax.* The Thoracic Trauma Index (TTI(d)) shall not exceed:

(1) 85 g for a passenger car with four side doors, and for any multipurpose passenger vehicle, truck, or bus; and,

(2) 90 g for a passenger car with two side doors, when calculated in accordance with the following formula:

$TI(d) = \frac{1}{2} (G_R + G_{LS})$

Where the term "$G_R$" is the greater of the peak accelerations of either the upper or lower rib, expressed in g's and the term "$G_{LS}$" is the lower spine (T12) peak acceleration, expressed in g's. The peak acceleration values are obtained in accordance with the procedure specified in S11.5.

(b) *Pelvis.* The peak lateral acceleration of the pelvis, as measured in accordance with S11.5, shall not exceed 130 g's.

S7.2 *MDB test with advanced test dummies.*

S7.2.1 *Vehicles manufactured on or after September 1, 2010 to August 31, 2014.*

(a) Except as provided in S7.2.4 of this section, for vehicles manufactured on or after September 1, 2010 to August 31, 2014, a percentage of each manufacturer's production, as specified in S13.1.1, S13.1.2, S13.1.3, and S13.1.4, shall meet the requirements of S7.2.5 and S7.2.6 when tested with the test dummy specified in those sections. Vehicles manufactured before September 1, 2014 may be certified as meeting the requirements of S7.2.5 and S7.2.6.

(b) For vehicles manufactured on or after September 1, 2010 that are not part of the percentage of a manufacturer's production meeting S7.2.1 of this section, the requirements of S7.1 of this section must be met.

(c) Place the Subpart U ES-2re 50th percentile male dummy in the front seat and the Subpart V SID-IIs 5th percentile female test dummy in the rear seat. The test dummies are placed and positioned in the front and rear outboard seating positions on the struck side of the vehicle, as specified in S11 and S12 of this standard (49 CFR 571.214).

S7.2.2 *Vehicles manufactured on or after September 1, 2014.*

(a) Subject to S7.2.4 of this section, each vehicle manufactured on or after September 1, 2014 must meet the requirements of S7.2.5 and S7.2.6, when tested with the test dummy specified in those sections.

(b) Place the Subpart U ES-2re 50th percentile male dummy in the front seat and the Subpart V SID-IIs 5th percentile female test dummy in the rear seat. The test dummies are placed and positioned in the front and rear outboard seating positions on the struck side of the vehicle, as specified in S11 and S12 of this standard (49 CFR 571.214).

S7.2.3 [Reserved]

S7.2.4 *Exceptions from the MDB phase-in; special allowances.*

(a)(1) Vehicles that are manufactured by an original vehicle manufacturer that produces or assembles fewer than 5,000 vehicles annually for sale in the United States are not subject to S7.2.1 of this section (but vehicles that will be manufactured on or after September 1, 2014 are subject to S7.2.2);

(2) Vehicles that are manufactured by a limited line manufacturer are not subject to S7.2.1 of this section (but vehicles that will be manufactured on or after September 1, 2014 are subject to S7.2.2).

(3) Convertibles manufactured before September 1, 2015, are not subject to S7.2.1 or S7.2.2 of this section. These vehicles may be voluntarily certified to meet the MDB test requirements prior to September 1, 2015. Vehicles manufactured on or after September 1, 2015 are subject to S7 and S7.2.2.

(b) Vehicles that are altered (within the meaning of 49 CFR 567.7) before September 1, 2016 after having been previously certified in accordance with part 567 of this chapter, and vehicles manufactured in two or more stages before September 1, 2016, are not subject to S7.2.1. Vehicles that are altered on or after September 1, 2016, and vehicles that are manufactured in two or more stages on or after September 1, 2016, must meet the requirements of S7.2.5 and S7.2.6, when tested with the test dummy specified in those sections. Place the Subpart U ES-2re 50th percentile male dummy in the front seat and the Subpart V SID-IIs 5th percentile female test dummy in the rear seat. The test dummies are placed and positioned in the front and rear

outboard seating positions on the struck side of the vehicle, as specified in S11 and S12 of this standard (49 CFR 571.214).

S7.2.5 *Dynamic performance requirements using the Part 572 Subpart U dummy (ES-2re 50th percentile male) dummy.* Use the 49 CFR Part 572 Subpart U ES-2re dummy specified in S11 with measurements in accordance with S11.5. The following criteria shall be met:

(a) The HIC shall not exceed 1000 when calculated in accordance with the following formula:

$$HIC = \left[\frac{1}{(t_2 - t_1)}\int_{t_1}^{t_2} a\,dt\right]^{2.5}(t_2 - t_1)$$

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Where the term *a* is the resultant head acceleration at the center of gravity of the dummy head expressed as a multiple of *g* (the acceleration of gravity), and t1 and t2 are any two points in time during the impact which are separated by not more than a 36 millisecond time interval and where t1 is less than t2.

(b) Thorax. The deflection of any of the upper, middle, and lower ribs, shall not exceed 44 mm (1.73 inches).

(c) Force measurements.

(1) The sum of the front, middle and rear abdominal forces, shall not exceed 2,500 N (562 lb).

(2) The pubic symphysis force shall not exceed 6,000 N (1,350 pounds).

S7.2.6 *Dynamic performance requirements using the Part 572 Subpart V SID-IIs (5th percentile female) dummy.* Use the 49 CFR Part 572 Subpart V SID-IIs 5th percentile female dummy specified in S11 with measurements in accordance with S11.5. The following criteria shall be met:

(a) The HIC shall not exceed 1000 when calculated in accordance with the following formula:

$$HIC = \left[\frac{1}{(t_2 - t_1)}\int_{t_1}^{t_2} a\,dt\right]^{2.5}(t_2 - t_1)$$

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Where the term *a* is the resultant head acceleration expressed as a multiple of *g* (the acceleration of gravity), and t1 and t2 are any two points in time during the impact which are separated by not more than a 36 millisecond time interval.

(b) The resultant lower spine acceleration shall not exceed 82 g.

(c) The sum of the acetabular and iliac pelvic forces shall not exceed 5,525 N.

S7.3 *Door opening.*

(a) Any side door that is struck by the moving deformable barrier shall not separate totally from the vehicle.

(b) Any door (including a rear hatchback or tailgate) that is not struck by the moving deformable barrier shall meet the following requirements:

(1) The door shall not disengage from the latched position;

(2) The latch shall not separate from the striker, and the hinge components shall not separate from each other or from their attachment to the vehicle.

(3) Neither the latch nor the hinge systems of the door shall pull out of their anchorages.

S8 *Test conditions for determining compliance with moving deformable barrier requirements.* General test conditions for determining compliance with the moving deformable barrier test are specified below. Additional specifications may also be found in S12 of this standard (49 CFR 571.214).

S8.1 *Test weight.* Each vehicle is loaded to its unloaded vehicle weight, plus 136 kg (300 pounds) or its rated cargo and luggage capacity (whichever is less), secured in the luggage or load-carrying area, plus the weight of the necessary anthropomorphic test dummies. Any added test equipment is located away from impact areas in secure places in the vehicle. The vehicle's fuel system is filled in accordance with the following procedure. With the test vehicle on a level surface, pump the fuel from the vehicle's fuel tank and then operate the engine until it stops. Then, add Stoddard solvent to the test vehicle's fuel tank in an amount that is equal to not less than 92 percent and not more than 94 percent of the fuel tank's usable capacity stated by the vehicle's manufacturer. In addition, add the amount of Stoddard solvent needed to fill the entire fuel system from the fuel tank through the engine's induction system.

S8.2 *Vehicle test attitude.* Determine the distance between a level surface and a standard reference point on the test vehicle's body, directly above each wheel opening, when the vehicle is in its fully loaded condition at the test site, with all tires inflated to the manufacturer's specifications listed on the vehicle's tire placard, and with the vehicle filled to 100 percent of all fluid capacities. The “fully loaded condition” is the test vehicle loaded in accordance with S8.1 of this standard (49 CFR 571.214). The load placed in the cargo area is centered over the longitudinal centerline of the vehicle. The pretest vehicle attitude is equal to the fully loaded attitude ± 10 mm.

S8.3 *Adjustable seats.*

S8.3.1 *50th Percentile Male ES-2re Dummy (49 CFR Part 572 Subpart U) In Front Seats*

S8.3.1.1 *Lumbar support adjustment.* Position adjustable lumbar supports so that the lumbar support is in its lowest, retracted or deflated adjustment position.

S8.3.1.2 *Other seat adjustments.* Position any adjustable parts of the seat that provide additional support so that they are in the lowest or non-deployed adjustment position. Position any adjustable head restraint in the highest and most forward position. Place adjustable seat backs in the manufacturer's nominal design riding position in the manner specified by the manufacturer. If the position is not specified, set the seat back at the first detent rearward of 25° from the vertical.

S8.3.1.3 *Seat position adjustment.* If the driver and **any front outboard** passenger seats do not adjust independently of each other, the struck side seat shall control the final position of the non-struck side seat. If the driver and **any front outboard** passenger seats adjust independently of each other, adjust both the struck and non-struck side seats in the manner specified in S8.3.1.

S8.3.1.3.1 Using only the controls that primarily move the seat and seat cushion independent of the seat back in the fore and aft directions, move the seat cushion reference point (SCRP) to the rearmost position. Using any part of any control, other than those just used, determine the full range of angles of the seat cushion reference line and set the seat cushion reference line to the middle of the range. Using any part of any control other than those that primarily move the seat or seat cushion fore and aft, while maintaining the seat cushion reference line angle, place the SCRP to its lowest position.

S8.3.1.3.2 Using only the control that primarily moves the seat fore and aft, move the seat cushion reference point to the mid travel position. If an adjustment position does not exist midway between the forwardmost and rearmost positions, the closest adjustment position to the rear of the midpoint is used.

S8.3.1.3.3 If the seat or seat cushion height is adjustable, other than by the controls that primarily move the seat or seat cushion fore and aft, set the height of the seat cushion reference point to the minimum height, with the seat cushion reference line angle set as closely as possible to the angle determined in S8.3.1.3.1. Mark location of the seat for future reference.

S8.3.2 *50th Percentile Male SID Dummy (49 CFR Part 572 Subpart F) in Front and Rear Seats*

S8.3.2.1 *Adjustable seats.* Adjustable seats are placed in the adjustment position midway between the forward most and rearmost positions, and if separately adjustable in a vertical direction, are at the lowest position. If an adjustment position does not exist midway between the forward most and rearmost positions, the closest adjustment position to the rear of the mid-point is used.

S8.3.2.2 *Adjustable seat back placement.* Place adjustable seat backs in the manufacturer's nominal design riding position in the manner specified by the manufacturer. If the position is not specified, set the seat back at the first detent rearward of 25° from the vertical. Place each adjustable head restraint in its highest adjustment position. Position adjustable lumbar supports so that they are set in their released, i.e., full back position.

S8.3.3 *5th Percentile Female Dummy in Second Row Seat.*

S8.3.3.1 *Lumbar support adjustment.* Position adjustable lumbar supports so that the lumbar support is in its lowest, retracted or deflated adjustment position.

S8.3.3.2 *Other seat adjustments.* Position any adjustable parts of the seat that provide additional support so that they are in the lowest or non-deployed adjustment position. Position any adjustable head restraint in the lowest and most forward in-use position. If it is possible to achieve a position lower than the effective detent range, the head restraint should be set to its lowest possible position. A non-use position as specified by S4.4 of FMVSS No. 202a, is excluded from being considered as the lowest possible position.

S8.3.3.3 *Seat position adjustment.* Using only the controls that primarily move the seat and seat cushion independent of the seat back in the fore and aft directions, move the seat cushion reference point (SCRP) to the rearmost position. Using any part of any control, other than those just used, determine the full range of angles of the seat cushion reference line and set the seat cushion reference line to the middle of the range. Using any part of any control other than those that primarily move the seat or seat cushion fore and aft, while maintaining the seat cushion reference line angle, place the SCRP to its lowest position. Mark location of the seat for future reference. If the non-struck side seat adjusts independently of the struck side seat, adjust the seat in the manner specified in this section.

S8.4 *Adjustable steering ~~wheel~~**controls*.** Adjustable steering controls are adjusted so that the steering ~~wheel~~**control** hub is at the geometric center of the locus it describes when it is moved through its full range of driving positions. If there is no setting detent in the mid-position, lower the steering ~~wheel~~**control** to the detent just below the mid-position. If the steering column is telescoping, place the steering column in the mid-position. If there is no mid-position, move the steering ~~wheel~~**control** rearward one position from the mid-position.

S8.5 *Windows and sunroofs.* Movable vehicle windows and vents are placed in the fully closed position on the struck side of the vehicle. Any sunroof shall be placed in the fully closed position.

S8.6 *Convertible tops.* Convertibles and open-body type vehicles have the top, if any, in place in the closed passenger compartment configuration.

S8.7 *Doors.* Doors, including any rear hatchback or tailgate, are fully closed and latched but not locked.

S8.8 *Transmission and brake engagement.* For a vehicle equipped with a manual transmission, the transmission is placed in second gear. For a vehicle equipped with an automatic transmission, the transmission is placed in neutral. For all vehicles, the parking brake is engaged.

S8.9 *Moving deformable barrier.* The moving deformable barrier conforms to the dimensions shown in Figure 2 and specified in 49 CFR Part 587.

S8.10 *Impact configuration.* The test vehicle (vehicle A in Figure 3) is stationary. The line of forward motion of the moving deformable barrier (vehicle B in Figure 3) forms an angle of 63 degrees with the centerline of the test vehicle. The longitudinal centerline of the moving deformable barrier is perpendicular to the longitudinal centerline of the test vehicle when the barrier strikes the test vehicle. In a test in which the test vehicle is to be struck on its left (right) side: All wheels of the moving deformable barrier are positioned at an angle of 27 ±1 degrees to the right (left) of the centerline of the moving deformable barrier; and the left (right) forward edge of the moving deformable barrier is aligned so that a longitudinal plane tangent to that side passes through the impact reference line within a tolerance of ±51 mm (2 inches) when the barrier strikes the test vehicle.

S8.11 *Impact reference line.* Place a vertical reference line at the location described below on the side of the vehicle that will be struck by the moving deformable barrier.

S8.11.1 *Passenger cars.*

(a) For vehicles with a wheelbase of 2,896 mm (114 inches) or less, 940 mm (37 inches) forward of the center of the vehicle's wheelbase.

(b) For vehicles with a wheelbase greater than 2,896 mm (114 inches), 508 mm (20 inches) rearward of the centerline of the vehicle's front axle.

S8.11.2 *Multipurpose passenger vehicles, trucks and buses.*

(a) For vehicles with a wheelbase of 2,489 mm (98 inches) or less, 305 mm (12 inches) rearward of the centerline of the vehicle's front axle, except as otherwise specified in paragraph (d) of this section.

(b) For vehicles with a wheelbase of greater than 2,489 mm (98 inches) but not greater than 2,896 mm (114 inches), 940 mm (37 inches) forward of the center of the vehicle's wheelbase, except as otherwise specified in paragraph (d) of this section.

(c) For vehicles with a wheelbase greater than 2,896 mm (114 inches), 508 mm (20 inches) rearward of the centerline of the vehicle's front axle, except as otherwise specified in paragraph (d) of this section.

(d) At the manufacturer's option, for different wheelbase versions of the same model vehicle, the impact reference line may be located by the following:

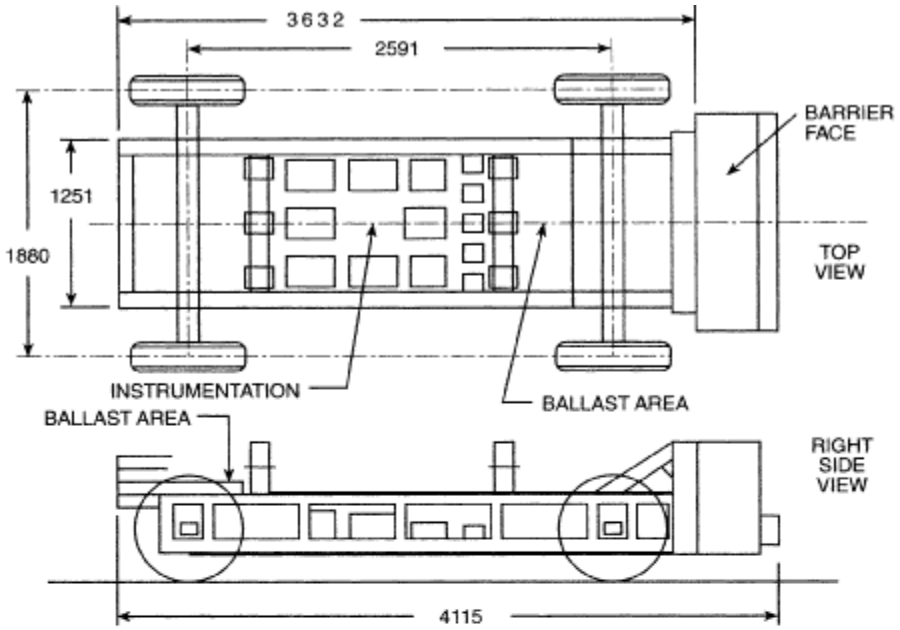
(1) Select the shortest wheelbase vehicle of the different wheelbase versions of the same model and locate on it the impact reference line at the location described in (a), (b) or (c) of this section, as appropriate;

(2) Measure the distance between the seating reference point (SgRP) and the impact reference line;

(3) Maintain the same distance between the SgRP and the impact reference line for the version being tested as that between the SgRP and the impact reference line for the shortest wheelbase version of the model.

(e) For the compliance test, the impact reference line will be located using the procedure used by the manufacturer as the basis for its certification of compliance with the requirements of this standard. If the manufacturer did not use any of the procedures in this section, or does not specify a procedure when asked by the agency, the agency may locate the impact reference line using either procedure.

S8.12 *Anthropomorphic test dummies.* The anthropomorphic test dummies used to evaluate a vehicle's performance in the moving deformable barrier test conform to the requirements of S11 and are positioned as described in S12 of this standard (49 CFR 571.214).




**NHTSA VEHICLE SIMULATOR**
**All dimensions in millimeters (mm)**

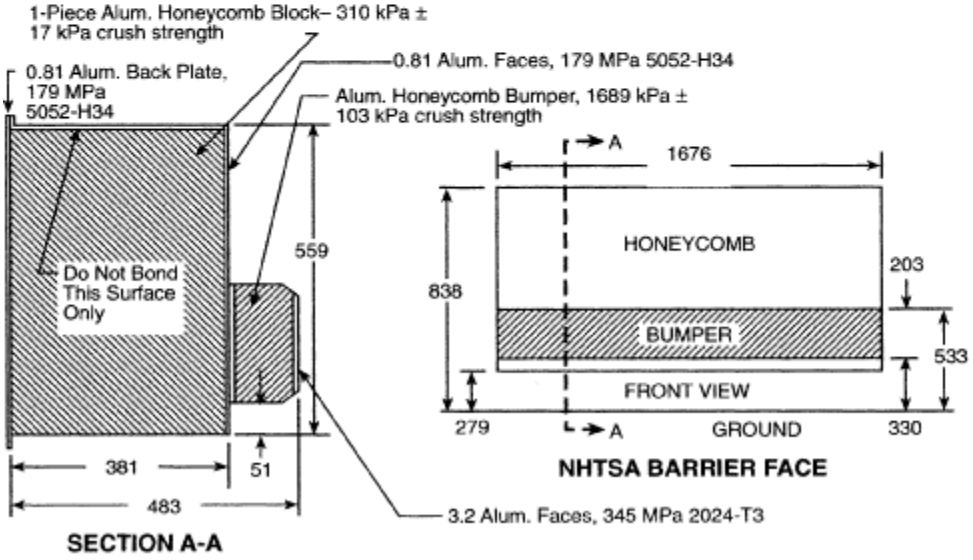



**Figure 2—NHTSA SIDE IMPACTOR – MOVING DEFORMABLE BARRIER**
**All dimensions in millimeters (mm)**

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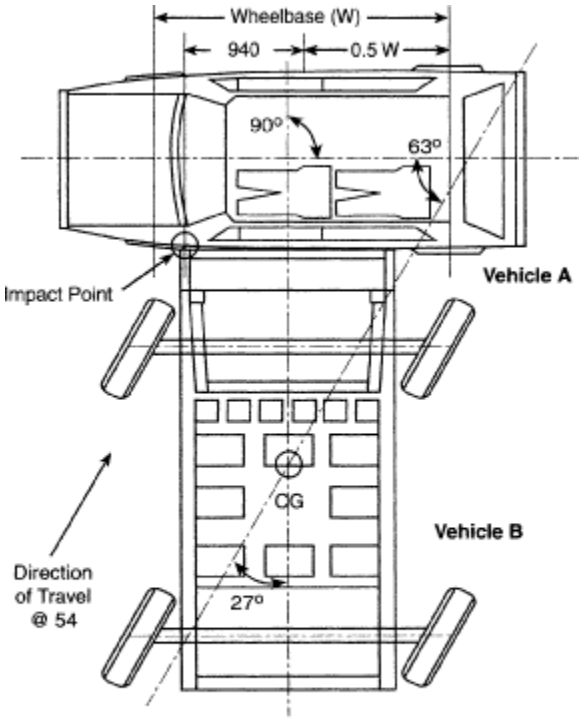


**Figure 3—TEST CONFIGURATION**
**All dimensions in millimeters (mm)**
**velocity in km/h**

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S9. *Vehicle-To-Pole Requirements.*

S9.1 Except as provided in S5, when tested under the conditions of S10:

S9.1.1 Except as provided in S9.1.3 of this section, for vehicles manufactured on or after September 1, 2010 to August 31, 2014, a percentage of each manufacturer's production, as specified in S13.1.1, S13.1.2, S13.1.3, and S13.1.4 shall meet the requirements of S9.2.1, S9.2.2, and S9.2.3 when tested under the conditions of S10 into a fixed, rigid pole of 254 mm (10 inches) in diameter, at any velocity between 26 km/h to 32 km/h (16 to 20 mph) inclusive. Vehicles manufactured before September 1, 2014 that are not subject to the phase-in may be certified as meeting the requirements specified in this section.

S9.1.2 Except as provided in S9.1.3 of this section, each vehicle manufactured on or after September 1, 2014, must meet the requirements of S9.2.1, S9.2.2 and S9.2.3, when tested under the conditions specified in S10 into a fixed, rigid pole of 254 mm (10 inches) in diameter, at any speed up to and including 32 km/h (20 mph). All vehicles manufactured on or after September 1, 2014 must meet S9.1.2 without the use of advance credits.

S9.1.3 *Exceptions from the phase-in; special allowances.*

(a)(1) Vehicles that are manufactured by an original vehicle manufacturer that produces or assembles fewer than 5,000 vehicles annually for sale in the United States are not subject to S9.1.1 of this section (but vehicles manufactured on or after September 1, 2014 by these manufacturers are subject to S9.1.2);

(2) Vehicles that are manufactured by a limited line manufacturer are not subject to S9.1.1 of this section (but vehicles manufactured on or after September 1, 2014 by these manufacturers are subject to S9.1.2).

(b) Vehicles that are altered (within the meaning of 49 CFR 567.7) before September 1, 2016 after having been previously certified in accordance with part 567 of this chapter, and vehicles manufactured in two or more stages before September 1, 2016, are not subject to S9.1.1. Vehicles that are altered on or after September 1, 2016, and vehicles that are manufactured in two or more stages on or after September 1, 2016, must meet the requirements of S9.1.2, when tested under the conditions specified in S10 into a fixed, rigid pole of 254 mm (10 inches) in diameter, at any speed up to and including 32 km/h (20 mph).

(c) Vehicles with a gross vehicle weight rating greater than 3,855 kg (8,500 lb) manufactured before September 1, 2015 are not subject to S9.1.1 or S9.1.2 of this section. These vehicles may be voluntarily certified to meet the pole test requirements prior to September 1, 2015. Vehicles with a gross vehicle weight rating greater than 3,855 kg (8,500 lb) manufactured on or after September 1, 2015 must meet the requirements of S9.2.1, S9.2.2 and S9.2.3, when tested under the conditions specified in S10 into a fixed, rigid pole of 254 mm (10 inches) in diameter, at any speed up to and including 32 km/h (20 mph).

(d)(1) Convertibles manufactured before September 1, 2015 are not subject to S9.1.1 or S9.1.2 of this section. These vehicles may be voluntarily certified to meet the pole test requirements prior to September 1, 2015.

(2) Convertibles manufactured on or after September 1, 2015 must meet the requirements of S9.2.1, S9.2.2 and S9.2.3, when tested under the conditions specified in S10 into a fixed, rigid pole of 254 mm (10 inches) in diameter, at any speed up to and including 32 km/h (20 mph).

S9.2 *Requirements.* Each vehicle shall meet these vehicle-to-pole test requirements when tested under the conditions of S10 of this standard. At NHTSA's option, either the 50th percentile adult male test dummy (ES-2re dummy, 49 CFR Part 572 Subpart U) or the 5th percentile adult female test dummy (SID-IIs, 49 CFR Part 572 Subpart V) shall be used in the test. At NHTSA's option, either front outboard seating position shall be tested. The vehicle shall meet the specific requirements at all front outboard seating positions.

S9.2.1 *Dynamic performance requirements using the Part 572 Subpart U (ES-2re 50th percentile male) dummy.* When using the ES-2re Part 572 Subpart U dummy, use the specifications of S11 of this standard (49 CFR 571.214). When using the dummy, the following performance requirements must be met using measurements in accordance with S11.5.

(a) The HIC shall not exceed 1000 when calculated in accordance with the following formula:

$$HIC = [\frac{1}{(t_2 - t_1)} \int_{t_1}^{t_2} a dt]^{2.5} (t_2 - t_1)$$

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Where the term *a* is the resultant head acceleration at the center of gravity of the dummy head expressed as a multiple of g (the acceleration of gravity), and t1 and t2 are any two points in time during the impact which are separated by not more than a 36 millisecond time interval and where t1 is less than t2.

(b) Thorax. The deflection of any of the upper, middle, and lower ribs, shall not exceed 44 mm (1.73 inches).

(c) Force measurements.

(1) The sum of the front, middle and rear abdominal forces, shall not exceed 2,500 N (562 pounds).

(2) The pubic symphysis force shall not exceed 6,000 N (1,350 pounds).

S9.2.2 *Dynamic performance requirements using the Part 572 Subpart V SID-IIs (5th percentile female) dummy.* When using the SID-IIs Part 572 Subpart V dummy, use the specifications of S11 of this standard (49 CFR 571.214). When using the dummy, the following performance requirements must be met.

(a) The HIC shall not exceed 1000 when calculated in accordance with the following formula:

$$HIC = [\frac{1}{(t_2 - t_1)} \int_{t_1}^{t_2} a dt]^{2.5} (t_2 - t_1)$$

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Where the term *a* is the resultant head acceleration at the center of gravity of the dummy head expressed as a multiple of g (the acceleration of gravity), and t1 and t2 are any two points in time during the impact which are separated by not more than a 36 millisecond time interval and where t1 is less than t2.

(b) Resultant lower spine acceleration must not exceed 82 g.

(c) The sum of the acetabular and iliac pelvic forces must not exceed 5,525 N.

S9.2.3 *Door opening.*

(a) Any side door that is struck by the pole shall not separate totally from the vehicle.

(b) Any door (including a rear hatchback or tailgate) that is not struck by the pole shall meet the following requirements:

(1) The door shall not disengage from the latched position; and

(2) The latch shall not separate from the striker, and the hinge components shall not separate from each other or from their attachment to the vehicle.

(3) Neither the latch nor the hinge systems of the door shall pull out of their anchorages.

S10. *General test conditions for determining compliance with vehicle-to-pole requirements.* General test conditions for determining compliance with the vehicle-to-pole test are specified below and in S12 of this standard (49 CFR 571.214).

S10.1 *Test weight.* Each vehicle is loaded as specified in S8.1 of this standard (49 CFR 571.214).

S10.2 *Vehicle test attitude.* When the vehicle is in its "as delivered," "fully loaded" and "as tested" condition, locate the vehicle on a flat, horizontal surface to determine the vehicle attitude. Use the same level surface or reference plane and the same standard points on the test vehicle when determining the "as delivered," "fully loaded" and "as tested" conditions. Measure the angles relative to a horizontal plane, front-to-rear and from left-to-right for the "as delivered," "fully loaded," and "as tested" conditions. The front-to-rear angle (pitch) is measured along a fixed reference on the ~~driver's~~**left** and ~~front~~**right front occupant's** ~~**passenger's**~~ door sill**s**. Mark where the angles are taken on the door sill**s**. The left to right angle (roll) is measured along a fixed reference point at the front and rear of the vehicle at the vehicle longitudinal center plane. Mark where the angles are measured. The "as delivered" condition is the vehicle as received at the test site, with 100 percent of all fluid capacities and all tires inflated to the manufacturer's specifications listed on the vehicle's tire placard. When the vehicle is in its "fully loaded" condition, measure the angle between the ~~driver's~~**left front occupant's** door sill and the horizontal, at the same place the "as delivered" angle was measured. The "fully loaded condition" is the test vehicle loaded in accordance with S8.1 of this standard (49 CFR 571.214). The load placed in the cargo area is centered over the longitudinal centerline of the vehicle. The vehicle "as tested" pitch and roll angles are between the "as delivered" and "fully loaded" condition, inclusive.

S10.3 *Adjustable seats.*

S10.3.1 *Driver and front **outboard** passenger seat set-up for 50th percentile male dummy.* The driver and front **outboard** passenger seats are set up as specified in S8.3.1 of this standard, 49 CFR 571.214.

S10.3.2. *Driver and front **outboard** passenger seat set-up for 49 CFR Part 572 Subpart V 5th percentile female dummy.*

S10.3.2.1 *Lumbar support adjustment.* Position adjustable lumbar supports so that the lumbar support is in its lowest, retracted or deflated adjustment position.

S10.3.2.2 *Other seat adjustments.* Position any adjustable parts of the seat that provide additional support so that they are in the lowest or non-deployed adjustment position. Position any adjustable head restraint in the lowest and most forward in-use position. If it is possible to achieve a position lower than the effective detent range, the head restraint should be set to its lowest possible position. A non-use position as specified by S4.4 of FMVSS No. 202a, is excluded from being considered as the lowest possible position.

S10.3.2.3 *Seat position adjustment.* If the driver and **any front outboard** passenger seats do not adjust independently of each other, the struck side seat shall control the final position of the non-struck side seat. If the driver and **any front outboard** passenger seats adjust independently of each other, adjust both the struck and non-struck side seats in the manner specified in S10.3.2.

S10.3.2.3.1 Using only the controls that primarily move the seat and seat cushion independent of the seat back in the fore and aft directions, move the seat cushion reference point (SCRP) to the rearmost position. Using any part of any control, other than those just used, determine the full range of angles of the seat cushion reference line and set the seat cushion reference line to the middle of the range. Using any part of any control other than those that primarily move the seat or seat cushion fore and aft, while maintaining the seat cushion reference line angle, place the SCRP to its lowest position.

S10.3.2.3.2 Using only the control that primarily moves the seat fore and aft, move the seat reference point to the most forward position.

S10.3.2.3.3 If the seat or seat cushion height is adjustable, other than by the controls that primarily move the seat or seat cushion fore and aft, set the seat reference point to the midpoint height, with the seat cushion reference line angle set as close as possible to the angle determined in S10.3.2.3.1. Mark location of the seat for future reference.

S10.4 *Positioning dummies for the vehicle-to-pole test.*

(a) *50th percentile male test dummy (49 CFR Part 572 Subpart U ES-2re dummy).* The 50th percentile male test dummy is positioned in the front outboard seating position on the struck side of the vehicle in accordance with the provisions of S12.2 of this standard, 49 CFR 571.214.

(b) *5th percentile female test dummy (49 CFR Part 572 Subpart V SID-IIs dummy).* The 5th percentile female test dummy is positioned in the front outboard seating positions on the struck side of the vehicle in accordance with the provisions of S12.3 of this standard, 49 CFR 571.214.

S10.5 *Adjustable steering ~~wheel~~**controls**.* Adjustable steering controls are adjusted so that the steering ~~wheel~~**control** hub is at the geometric center of the locus it describes when it is moved through its full range of driving positions. If there is no setting detent in the mid-position, lower the steering ~~wheel~~**control** to the detent just below the mid-position. If the steering column is

telescoping, place the steering column in the mid-position. If there is no mid-position, move the steering ~~wheel~~**control** rearward one position from the mid-position.

S10.6 *Windows and sunroofs.* Movable vehicle windows and vents are placed in the fully closed position on the struck side of the vehicle. Any sunroof is placed in the fully closed position.

S10.7 *Convertible tops.* Convertibles and open-body type vehicles have the top, if any, in place in the closed passenger compartment configuration.

S10.8 *Doors.* Doors, including any rear hatchback or tailgate, are fully closed and latched but not locked.

S10.9 *Transmission and brake engagement.* For a vehicle equipped with a manual transmission, the transmission is placed in second gear. For a vehicle equipped with an automatic transmission, the transmission is placed in neutral. For all vehicles, the parking brake is engaged.

S10.10 *Rigid pole.* The rigid pole is a vertical metal structure beginning no more than 102 millimeters (4 inches) above the lowest point of the tires on the striking side of the test vehicle when the vehicle is loaded as specified in S8.1 and extending above the highest point of the roof of the test vehicle. The pole is 254 mm (10 inches) ±6 mm (0.25 in) in diameter and set off from any mounting surface, such as a barrier or other structure, so that the test vehicle will not contact such a mount or support at any time within 100 milliseconds of the initiation of vehicle to pole contact.

S10.11 *Impact reference line.* The impact reference line is located on the striking side of the vehicle at the intersection of the vehicle exterior and a vertical plane passing through the center of gravity of the head of the dummy seated in accordance with S12 in the front outboard designated seating position. The vertical plane forms an angle of 285 (or 75) degrees with the vehicle's longitudinal centerline for the right (or left) side impact test. The angle is measured counterclockwise from the vehicle's positive X-axis as defined in S10.13.

S10.12 *Impact configuration.*

S10.12.1 The rigid pole is stationary.

S10.12.2 The test vehicle is propelled sideways so that its line of forward motion forms an angle of 285 (or 75) degrees (±3 degrees) for the right (or left) side impact with the vehicle's longitudinal centerline. The angle is measured counterclockwise from the vehicle's positive X-axis as defined in S10.13. The impact reference line is aligned with the center line of the rigid pole surface, as viewed in the direction of vehicle motion, so that, when the vehicle-to-pole contact occurs, the center line contacts the vehicle area bounded by two vertical planes parallel to and 38 mm (1.5 inches) forward and aft of the impact reference line.

S10.13 *Vehicle reference coordinate system.* The vehicle reference coordinate system is an orthogonal coordinate system consisting of three axes, a longitudinal axis (X), a transverse axis

(Y), and a vertical axis (Z). X and Y are in the same horizontal plane and Z passes through the intersection of X and Y. The origin of the system is at the center of gravity of the vehicle. The X-axis is parallel to the longitudinal centerline of the vehicle and is positive to the vehicle front end and negative to the rear end. The Y-axis is positive to the left side of the vehicle and negative to the right side. The Z-axis is positive above the X-Y plane and negative below it.

S11 *Anthropomorphic test dummies.* The anthropomorphic test dummies used to evaluate a vehicle's performance in the moving deformable barrier and vehicle-to-pole tests are specified in 49 CFR part 572. In a test in which the test vehicle is to be struck on its left side, each dummy is to be configured and instrumented to be struck on its left side, in accordance with part 572. In a test in which the test vehicle is to be struck on its right side, each dummy is to be configured and instrumented to be struck on its right side, in accordance with part 572.

S11.1 *Clothing.*

(a) *50th percentile male.* Each test dummy representing a 50th percentile male is clothed in formfitting cotton stretch garments with short sleeves and midcalf length pants. Each foot of the test dummy is equipped with a size 11EEE shoe, which meets the configuration size, sole, and heel thickness specifications of MIL-S-13192 (incorporated by reference, see §571.5) and weighs 0.68 ±0.09 kilograms (1.25 ±0.2 lb).

(b) *5th percentile female.* The 49 CFR Part 572 Subpart V test dummy representing a 5th percentile female is clothed in formfitting cotton stretch garments with short sleeves and about the knee length pants. Each foot has on a size 7.5W shoe that meets the configuration and size specifications of MIL-S-21711E (incorporated by reference, see §571.5) or its equivalent.

S11.2 *Limb joints.*

(a) For the 50th percentile male dummy, set the limb joints at between 1 and 2 g. Adjust the leg joints with the torso in the supine position. Adjust the knee and ankle joints so that they just support the lower leg and the foot when extended horizontally (1 to 2 g adjustment).

(b) For the 49 CFR Part 572 Subpart V 5th percentile female dummy, set the limb joints at slightly above 1 g, barely restraining the weight of the limb when extended horizontally. The force needed to move a limb segment does not exceed 2 g throughout the range of limb motion. Adjust the leg joints with the torso in the supine position.

S11.3 The stabilized temperature of the test dummy at the time of the test is at any temperature between 20.6 degrees C and 22.2 degrees C.

S11.4 *Acceleration data.* Accelerometers are installed on the head, rib, spine and pelvis components of various dummies as required to meet the injury criteria of the standard. Accelerations measured from different dummy components may use different filters and processing methods.

S11.5 *Processing Data.*

(a) *Subpart F (SID) test dummy*.

(1) Process the acceleration data from the accelerometers mounted on the ribs, spine and pelvis of the Subpart F dummy with the FIR100 software specified in 49 CFR 572.44(d). Process the data in the following manner:

(i) Filter the data with a 300 Hz, SAE Class 180 filter;

(ii) Subsample the data to a 1600 Hz sampling rate;

(iii) Remove the bias from the subsampled data; and

(iv) Filter the data with the FIR100 software specified in 49 CFR 572.44(d), which has the following characteristics—

(A) Passband frequency 100 Hz.

(B) Stopband frequency 189 Hz.

(C) Stopband gain −50 db.

(D) Passband ripple 0.0225 db.

(2) [Reserved]

(b) *Subpart U (ES-2re 50th percentile male) test dummy.*

(1) The rib deflection data are filtered at channel frequency class 180 Hz. Abdominal and pubic force data are filtered at channel frequency class of 600 Hz.

(2) The acceleration data from the accelerometers installed inside the skull cavity of the ES-2re test dummy are filtered at channel frequency class of 1000 Hz.

(c) *Subpart V (SID-IIs 5th percentile female) test dummy.*

(1) The acceleration data from the accelerometers installed inside the skull cavity of the SID-IIs test dummy are filtered at channel frequency class of 1000 Hz.

(2) The acceleration data from the accelerometers installed on the lower spine of the SID-IIs test dummy are filtered at channel frequency class of 180 Hz.

(3) The iliac and acetabular forces from load cells installed in the pelvis of the SID-IIs are filtered at channel frequency class of 600 Hz.

S12 *Positioning procedures for the anthropomorphic test dummies.*

S12.1 *50th percentile male test dummy—49 CFR part 572 subpart F (SID).* Position a correctly configured test dummy, conforming to the applicable requirements of part 572 Subpart F of this chapter, in the front outboard seating position on the side of the test vehicle to be struck by the moving deformable barrier and, if the vehicle has a second seat, position another conforming test dummy in the second seat outboard position on the same side of the vehicle, as specified in S12.1.3. Each test dummy is restrained using all available belt systems in all seating positions where such belt restraints are provided. Place any adjustable anchorages at the manufacturer's nominal design position for a 50th percentile adult male occupant. In addition, any folding armrest is retracted. Additional positioning procedures are specified below.

S12.1.1 *Positioning a Part 572 Subpart F (SID) dummy in the driver**'s seating** position.*

(a) *Torso.* Hold the dummy's head in place and push laterally on the non-impacted side of the upper torso in a single stroke with a force of 66.7-89.0 N (15-20 lb) towards the impacted side.

(1) For a bench seat. The upper torso of the test dummy rests against the seat back. The midsagittal plane of the test dummy is vertical and parallel to the vehicle's longitudinal centerline, and passes through the center of the steering ~~wheel~~**control**.

(2) For a bucket seat. The upper torso of the test dummy rests against the seat back. The midsagittal plane of the test dummy is vertical and parallel to the vehicle's longitudinal centerline, and coincides with the longitudinal centerline of the bucket seat.

(b) *Pelvis.*

(1) H-point. The H-points of each test dummy coincide within 12.7 mm ( ½ inch) in the vertical dimension and 12.7 mm ( ½ inch) in the horizontal dimension of a point that is located 6.4 mm ( ¼ inch) below the position of the H-point determined by using the equipment for the 50th percentile and procedures specified in SAE Standard J826-1980 (incorporated by reference, see §571.5), except that Table 1 of SAE Standard J826-1980 is not applicable. The length of the lower leg and thigh segments of the H-point machine are adjusted to 414 and 401 mm (16.3 and 15.8 inches), respectively.

(2) Pelvic angle. As determined using the pelvic angle gauge (GM drawing 78051-532 incorporated by reference in part 572, Subpart E of this chapter) which is inserted into the H-point gauging hole of the dummy, the angle of the plane of the surface on the lumbar-pelvic adaptor on which the lumbar spine attaches is 23 to 25 degrees from the horizontal, sloping upward toward the front of the vehicle.

(3) *Legs.* The upper legs of each test dummy rest against the seat cushion to the extent permitted by placement of the feet. The left knee of the dummy is positioned such that the distance from the outer surface of the knee pivot bolt to the dummy's midsagittal plane is 152.4 mm (6.0 inches). To the extent practicable, the left leg of the test dummy is in a vertical longitudinal plane.

(4) *Feet.* The right foot of the test dummy rests on the undepressed accelerator with the heel resting as far forward as possible on the floorpan. The left foot is set perpendicular to the lower leg with the heel resting on the floorpan in the same lateral line as the right heel.

S12.1.2 *Positioning a Part 572 Subpart F (SID) dummy in ~~the~~**any** front outboard **passenger** seating position.*

(a) *Torso.* Hold the dummy's head in place and push laterally on the non-impacted side of the upper torso in a single stroke with a force of 66.7-89.0 N (15-20 lb) towards the impacted side.

(1) For a bench seat. The upper torso of the test dummy rests against the seat back. The midsagittal plane of the test dummy is vertical and parallel to the vehicle's longitudinal centerline**. For vehicles with manually-operated driving controls the midsagittal plane of the test dummy is**~~, and~~ the same distance from the vehicle's longitudinal centerline as would be the midsagittal plane of a test dummy positioned in the driver**'s seating** position under S12.1.1(a)(1)**. For vehicles without manually-operated driving controls the midsagittal plane of the test dummy shall be vertical and parallel to the vehicle's longitudinal centerline, and passes through any front outboard passenger seat's SgRP.**

(2) For a bucket seat. The upper torso of the test dummy rests against the seat back. The midsagittal plane of the test dummy is vertical and parallel to the vehicle's longitudinal centerline, and coincides with the longitudinal centerline of the bucket seat.

(b) *Pelvis.*

(1) H-point. The H-points of each test dummy coincide within 12.7 mm ( ½ inch) in the vertical dimension and 12.7 mm ( ½ inch) in the horizontal dimension of a point that is located 6.4 mm ( ¼ inch) below the position of the H-point determined by using the equipment for the 50th percentile and procedures specified in SAE Standard J826-1980 (incorporated by reference, see §571.5), except that Table 1 of SAE J826-1980 is not applicable. The length of the lower leg and thigh segments of the H-point machine are adjusted to 414 and 401 mm (16.3 and 15.8 inches), respectively.

(2) Pelvic angle. As determined using the pelvic angle gauge (GM drawing 78051-532 incorporated by reference in part 572, Subpart E of this chapter) which is inserted into the H-point gauging hole of the dummy, the angle of the plane of the surface on the lumbar-pelvic adaptor on which the lumbar spine attaches is 23 to 25 degrees from the horizontal, sloping upward toward the front of the vehicle.

(c) *Legs.* The upper legs of each test dummy rest against the seat cushion to the extent permitted by placement of the feet. The initial distance between the outboard knee clevis flange surfaces is 292 mm (11.5 inches). To the extent practicable, both legs of the test dummies in outboard passenger positions are in vertical longitudinal planes. Final adjustment to accommodate placement of feet in accordance with S12.1.2(d) for various passenger compartment configurations is permitted.

(d) *Feet.* The feet of the test dummy are placed on the vehicle's toeboard with the heels resting on the floorpan as close as possible to the intersection of the toeboard and floorpan. If the feet cannot be placed flat on the toeboard, they are set perpendicular to the lower legs and placed as far forward as possible so that the heels rest on the floorpan.

S12.1.3 *Positioning a Part 572 Subpart F (SID) dummy in the rear outboard seating positions.*

(a) *Torso.* Hold the dummy's head in place and push laterally on the non-impacted side of the upper torso in a single stroke with a force of 66.7-89.0 N (15-20 lb) towards the impacted side.

(1) For a bench seat. The upper torso of the test dummy rests against the seat back. The midsagittal plane of the test dummy is vertical and parallel to the vehicle's longitudinal centerline, and, if possible, the same distance from the vehicle's longitudinal centerline as the midsagittal plane of a test dummy positioned in the driver**'s seating** position under S12.1.1(a)(1) **or left front passenger seating positioned under S12.1.2(a)(1) in vehicles without manually-operated driving controls**. If it is not possible to position the test dummy so that its midsagittal plane is parallel to the vehicle longitudinal centerline and is at this distance from the vehicle's longitudinal centerline, the test dummy is positioned so that some portion of the test dummy just touches, at or above the seat level, the side surface of the vehicle, such as the upper quarter panel, an armrest, or any interior trim (i.e., either the broad trim panel surface or a smaller, localized trim feature).

(2) For a bucket or contoured seat. The upper torso of the test dummy rests against the seat back. The midsagittal plane of the test dummy is vertical and parallel to the vehicle's longitudinal centerline, and coincides with the longitudinal centerline of the bucket or contoured seat.

(b) *Pelvis.*

(1) H-point. The H-points of each test dummy coincide within 12.7 mm ( ½ inch) in the vertical dimension and 12.7 mm ( ½ inch) in the horizontal dimension of a point that is located 6.4 mm ( ¼ inch) below the position of the H-point determined by using the equipment for the 50th percentile and procedures specified in SAE Standard J826-1980 (incorporated by reference, see §571.5), except that Table 1 of SAE J826-1980 is not applicable. The length of the lower leg and thigh segments of the H-point machine are adjusted to 414 and 401 mm (16.3 and 15.8 inches), respectively.

(2) Pelvic angle. As determined using the pelvic angle gauge (GM drawing 78051-532 incorporated by reference in part 572, Subpart E of this chapter) which is inserted into the H-point gauging hole of the dummy, the angle of the plane of the surface on the lumbar-pelvic adaptor on which the lumbar spine attaches is 23 to 25 degrees from the horizontal, sloping upward toward the front of the vehicle.

(c) *Legs.* Rest the upper legs of each test dummy against the seat cushion to the extent permitted by placement of the feet. The initial distance between the outboard knee clevis flange surfaces is 292 mm (11.5 inches). To the extent practicable, both legs of the test dummies in outboard passenger positions are in vertical longitudinal planes. Final adjustment to accommodate

placement of feet in accordance with S12.1.3(d) for various passenger compartment configurations is permitted.

(d) *Feet.* Place the feet of the test dummy flat on the floorpan and beneath the front seat as far as possible without front seat interference. If necessary, the distance between the knees may be changed in order to place the feet beneath the seat.

S12.2 *50th percentile male test dummy—49 CFR Part 572 Subpart U (ES-2re).*

S12.2.1 *Positioning an ES-2re dummy in all seating positions.* Position a correctly configured ES-2re test dummy, conforming to the applicable requirements of part 572 of this chapter, in the front outboard seating position on the side of the test vehicle to be struck by the moving deformable barrier or pole. Restrain the test dummy using all available belt systems in the seating positions where the belt restraints are provided. Place any adjustable anchorages at the manufacturer's nominal design position for a 50th percentile adult male occupant. Retract any folding armrest.

(a) *Upper torso.*

(1) The plane of symmetry of the dummy coincides with the vertical median plane of the specified seating position.

(2) Bend the upper torso forward and then lay it back against the seat back. Set the shoulders of the dummy fully rearward.

(b) *Pelvis.* Position the pelvis of the dummy according to the following:

(1) Position the pelvis of the dummy such that a lateral line passing through the dummy H-points is perpendicular to the longitudinal center plane of the seat. The line through the dummy H-points is horizontal with a maximum inclination of ±2 degrees. The dummy may be equipped with tilt sensors in the thorax and the pelvis. These instruments can help to obtain the desired position.

(2) The correct position of the dummy pelvis may be checked relative to the H-point of the H-point Manikin by using the M3 holes in the H-point back plates at each side of the ES-2re pelvis. Position the dummy such that the M3 holes are located within a circle of radius 10 mm (0.39 in.) around the H-point of the H-point Manikin.

(c) *Arms.* For the driver**'s** seating position and for ~~the~~**any** front outboard passenger seating position, place the dummy's upper arms such that the angle between the projection of the arm centerline on the mid-sagittal plane of the dummy and the torso reference line is 40° ±5°. The torso reference line is defined as the thoracic spine centerline. The shoulder-arm joint allows for discrete arm positions at 0, 40, and 90 degree settings forward of the spine.

(d) *Legs and Feet.* Position the legs and feet of the dummy according to the following:

(1) For the driver's seating position, without inducing pelvis or torso movement, place the right foot of the dummy on the un-pressed accelerator pedal with the heel resting as far forward as possible on the floor pan. Set the left foot perpendicular to the lower leg with the heel resting on the floor pan in the same lateral line as the right heel. Set the knees of the dummy such that their outside surfaces are 150 ±10 mm (5.9 ±0.4 inches) from the plane of symmetry of the dummy. If possible within these constraints, place the thighs of the dummy in contact with the seat cushion.

(2) For other seating positions, without inducing pelvis or torso movement, place the heels of the dummy as far forward as possible on the floor pan without compressing the seat cushion more than the compression due to the weight of the leg. Set the knees of the dummy such that their outside surfaces are 150 ±10 mm (5.9 ±0.4 inches) from the plane of symmetry of the dummy.

S12.3 *5th percentile female test dummy—49 CFR Part 572 Subpart V (SID-IIs).* Position a correctly configured 5th percentile female Part 572 Subpart V (SID-IIs) test dummy, conforming to the applicable requirements of part 572 of this chapter, in the front outboard seating position on the side of the test vehicle to be struck by the pole and, for the moving deformable barrier, if the vehicle has a second seat, position a conforming test dummy in the second seat outboard position on the same side of the vehicle (side to be struck) as specified in S12.3.4. Retract any folding armrest. Additional procedures are specified below.

S12.3.1 *General provisions and definitions.*

(a) Measure all angles with respect to the horizontal plane unless otherwise stated.

(b) Adjust the SID-IIs dummy's neck bracket to align the zero degree index marks.

(c) Other seat adjustments. The longitudinal centerline of a bucket seat cushion passes through the SgRP and is parallel to the longitudinal centerline of the vehicle.

(d) *Driver and **any front outboard** passenger **dummy** manual belt adjustment.* Use all available belt systems. Place adjustable belt anchorages at the nominal position for a 5th percentile adult female suggested by the vehicle manufacturer.

(e) *Definitions.*

(1) The term “midsagittal plane” refers to the vertical plane that separates the dummy into equal left and right halves.

(2) The term “vertical longitudinal plane” refers to a vertical plane parallel to the vehicle's longitudinal centerline.

(3) The term “vertical plane” refers to a vertical plane, not necessarily parallel to the vehicle's longitudinal centerline.

(4) The term “transverse instrumentation platform” refers to the transverse instrumentation surface inside the dummy's skull casting to which the neck load cell mounts. This surface is perpendicular to the skull cap's machined inferior-superior mounting surface.

(5) The term “thigh” refers to the femur between, but not including, the knee and the pelvis.

(6) The term “leg” refers to the lower part of the entire leg including the knee.

(7) The term “foot” refers to the foot, including the ankle.

(8) For leg and thigh angles, use the following references:

(i) Thigh—a straight line on the thigh skin between the center of the ½ -13 UNC-2B tapped hole in the upper leg femur clamp and the knee pivot shoulder bolt.

(ii) Leg—a straight line on the leg skin between the center of the ankle shell and the knee pivot shoulder bolt.

(9) The term “seat cushion reference point” (SCRP) means a point placed on the outboard side of the seat cushion at a horizontal distance between 150 mm (5.9 in) and 250 mm (9.8 in) from the front edge of the seat used as a guide in positioning the seat.

(10) The term “seat cushion reference line” means a line on the side of the seat cushion, passing through the seat cushion reference point, whose projection in the vehicle vertical longitudinal plane is straight and has a known angle with respect to the horizontal.

S12.3.2 *5th percentile female driver dummy positioning.*

(a) *Driver torso/head/seat back angle positioning.*

(1) With the seat in the position determined in S10.3.2, use only the control that moves the seat fore and aft to place the seat in the rearmost position. If the seat cushion reference line angle automatically changes as the seat is moved from the full forward position, maintain, as closely as possible, the seat cushion reference line angle determined in S10.3.2.3.3, for the final forward position when measuring the pelvic angle as specified in S12.3.2(a)(11). The seat cushion reference line angle position may be achieved through the use of any seat or seat cushion adjustments other than that which primarily moves the seat or seat cushion fore-aft.

(2) Fully recline the seat back, if adjustable. Install the dummy into the driver's seat, such that when the legs are positioned 120 degrees to the thighs, the calves of the legs are not touching the seat cushion.

(3) Bucket seats. Center the dummy on the seat cushion so that its midsagittal plane is vertical and passes through the SgRP within ±10 mm (±0.4 in).

(4) Bench seats. Position the midsagittal plane of the dummy vertical and parallel to the vehicle's longitudinal centerline and aligned within ±10 mm (±0.4 in) of the center of the steering ~~wheel~~**control** rim.

(5) Hold the dummy's thighs down and push rearward on the upper torso to maximize the dummy's pelvic angle.

(6) Place the legs at 120 degrees to the thighs. Set the initial transverse distance between the longitudinal centerlines at the front of the dummy's knees at 160 to 170 mm (6.3 to 6.7 in), with the thighs and legs of the dummy in vertical planes. Push rearward on the dummy's knees to force the pelvis into the seat so there is no gap between the pelvis and the seat back or until contact occurs between the back of the dummy's calves and the front of the seat cushion.

(7) Gently rock the upper torso relative to the lower torso laterally in a side to side motion three times through a ±5 degree arc (approximately 51 mm (2 in) side to side).

(8) If needed, extend the legs slightly so that the feet are not in contact with the floor pan. Let the thighs rest on the seat cushion to the extent permitted by the foot movement. Keeping the leg and the thigh in a vertical plane, place the foot in the vertical longitudinal plane that passes through the centerline of the accelerator pedal. Rotate the left thigh outboard about the hip until the center of the knee is the same distance from the midsagittal plane of the dummy as the right knee ±5 mm (±0.2 in). Using only the control that moves the seat fore and aft, attempt to return the seat to the full forward position. If either of the dummy's legs first contacts the steering ~~wheel~~**control**, then adjust the steering ~~wheel~~**control**, if adjustable, upward until contact with the steering ~~wheel~~**control** is avoided. If the steering ~~wheel~~**control** is not adjustable, separate the knees enough to avoid steering ~~wheel~~**control** contact. Proceed with moving the seat forward until either the leg contacts the vehicle interior or the seat reaches the full forward position. (The right foot may contact and depress the accelerator and/or change the angle of the foot with respect to the leg during seat movement.) If necessary to avoid contact with the vehicle's brake or clutch pedal, rotate the test dummy's left foot about the leg. If there is still interference, rotate the left thigh outboard about the hip the minimum distance necessary to avoid pedal interference. If a dummy leg contacts the vehicle interior before the full forward position is attained, position the seat at the next detent where there is no contact. If the seat is a power seat, move the seat fore and aft to avoid contact while assuring that there is a maximum of 5 mm (0.2 in) distance between the vehicle interior and the point on the dummy that would first contact the vehicle interior. If the steering ~~wheel~~**control** was moved, return it to the position described in S10.5. If the steering ~~wheel~~**control** contacts the dummy's leg(s) prior to attaining this position, adjust it to the next higher detent, or if infinitely adjustable, until there is 5 mm (0.2 in) clearance between the ~~wheel~~**control** and the dummy's leg(s).

(9) *Head leveling.*

(i) *Vehicles with fixed seat backs.* Adjust the lower neck bracket to level the transverse instrumentation platform angle of the head to within ±0.5 degrees. If it is not possible to level the transverse instrumentation platform to within ±0.5 degrees, select the neck bracket adjustment

position that minimizes the difference between the transverse instrumentation platform angle and level.

(ii) *Vehicles with adjustable seat backs.* While holding the thighs in place, rotate the seat back forward until the transverse instrumentation platform angle of the head is level to within ±0.5 degrees, making sure that the pelvis does not interfere with the seat bight. (If the torso contacts the steering ~~wheel~~**control**, use S12.3.2(a)(10) before proceeding with the remaining portion of this paragraph.) If it is not possible to level the transverse instrumentation platform to within ±0.5 degrees, select the seat back adjustment position that minimizes the difference between the transverse instrumentation platform angle and level, then adjust the neck bracket to level the transverse instrumentation platform angle to within ±0.5 degrees if possible. If it is still not possible to level the transverse instrumentation platform to within ±0.5 degrees, select the neck bracket angle position that minimizes the difference between the transverse instrumentation platform angle and level.

(10) If the torso contacts the steering ~~wheel~~**control**, adjust the steering ~~wheel~~**control** in the following order until there is no contact: telescoping adjustment, lowering adjustment, raising adjustment. If the vehicle has no adjustments or contact with the steering ~~wheel~~**control** cannot be eliminated by adjustment, position the seat at the next detent where there is no contact with the steering ~~wheel~~**control** as adjusted in S10.5. If the seat is a power seat, position the seat to avoid contact while assuring that there is a maximum of 5 mm (0.2 in) distance between the steering ~~wheel~~**control** as adjusted in S10.5 and the point of contact on the dummy.

(11) Measure and set the dummy's pelvic angle using the pelvic angle gage. The angle is set to 20.0 degrees ±2.5 degrees. If this is not possible, adjust the pelvic angle as close to 20.0 degrees as possible while keeping the transverse instrumentation platform of the head as level as possible by adjustments specified in S12.3.2(a)(9).

(12) If the dummy is contacting the vehicle interior after these adjustments, move the seat rearward until there is a maximum of 5 mm (0.2 in) between the contact point of the dummy and the interior of the vehicle or if it has a manual seat adjustment, to the next rearward detent position. If after these adjustments, the dummy contact point is more than 5 mm (0.2 in) from the vehicle interior and the seat is still not in its forwardmost position, move the seat forward until the contact point is 5 mm (0.2 in) or less from the vehicle interior, or if it has a manual seat adjustment, move the seat to the closest detent position without making contact, or until the seat reaches its forwardmost position, whichever occurs first.

(b) *Driver foot positioning.*

(1) If the vehicle has an adjustable accelerator pedal, adjust it to the full forward position. If the heel of the right foot can contact the floor pan, follow the positioning procedure in S12.3.2(b)(1)(i). If not, follow the positioning procedure in S12.3.2(b)(1)(ii).

(i) Rest the right foot of the test dummy on the un-depressed accelerator pedal with the rearmost point of the heel on the floor pan in the plane of the pedal. If the foot cannot be placed on the accelerator pedal, set it initially perpendicular to the leg and then place it as far forward as

possible in the direction of the pedal centerline with the rearmost point of the heel resting on the floor pan. If the vehicle has an adjustable accelerator pedal and the right foot is not touching the accelerator pedal when positioned as above, move the pedal rearward until it touches the right foot. If the accelerator pedal in the full rearward position still does not touch the foot, leave the pedal in that position.

(ii) Extend the foot and lower leg by decreasing the knee flexion angle until any part of the foot contacts the un-depressed accelerator pedal or the highest part of the foot is at the same height as the highest part of the pedal. If the vehicle has an adjustable accelerator pedal and the right foot is not touching the accelerator pedal when positioned as above, move the pedal rearward until it touches the right foot.

(2) If the ball of the foot does not contact the pedal, increase the ankle plantar flexion angle such that the toe of the foot contacts or is as close as possible to contact with the un-depressed accelerator pedal.

(3) If, in its final position, the heel is off of the vehicle floor, a spacer block is used under the heel to support the final foot position. The surface of the block in contact with the heel has an inclination of 30 degrees, measured from the horizontal, with the highest surface towards the rear of the vehicle.

(4) Place the left foot on the toe-board with the rearmost point of the heel resting on the floor pan as close as possible to the point of intersection of the planes described by the toe-board and floor pan, and not on or in contact with the vehicle's brake pedal, clutch pedal, wheel-well projection or foot rest, except as provided in S12.3.2(b)(6).

(5) If the left foot cannot be positioned on the toe board, place the foot perpendicular to the lower leg centerline as far forward as possible with the heel resting on the floor pan.

(6) If the left foot does not contact the floor pan, place the foot parallel to the floor and place the leg as perpendicular to the thigh as possible. If necessary to avoid contact with the vehicle's brake pedal, clutch pedal, wheel-well, or foot rest, use the three foot position adjustments listed in S12.3.2(b)(6)(i) through (iii). The adjustment options are listed in priority order, with each subsequent option incorporating the previous. In making each adjustment, move the foot the minimum distance necessary to avoid contact. If it is not possible to avoid all prohibited foot contact, priority is given to avoiding brake or clutch pedal contact:

(i) Rotate (abduction/adduction) the test dummy's left foot about the lower leg;

(ii) Planar flex the foot;

(iii) Rotate the left leg outboard about the hip.

(c) *Driver arm/hand positioning.* Place the dummy's upper arm such that the angle between the projection of the arm centerline on the midsagittal plane of the dummy and the torso reference line is 45° ±5°. The torso reference line is defined as the thoracic spine centerline. The shoulder-

arm joint allows for discrete arm positions at 0, ±45, ±90, ±135, and 180 degree settings where positive is forward of the spine.

S12.3.3 *5th percentile female front passenger dummy positioning.*

(a) *Passenger torso/head/seat back angle positioning.*

(1) With the seat at the mid-height in the full-forward position determined in S10.3.2, use only the control that primarily moves the seat fore and aft to place the seat in the rearmost position, without adjusting independent height controls. If the seat cushion reference line angle automatically changes as the seat is moved from the full forward position, maintain, as closely as possible, the seat cushion reference line angle determined in S10.3.2.3.3, for the final forward position when measuring the pelvic angle as specified in S12.3.3(a)(11). The seat cushion reference line angle position may be achieved through the use of any seat or seat cushion adjustments other than that which primarily moves the seat or seat cushion fore-aft.

(2) Fully recline the seat back, if adjustable. Place the dummy into ~~the~~**any** passenger~~'s~~ seat, such that when the legs are positioned 120 degrees to the thighs, the calves of the legs are not touching the seat cushion.

(3) Bucket seats. Place the dummy on the seat cushion so that its midsagittal plane is vertical and passes through the SgRP within ±10 mm (±0.4 in).

(4) Bench seats. Position the midsagittal plane of the dummy vertical and parallel to the vehicle's longitudinal centerline and the same distance from the vehicle's longitudinal centerline, within ±10 mm (±0.4 in), as the midsagittal plane of the driver dummy**, if there is a driver's seating position. Otherwise, the midsagittal plane of any front outboard passenger dummy shall be vertical, parallel to the vehicle's longitudinal centerline, and pass, within ±10 mm (±0.4 in), through the seating reference point of the seating that it occupies**.

(5) Hold the dummy's thighs down and push rearward on the upper torso to maximize the dummy's pelvic angle.

(6) Place the legs at 120 degrees to the thighs. Set the initial transverse distance between the longitudinal centerlines at the front of the dummy's knees at 160 to 170 mm (6.3 to 6.7 in), with the thighs and legs of the dummy in vertical planes. Push rearward on the dummy's knees to force the pelvis into the seat so there is no gap between the pelvis and the seat back or until contact occurs between the back of the dummy's calves and the front of the seat cushion.

(7) Gently rock the upper torso relative to the lower torso laterally in a side to side motion three times through a ±5 degree arc (approximately 51 mm (2 in) side to side).

(8) If needed, extend the legs slightly so that the feet are not in contact with the floor pan. Let the thighs rest on the seat cushion to the extent permitted by the foot movement. With the feet perpendicular to the legs, place the heels on the floor pan. If a heel will not contact the floor pan, place it as close to the floor pan as possible. Using only the control that primarily moves the seat

fore and aft, attempt to return the seat to the full forward position. If a dummy leg contacts the vehicle interior before the full forward position is attained, position the seat at the next detent where there is no contact. If the seats are power seats, position the seat to avoid contact while assuring that there is a maximum of 5 mm (0.2 in) distance between the vehicle interior and the point on the dummy that would first contact the vehicle interior.

(9) *Head leveling.*

(i) *Vehicles with fixed seat backs.* Adjust the lower neck bracket to level the transverse instrumentation platform angle of the head to within ±0.5 degrees. If it is not possible to level the transverse instrumentation platform to within ±0.5 degrees, select the neck bracket adjustment position that minimizes the difference between the transverse instrumentation platform angle and level.

(ii) *Vehicles with adjustable seat backs.* While holding the thighs in place, rotate the seat back forward until the transverse instrumentation platform angle of the head is level to within ±0.5 degrees, making sure that the pelvis does not interfere with the seat bight. If it is not possible to level the transverse instrumentation platform to within ±0.5 degrees, select the seat back adjustment position that minimizes the difference between the transverse instrumentation platform angle and level, then adjust the neck bracket to level the transverse instrumentation platform angle to within ±0.5 degrees if possible. If it is still not possible to level the transverse instrumentation platform to within ±0.5 degrees, select the neck bracket angle position that minimizes the difference between the transverse instrumentation platform angle and level.

(10) Measure and set the dummy's pelvic angle using the pelvic angle gage. The angle is set to 20.0 degrees ±2.5 degrees. If this is not possible, adjust the pelvic angle as close to 20.0 degrees as possible while keeping the transverse instrumentation platform of the head as level as possible by adjustments specified in S12.3.2(a)(9).

(11) If the dummy is contacting the vehicle interior after these adjustments, move the seat rearward until there is a maximum of 5 mm (0.2 in) between the contact point of the dummy and the interior of the vehicle or if it has a manual seat adjustment, to the next rearward detent position. If after these adjustments, the dummy contact point is more than 5 mm (0.2 in) from the vehicle interior and the seat is still not in its forwardmost position, move the seat forward until the contact point is 5 mm (0.2 in) or less from the vehicle interior, or if it has a manual seat adjustment, move the seat to the closest detent position without making contact, or until the seat reaches its forwardmost position, whichever occurs first.

(b) *Passenger foot positioning.*

(1) Place the front passenger's feet flat on the toe board.

(2) If the feet cannot be placed flat on the toe board, set them perpendicular to the leg center lines and place them as far forward as possible with the heels resting on the floor pan.

(3) If either foot does not contact the floor pan, place the foot parallel to the floor pan and place the lower leg as perpendicular to the thigh as possible.

(c) *Passenger arm/hand positioning.* Place the dummy's upper arm such that the angle between the projection of the arm centerline on the midsagittal plane of the dummy and the torso reference line is 45° ±5°. The torso reference line is defined as the thoracic spine centerline. The shoulder-arm joint allows for discrete arm positions at 0, ±45, ±90, ±135, and 180 degree settings where positive is forward of the spine.

S12.3.4 *5th percentile female in rear outboard seating positions.*

(a) Set the rear outboard seat at the full rearward, full down position determined in S8.3.3.

(b) Fully recline the seat back, if adjustable. Install the dummy into the passenger~~'s~~ seat, such that when the legs are 120 degrees to the thighs, the calves of the legs are not touching the seat cushion.

(c) Place the dummy on the seat cushion so that its midsagittal plane is vertical and coincides with the vertical longitudinal plane through the center of the seating position SgRP within ±10 mm (±0.4 in).

(d) Hold the dummy's thighs down and push rearward on the upper torso to maximize the dummy's pelvic angle.

(e) Place the legs at 120 degrees to the thighs. Set the initial transverse distance between the longitudinal centerlines at the front of the dummy's knees at 160 to 170 mm (6.3 to 6.7 in), with the thighs and legs of the dummy in vertical planes. Push rearward on the dummy's knees to force the pelvis into the seat so there is no gap between the pelvis and the seat back or until contact occurs between the back of the dummy's calves and the front of the seat cushion.

(f) Gently rock the upper torso laterally side to side three times through a ±5 degree arc (approximately 51 mm (2 in) side to side).

(g) If needed, extend the legs slightly so that the feet are not in contact with the floor pan. Let the thighs rest on the seat cushion to the extent permitted by the foot movement. With the feet perpendicular to the legs, place the heels on the floor pan. If a heel will not contact the floor pan, place it as close to the floor pan as possible.

(h) Head leveling.

(1) Vehicles with fixed seat backs. Adjust the lower neck bracket to level the transverse instrumentation platform angle of the head to within ±0.5 degrees. If it is not possible to level the transverse instrumentation platform to within ±0.5 degrees, select the neck bracket adjustment position that minimizes the difference between the transverse instrumentation platform angle and level.

(2) Vehicles with adjustable seat backs. While holding the thighs in place, rotate the seat back forward until the transverse instrumentation platform angle of the head is level to within ±0.5 degrees, making sure that the pelvis does not interfere with the seat bight. If it is not possible to level the transverse instrumentation platform to within ±0.5 degrees, select the seat back adjustment position that minimizes the difference between the transverse instrumentation platform angle and level, then adjust the neck bracket to level the transverse instrumentation platform angle to within ±0.5 degrees if possible. If it is still not possible to level the transverse instrumentation platform to within ±0.5 degrees, select the neck bracket angle position that minimizes the difference between the transverse instrumentation platform angle and level.

(i) [Reserved]

(j) Measure and set the dummy's pelvic angle using the pelvic angle gauge. The angle is set to 20.0 degrees ±2.5 degrees. If this is not possible, adjust the pelvic angle as close to 20.0 degrees as possible while keeping the transverse instrumentation platform of the head as level as possible, as specified in S12.3.4(h).

(k) *Passenger foot positioning.*

(1) Place the rear seat passenger's feet flat on the floor pan and beneath the front seat as far as possible without front seat interference.

(2) If either foot does not contact the floor pan, place the foot parallel to the floor and place the leg as perpendicular to the thigh as possible.

(l) *Passenger arm/hand positioning.* Place the rear dummy's upper arm such that the angle between the projection of the arm centerline on the midsagittal plane of the dummy and the torso reference line is 45° ±5°. The torso reference line is defined as the thoracic spine centerline. The shoulder-arm joint allows for discrete arm positions at 0, ±45, ±90, ±135, and 180 degree settings where positive is forward of the spine.

S13 *Phase-in of moving deformable barrier and vehicle-to-pole performance requirements.*

S13.1 *Vehicles manufactured on or after September 1, 2010 and before September 1, 2014.* At anytime during the production years ending August 31, 2011, August 31, 2012, August 31, 2013, and August 31, 2014, each manufacturer shall, upon request from the Office of Vehicle Safety Compliance, provide information identifying the vehicles (by make, model and vehicle identification number) that have been certified as complying with the moving deformable barrier test with advanced test dummies (S7.2), or the vehicles (by make, model and vehicle identification number) that have been certified as complying with the vehicle-to-pole test requirements (S9.1) of this standard. The manufacturer's designation of a vehicle as a certified vehicle meeting S7.2 or S9.1 is irrevocable.

S13.1.1 *Vehicles manufactured on or after September 1, 2010 and before September 1, 2011.*

(a) Subject to S13.4, for vehicles manufactured on or after September 1, 2010 and before September 1, 2011, the number of vehicles complying with S7.2 shall be not less than 20 percent of:

(1) The manufacturer's average annual production of vehicles manufactured in the three previous production years; or

(2) The manufacturer's production in the current production year.

(b) Subject to S13.4, for vehicles manufactured on or after September 1, 2010 and before September 1, 2011, the number of vehicles complying with S9.1 shall be not less than 20 percent of:

(1) The manufacturer's average annual production of vehicles manufactured in the three previous production years; or

(2) The manufacturer's production in the current production year.

S13.1.2 *Vehicles manufactured on or after September 1, 2011 and before September 1, 2012.*

(a) Subject to S13.4, for vehicles manufactured on or after September 1, 2011 and before September 1, 2012, the number of vehicles complying with S7.2 shall be not less than 40 percent of:

(1) The manufacturer's average annual production of vehicles manufactured in the three previous production years; or

(2) The manufacturer's production in the current production year.

(b) Subject to S13.4, for vehicles manufactured on or after September 1, 2011 and before September 1, 2012, the number of vehicles complying with S9.1 shall be not less than 40 percent of:

(1) The manufacturer's average annual production of vehicles manufactured in the three previous production years; or

(2) The manufacturer's production in the current production year.

S13.1.3 *Vehicles manufactured on or after September 1, 2012 and before September 1, 2013.*

(a) Subject to S13.4, for vehicles manufactured on or after September 1, 2012 and before September 1, 2013, the number of vehicles complying with S7.2 shall be not less than 60 percent of:

(1) The manufacturer's average annual production of vehicles manufactured in the three previous production years; or

(2) The manufacturer's production in the current production year.

(b) Subject to S13.4, for vehicles manufactured on or after September 1, 2012 and before September 1, 2013, the number of vehicles complying with S9.1 shall be not less than 60 percent of:

(1) The manufacturer's average annual production of vehicles manufactured in the three previous production years; or

(2) The manufacturer's production in the current production year.

S13.1.4 *Vehicles manufactured on or after September 1, 2013 and before September 1, 2014.*

(a) Subject to S13.4, for vehicles manufactured on or after September 1, 2013 and before September 1, 2014, the number of vehicles complying with S7.2 shall be not less than 80 percent of:

(1) The manufacturer's average annual production of vehicles manufactured in the three previous production years; or

(2) The manufacturer's production in the current production year.

(b) Subject to S13.4, for vehicles manufactured on or after September 1, 2013 and before September 1, 2014, the number of vehicles complying with S9.1 shall be not less than 80 percent of:

(1) The manufacturer's average annual production of vehicles manufactured in the three previous production years; or

(2) The manufacturer's production in the current production year.

S13.2 *Vehicles produced by more than one manufacturer.*

S13.2.1 For the purpose of calculating average annual production of vehicles for each manufacturer and the number of vehicles manufactured by each manufacturer under S13.1.1 and S13.1.2, a vehicle produced by more than one manufacturer shall be attributed to a single manufacturer as follows, subject to S13.2.2.

(a) A vehicle that is imported shall be attributed to the importer.

(b) A vehicle manufactured in the United States by more than one manufacturer, one of which also markets the vehicle, shall be attributed to the manufacturer that markets the vehicle.

S13.2.2 A vehicle produced by more than one manufacturer shall be attributed to any one of the vehicle's manufacturers specified by an express written contract, reported to the National

Highway Traffic Safety Administration under 49 CFR part 585, between the manufacturer so specified and the manufacturer to which the vehicle would otherwise be attributed under S13.2.1.

S13.3(a) For the purposes of calculating average annual production of vehicles for each manufacturer and the number of vehicles manufactured by each manufacturer under S13.1.1(a), S13.1.2(a), S13.1.3(a), and S13.1.4(a), do not count any vehicle that is excluded by Standard No. 214 from the moving deformable barrier test with the ES-2re or SID-IIs test dummies (S7.2).

(b) For the purposes of calculating average annual production of vehicles for each manufacturer and the number of vehicles manufactured by each manufacturer under S13.1.1(b), S13.1.2(b), S13.1.3(b), and S13.1.4(b), do not count any vehicle that is excluded by Standard No. 214 from the vehicle-to-pole test (S9).

S13.4 *Calculation of complying vehicles.*

(a) For the purposes of calculating the vehicles complying with S13.1.1, a manufacturer may count a vehicle if it is manufactured on or after October 11, 2007 but before September 1, 2011.

(b) For purposes of complying with S13.1.2, a manufacturer may count a vehicle if it—

(1) Is manufactured on or after October 11, 2007 but before September 1, 2012 and,

(2) Is not counted toward compliance with S13.1.1.

(c) For purposes of complying with S13.1.3, a manufacturer may count a vehicle if it—

(1) Is manufactured on or after October 11, 2007 but before September 1, 2013 and,

(2) Is not counted toward compliance with S13.1.1 or S13.1.2.

(d) For purposes of complying with S13.1.4, a manufacturer may count a vehicle if it—

(1) Is manufactured on or after October 11, 2007 but before September 1, 2014 and,

(2) Is not counted toward compliance with S13.1.1, S13.1.2, or S13.1.3.

(e) For the purposes of calculating average annual production of vehicles for each manufacturer and the number of vehicles manufactured by each manufacturer, each vehicle that is excluded from having to meet the applicable requirement is not counted.

[72 FR 51957, Sept. 11, 2007, as amended at 73 FR 32483, June 9, 2008; 75 FR 12139, Mar. 15, 2010; 77 FR 767, Jan. 6, 2012; 76 FR 52884, Aug. 24, 2011; 77 FR 70914, Nov. 28, 2012]

# §571.216a Standard No. 216a; Roof crush resistance; Upgraded standard.

S1. *Scope.* This standard establishes strength requirements for the passenger compartment roof.

S2. *Purpose.* The purpose of this standard is to reduce deaths and injuries due to the crushing of the roof into the occupant compartment in rollover crashes.

S3 *Application and selection of compliance options.*

S3.1 *Application.*

(a) This standard applies to passenger cars, and to multipurpose passenger vehicles, trucks **with at least one designated seating position,** and buses with a GVWR of 4,536 kilograms (10,000 pounds) or less, according to the implementation schedule specified in S8 and S9 of this section. However, it does not apply to—

(1) School buses;

(2) Vehicles that conform to the rollover test requirements (S5.3) of Standard No. 208 (§571.208) by means that require no action by vehicle occupants;

(3) Convertibles, except for optional compliance with the standard as an alternative to the rollover test requirement (S5.3) of Standard No. 208; or

(4) Trucks built in two or more stages with a GVWR greater than 2,722 kilograms (6,000 pounds) not built using a chassis cab or using an incomplete vehicle with a full exterior van body.

(b) At the option of the manufacturer, vehicles within either of the following categories may comply with the roof crush requirements (S4) of Standard No. 220 (§571.220) instead of the requirements of this standard:

(1) Vehicles built in two or more stages, other than vehicles built using a chassis cab;

(2) Vehicles with a GVWR greater than 2,722 kilograms (6,000 pounds) that have an altered roof as defined by S4 of this section.

(c) Manufacturers may comply with the standard in this §571.216a as an alternative to §571.216.

S3.2 *Selection of compliance option.* Where manufacturer options are specified, the manufacturer shall select the option by the time it certifies the vehicle and may not thereafter select a different option for the vehicle. Each manufacturer shall, upon the request from the National Highway Traffic Safety Administration, provide information regarding which of the compliance options it selected for a particular vehicle or make/model.

S4. *Definitions.*

*Altered roof* means the replacement roof on a motor vehicle whose original roof has been removed, in part or in total, and replaced by a roof that is higher than the original roof. The replacement roof on a motor vehicle whose original roof has been replaced, in whole or in part, by a roof that consists of glazing materials, such as those in T-tops and sunroofs, and is located at the level of the original roof, is not considered to be an altered roof.

*Convertible* means a vehicle whose A-pillars are not joined with the B-pillars (or rearmost pillars) by a fixed, rigid structural member.

S5. *Requirements.*

S5.1 When the test device described in S6 is used to apply a force to a vehicle's roof in accordance with S7, first to one side of the roof and then to the other side of the roof:

(a) The lower surface of the test device must not move more than 127 millimeters, and

(b) No load greater than 222 Newtons (50 pounds) may be applied to the head form specified in S5.2 of 49 CFR 571.201 located at the head position of a 50th percentile adult male in accordance with S7.2 of this section.

S5.2 The maximum applied force to the vehicle's roof in Newtons is:

(a) For vehicles with a GVWR of 2,722 kilograms (6,000 pounds) or less, any value up to and including 3.0 times the unloaded vehicle weight of the vehicle, measured in kilograms and multiplied by 9.8, and

(b) For vehicles with a GVWR greater than 2,722 kilograms (6,000 pounds), any value up to and including 1.5 times the unloaded vehicle weight of the vehicle, measured in kilograms and multiplied by 9.8.

S6. *Test device.* The test device is a rigid unyielding block whose lower surface is a flat rectangle measuring 762 millimeters by 1,829 millimeters.

S7. *Test procedure.* Each vehicle must be capable of meeting the requirements of S5 when tested in accordance with the procedure in S7.1 through S7.6.

S7.1 Support the vehicle off its suspension and rigidly secure the sills and the chassis frame (when applicable) of the vehicle on a rigid horizontal surface(s) at a longitudinal attitude of 0 degrees ±0.5 degrees. Measure the longitudinal vehicle attitude along both the ~~driver~~**left** and ~~passenger~~**right front** sill. Determine the lateral vehicle attitude by measuring the vertical distance between a level surface and a standard reference point on the bottom of the ~~driver~~**left** and ~~passenger~~**right front** side sills. The difference between the vertical distance measured on the ~~driver~~**left front** side and the ~~passenger~~**right front** side sills is not more than ±10 mm. Close all windows, close and lock all doors, and close and secure any moveable roof panel, moveable

shade, or removable roof structure in place over the occupant compartment. Remove roof racks or other non-structural components. For a vehicle built on a chassis-cab incomplete vehicle that has some portion of the added body structure above the height of the incomplete vehicle, remove the entire added body structure prior to testing (the vehicle's unloaded vehicle weight as specified in S5 includes the weight of the added body structure).

S7.2 Adjust the seats in accordance with S8.3.1 of 49 CFR 571.214. Position the top center of the head form specified in S5.2 of 49 CFR 571.201 at the location of the top center of the Head Restraint Measurement Device (HRMD) specified in 49 CFR 571.202a, in the front outboard designated seating position on the side of the vehicle being tested as follows:

(a) Position the three dimensional manikin specified in SAE Standard J826 JUL95 (incorporated by reference, see §571.5), in accordance to the seating procedure specified in that document, except that the length of the lower leg and thigh segments of the H-point machine are adjusted to 414 and 401 millimeters, respectively, instead of the 50th percentile values specified in Table 1 of SAE J826 JUL95.

(b) Remove four torso weights from the three-dimensional manikin specified in SAE J826 (July 1995) (two from the left side and two from the right side), replace with two HRMD torso weights (one on each side), and attach and level the HRMD head form.

(c) Mark the location of the top center of the HRMD in three dimensional space to locate the top center of the head form specified in S5.2 of 49 CFR 571.201.

S7.3 Orient the test device as shown in Figure 1 of this section, so that—

(a) Its longitudinal axis is at a forward angle (in side view) of 5 degrees (±0.5 degrees) below the horizontal, and is parallel to the vertical plane through the vehicle's longitudinal centerline;

(b) Its transverse axis is at an outboard angle, in the front view projection, of 25 degrees below the horizontal (±0.5 degrees).

S7.4 Maintaining the orientation specified in S7.3 of this section—

(a) Lower the test device until it initially makes contact with the roof of the vehicle.

(b) Position the test device so that—

(1) The longitudinal centerline on its lower surface is within 10 mm of the initial point of contact, or on the center of the initial contact area, with the roof; and

(2) The midpoint of the forward edge of the lower surface of the test device is within 10 mm of the transverse vertical plane 254 mm forward of the forwardmost point on the exterior surface of the roof, including windshield trim, that lies in the longitudinal vertical plane passing through the vehicle's longitudinal centerline.

S7.5 Apply force so that the test device moves in a downward direction perpendicular to the lower surface of the test device at a rate of not more than 13 millimeters per second until reaching the force level specified in S5. Guide the test device so that throughout the test it moves, without rotation, in a straight line with its lower surface oriented as specified in S7.3(a) and S7.3(b). Complete the test within 120 seconds.

S7.6 Repeat the test on the other side of the vehicle.

S8. *Phase-in schedule for vehicles with a GVWR of 2,722 kilograms (6,000 pounds) or less.*

S8.1 *Vehicles manufactured on or after September 1, 2012, and before September 1, 2013.* For vehicles manufactured on or after September 1, 2012, and before September 1, 2013, the number of vehicles complying with this standard must not be less than 25 percent of:

(a) The manufacturer's average annual production of vehicles manufactured on or after September 1, 2009, and before September 1, 2012; or

(b) The manufacturer's production on or after September 1, 2012, and before September 1, 2013.

S8.2 *Vehicles manufactured on or after September 1, 2013, and before September 1, 2014.* For vehicles manufactured on or after September 1, 2013, and before September 1, 2014, the number of vehicles complying with this standard must not be less than 50 percent of:

(a) The manufacturer's average annual production of vehicles manufactured on or after September 1, 2010, and before September 1, 2013; or

(b) The manufacturer's production on or after September 1, 2013, and before September 1, 2014.

S8.3 *Vehicles manufactured on or after September 1, 2014, and before September 1, 2015.* For vehicles manufactured on or after September 1, 2014, and before September 1, 2015, the number of vehicles complying with this standard must not be less than 75 percent of:

(a) The manufacturer's average annual production of vehicles manufactured on or after September 1, 2011, and before September 1, 2014; or

(b) The manufacturer's production on or after September 1, 2014, and before September 1, 2015.

S8.4 *Vehicles manufactured on or after September 1, 2015.* Except as provided in S8.8, each vehicle manufactured on or after September 1, 2015 must comply with this standard.

S8.5 *Calculation of complying vehicles.*

(a) For purpose of complying with S8.1, a manufacturer may count a vehicle if it is certified as complying with this standard and is manufactured on or after September 1, 2012, but before September 1, 2013.

(b) For purposes of complying with S8.2, a manufacturer may count a vehicle if it:

(1) Is certified as complying with this standard and is manufactured on or after September 1, 2012, but before September 1, 2014; and

(2) Is not counted toward compliance with S8.1.

(c) For purposes of complying with S8.3, a manufacturer may count a vehicle if it:

(1) Is certified as complying with this standard and is manufactured on or after September 1, 2012, but before September 1, 2015; and

(2) Is not counted toward compliance with S8.1 or S8.2.

S8.6 *Vehicles produced by more than one manufacturer.*

S8.6.1 For the purpose of calculating average annual production of vehicles for each manufacturer and the number of vehicles manufactured by each manufacturer under S8.1 through S8.3, a vehicle produced by more than one manufacturer must be attributed to a single manufacturer as follows, subject to S8.6.2:

(a) A vehicle that is imported must be attributed to the importer.

(b) A vehicle manufactured in the United States by more than one manufacturer, one of which also markets the vehicle, must be attributed to the manufacturer that markets the vehicle.

S8.6.2 A vehicle produced by more than one manufacturer must be attributed to any one of the vehicle's manufacturers specified by an express written contract, reported to the National Highway Traffic Safety Administration under 49 CFR Part 585, between the manufacturer so specified and the manufacturer to which the vehicle would otherwise be attributed under S8.6.1.

S8.7 *Small volume manufacturers.* Vehicles manufactured during any of the three years of the September 1, 2012 through August 31, 2015 phase-in by a manufacturer that produces fewer than 5,000 vehicles for sale in the United States during that year are not subject to the requirements of S8.1, S8.2, and S8.3.

S8.8 *Final-stage manufacturers and alterers.*

Vehicles that are manufactured in two or more stages or that are altered (within the meaning of 49 CFR 567.7) after having previously been certified in accordance with Part 567 of this chapter are not subject to the requirements of S8.1 through S8.3. Instead, all vehicles produced by these manufacturers on or after September 1, 2016 must comply with this standard.

S9 *Vehicles with a GVWR above 2,722 kilograms (6,000 pounds).*

(a) Except as provided in S9(b), each vehicle manufactured on or after September 1, 2016 must comply with this standard.

(b) Vehicles that are manufactured in two or more stages or that are altered (within the meaning of 49 CFR 567.7) after having previously been certified in accordance with part 567 of this chapter are not subject to the requirements of S8.1 through S8.3. Instead, all vehicles produced by these manufacturers on or after September 1, 2017 must comply with this standard.

**Figure 1 to § 571.216**

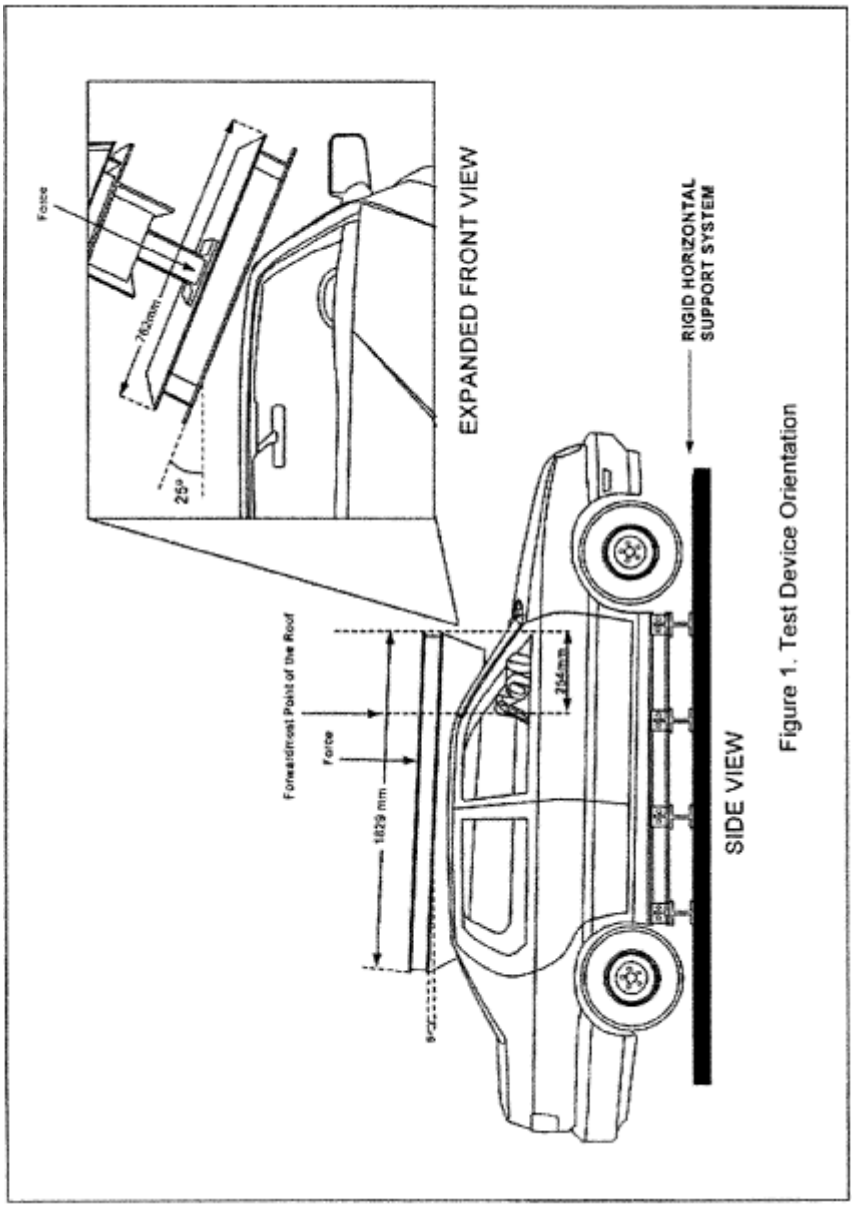


Figure 1. Test Device Orientation

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[74 FR 22384, May 12, 2009, as amended at 75 FR 17605, Apr. 7, 2010; 77 FR 768, Jan. 6, 2012]

# §571.225 Standard No. 225; Child restraint anchorage systems.

S1. *Purpose and scope.* This standard establishes requirements for child restraint anchorage systems to ensure their proper location and strength for the effective securing of child restraints, to reduce the likelihood of the anchorage systems' failure, and to increase the likelihood that child restraints are properly secured and thus more fully achieve their potential effectiveness in motor vehicles.

S2. *Application.* This standard applies to passenger cars; to trucks and multipurpose passenger vehicles with a gross vehicle weight rating (GVWR) of 3,855 kilograms (8,500 pounds) or less; and to buses (including school buses) with a GVWR of 4,536 kg (10,000 lb) or less. This standard does not apply to walk-in van-type vehicles, vehicles manufactured to be sold exclusively to the U.S. Postal Service, shuttle buses, and funeral coaches.

S3. *Definitions.*

*Child restraint anchorage* means any vehicle component, other than Type I or Type II seat belts, that is involved in transferring loads generated by a child restraint system to the vehicle structure.

*Child restraint anchorage system* means a vehicle system that is designed for attaching a child restraint system to a vehicle at a particular designated seating position, consisting of:

(a) Two lower anchorages meeting the requirements of S9; and

(b) A tether anchorage meeting the requirements of S6.

*Child restraint fixture (CRF)* means the fixture depicted in Figures 1 and 2 of this standard that simulates the dimensions of a child restraint system, and that is used to determine the space required by the child restraint system and the location and accessibility of the lower anchorages.

*Funeral coach* means a vehicle that contains only a front row of occupant seats, is designed exclusively for transporting a body and casket and that is equipped with features to secure a casket in place during operation of the vehicle.

*Rear designated seating position* means any designated seating position (as that term is defined at §571.3) that is rearward of the front seats(s).

*Seat bight* means the area close to and including the intersection of the surfaces of the vehicle seat cushion and the seat back.

*SFAD 1* means Static Force Application Device 1 shown in Figures 12 to 16 of this standard.

*SFAD 2* means Static Force Application Device 2 shown in Figures 17 and 18 of this standard.

*Shuttle bus* means a bus with only one row of forward-facing seating positions rearward of the driver's seat **or, for a vehicle without manually-operated controls, means a bus with only one row of forward-facing seating positions rearward of all front row passenger seats**.

*Tether anchorage* means a user-ready, permanently installed vehicle system that transfers loads from a tether strap through the tether hook to the vehicle structure and that accepts a tether hook.

*Tether strap* means a strap that is secured to the rigid structure of the seat back of a child restraint system, and is connected to a tether hook that transfers the load from that system to the tether anchorage.

*Tether hook* means a device, illustrated in Figure 11 of Standard No. 213 (§571.213), used to attach a tether strap to a tether anchorage.

S4. *General vehicle requirements.*

S4.1 Each tether anchorage and each child restraint anchorage system installed, either voluntarily or pursuant to this standard, in any new vehicle manufactured on or after September 1, 1999, shall comply with the configuration, location, marking and strength requirements of this standard. The vehicle shall be delivered with written information, in English, on how to appropriately use those anchorages and systems.

S4.2 For passenger cars manufactured on or after September 1, 1999 and before September 1, 2000, not less than 80 percent of the manufacturer's average annual production of vehicles (not including convertibles), as set forth in S13, shall be equipped with a tether anchorage as specified in paragraphs (a), (b) and (c) of S4.2, except as provided in S5.

(a) Each vehicle with three or more forward-facing rear designated seating positions shall be equipped with a tether anchorage conforming to the requirements of S6 at no fewer than three forward-facing rear designated seating positions. The tether anchorage of a child restraint anchorage system may count towards the three required tether anchorages. In each vehicle with a forward-facing rear designated seating position other than an outboard designated seating position, at least one tether anchorage (with or without the lower anchorages of a child restraint anchorage system) shall be at such a designated seating position. In a vehicle with three or more rows of seating positions, at least one of the tether anchorages (with or without the lower

anchorages of a child restraint anchorage system) shall be installed at a forward-facing seating position in the second row if such a forward-facing seating position is available in that row.

(b) Each vehicle with not more than two forward-facing rear designated seating positions shall be equipped with a tether anchorage conforming to the requirements of S6 at each forward-facing rear designated seating position. The tether anchorage of a child restraint anchorage system may count toward the required tether anchorages.

(c) Each vehicle without any forward-facing rear designated seating position shall be equipped with a tether anchorage conforming to the requirements of S6 at each front forward-facing passenger seating position.

S4.3 Each vehicle manufactured on or after September 1, 2000 and before September 1, 2002, shall be equipped as specified in paragraphs (a) and (b) of S4.3, except as provided in S5.

(a) A specified percentage of each manufacturer's yearly production, as set forth in S14, shall be equipped as follows:

(1) Each vehicle with three or more forward-facing rear designated seating positions shall be equipped with a child restraint anchorage system conforming to the requirements of S9 at not fewer than two forward-facing rear designated seating positions. In a vehicle with three or more rows of seating positions, at least one of the child restraint anchorage systems shall be at a forward-facing seating position in the second row if such a forward-facing seating position is available in that row.

(2) Each vehicle with not more than two forward-facing rear designated seating positions shall be equipped with a child restraint anchorage system conforming to the requirements of S9 at each forward-facing rear designated seating position.

(b) Each vehicle, including a vehicle that is counted toward the percentage of a manufacturer's yearly production required to be equipped with child restraint anchorage systems, shall be equipped as described in S4.3(b)(1), (2) or (3), subject to S13.

(1) Each vehicle with three or more forward-facing rear designated seating positions shall be equipped with a tether anchorage conforming to the requirements of S6 at no fewer than three forward-facing rear designated seating positions. The tether anchorage of a child restraint anchorage system may count towards the three required tether anchorages. In each vehicle with a forward-facing rear designated seating position other than an outboard designated seating position, at least one tether anchorage (with or without the lower anchorages of a child restraint anchorage system) shall be at such a designated seating position. In a vehicle with three or more rows of seating positions, at least one of the tether anchorages (with or without the lower anchorages of a child restraint anchorage system) shall be installed at a forward-facing seating position in the second row if such a forward-facing seating position is available in that row.

(2) Each vehicle with not more than two forward-facing rear designated seating positions shall be equipped with a tether anchorage conforming to the requirements of S6 at each forward-

facing rear designated seating position. The tether anchorage of a child restraint anchorage system may count toward the required tether anchorages.

(3) Each vehicle without any forward-facing rear designated seating position shall be equipped with a tether anchorage conforming to the requirements of S6 at each front passenger seating position.

S4.4 Vehicles manufactured on or after September 1, 2002 shall be equipped as specified in paragraphs (a) through (c) of S4.4, except as provided in S5.

(a) Each vehicle with three or more forward-facing rear designated seating positions shall be equipped as specified in S4.4(a)(1) and (2).

(1) Each vehicle shall be equipped with a child restraint anchorage system conforming to the requirements of S9 at not fewer than two forward-facing rear designated seating positions. At least one of the child restraint anchorage systems shall be installed at a forward-facing seating position in the second row in each vehicle that has three or more rows, if such a forward-facing seating position is available in that row.

(2) Each vehicle shall be equipped with a tether anchorage conforming to the requirements of S6 at a third forward-facing rear designated seating position. The tether anchorage of a child restraint anchorage system may count towards the third required tether anchorage. In each vehicle with a forward-facing rear designated seating position other than an outboard designated seating position, at least one tether anchorage (with or without the lower anchorages of a child restraint anchorage system) shall be at such a designated seating position.

(b) Each vehicle with not more than two forward-facing rear designated seating positions shall be equipped with a child restraint anchorage system conforming to the requirements of S9 at each forward-facing rear designated seating position.

(c) Each vehicle without any forward-facing rear designated seating position shall be equipped with a tether anchorage conforming to the requirements of S6 at each front forward-facing passenger seating position.

S4.5 As an alternative to complying with the requirements of S4.2 through S4.4 that specify the number of tether anchorages that are required in a vehicle and the designated seating positions for which tether anchorages must be provided, a vehicle manufactured from September 1, 1999 to August 31, 2004 may, at the manufacturer's option (with said option irrevocably selected prior to, or at the time of, certification of the vehicle), meet the requirements of this S4.5. This alternative ceases to be available on and after September 1, 2004. A tether anchorage conforming to the requirements of S6 must be installed—

(a) For each designated seating position, other than that of the driver, in a vehicle that has only one row of designated seating positions;

(b) For each forward-facing designated seating position in the second row of seating positions in a passenger car or truck;

(c) For each of any two forward-facing designated seating positions in the second row of seating positions in a multipurpose passenger vehicle that has five or fewer designated seating positions; and,

(d) For each of any three forward-facing designated seating positions that are located to the rear of the first row of designated seating positions in a multipurpose passenger vehicle that has six or more designated seating positions.

S4.6 *Adjustable seats.* (a) A vehicle that is equipped with a forward-facing rear designated seating position that can be relocated such that it is capable of being used at either an outboard or non-outboard forward-facing seating position shall be considered as having a forward-facing non-outboard seating position. Such an adjustable seat must be equipped with a tether anchorage (with or without the lower anchorages of a child restraint anchorage system) if the vehicle does not have another forward-facing non-outboard seating position that is so equipped.

(b) Tether and lower anchorages shall be available for use at all times, except when the seating position for which it is installed is not available for use because the vehicle seat has been removed or converted to an alternate use such as the carrying of cargo.

S5. *General exceptions.*

(a) Convertibles and school buses are excluded from the requirements to be equipped with tether anchorages.

(b) A vehicle may be equipped with a built-in child restraint system conforming to the requirements of Standard No. 213 (49 CFR 571.213) instead of one of the required tether anchorages or child restraint anchorage systems.

(c)(1) Each vehicle that—

(i) Does not have a rear designated seating position and that thus meets the conditions in S4.5.4.1(a) of Standard No. 208 (§571.208); and

(ii) Has an air bag on-off switch meeting the requirements of S4.5.4 of Standard No. 208 (§571.208), shall have a child restraint anchorage system for a designated passenger seating position in the front seat, instead of only a tether anchorage. In the case of convertibles, the front designated passenger seating position need have only the two lower anchorages meeting the requirements of S9 of this standard.

(iii) For vehicles manufactured on or after September 1, 2002, each vehicle that does not have a rear designated seating position, and does not have an air bag installed at front passenger designated seating positions pursuant to a temporary exemption granted by NHTSA under 49 CFR Part 555, must have a child restraint anchorage system installed at a front passenger

designated seating position. In the case of convertibles, the front designated passenger seating position need have only the two lower anchorages meeting the requirements of S9 of this standard.

(2) Each vehicle that—

(i) Has a rear designated seating position and meets the conditions in S4.5.4.1(b) of Standard No. 208 (§571.208); and,

(ii) Has an air bag on-off switch meeting the requirements of S4.5.4 of Standard 208 (§571.208), shall have a child restraint anchorage system for a designated passenger seating position in the front seat, instead of a child restraint anchorage system that is required for the rear seat. In the case of convertibles, the front designated passenger seating position need have only the two lower anchorages meeting the requirements of S9 of this standard.

(iii) For vehicles manufactured on or after September 1, 2002, each vehicle that has a rear designated seating position and meets the conditions in S4.5.4.1(b) of Standard No. 208 (§571.208), and does not have an air bag installed at front passenger designated seating positions pursuant to a temporary exemption granted by NHTSA under 49 CFR Part 555, must have a child restraint anchorage system installed at a front passenger designated seating position in place of one of the child restraint anchorage systems that is required for the rear seat. In the case of convertibles, the front designated passenger seating position need have only the two lower anchorages meeting the requirements of S9 of this standard.

(d) A vehicle that does not have an air bag on-off switch meeting the requirements of S4.5.4 of Standard No. 208 (§571.208), shall not have any child restraint anchorage system installed at a front designated seating position.

(e) A vehicle with a rear designated seating position for which interference with transmission and/or suspension components prevents the location of the lower bars of a child restraint anchorage system anywhere within the zone described by S9.2 or S15.1.2.2(b) such that the attitude angles of S15.1.2.2(a) could be met, is excluded from the requirement to provide a child restraint anchorage system at that position. However, except as provided elsewhere in S5 of this standard, for vehicles manufactured on or after September 1, 2001, such a vehicle must have a tether anchorage at a front passenger designated seating position.

S6. *Requirements for tether anchorages.*

S6.1 *Configuration of the tether anchorage.* Each tether anchorage shall:

(a) Permit the attachment of a tether hook of a child restraint system meeting the configuration and geometry specified in Figure 11 of Standard No. 213 (§571.213);

(b) Be accessible without the need for any tools other than a screwdriver or coin;

(c) Once accessed, be ready for use without the need for any tools; and

(d) Be sealed to prevent the entry of exhaust fumes into the passenger compartment.

S6.2 *Location of the tether anchorage.* A vehicle manufactured on or after September 1, 1999 and before September 1, 2004 may, at the manufacturer's option (with said option irrevocably selected prior to, or at the time of, certification of the vehicle), meet the requirements of S6.2.1 or S6.2.2. Vehicles manufactured on or after September 1, 2004 must meet the requirements of S6.2.1 of this standard.

S6.2.1 Subject to S6.2.1.1 and S6.2.1.2, the part of each tether anchorage that attaches to a tether hook must be located within the shaded zone shown in Figures 3 to 7 of this standard of the designated seating position for which it is installed. The zone is defined with reference to the seating reference point (see §571.3). (For purposes of the figures, “H Point” is defined to mean seating reference point.) A tether anchorage may be recessed in the seat back, provided that it is not in the strap wrap-around area at the top of the vehicle seat back. For the area under the vehicle seat, the forwardmost edge of the shaded zone is defined by the torso line reference plane.

S6.2.1.1 In the case of passenger cars and multipurpose passenger vehicles manufactured before September 1, 2004, the part of each user-ready tether anchorage that attaches to a tether hook may, at the manufacturer's option (with said option selected prior to, or at the time of, certification of the vehicle), instead of complying with S6.2.1, be located within the shaded zone shown in Figures 8 to 11 of this standard of the designated seating position for which it is installed, relative to the shoulder reference point of the three dimensional H-point machine described in section 3.1 of SAE Standard J826-1992 (incorporated by reference, see §571.5) such that—

(a) The H-point of the three dimensional H-point machine is located—

(1) At the actual H-point of the seat, as defined in section 2.2.11.3 of SAE Recommended Practice J1100-1993 (incorporated by reference, see §571.5), at the full rearward and downward position of the seat; or

(2) In the case of a designated seating position that has a child restraint anchorage system, midway between vertical longitudinal planes passing through the lateral center of the bar in each of the two lower anchorages of that system; and

(b) The back pan of the H-point machine is at the same angle to the vertical as the vehicle seat back with the seat adjusted to its full rearward and full downward position and the seat back in its most upright position.

S6.2.1.2 In the case of a vehicle that—

(a) Has a user-ready tether anchorage for which no part of the shaded zone shown in Figures 3 to 7 of this standard of the designated seating position for which the anchorage is installed is accessible without removing a seating component of the vehicle; and

(b) Has a tether strap routing device that is—

(1) Not less than 65 mm behind the torso line for that seating position, in the case of a flexible routing device or a deployable routing device, measured horizontally and in a vertical longitudinal plane; or

(2) Not less than 100 mm behind the torso line for that seating position, in the case of a fixed rigid routing device, measured horizontally and in a vertical longitudinal plane, the part of that anchorage that attaches to a tether hook may, at the manufacturer's option (with said option selected prior to, or at the time of, certification of the vehicle) be located outside that zone.

(c) The measurement of the location of the flexible or deployable routing device described in S6.2.1.2(b)(1) is made with SFAD 2 properly attached to the lower anchorages. A 40 mm wide nylon tether strap is routed through the routing device and attached to the tether anchorage in accordance with the written instructions required by S12 of this standard. The forwardmost contact point between the strap and the routing device must be within the stated limit when the tether strap is flat against the top surface of the SFAD and tensioned to 55 to 65 N. In seating positions without lower anchorages of a child restraint anchorage system, the SFAD 2 is held with its central lateral plane in the central vertical longitudinal plane of the seating position. The adjustable anchor attaching bars of the SFAD 2 are replaced by spacers that end flush with the back surface of the SFAD.

S6.2.2 Subject to S6.2.2.1 and S6.2.2.2, the portion of each user-ready tether anchorage that is designed to bind with a tether strap hook shall be located within the shaded zone shown in Figures 3 to 7 of this standard of the designated seating position for which it is installed, with reference to the H-point of a template described in section 3.1 of SAE Standard J826-1992 (incorporated by reference, see §571.5), if:

(a) The H-point of the template is located—

(1) At the unique Design H-point of the designated seating position, as defined in section 2.2.11.1 of SAE Recommended Practice J1100-1993 (incorporated by reference, see §571.5), at the full downward and full rearward position of the seat, or—

(2) In the case of a designated seating position that has a means of affixing the lower portion of a child restraint system to the vehicle, other than a vehicle seat belt, midway between the two lower restraint system anchorages;

(b) The torso line of the template is at the same angle to the transverse vertical plane as the vehicle seat back with the seat adjusted to its full rearward and full downward position and the seat back in its most upright position; and

(c) The template is positioned in the vertical longitudinal plane that contains the H-point of the template.

S6.2.2.1 In passenger cars and multipurpose passenger vehicles manufactured before September 1, 2004, the portion of each user-ready tether anchorage to which a tether strap hook attaches may be located within the shaded zone shown in Figures 8 to 11 of the designated seating position for which it is installed, with reference to the shoulder reference point of a template described in section 3.1 of SAE Standard J826-1992 (incorporated by reference, see §571.5), if:

(a) The H-point of the template is located—

(1) At the unique Design H-point of the designated seating position, as defined in section 2.2.11.1 of SAE Recommended Practice J1100-1993 (incorporated by reference, see §571.5), at the full downward and full rearward position of the seat, or—

(2) In the case of a designated seating position that has a means of affixing the lower portion of a child restraint system to the vehicle, other than a vehicle seat belt, midway between the two lower restraint system anchorages;

(b) The torso line of the template is at the same angle to the vertical plane as the vehicle seat back with the seat adjusted to its full rearward and full downward position and the seat back in its most upright position; and

(c) The template is positioned in the vertical longitudinal plane that contains the H-point of the template.

S6.2.2.2 The portion of a user-ready tether anchorage in a vehicle that is designed to bind with the tether strap hook may be located outside the shaded zone referred to in S6.2.2, if no part of the shaded zone is accessible without removing a seating component of the vehicle and the vehicle is equipped with a routing device that—

(a) Ensures that the tether strap functions as if the portion of the anchorage designed to bind with the tether strap hook were located within the shaded zone;

(b) Is at least 65 mm behind the torso line, in the case of a non-rigid-webbing-type routing device or a deployable routing device, or at least 100 mm behind the torso line, in the case of a fixed rigid routing device; and

(c) When tested after being installed as it is intended to be used, is of sufficient strength to withstand, with the user-ready tether anchorage, the load referred to in S6.3.4 or S6.3.4.1, as applicable.

S6.3 *Strength requirements for tether anchorages.* Subject to S6.3.2, a vehicle manufactured on or after September 1, 1999, and before September 1, 2004 may, at the manufacturer's option (with said option irrevocably selected prior to, or at the time of, certification of the vehicle), meet the requirements of S6.3.1 or S6.3.4. Vehicles manufactured on or after September 1, 2004 and before September 1, 2005 must meet the requirements of

S6.3.1 of this standard, except as provided in S16 of this standard. Vehicles manufactured on or after September 1, 2005 must meet the requirements of S6.3.1.

S6.3.1 Subject to S6.3.2, when tested in accordance with S8, after preloading the device with a force of 500 N, the tether anchorage must not separate completely from the vehicle seat or seat anchorage or the structure of the vehicle.

S6.3.2 In vehicles manufactured before September 1, 2004, each user-ready tether anchorage in a row of designated seating positions in a passenger car may, at the manufacturer's option (with said option selected prior to, or at the time of, certification of the vehicle), instead of complying with S6.3.1, withstand the application of a force of 5,300 N, when tested in accordance with S8.2, such that the anchorage does not release the belt strap specified in S8.2 or allow any point on the tether anchorage to be displaced more than 125 mm.

S6.3.3 *Provisions for simultaneous and sequential testing.* (a) In the case of vehicle seat assemblies equipped with more than one tether anchorage system, the force referred to in S6.3.1 and S6.3.2 may, at the agency's option, be applied simultaneously to each of those tether anchorages. However, that force may not be applied simultaneously to tether anchorages for any two adjacent seating positions whose midpoints are less than 400 mm apart, as measured in accordance with S6.3.3(a)(1) and (2) and Figure 20.

(1) The midpoint of the seating position lies in the vertical longitudinal plane that is equidistant from vertical longitudinal planes through the geometric center of each of the two lower anchorages at the seating position. For those seating positions that do not provide lower anchorages, the midpoint of the seating position lies in the vertical longitudinal plane that passes through the SgRP of the seating position.

(2) Measure the distance between the vertical longitudinal planes passing through the midpoints of the adjacent seating positions, as measured along a line perpendicular to the planes.

(b) A tether anchorage of a particular child restraint anchorage system will not be tested with the lower anchorages of that anchorage system if one or both of those lower anchorages have been previously tested under this standard.

S6.3.4 Subject to subsections S6.3.4.1 and S6.3.4.2, every user-ready tether anchorage in a row of designated seating positions shall, when tested, withstand the application of a force of 10,000 N—

(a) Applied by means of one of the following types of test devices, installed as a child restraint system would be installed in accordance with the manufacturer's installation instructions, namely,

(1) SFAD 1, to test a tether anchorage at a designated seating position that does not have a child restraint anchorage system; or

(2) SFAD 2, to test a tether anchorage at a designated seating position that has a child restraint anchorage system;

(b) Applied—

(1) In a forward direction parallel to the vehicle's vertical longitudinal plane through the X point on the test device, and,

(2) Initially, along a horizontal line or along any line below or above that line that is at an angle to that line of not more than 5 degrees;

(c) Approximately linearly over a time, at the option of the vehicle manufacturer, of not more than 30 seconds, at any onset force rate of not more than 135 000 N/s; and

(d) Maintained at a 10,000 N level for one second.

S6.3.4.1 In a passenger car manufactured before September 1, 2004, every user-ready tether anchorage in a row of designated seating positions must, when tested, subject to subsection S6.3.4.2, withstand the application of a force of 5,300 N, which force must be—

(a) Applied by means of a belt strap that—

(1) Extends not less than 250 mm forward from the vertical plane touching the rear top edge of the vehicle seat back,

(2) Is fitted at one end with suitable hardware for applying the force and at the other end with a bracket for the attachment of the user-ready tether anchorage, and

(3) Passes over the top of the vehicle seat back as shown in Figure 19 of this standard;

(b) Applied—

(1) In a forward direction parallel to the vehicle's longitudinal vertical plane, and

(2) Initially, along a horizontal line or along any line below that line that is at an angle to that line of not more than 20 degrees;

(c) Attained within 30 seconds, at any onset force rate of not more than 135,000 N/s; and

(d) Maintained at a 5,300 N level for one second.

S6.3.4.2 If the zones in which tether anchorages are located overlap and if, in the overlap area, a user-ready tether anchorage is installed that is designed to accept the tether strap hooks of two restraint systems simultaneously, both portions of the tether anchorage that are designed to bind with a tether strap hook shall withstand the force referred to in subsection S6.3.4 or S6.3.4.1, as the case may be, applied to both portions simultaneously.

S6.3.4.3 *Provisions for simultaneous and sequential testing.* (a) In the case of vehicle seat assemblies equipped with more than one tether anchorage system, the force referred to in S6.3.4, 6.3.4.1 or S6.3.4.2 may, at the agency's option, be applied simultaneously to each of those tether anchorages. However, that force may not be applied simultaneously to tether anchorages for any two adjacent seating positions whose midpoints are less than 400 mm apart, as measured in accordance with S6.3.4.3(a)(1) and (2) and Figure 20.

(1) The midpoint of the seating position lies in the vertical longitudinal plane that is equidistant from vertical longitudinal planes through the geometric center of each of the two lower anchorages at the seating position. For those seating positions that do not provide lower anchorages, the midpoint of the seating position lies in the vertical longitudinal plane that passes through the SgRP of the seating position.

(2) Measure the distance between the vertical longitudinal planes passing through the midpoints of the adjacent seating positions, as measured along a line perpendicular to the planes.

(b) A tether anchorage of a particular child restraint anchorage system will not be tested with the lower anchorages of that anchorage system if one or both of those lower anchorages have been previously tested under this standard.

S6.3.4.4 The strength requirement tests shall be conducted with the vehicle seat adjusted to its full rearward and full downward position and the seat back in its most upright position. When SFAD 2 is used in testing and cannot be attached to the lower anchorages with the seat back in this position, adjust the seat back as recommended by the manufacturer in its instructions for attaching child restraints. If no instructions are provided, adjust the seat back to the position that enables SFAD 2 to attach to the lower anchorages that is the closest to the most upright position.

S7. *Test conditions for testing tether anchorages.*

The test conditions described in paragraphs (a) and (b) of S7 apply to the test procedures in S8.

(a) Vehicle seats are adjusted to their full rearward and full downward position and the seat back is placed in its most upright position. When SFAD 2 is used in testing and cannot be attached to the lower anchorages with the seat back in this position, adjust the seat back as recommended by the manufacturer in its instructions for attaching child restraints. If no instructions are provided, adjust the seat back to the position that enables SFAD 2 to attach to the lower anchorages that is the closest to the most upright position.

(b) Head restraints are adjusted in accordance with the manufacturer's instructions, provided pursuant to S12, as to how the head restraints should be adjusted when using the child restraint anchorage system. If instructions with regard to head restraint adjustment are not provided pursuant to S12, the head restraints are adjusted to any position.

S8 *Test procedures.* Each vehicle shall meet the requirements of S6.3.1 and S6.3.3 when tested according to the following procedures. Where a range of values is specified, the vehicle

shall be able to meet the requirements at all points within the range. For the testing specified in these procedures, the SFAD used in the test has a tether strap consisting of webbing material with an elongation limit of 4 percent at a tensile load of 65,000 N (14,612 lb). Pretension the tether strap with 53.5 N to 67 N of preload prior to the test. The strap is fitted at one end with a high strength steel tether hook for attachment to the tether anchorage. The tether hook meets the specifications in Standard No. 213 (49 CFR §571.213) as to the configuration and geometry of tether hooks required by the standard. A steel cable is connected to the X point through which the test force is applied.

S8.1 Apply the force specified in S6.3.1 as follows—

(a) Use the following specified test device, as appropriate:

(1) SFAD 1, to test a tether anchorage at a designated seating position that does not have a child restraint anchorage system; or,

(2) SFAD 2, to test a tether anchorage at a designated seating position that has a child restraint anchorage system.

(b) Attach the SFAD 1 to the vehicle seat using the vehicle belts or the SFAD 2 to the lower anchorages of the child restraint anchorage system, as appropriate, and attach the test device to the tether anchorage, in accordance with the manufacturer's instructions provided pursuant to S12 of this standard. For the testing specified in this procedure, if SFAD 1 cannot be attached using the vehicle belts because of the location of the vehicle belt buckle, the test device is attached by material whose breaking strength is equal to or greater than the breaking strength of the webbing for the seat belt assembly installed as original equipment at that seating position. The geometry of the attachment duplicates the geometry, at the pre-load point, of the attachment of the originally installed seat belt assembly. All belt systems (including the tether) used to attach the test device are tightened to a tension of not less than 53.5 N and not more than 67 N on the webbing portion of the belt. For SFAD 1, apply a rearward force of 135 N ±15 N, in a horizontal plane through point “X” of SFAD 1. While maintaining the force, tighten the vehicle seat belt to a tension of not less than 53.5 N and not more than 67 N measured at the lap portion of the seat belt and maintain the tension during the preload, lock the seat belt retractor, and tighten the tether belt strap to remove all slack. A rearward force of 135 N ±15 N is applied to the center of the lower front crossmember of SFAD 2 to press the device against the seat back as the fore-aft position of the rearward extensions of the SFAD is adjusted to remove any slack or tension.

(c) Apply the force—

(1) Initially, in a forward direction in a vertical longitudinal plane and through the Point X on the test device; and

(2) Initially, along a line through the X point and at an angle of 10 ±5 degrees above the horizontal. Apply a preload force of 500 N to measure the angle; and then

(3) Increase the pull force as linearly as practicable to a full force application of 15,000 N in not less than 24 seconds and not more than 30 seconds, and maintain at a 15,000 N level for 1 second.

S8.2 Apply the force specified in S6.3.2 as follows:

(a) Attach a belt strap, and tether hook, to the user-ready tether anchorage. The belt strap extends not less than 250 mm forward from the vertical transverse plane touching the rear top edge of the vehicle seat back, and passes over the top of the vehicle seat back as shown in Figure 19 of this standard;

(b) Apply the force at the end of the belt strap—

(1) Initially, in a forward direction in a vertical longitudinal plane that is parallel to the vehicle's longitudinal centerline;

(2) Initially, along a horizontal line or along any line below or above that line that is at an angle to that line of not more than 20 degrees;

(3) So that the force is attained within 30 seconds, at any onset rate of not more than 135,000 N/s; and

(4) Maintained at a 5,300 N level for a minimum of 1 second.

S9 *Requirements for the lower anchorages of the child restraint anchorage system.* As an alternative to complying with the requirements of S9, a vehicle manufactured on or after September 1, 1999 and before September 1, 2004 may, at the manufacturer's option (with said option irrevocably selected prior to, or at the time of, certification of the vehicle), meet the requirements in S15 of this standard. Vehicles manufactured on or after September 1, 2004 and before September 1, 2005 must meet all of the requirements of S9 of this standard, except as provided in S16 of this standard with regard to S9.4. Vehicles manufactured on or after September 1, 2005 must meet all the requirements of S9 of this standard.

S9.1 *Configuration of the lower anchorages*

S9.1.1 The lower anchorages shall consist of two bars that—

(a) Are 6 mm ±.1 mm in diameter;

(b) Are straight, horizontal and transverse;

(c) As shown in Figure 21, are:

(i) Not less than 25 mm in length, and

(ii) Are not more than 60 mm in length between the anchor bar supports or other structural members of the vehicle that restrict lateral movement of the components of a child restraint that are designed to attach to the bars, measured in a vertical plane 7 mm rearward of the vertical plane that is tangent of the rearward face of the anchor bar.

(d) For bars installed in vehicles manufactured on or after March 1, 2005, the bars must not be capable of being stowable (foldable or otherwise stowable).

(e) [Reserved]

(f) Are part of the vehicle, such that they can only be removed by use of a tool, such as a screwdriver or wrench; and

(g) Are rigidly attached to the vehicle such that they will not deform more than 5 mm when subjected to a 100 N force in any direction.

S9.2 *Location of the lower anchorages.*

S9.2.1 The anchorage bars are located at the vehicle seating position by using the CRF rearward extensions, with the CRF placed against or near the vehicle seat back. With the CRF attached to the anchorages and resting on the seat cushion, the bottom surface shall have attitude angles within the limits in the following table, angles measured relative to the vehicle horizontal, longitudinal and transverse reference planes.

**TABLE TO S9.2.1**

| | |
|---|---|
| Pitch | 15° ±10° |
| Roll | 0° ±5° |
| Yaw | 0° ±10° |

NOTE: An explanation of the above angles is given in Figure 1.

S9.2.2 With adjustable seats adjusted as described in S9.2.3, each lower anchorage bar shall be located so that a vertical transverse plane tangent to the front surface of the bar is:

(a) Not more than 70 mm behind the corresponding point Z of the CRF, measured parallel to the bottom surface of the CRF and in a vertical longitudinal plane, while the CRF is pressed against the seat back by the rearward application of a horizontal force of 100 N at point A on the CRF; and

(b) Not less than 120 mm behind the vehicle seating reference point, measured horizontally and in a vertical longitudinal plane.

S9.2.3 Adjustable seats are adjusted as follows:

(a) Place adjustable seat backs in the manufacturer's nominal design riding position in the manner specified by the manufacturer; and

(b) Place adjustable seats in the full rearward and full downward position.

S9.3 *Adequate fit of the lower anchorages.* Each vehicle and each child restraint anchorage system in that vehicle shall be designed such that the CRF can be placed inside the vehicle and attached to the lower anchorages of each child restraint anchorage system, with adjustable seats adjusted as described in S9.3(a) and (b).

(a) Place adjustable seat backs in the manufacturer's nominal design riding position in the manner specified by the manufacturer; and

(b) Place adjustable seats in the full rearward and full downward position.

(c) To facilitate installation of the CRF in a vehicle seat, the side, back and top frames of the CRF may be removed for installation in the vehicle, as indicated in Figure 1A of this standard. If necessary, the height of the CRF may be 560 mm.

S9.4 *Strength of the lower anchorages.*

S9.4.1 When tested in accordance with S11, the lower anchorages shall not allow point X on SFAD 2 to be displaced horizontally more than the distances specified below, after preloading the device—

(a) 175 mm, when a force of 11,000 N is applied in a forward direction in a vertical longitudinal plane; and

(b) 150 mm, for lower anchorages when a force of 5,000 N is applied in a lateral direction in a vertical longitudinal plane that is 75 ±5 degrees to either side of a vertical longitudinal plane.

S9.4.1.1 Forces described in S9.4.1(a), forward direction, shall be applied with an initial force application angle of 10 ±5 degrees above the horizontal. Forces described in S9.4.1(b), lateral direction, shall be applied horizontally (0 ±5 degrees).

S9.4.1.2 The amount of displacement is measured relative to an undisturbed point on the vehicle body.

S9.4.2 *Provisions for simultaneous and sequential testing.* (a) In the case of vehicle seat assemblies equipped with more than one child restraint anchorage system, the lower anchorages may, at the agency's option, be tested simultaneously. However, forces may not be applied simultaneously for any two adjacent seating positions whose midpoints are less than 400 mm apart, as measured in accordance with S9.4.2(a)(1) and (2) and Figure 20.

(1) The midpoint of the seating position lies in the vertical longitudinal plane that is equidistant from vertical longitudinal planes through the geometric center of each of the two lower anchorages at the seating position.

(2) Measure the distance between the vertical longitudinal planes passing through the midpoints of the adjacent seating positions, as measured along a line perpendicular to the planes.

(b) The lower anchorages of a particular child restraint anchorage system will not be tested if one or both of the anchorages have been previously tested under this standard.

S9.5 *Marking and conspicuity of the lower anchorages.* Each vehicle shall comply with S9.5(a) or (b).

(a) Above each bar installed pursuant to S4, the vehicle shall be permanently marked with a circle:

(1) That is not less than 13 mm in diameter;

(2) That is either solid or open, with or without words, symbols or pictograms, provided that if words, symbols or pictograms are used, their meaning is explained to the consumer in writing, such as in the vehicle's owners manual; and

(3) That is located such that its center is on each seat back between 50 and 100 mm above or on the seat cushion 100 ±25 mm forward of the intersection of the vertical transverse and horizontal longitudinal planes intersecting at the horizontal centerline of each lower anchorage, as illustrated in Figure 22. The center of the circle must be in the vertical longitudinal plane that passes through the center of the bar (±25 mm).

(4) The circle may be on a tag.

(b) The vehicle shall be configured such that the following is visible: Each of the bars installed pursuant to S4, or a permanently attached guide device for each bar. The bar or guide device must be visible without the compression of the seat cushion or seat back, when the bar or device is viewed, in a vertical longitudinal plane passing through the center of the bar or guide device, along a line making an upward 30 degree angle with a horizontal plane. Seat backs are in the nominal design riding position. The bars may be covered by a removable cap or cover, provided that the cap or cover is permanently marked with words, symbols or pictograms whose meaning is explained to the consumer in written form as part of the owner's manual.

S10. *Test conditions for testing the lower anchorages.* The test conditions described in this paragraph apply to the test procedures in S11.

(a) Adjust vehicle seats to their full rearward and full downward position and place the seat backs in their most upright position. When SFAD 2 is used in testing and cannot be attached to the lower anchorages with the seat back in this position, adjust the seat back as recommended by the manufacturer in its instructions for attaching child restraints. If no instructions are provided,

adjust the seat back to the position closest to the upright position that enables SFAD 2 to attach to the lower anchorages.

(b) Head restraints are adjusted in accordance with the manufacturer's instructions, provided pursuant to S12, as to how the head restraints should be adjusted when using the child restraint anchorage system. If instructions with regard to head restraint adjustment are not provided pursuant to S12, the head restraints are adjusted to any position.

S11. *Test procedure.* Each vehicle shall meet the requirements of S9.4 when tested according to the following procedures. Where a range of values is specified, the vehicle shall be able to meet the requirements at all points within the range.

(a) *Forward force direction.* Place SFAD 2 in the vehicle seating position and attach it to the two lower anchorages of the child restraint anchorage system. Do not attach the tether anchorage. A rearward force of 135 ±15 N is applied to the center of the lower front crossbar of SFAD 2 to press the device against the seat back as the fore-aft position of the rearward extensions of the SFAD is adjusted to remove any slack or tension. Apply a preload force of 500 N at point X of the test device. Increase the pull force as linearly as practicable to a full force application of 11,000 N in not less than 24 seconds and not more than 30 seconds, and maintain at an 11,000 N level for 1 second.

(b) *Lateral force direction.* Place SFAD 2 in the vehicle seating position and attach it to the two lower anchorages of the child restraint anchorage system. Do not attach the tether anchorage. A rearward force of 135 ±15 N is applied to the center of the lower front crossbar of SFAD 2 to press the device against the seat back as the fore-aft position of the rearward extensions of the SFAD is adjusted to remove any slack or tension. Apply a preload force of 500 N at point X of the test device. Increase the pull force as linearly as practicable to a full force application of 5,000 N in not less than 24 seconds and not more than 30 seconds, and maintain at a 5,000 N level for 1 second.

S12. *Written instructions.* The vehicle must provide written instructions, in English, for using the tether anchorages and the child restraint anchorage system in the vehicle. If the vehicle has an owner's manual, the instructions must be in that manual. The instructions shall:

(a) Indicate which seating positions in the vehicle are equipped with tether anchorages and child restraint anchorage systems;

(b) In the case of vehicles required to be marked as specified in paragraphs S4.1, S9.5(a), or S15.4, explain the meaning of markings provided to locate the lower anchorages of child restraint anchorage systems; and

(c) Include instructions that provide a step-by-step procedure, including diagrams, for properly attaching a child restraint system's tether strap to the tether anchorages.

S13. *Tether anchorage phase-in requirements.*

S13.1 Passenger cars manufactured on or after September 1, 1999 and before September 1, 2000 shall comply with S13.1.1 through S13.2. At anytime during the production year ending August 31, 2000, each manufacturer shall, upon request from the Office of Vehicle Safety Compliance, provide information identifying the passenger cars (by make, model and vehicle identification number) that have been certified as complying with the tether anchorage requirements of this standard. The manufacturer's designation of a passenger car as a certified vehicle is irrevocable.

S13.1.1 Subject to S13.2, for passenger cars manufactured on or after September 1, 1999 and before September 1, 2000, the number of vehicles complying with S4.2 shall be not less than 80 percent of:

(a) The manufacturer's average annual production of passenger cars manufactured on or after September 1, 1996 and before September 1, 1999; or

(b) The manufacturer's production of passenger cars manufactured on or after September 1, 1999 and before September 1, 2000.

S13.1.2 For the purpose of calculating average annual production of vehicles for each manufacturer and the number of vehicles manufactured by each manufacturer under S13.1.1, a vehicle produced by more than one manufacturer shall be attributed to a single manufacturer as provided in S13.1.2(a) through (c), subject to S13.2.

(a) A vehicle which is imported shall be attributed to the importer.

(b) A vehicle manufactured in the United States by more than one manufacturer, one of which also markets the vehicle, shall be attributed to the manufacturer which markets the vehicle.

(c) A vehicle produced by more than one manufacturer must be attributed to any one of the vehicle's manufacturers specified by an express written contract, reported to the National Highway Traffic Safety Administration under 49 CFR part 585, between the manufacturer so specified and the manufacturer to which the vehicle would otherwise be attributed under S13.1.2(a) or (b).

S13.2 For the purposes of calculating average annual production of passenger cars for each manufacturer and the number of passenger cars manufactured by each manufacturer under S13.1, each passenger car that is excluded from the requirement to provide tether anchorages is not counted.

S13.3 Until May 1, 2001, vehicles manufactured by a final-stage manufacturer or alterer need not be equipped with the tether anchorages required by S4.3 of this standard. Vehicles manufactured by a final-stage manufacturer or alterer on or after May 1, 2001 must be equipped with the tether anchorages specified in S4.3.

S14. *Lower anchorages phase-in requirements for vehicles manufactured on or after September 1, 2000 and before September 1, 2002.*

S14.1 Vehicles manufactured on or after September 1, 2000 and before September 1, 2002 shall comply with S14.1.1 through S14.1.2. At anytime during the production years ending August 31, 2001, and August 31, 2002, each manufacturer shall, upon request from the Office of Vehicle Safety Compliance, provide information identifying the vehicles (by make, model and vehicle identification number) that have been certified as complying with the child restraint anchorage requirements of this standard. The manufacturer's designation of a vehicle as a certified vehicle is irrevocable.

S14.1.1 *Vehicles manufactured on or after September 1, 2000 and before September 1, 2001.* Subject to S14.4, for vehicles manufactured on or after September 1, 2000 and before September 1, 2001, the number of vehicles complying with S4.3 shall be not less than 20 percent of:

(a) The manufacturer's average annual production of vehicles manufactured on or after September 1, 1997 and before September 1, 2000; or

(b) The manufacturer's production on or after September 1, 2000 and before September 1, 2001.

S14.1.2 *Vehicles manufactured on or after September 1, 2001 and before September 1, 2002.* Subject to S14.4, for vehicles manufactured on or after September 1, 2001 and before September 1, 2002, the number of vehicles complying with S4.3 shall be not less than 50 percent of:

(a) The manufacturer's average annual production of vehicles manufactured on or after September 1, 1998 and before September 1, 2001; or

(b) The manufacturer's production on or after September 1, 2001 and before September 1, 2002.

S14.2 *Vehicles produced by more than one manufacturer.*

S14.2.1 For the purpose of calculating average annual production of vehicles for each manufacturer and the number of vehicles manufactured by each manufacturer under S14.1.1 through S14.1.2, a vehicle produced by more than one manufacturer shall be attributed to a single manufacturer as follows, subject to S14.2.2.

(a) A vehicle which is imported shall be attributed to the importer.

(b) A vehicle manufactured in the United States by more than one manufacturer, one of which also markets the vehicle, shall be attributed to the manufacturer which markets the vehicle.

S14.2.2 A vehicle produced by more than one manufacturer must be attributed to any one of the vehicle's manufacturers specified by an express written contract, reported to the National Highway Traffic Safety Administration under 49 CFR part 585, between the manufacturer so specified and the manufacturer to which the vehicle would otherwise be attributed under S14.2.1.

S14.3 *Alternative phase-in schedules.* (a) *Final-stage manufacturers and alterers.* A final-stage manufacturer or alterer may, at its option, comply with the requirements set forth in S14.3(a)(1) and (2), instead of the requirements set forth in S14.1.1 through S14.1.2.

(1) Vehicles manufactured on or after September 1, 2000 and before September 1, 2002 are not required to be equipped with the lower anchorages specified in this standard.

(2) Vehicles manufactured on or after September 1, 2002 must be equipped with the lower anchorages specified in this standard.

(b) *Small volume manufacturers.* Vehicles manufactured on or after September 1, 2000 and before September 1, 2002 that are manufactured by a manufacturer that produces fewer than 5,000 vehicles worldwide annually are not required to provide the lower anchorages specified in this standard.

S14.4 For the purposes of calculating average annual production of vehicles for each manufacturer and the number of vehicles manufactured by each manufacturer under S14.1.1 and S14.1.2, each vehicle that is excluded from the requirement to provide child restraint anchorage systems is not counted.

S15 *Alternative to complying with the requirements of S9.* As an alternative to complying with the requirements of S9, a vehicle manufactured on or after September 1, 1999 and before September 1, 2004 may, at the manufacturer's option (with said option irrevocably selected prior to, or at the time of, certification of the vehicle), meet the requirements in S15 of this standard. Vehicles manufactured on or after September 1, 2004 must meet the requirements of S9 of this standard.

S15.1 *Dimensions and installation requirements.*

S15.1.1 *General.* The vehicle anchorages are positioned near the seat bight. The location of the anchorages is defined with respect to the CRF. If the vehicle seat is adjustable, it is adjusted as recommended by the vehicle manufacturer for use with child restraint systems.

S15.1.2 *Anchorage dimensions and location.*

S15.1.2.1 The lower anchorages shall consist of two bars that—

(a) Are 6 mm ±.1 mm in diameter;

(b) Are straight, horizontal and transverse;

(c) Are not less than 25 mm in length;

(d)-(e) [Reserved]

(f) Are permanently attached to the vehicle or vehicle seat such that they can only be removed by use of a tool, such as a screwdriver or wrench.

S15.1.2.2 (a) The anchorage bars are located at the vehicle seating position with the aid of and with respect to the CRF rearward extensions, with the CRF placed against or near the vehicle seat back. With the CRF attached to the anchorages and resting on the seat cushion, the bottom surface shall have attitude angles within the limits in the following table, angles measured relative to the vehicle horizontal, longitudinal and transverse reference planes.

**TABLE TO S15.1.2.2(a)**

| | |
|---|---|
| Pitch | 15° ±10° |
| Roll | 0° ±5° |
| Yaw | 0° ±10° |

NOTE: An explanation of the above angles is given in Figure 1.

(b) With adjustable seats adjusted as described in S15.1.2.2(c), each lower anchorage bar shall be located so that a vertical transverse plane intersecting the center of the bar is:

(1) Not more than 70 mm behind point Z of the CRF, measured parallel to the bottom surface of the CRF and to the center of the bar, with the CRF rear surface against the seat back; and

(2) Not less than 120 mm behind the vehicle seating reference point, measured horizontally and to the center of the bar. (NOTE: To facilitate installation of the CRF in a vehicle seat, the CRF may be constructed of smaller separable parts and assembled in the vehicle seat. Alternatively, vehicle components may be removed to allow access.)

(c) Adjustable seats are adjusted as recommended by the vehicle manufacturer for use with child restraint systems.

S15.2 *Static Strength Requirements.*

S15.2.1 The strength of the anchorages shall be determined using the procedure of S15.3 to apply forces to the SFAD 2, installed in the vehicle seating position and engaged with the anchorages. The vehicle seat shall be installed in the vehicle, or in sufficient parts of the vehicle so as to be representative of the strength and rigidity of the vehicle structure. If the seat is adjustable, it shall be placed in the position recommended by the vehicle manufacturer for use

with child restraint systems. If no adjusted position is recommended, the seat shall be placed in any position, at the agency's option.

S15.2.2 Horizontal excursion of point X during application of the 8 kN and 5 kN forces must be not more than 125 mm, after preloading the device. The amount of displacement is measured relative to an undisturbed point on the vehicle body.

S15.3 *Forces and directions.*

S15.3.1 A rearward force of 135 N ±15 N shall be applied to the center of the lower front crossbar of SFAD 2 to press the device against the seat back as the fore-aft position of the rearward extensions of the SFAD is adjusted to remove any slack or tension. Forces shall be applied to SFAD 2 in forward and lateral directions according to the following table.

**TABLE TO S15.3.1—DIRECTIONS OF TEST FORCES**

| | | |
|---|---|---|
| Forward | 0° ±5° | 8 kN ±0.25 kN |
| Lateral | 75° ±5° (to both sides of straight forward) | 5 kN ±0.25 kN |

S15.3.2 Forces in the forward direction shall be applied with an initial force application angle of 10 ±5 degrees above the horizontal. Lateral forces shall be applied horizontally (0° ±5°). A pre-load force of 500 N ±25 N shall be applied at the prescribed loading point (point X) in Figure 17. The force shall be increased to 8 kN ±0.25 kN for forward tests, or to 5 kN ±0.25 kN for lateral tests. Full application of the force shall be achieved within a time period of 2 seconds or less. The force shall be maintained for a period of 0.25 seconds ±0.05 seconds.

S15.3.3 *Provisions for simultaneous and sequential testing.* (a) If anchorages for more than one child restraint anchorage system are installed in the vehicle seat assembly and not directly into the vehicle structure, the forces described in S15.3 may, at the agency's option, be applied simultaneously to SFADs engaged with the anchorages. However, that force may not be applied simultaneously to SFADs engaged at any two adjacent seating positions whose midpoints are less than 400 mm apart, as measured in accordance with S15.3.3(a)(1) and (2) and Figure 20.

(1) The midpoint of the seating position lies in the vertical longitudinal plane that is equidistant from vertical longitudinal planes through the geometric center of each of the two lower anchorages at the seating position.

(2) Measure the distance between the vertical longitudinal planes passing through the midpoints of the adjacent seating positions, as measured along a line perpendicular to the planes.

(b) The lower anchorages of a particular child restraint anchorage system will not be tested if one or both of the anchorages have been previously tested under this standard.

S15.4 *Marking and conspicuity of the lower anchorages.* At least one anchorage bar (when deployed for use), one guidance fixture, or one seat marking feature shall be readily visible to the person installing the CRF. If guidance fixtures are used to meet this requirement, the fixture(s) (although removable) must be installed. Storable anchorages shall be provided with a tell-tale or label that is visible when the anchorage is stored.

S16. *Phase-in of strength requirements for vehicles manufactured on or after September 1, 2004 and before September 1, 2005.* At anytime during the production year ending August 31, 2005, each manufacturer shall, upon request from the Office of Vehicle Safety Compliance, provide information identifying the vehicles (by make, model and vehicle identification number) that have been certified as complying with S6.3.1 or S6.3.4, and with S9.4 or S15.2 and S15.3. The manufacturer's designation of a vehicle as meeting the particular requirement is irrevocable.

S16.1 *Tether anchorage phase-in of strength requirements.* For vehicles manufactured on or after September 1, 2004 and before September 1, 2005, the number of vehicles complying with S6.3.1 shall be not less than 90 percent of:

(a) the manufacturer's average annual production of vehicle manufactured on or after September 1, 2001 and before September 1, 2004; or

(b) The manufacturer's production on or after September 1, 2004 and before September 1, 2005.

S16.2 *Lower anchorages phase-in of strength requirements.*

For vehicles manufactured on or after September 1, 2004 and before September 1, 2005, the number of vehicles complying with S9.4 shall be not less than 90 percent of:

(a) The manufacturer's average annual production of vehicle manufactured on or after September 1, 2001 and before September 1, 2004; or

(b) The manufacturer's production on or after September 1, 2003 and before September 1, 2004.

S16.3 *Vehicles produced by more than one manufacturer.*

S16.3.1 For the purpose of calculating average annual production of vehicles for each manufacturer and the number of vehicles manufactured by each manufacturer under S16.1 and S16.2, a vehicle produced by more than one manufacturer shall be attributed to a single manufacturer as follows, subject to S16.3.2.

(a) A vehicle which is imported shall be attributed to the importer.

(b) A vehicle manufactured in the United States by more than one manufacturer, one of which also markets the vehicle, shall be attributed to the manufacturer that markets the vehicle.

S16.3.2 A vehicle produced by more than one manufacturer must be attributed to any one of the vehicle's manufacturers specified by an express written contract, reported to the National Highway Traffic Safety Administration under 49 CFR part 585, between the manufacturer so specified and the manufacturer to which the vehicle would otherwise be attributed under S16.3.1.

S16.4 *Alternative phase-in schedules.*

(a) *Final-stage manufacturers and alterers.* A final-stage manufacturer or alterer may, at its option, comply with the requirements set forth in S16.4(a)(1) and (2), instead of the requirements set forth in S16.1 through S16.2.

(1) Vehicles manufactured on or after September 1, 2004 and before September 1, 2005 may meet the requirements of S6.3.4 instead of S6.3.1, and may meet the requirements of S15.2 and S15.3 instead of S9.4.

(2) Vehicles manufactured on or after September 1, 2005 must meet the requirements of S6.3.4 and S9.4.

(b) *Small volume manufacturers.* Vehicles manufactured on or after September 1, 2004 and before September 1, 2005 that are manufactured by a manufacturer that produces fewer than 5,000 vehicles worldwide annually may meet the requirements of S6.3.4 instead of S6.3.1, and may meet the requirements of S15.2 and S15.3 instead of S9.4. Vehicles manufactured on or after September 1, 2005 must meet the requirements of S6.3.4 and S9.4.

Figures to §571.225

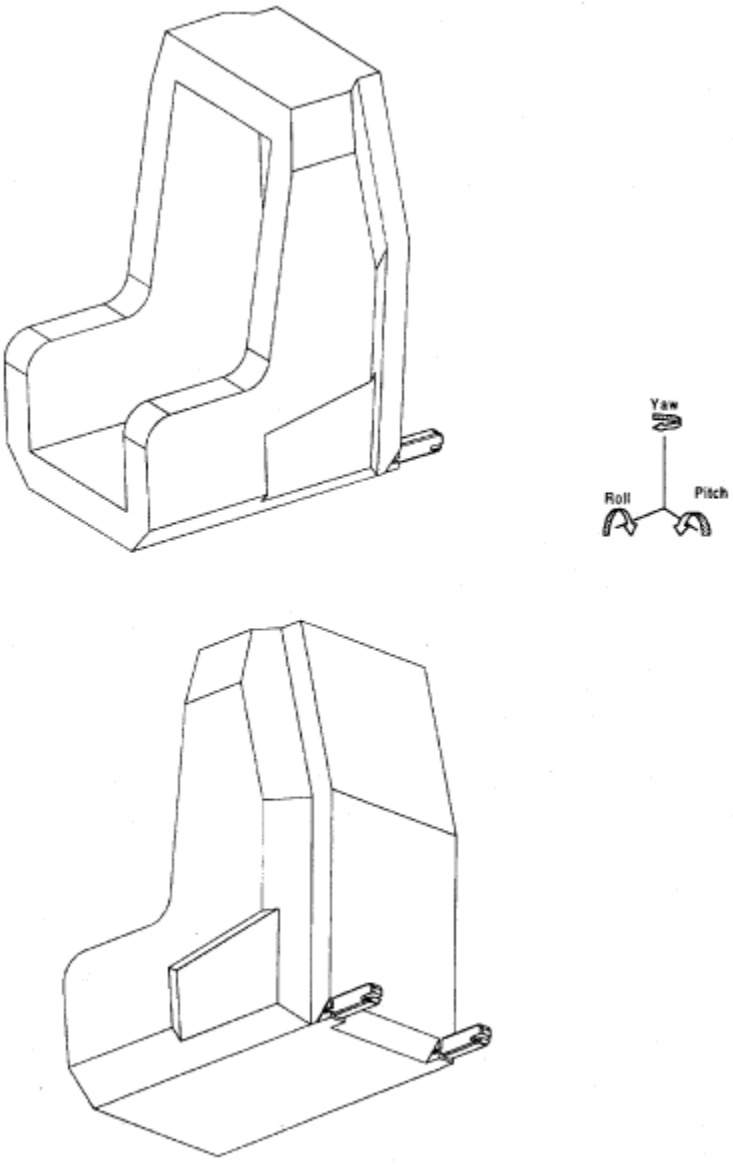


**Figure 1 – Child restraint fixture (CRF)**

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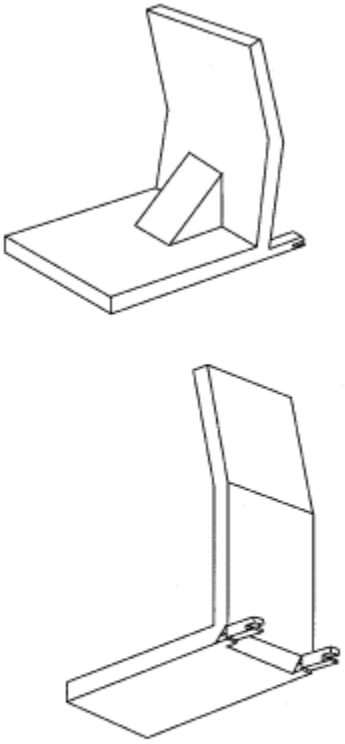

Figure 1A - Child Restraint Fixture (CRF) with Side and Top Frames Removed

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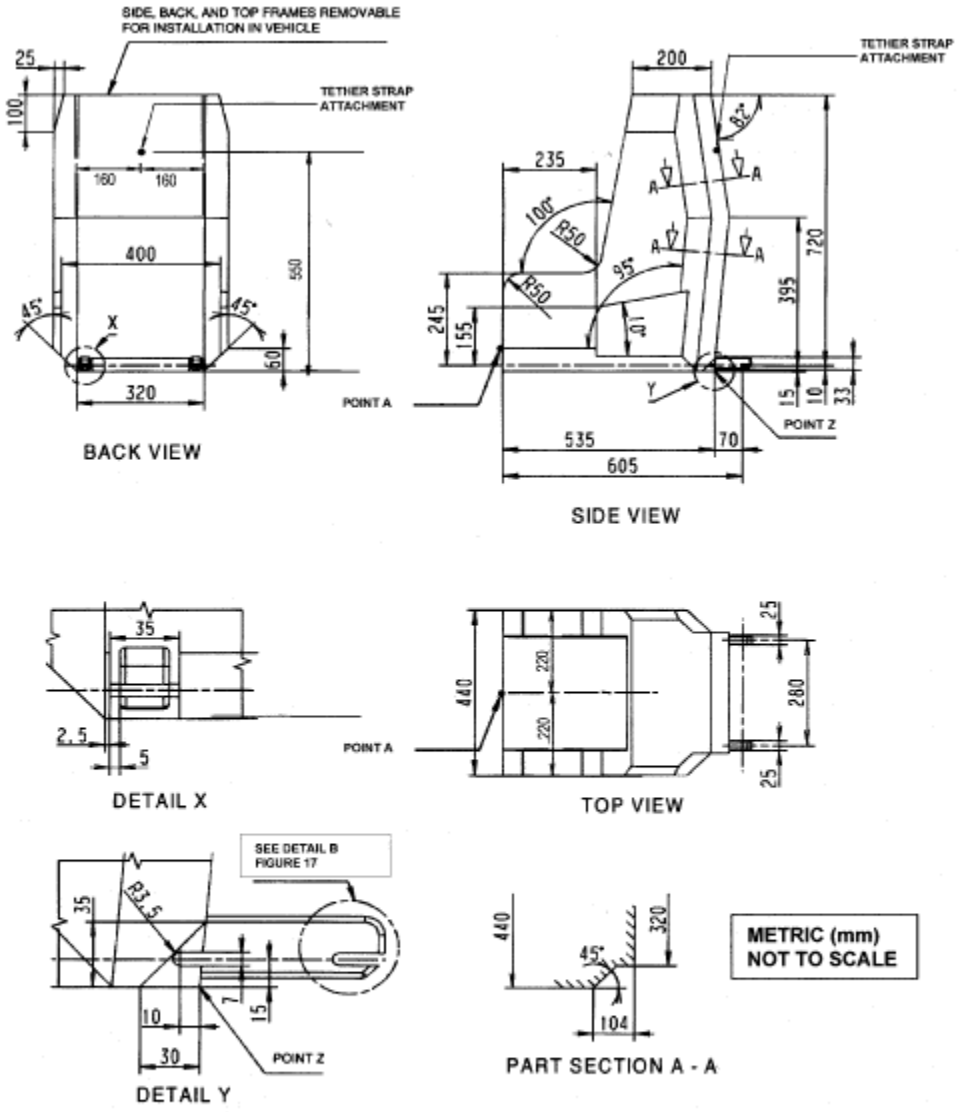


Note:
1. Mass of CRF 5 to 8 kg

**Figure 2 - Child restraint fixture (CRF)**

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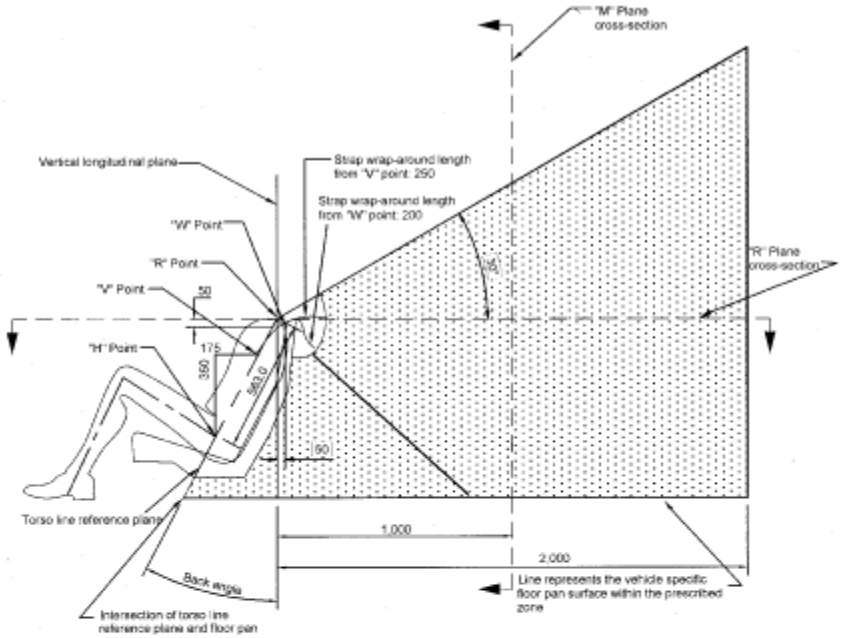


Notes

1. Dimensions in mm, except where otherwise indicated
2. Portion of user-ready tether anchorage that is designed to bind with the tether strap hook to be located within shaded zone
3. Drawing not to scale
4. "R" Point: Shoulder reference point
5. "V" Point: V-reference point, 350 mm vertically above and 175 mm horizontally back from H-point
6. "W" Point: W-reference point, 50 mm vertically below and 50 mm horizontally back from "R" Point
7. "M" Plane: M-reference plane, 1 000 mm horizontally back from "R" Point

**Figure 3 -- Side View, User-ready Tether Anchorage Location**

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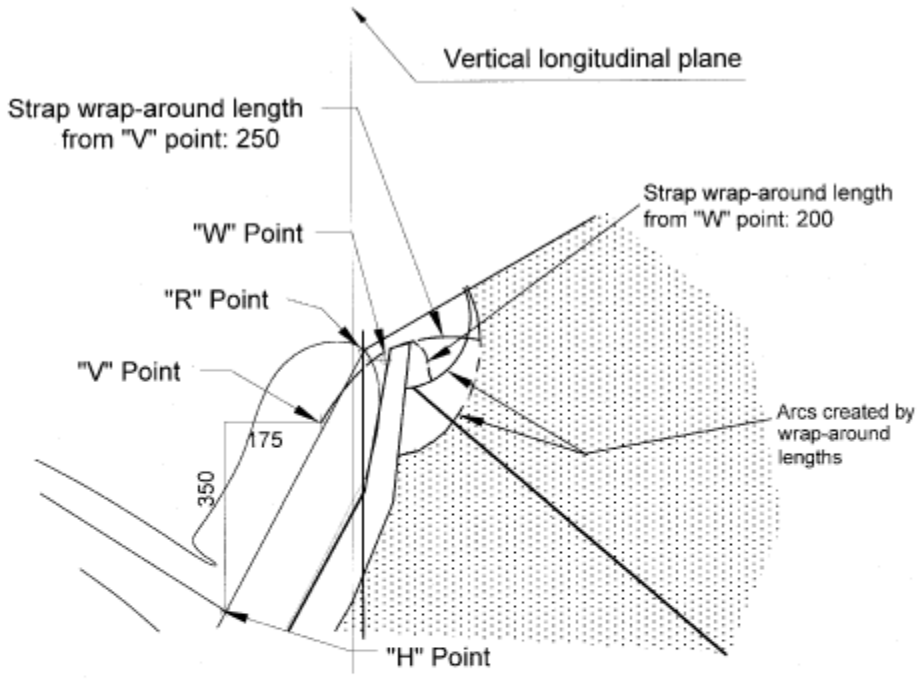


Notes

1. Dimensions in mm, except where otherwise indicated
2. Portion of user-ready tether anchorage that is designed to bind with the tether strap hook to be located within shaded zone
3. Drawing not to scale
4. "R" Point: Shoulder reference point
5. "V" Point: V-reference point, 350 mm vertically above and 175 mm horizontally back from H-point
6. "W" Point: W-reference point, 50 mm vertically below and 50 mm horizontally back from "R" Point
7. "M" Plane: M-reference plane, 1 000 mm horizontally back from "R" Point

**Figure 4 -- Enlarged Side View of Strap Wrap-around Area, User-ready Tether Anchorage Location**

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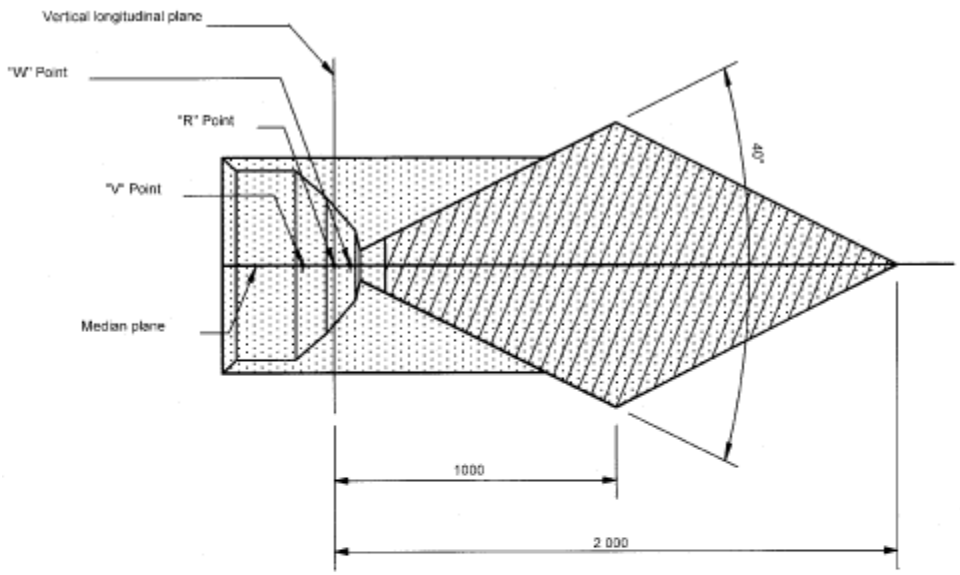


1. Dimensions in mm, except where otherwise indicated
2. Portion of user-ready tether anchorage that is designed to bind with the tether strap hook to be located within shaded zone
3. Drawing not to scale
4. "R" Point: Shoulder reference point
5. "V" Point: V-reference point, 350 mm vertically above and 175 mm horizontally back from H-point.
6. "W" Point: W-reference point, 50 mm vertically below and 50 mm horizontally back from "R" Point

**Figure 5. Plan View (R-plane Cross Section), User-ready Tether Anchorage Location**

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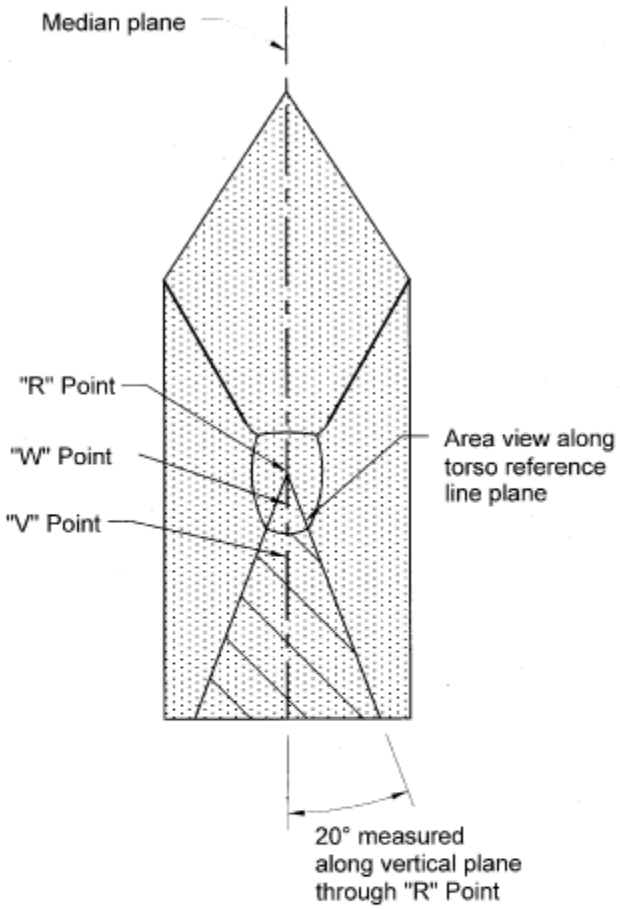


Notes
1. Portion of user-ready tether anchorage that is designed to bind with the tether strap hook to be located within shaded zone
2. Drawing not to scale
3. "R" Point: Shoulder reference point
4. "V" Point: V-reference point, 350 mm vertically above and 175 mm horizontally back from H-point
5. "W" Point: W-reference point, 50 mm vertically below and 50 mm horizontally back from "R" Point

**Figure 6 -- Front View, User-ready Tether Anchorage Location**

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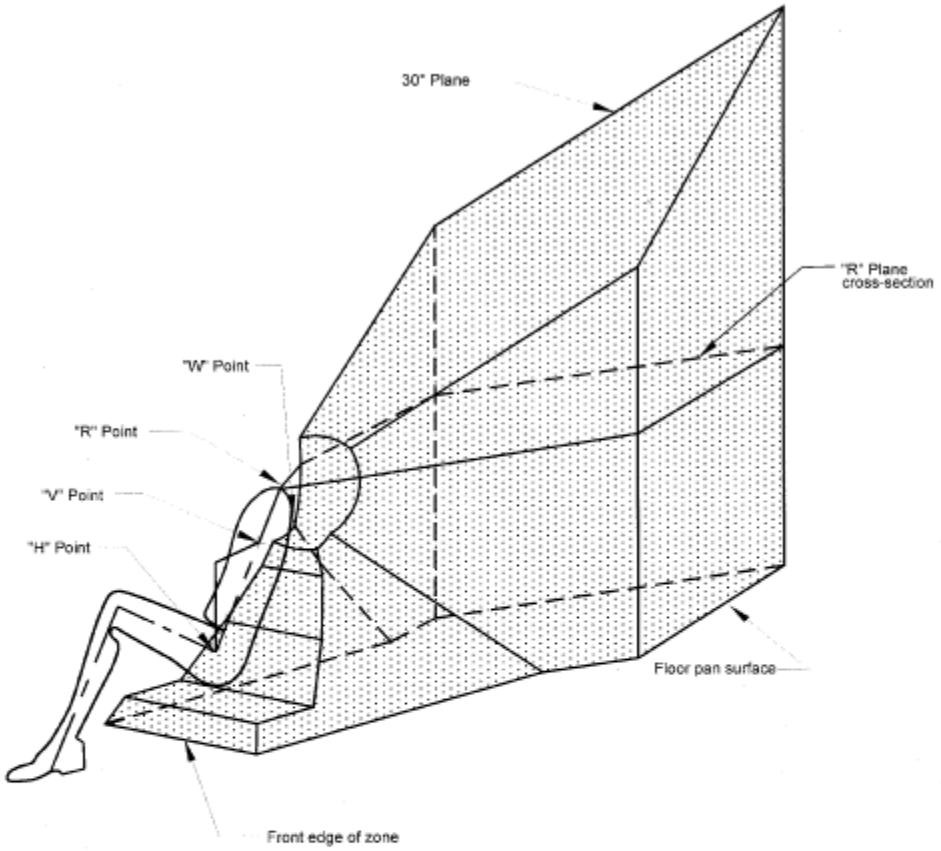


Notes

1. Portion of user-ready tether anchorage that is designed to bind with the tether strap hook to be located within shaded zone
2. Drawing not to scale
3. "R" Point: Shoulder reference point
4. "V" Point: V-reference point, 350 mm vertically above and 175 mm horizontally back from H-point
5. "W" Point: W-reference point, 50 mm vertically below and 50 mm horizontally back from "R" Point

**Figure 7 -- Three-dimensional Schematic View of User-ready Tether Anchorage Location**

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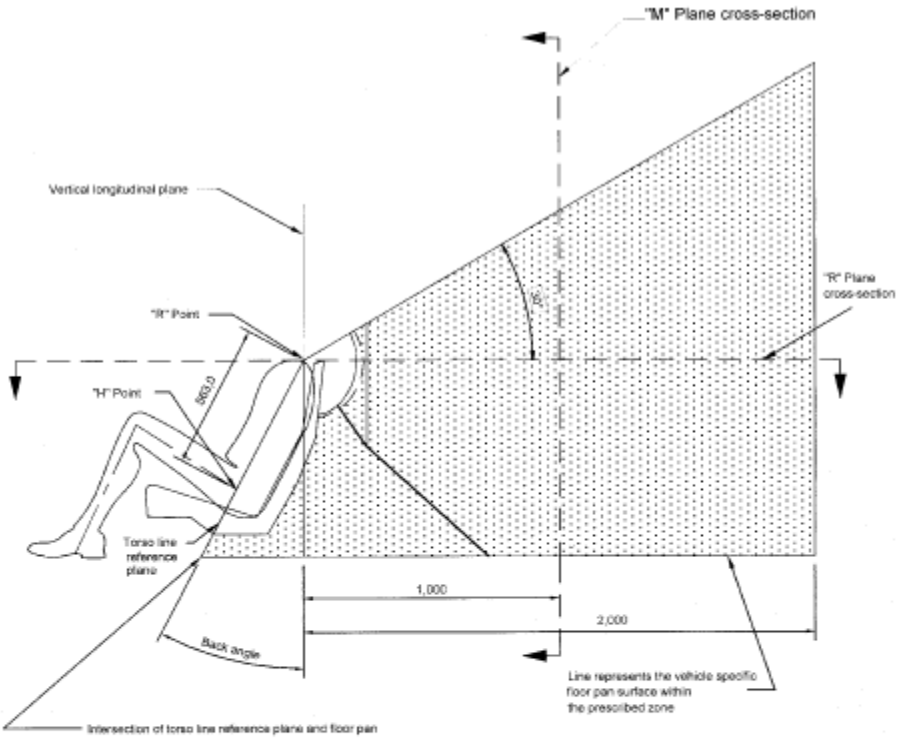


Notes

1. Dimensions in mm, except where otherwise indicated
2. Portion of user-ready tether anchorage that is designed to bind with the tether strap hook to be located within shaded zone
3. Drawing not to scale
4. "R" Point: Shoulder reference point
5. "M" Plane: M-reference plane, 1 000 mm horizontally back from "R" Point

**Figure 8 -- Side View, User-ready Tether Anchorage Optional Location for Passenger Cars and Multipurpose Passenger Vehicles until September 1, 2004**

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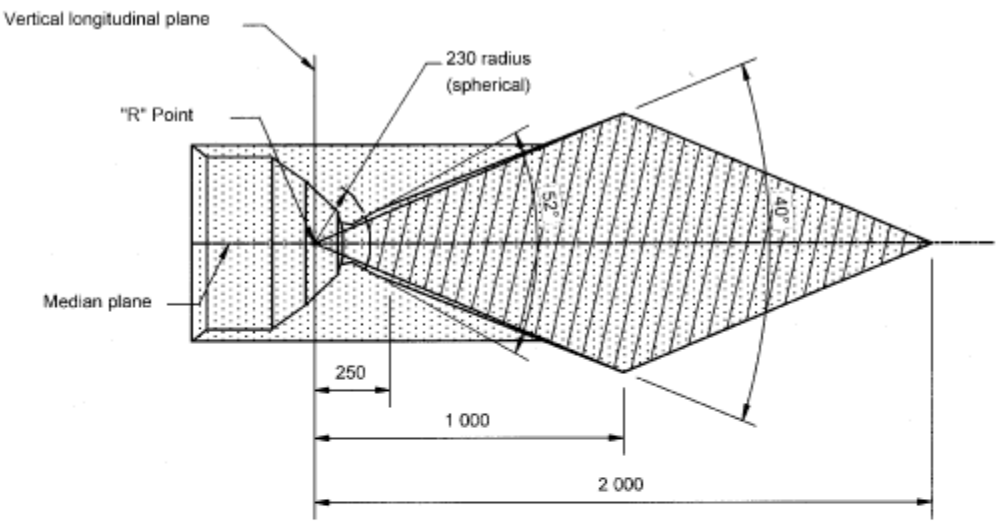


Notes

1. Dimensions in mm, except where otherwise indicated
2. Portion of user-ready tether anchorage that is designed to bind with the tether strap hook to be located within shaded zone
3. Drawing not to scale
4. "R" Point: Shoulder reference point

**Figure 9 -- Plan View (R-point Level), User-ready Tether Anchorage Optional Location for Passenger Cars and Multipurpose Passenger Vehicles until September 1, 2004**

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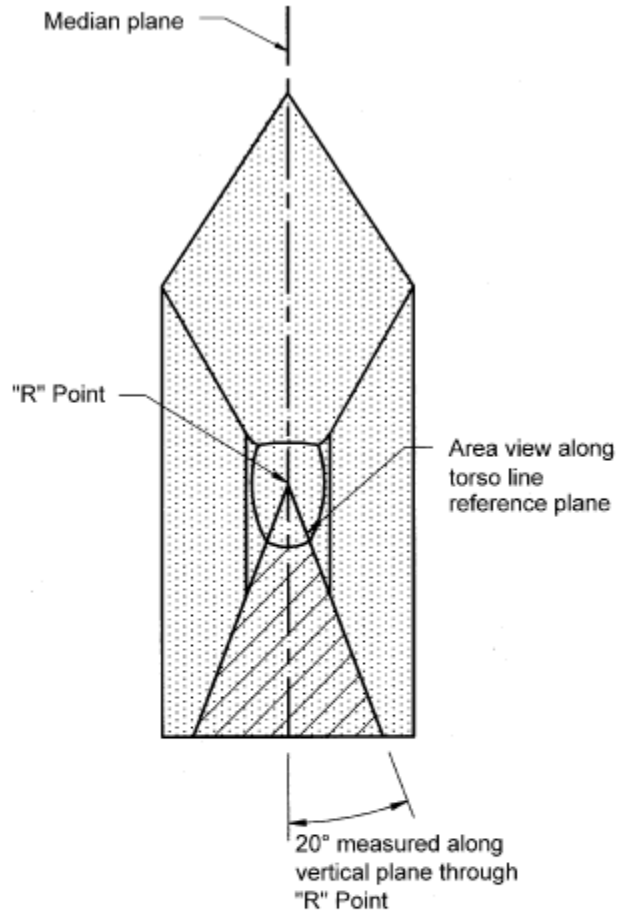


Notes

1. Portion of user-ready tether anchorage that is designed to bind with the tether strap hook to be located within shaded zone
2. Drawing not to scale
3. "R" Point: Shoulder reference point

**Figure 10 -- Front View, User-ready Tether Anchorage Optional Location for Passenger Cars and Multipurpose Passenger Vehicles until September 1, 2004**

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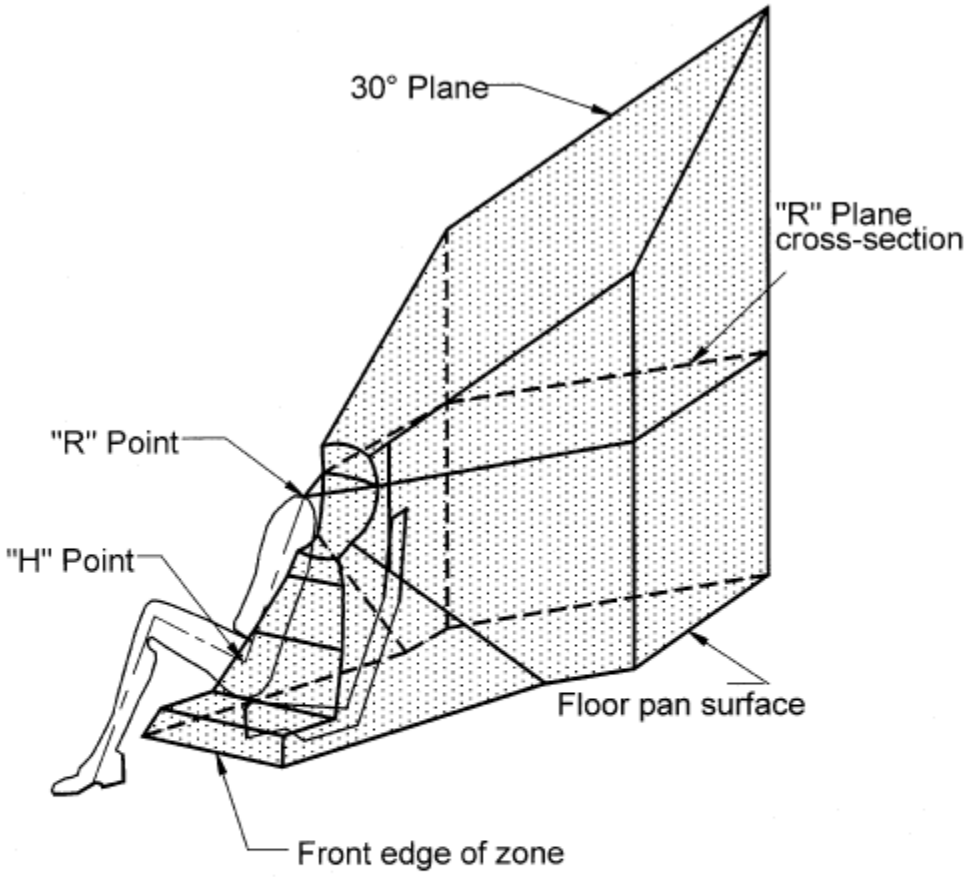


Notes

1. Portion of user-ready tether anchorage that is designed to bind with the tether strap hook to be located within shaded zone
2. Drawing not to scale
3. "R" Point: Shoulder reference point

**Figure 11 -- Three-dimensional Schematic View of User-ready Tether Anchorage Optional Location for Passenger Cars and Multipurpose Passenger Vehicles until September 1, 2004**

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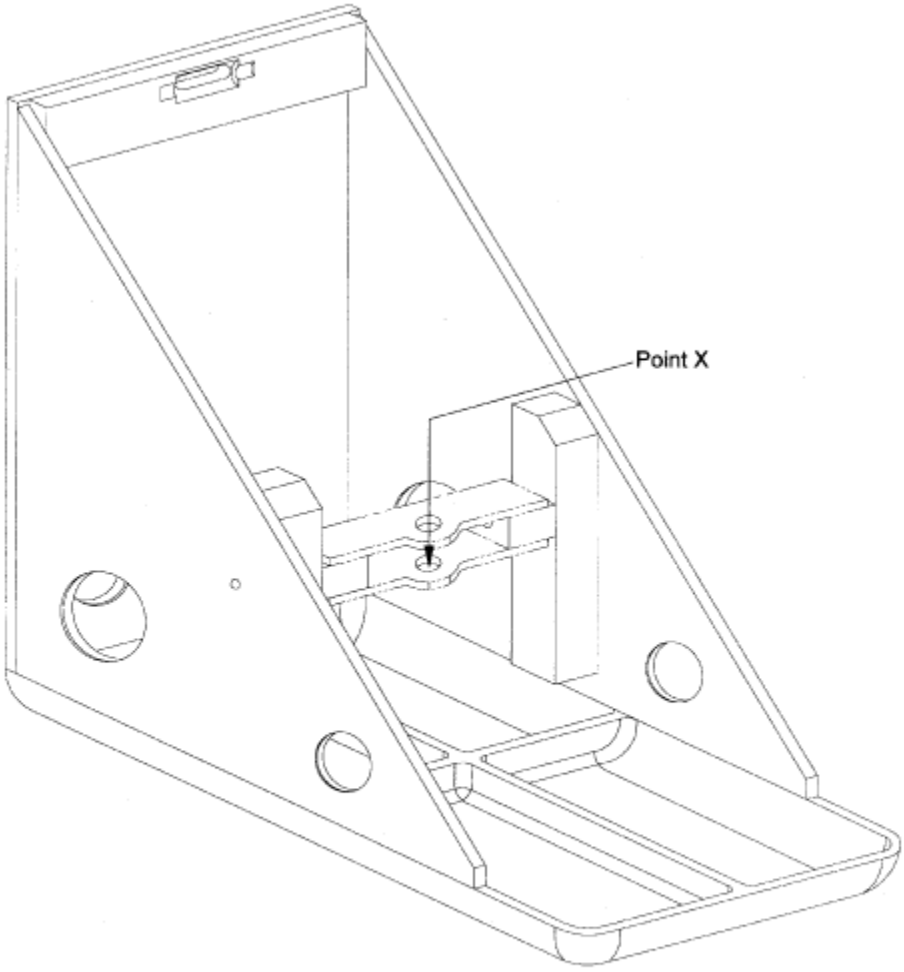


Figure 12 – Three Dimensional Schematic View of the Static Force Application Device 1 (SFAD 1)

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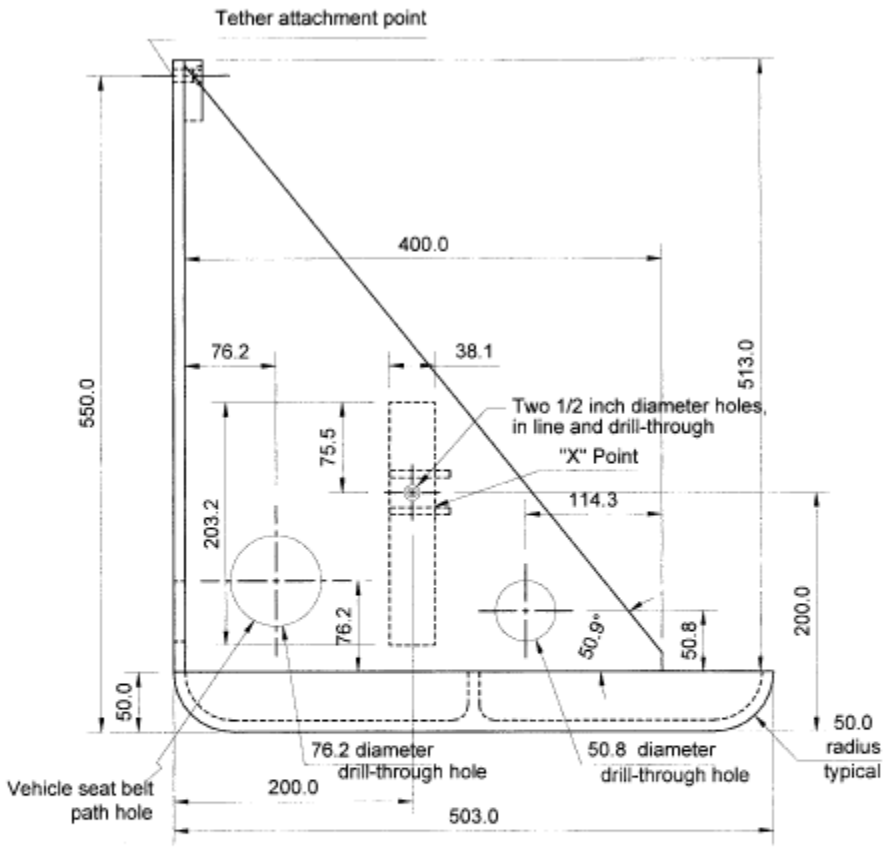


Notes

1. Material: 6061-T6-910 Aluminum
2. Dimensions in mm, except where otherwise indicated
3. Drawing not to scale
4. Break all outside corners

Figure 13 -- Side View, Static Force Application Device 1 (SFAD 1)

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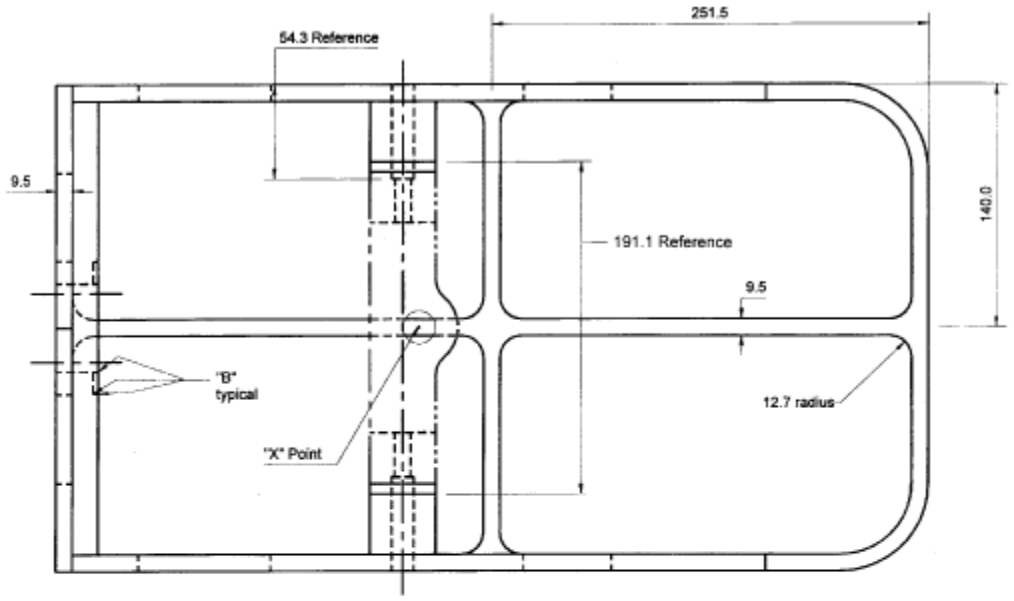


Notes

1. Material: 6061-T6-910 Aluminum
2. Dimensions in mm, except where otherwise indicated
3. Drawing not to scale
4. Break all outside corners and lightning hole edges 1.5 mm approximately.
5. Break edges of vehicle seat belt path holes at least 4 mm
6. "B" = approximately 0.8 mm

Figure 14 -- Plan View, Static Force Application Test Device 1 (SFAD 1)

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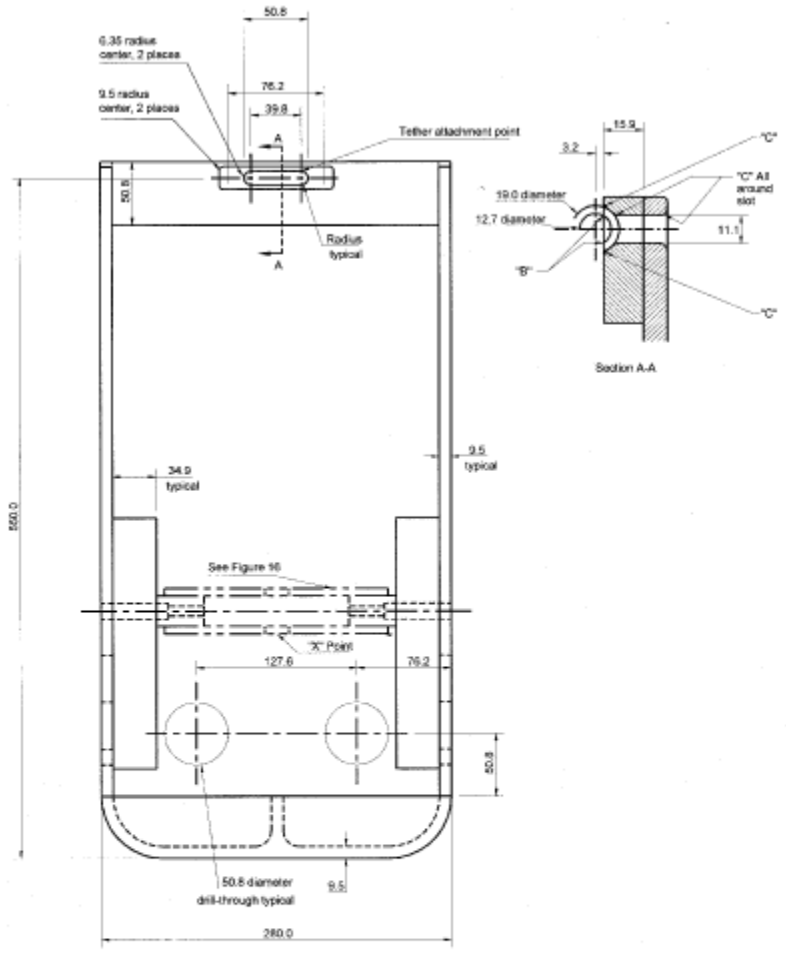


Notes
1. Material: 6061-T6-910 Aluminum
2. Dimensions in mm, except where otherwise indicated
3. Drawing not to scale
4. "B" = approximately 0.8 mm
5. "C" = approximately 3.2 mm

**Figure 15 -- Front View, Static Force Application Device 1 (SFAD 1)**

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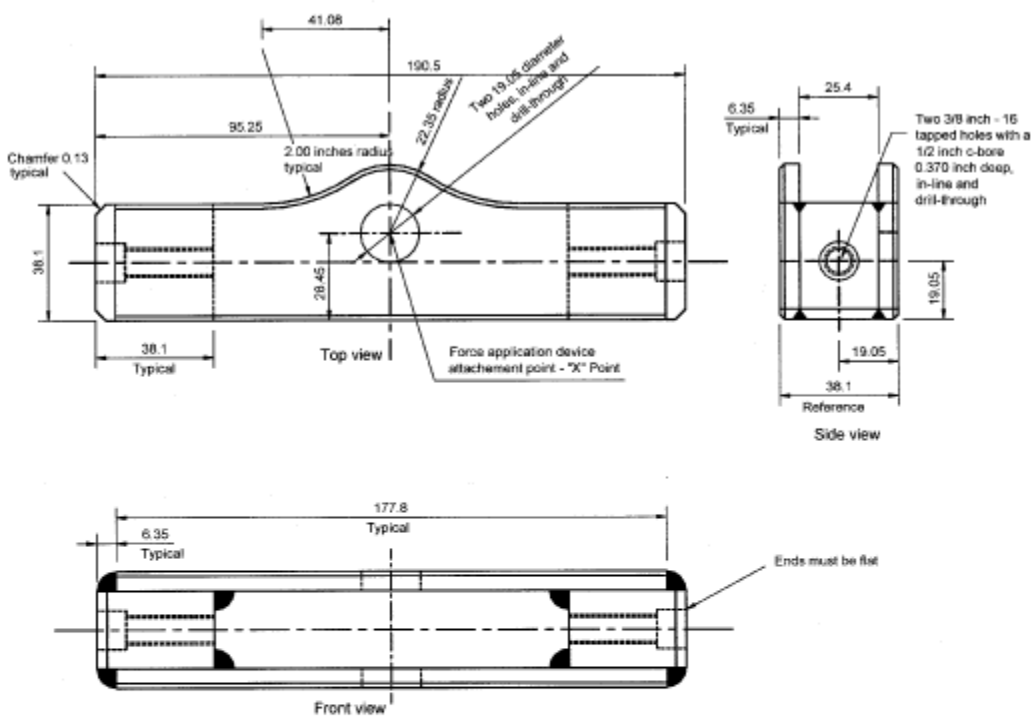


Notes
1. Material: Steel
2. Dimensions in mm, except where otherwise indicated
3. Drawing not to scale
4. Break all outside corners approximately 1.5 mm
5. Surfaces and edges are not to be machined unless otherwise specified for tolerance.
6. Saw-cut or stock size material whenever possible.
7. Construction to be securely welded.

**Figure 16 -- Cross Bar, Static Force Application Device 1 (SFAD 1)**

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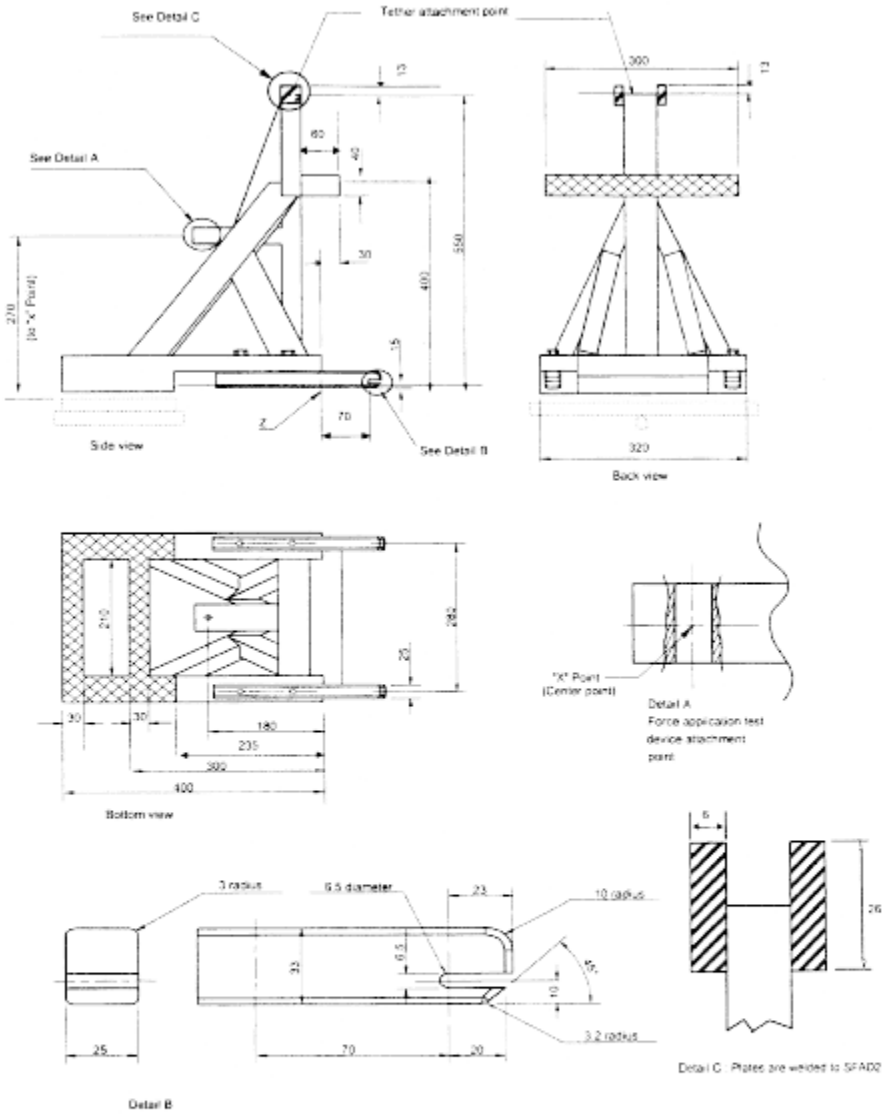


Notes:
1. Drawing not to scale
2. Dimensions in mm, except where otherwise indicated
3. Device stiffness satisfied when using a securely welded construction consisting of rectangular 3 mm steel tubing and 6 mm thick load application plate
4. If construction not as per note 3, stiffness of device is satisfied if movement of point "X" is not more than 2 mm in any direction when forces are applied as specified in S15.2.1, with device attached to rigid anchorage bars and the front cross member supported by a rigid bar that is held at the center by a longitudinal pivot 25 mm below the SFAD2 base (as shown in broken lines) to allow bending and twisting of the base of the device. Any deformation of the anchorage bars to be excluded from the measurements of the movement of point "X".

**Figure 17- Side, Back and Bottom Views, ISO 13216-1 Static Force Application Device 2 (SFAD 2)**

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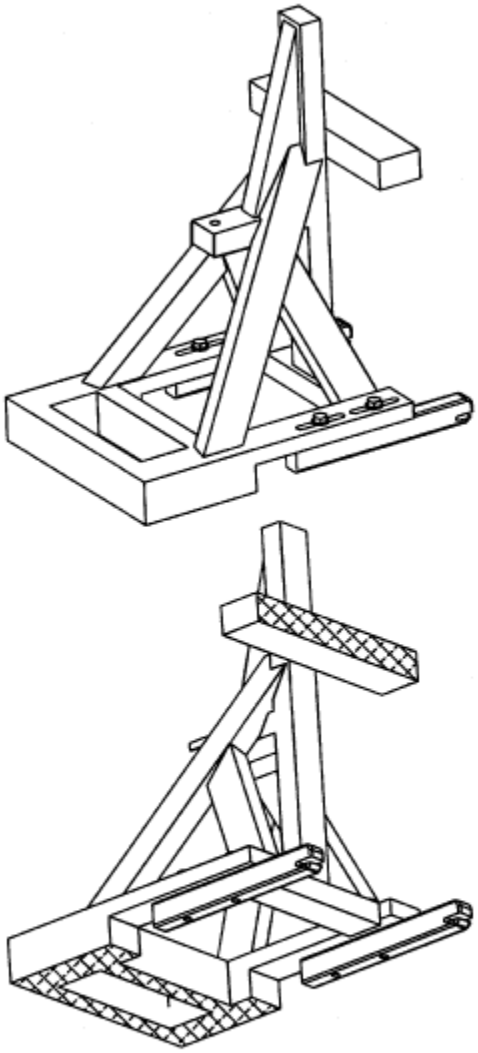

**Figure 18 -- Three-dimensional Schematic Views of the ISO 13216-1 Static Force Application Device 2 (SFAD 2)**

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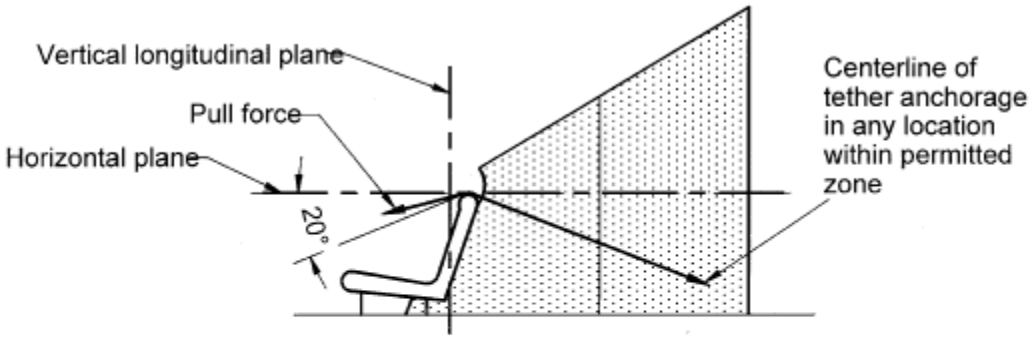


**Figure 19 – Side View, Optional Tether Anchorage Test for Passenger Cars until September 1, 2004**

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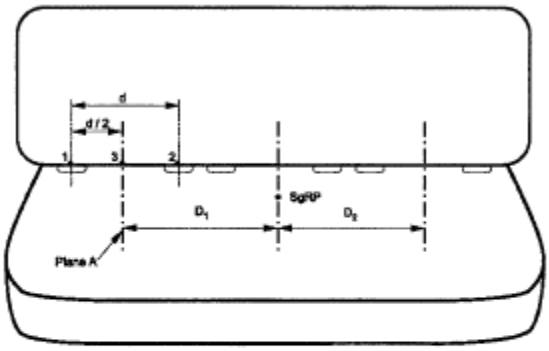


d = center to center distance between lower anchorages for a given seating position (nominally 280 mm).

D = distance between vertical longitudinal planes located midway between the anchorages for a given seating position.

SgRP = Seating reference point, as defined in 49 CFR §571.3.

**Figure 20 – Measurement of Distance Between Adjacent Seating Positions for Use in Simultaneous Testing**

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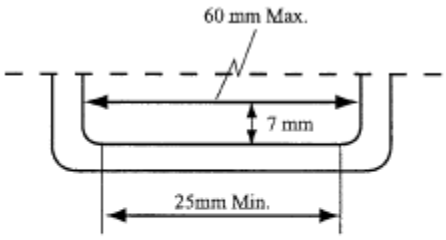


*Configuration shown is for illustration purposes only.*

Figure 21. Length of Lower Anchorage Bars

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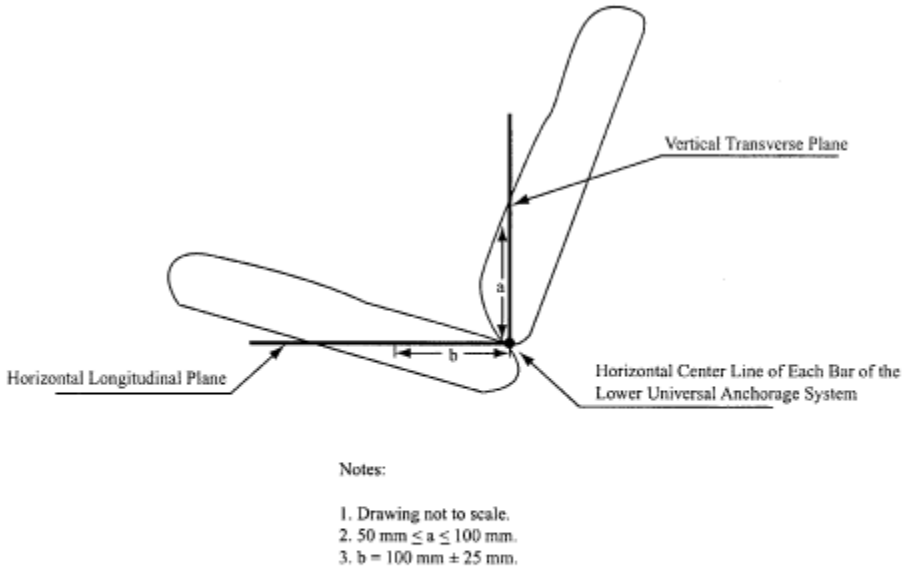


Notes:

1. Drawing not to scale.
2. 50 mm ≤ a ≤ 100 mm.
3. b = 100 mm ± 25 mm.

Figure 22. Placement of Symbol on the Seat Back and Seat Cushion of a vehicle

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[64 FR 10823, Mar. 5, 1999, as amended at 64 FR 47587, Aug. 31, 1999; 65 FR 46640, July 31, 2000; 68 FR 24667, May 8, 2003; 68 FR 38226, June 27, 2003; 69 FR 48823, Aug. 11, 2004; 69 FR 60565, Oct. 12, 2004; 69 FR 70915, Dec. 8, 2004; 77 FR 768, Jan. 6, 2012]

# §571.226 Standard No. 226; Ejection Mitigation.

S1. *Purpose and Scope.* This standard establishes requirements for ejection mitigation systems to reduce the likelihood of complete and partial ejections of vehicle occupants through side windows during rollovers or side impact events.

S2. *Application.* This standard applies to passenger cars, and to multipurpose passenger vehicles, trucks **with at least one designated seating position,** and buses with a gross vehicle weight rating of 4,536 kg or less, except walk-in vans, modified roof vehicles and convertibles. Also excluded from this standard are law enforcement vehicles, correctional institution vehicles, taxis and limousines, if they have a fixed security partition separating the 1st and 2nd or 2nd and 3rd rows and if they are produced by more than one manufacturer or are altered (within the meaning of 49 CFR 567.7).

S3. *Definitions.*

*Ejection impactor* means a device specified in S7.1 of this standard that is a component of the ejection mitigation test device and is the moving mass that strikes the ejection mitigation countermeasure.

*Ejection impactor targeting point* means the intersection of the y-axis of the ejection headform and the outer surface of the ejection headform.

*Ejection mitigation countermeasure* means a device or devices, except seat belts, integrated into the vehicle that reduce the likelihood of occupant ejection through a side window opening, and that requires no action by the occupant for activation.

*Ejection propulsion mechanism* means a device that is a component of the ejection mitigation test device consisting of a mechanism capable of propelling the ejection impactor and constraining it to move along its axis or shaft.

*Limited-line manufacturer* means a manufacturer that sells three or fewer carlines, as that term is defined in 49 CFR 583.4, in the United States during a production year.

*Modified roof* means the replacement roof on a motor vehicle whose original roof has been removed, in part or in total, or a roof that has to be built over the ~~driver's~~**occupant** compartment in vehicles that did not have an original roof over the ~~driver's~~**occupant** compartment.

*Movable window* means a daylight opening composed of glazing designed to be moved with respect to the vehicle or frame while the vehicle is in motion.

~~*Row means a set of one or more seats whose seat outlines do not overlap with the seat outline of any other seats, when all seats are adjusted to their rearmost normal riding or driving position, when viewed from the side.*~~

*Seat outline* means the outer limits of a seat projected laterally onto a vertical longitudinal vehicle plane.

*Side daylight opening* means, other than a door opening, the locus of all points where a horizontal line, perpendicular to the vehicle vertical longitudinal plane, is tangent to the periphery of the opening. The periphery includes surfaces 100 millimeters inboard of the inside surface of the window glazing and 25 mm outboard of the outside surface of the side glazing. The periphery excludes the following: any flexible gasket material or weather stripping used to create a waterproof seal between the glazing or door and the vehicle interior; grab handles used to facilitate occupant egress and ingress; and any part of a seat.

*Small manufacturer* means an original vehicle manufacturer that produces or assembles fewer than 5,000 vehicles annually for sale in the United States.

*Target* means the x-z plane projection of the ejection headform face as shown in Figure 1.

*Walk-in van* means a special cargo/mail delivery vehicle that only has a driver**'s** designated seating position. The vehicle has a sliding (or folding) side door and a roof clearance that enables a person of medium stature to enter the passenger compartment area in an up-right position.

*Zero displacement plane* means, a vertical plane parallel to the vehicle longitudinal centerline and tangent to the most outboard surface of the ejection headform when the headform is aligned with an impact target location and just touching the inside surface of a window covering the side daylight opening.

S4. *Phase-in, performance and other requirements.*

S4.1 *Phase-in requirements.*

S4.1.1 Except as provided in S4.1.3 of this standard, a percentage of each manufacturer's vehicle production, as specified in S8 of this standard, manufactured on or after September 1, 2013 to August 31, 2017, shall meet the requirements of S4.2. Vehicles that are not subject to the phase-in may be certified as meeting the requirements specified in this standard.

S4.1.2 Except as provided in S4.1.3 of this section, each vehicle manufactured on or after September 1, 2017 must meet the requirements of S4.2 without use of advanced credits.

S4.1.3 *Exceptions from the phase-in; special allowances.*

(a) Vehicles produced by a small manufacturer and by a limited line manufacturer are not subject to S4.1.1 of this standard, but are subject to S4.1.2.

(b) Vehicles that are altered (within the meaning of 49 CFR 567.7) before September 1, 2018, after having been previously certified in accordance with part 567 of this chapter, and vehicles manufactured in two or more stages before September 1, 2018, are not required to meet the requirements of S4.2. Vehicles that are altered on or after September 1, 2018, and vehicles that are manufactured in two or more stages on or after September 1, 2018, must meet the requirements of S4.2.

S4.2 *Performance and other requirements.*

S4.2.1 When the ejection propulsion mechanism propels the ejection impactor into the impact target locations of each side daylight opening of a vehicle according to the test procedures specified in S5 of this standard, the most outboard surface of the ejection headform must not displace more than 100 millimeters beyond the zero displacement plane.

S4.2.1.1 No vehicle shall use movable glazing as the sole means of meeting the displacement limit of S4.2.1.

S4.2.1.2 Vehicles with an ejection mitigation countermeasure that deploys in the event of a rollover must deploy the countermeasure for the side daylight opening being tested according to the procedure specified in S5 of this standard.

S4.2.1.3 If a side daylight opening contains no target locations, the impact test of S4.2.1 is not performed on that opening.

S4.2.2 Vehicles that have an ejection mitigation countermeasure that deploys in the event of a rollover must have a monitoring system with a readiness indicator. The indicator shall monitor its own readiness and must be clearly visible from the driver's designated seating position **and clearly visible from any designated seating position if no driver's seating position is occupied or present**. The same readiness indicator required by S4.5.2 of FMVSS No. 208 may be used to meet the requirement. A list of the elements of the system being monitored by the indicator shall be included with the information furnished in accordance with S4.2.3.

S4.2.3 *Written information.*

(a) Vehicles with an ejection mitigation countermeasure that deploys in the event of a rollover must be described as such in the vehicle's owner manual or in other written information provided by the vehicle manufacturer to the consumer.

(b) Vehicles that have an ejection mitigation countermeasure that deploys in the event of a rollover must include in written information a discussion of the readiness indicator required by S4.2.2, specifying a list of the elements of the system being monitored by the indicator, a discussion of the purpose and location of the telltale, and instructions to the consumer on the steps to take if the telltale is illuminated.

S4.2.4 *Technical Documentation.* For vehicles that have an ejection mitigation countermeasure that deploys in the event of a rollover, the vehicle manufacturer must make available to the agency, upon request, the following information: A discussion of the sensor system used to deploy the countermeasure, including the pertinent inputs to the computer or calculations within the computer and how its algorithm uses that information to determine if the countermeasure should be deployed.

S5. *Test procedures.*

S5.1 Demonstrate compliance with S4.2 of this standard in accordance with the test procedures specified in this standard, under the conditions of S6, using the equipment described in S7. In the impact test described by these procedures, target locations are identified (S5.2) and the zero displacement plane location is determined (S5.3). The glazing is pre-broken, fully retracted or removed prior to the impact test (S5.4). The countermeasure is deployed, if applicable, and an ejection impactor (see S7.1) strikes the countermeasure at the impact target locations, at the specified speeds and times (S5.5). The lateral displacement of the ejection impactor beyond the zero displacement plane is measured.

S5.2 *Determination of impact target locations.*

S5.2.1 *Boundary of target location.*

S5.2.1.1 *Initial determination of offset line.* Determine the location of an offset-line within the side daylight opening by projecting each point of the side daylight opening laterally onto a vehicle vertical longitudinal plane. Move each point by 25±2 mm towards the center of the side daylight opening projection and perpendicular to a line tangent to the projection at that point, while maintaining the point on a vehicle vertical longitudinal plane.

S5.2.1.2 *Rearmost limit of offset line.*

(a) *Seats fixed in a forward facing direction.* Except as provided in S5.2.1.2(b), if an offset line extends rearward of a transverse vertical vehicle plane located behind the seating reference point at the distance specified in 5.2.1.2(a)(1) or (2), the transverse vertical vehicle plane defines the rearward edge of the offset line for the purposes of determining target locations.

(1) For a vehicle with fewer than 3 rows—1,400 mm behind the rearmost SgRP.

(2) For a vehicle with 3 or more rows—600 mm behind the 3rd row SgRP.

(b) *Seats not fixed in a forward facing direction.* When the last row seat adjacent to the opening, in the case of a vehicle with fewer than 3 rows, or the 3rd row seat adjacent to the opening, in the case of a vehicle with 3 or more rows, is not fixed in the forward facing direction, the offset line may extend farther rearward than specified in S5.2.1.2(a) under the following conditions. With the seat in any non-forward facing orientation, the seat back set at an inclination position closest to the manufacturer's design seat back angle, and all other seat adjustments at any possible position of adjustment, determine the location of a vertical transverse vehicle plane located behind the portion of the seat rearmost in the vehicle, at the distance specified in 5.2.1.2(b)(1) and (2). The boundary of target locations extends to this vertical plane if it is farther rearward than the plane determined in S5.2.1.2(a).

(1) For a vehicle with fewer than 3 rows—1,400 mm behind the portion of the seat rearmost in the vehicle.

(2) For a vehicle with 3 or more rows—600 mm behind the portion of the seat rearmost in the vehicle, for a seat in the 3rd row.

(c) *Vehicles with partitions or bulkheads.* If a vehicle has a fixed transverse partition or bulkhead behind which there are no designated seating positions, a vertical transverse vehicle plane 25 mm forward of the most forward portion of the partition or bulkhead defines the rearward edge of the offset line for the purposes of determining target locations when said plane is forward of the limiting plane defined in S5.2.1.2(a) or (b).

S5.2.2 *Preliminary target locations.*

(a) To identify the impact target locations, the following procedures are performed with the x and z axes of the target, shown in Figure 1 (provided for illustration purposes), aligned within ±1 degree of the vehicle longitudinal and vertical axes, respectively, and the target y axis pointing in the outboard direction.

(b) Place targets at any location inside the offset-line where the target is tangent to within ±2 mm of the offset-line at just two or three points (see Figure 2) (figure provided for illustration purposes).

S5.2.3 *Determination of primary target locations.* Divide the side daylight opening into four quadrants by passing a vertical line and a horizontal line, in a vehicle vertical longitudinal plane, through the geometric center of the side daylight opening.

S5.2.3.1 *Front windows.* For any side daylight opening forward of the vehicle B-pillar, the primary quadrants are the forward-lower and rearward-upper.

S5.2.3.2 *Rear windows.* For any side daylight opening rearward of the B-pillar, the primary quadrants are the forward-upper and rearward-lower.

S5.2.3.3 If a primary quadrant contains only one target center, that target is the primary target for that quadrant (*see* Figure 3) (figure provided for illustration purposes). If there is more than one target center in a primary quadrant, the primary target for that quadrant is the lowest target in a lower quadrant and the highest target in an upper quadrant. If there is a primary quadrant that does not contain a target center, the target center closest to the primary quadrant outline is the primary target.

S5.2.4 *Determination of secondary target locations.*

S5.2.4.1 *Front windows.* Measure the horizontal distance between the centers of the primary targets. For a side daylight opening forward of the B-pillar, place one secondary target center rearward of the forward primary target by one-third of the horizontal distance between the primary target centers and tangent with upper portion of the offset-line. Place another secondary target center rearward of the forward primary target by two-thirds of the horizontal distance between the primary target centers and tangent with the lower portion of the offset-line (*see* figure 4) (figure provided for illustration purposes).

S5.2.4.2 *Rear windows.* For side daylight openings rearward of the B-pillar, place one secondary target center rearward of the forward primary target by one-third of the horizontal

distance between the primary target centers and tangent with lower portion of the offset-line. Place another secondary target center rearward of the forward primary target by two-thirds of the horizontal distance between the primary target centers and tangent with the upper portion of the offset-line (*see* Figure 4) (figure provided for illustration purposes).

S5.2.5 *Target adjustment.*

S5.2.5.1 *Target elimination and reconstitution.*

S5.2.5.1.1 *Target elimination.* Determine the horizontal and vertical distance between the centers of the targets. If the minimum distance between the z axes of the targets is less than 135 mm and the minimum distance between the x axes of the targets is less than 170 mm, eliminate the targets in the order of priority given in steps 1 through 4 of Table 1 (see Figure 5, 5a and 5b) (figures provided for illustration purposes). In each case, both the z axes of the targets must be closer than 135 mm and x axes of the targets must be closer than 170 mm. If the minimum distance between the z axes of the targets is not less than 135 mm or the minimum distance between the x axes of the targets is not less than 170 mm, do not eliminate the target. Continue checking all the targets listed in steps 1 through 4 of Table 1.

Table 1—Priority List of Target Distance To Be Checked Against Limits

| **Step** | **Measure distance from z axis to z axis and x axis to x axis for these targets** | **Eliminate this target if distances between z axes of targets and x axes of targets are less than 135 mm and 170 mm, respectively** |
|---|---|---|
| 1 | Upper Secondary to Lower Secondary | Upper Secondary. |
| 2 | Upper Primary to Upper or Remaining Secondary | Upper or Remaining Secondary. |
| 3 | Lower Primary to Lower or Remaining Secondary | Lower or Remaining Secondary. |
| 4 | Upper Primary to Lower Primary | Upper Primary. |

S5.2.5.1.2 *Target reconstitution.* If after following the procedure given in S5.2.5.1.1, there are only two targets remaining, determine the absolute distance between the centers of these targets. If this distance is greater than or equal to 360 mm, place a target such that its center bisects a line connecting the centers of the remaining targets.

S5.2.5.2 *Target reorientation—90 degree rotation.* If after following the procedure given in S5.2.5.1 there are less than four targets in a side daylight opening, repeat the procedure in 5.2 through 5.2.5.1.2, with a modification to S5.2 as follows. Reorient the target by rotating it 90 degrees about the y axis of the target such that the target positive z axis is aligned within ±1 degree of the vehicle longitudinal axis, pointing in the direction of the vehicle positive x axis (see Figures 5a and 5b) (figures provided for illustration purposes). If after performing the procedure in this section, the remaining targets exceed the number of targets determined with the

original orientation of the target, the reoriented targets represent the final target locations for the side daylight opening.

S5.2.5.3 *Target reorientation incremental rotation.* If after following the procedure given in S5.2.5.2 there are no targets in a side daylight opening, starting with the target in the position defined in S5.2.2(a), reorient the target by rotating it in 5 degree increments about the y axis of the target by rotating the target positive z axis toward the vehicle positive x axis. At each increment of rotation, attempt to fit the target within the offset line of the side daylight opening. At the first increment of rotation where the target will fit, place the target center as close as possible to the geometric center of the side daylight opening. If more than one position exists that is closest to the geometric center of the side daylight opening, select the lowest.

S5.3 *Determination of zero displacement plane.* The glazing covering the target location of the side daylight opening being tested is intact and in place in the case of fixed glazing and intact and fully closed in the case of movable glazing. With the ejection impactor targeting point aligned within ±2 mm of the center of any target location specified in S5.2, and with the ejection impactor on the inside of the vehicle, slowly move the impactor towards the window until contact is made with the interior of the glazing with no more than 20 N of pressure being applied to the window. The location of the most outboard surface of the headform establishes the zero displacement plane for this target location.

S5.4 *Window position and condition.*Subject to S5.5(b), prior to impact testing, the glazing covering the target location must be removed from the side daylight opening, fully retracted, or pre-broken according to the procedure in S5.4.1, at the vehicle manufacturer's option.

S5.4.1 *Window glazing pre-breaking procedure.*

S5.4.1.1 *Breakage pattern.* Locate the geometric center of the side daylight opening, established in S5.2.3 of this standard. Mark the outside surface of the window glazing in a horizontal and vertical grid of points separated by 75±2 mm with one point coincident within ±2 mm of the geometric center of the side daylight opening (see Figure 6) (figure provided for illustration purposes). Mark the inside surface of the window glazing in a horizontal and vertical grid of points separated by 75±2 mm with the entire grid horizontally offset by 37.5 ±2 mm from the grid of points on the outside of the glazing.

S5.4.1.2 *Breakage method.*

(a) Start with the inside surface of the window and forward-most, lowest mark made as specified in S5.4.1.1 of this standard. Use a center punch in this procedure. The punch tip has a 5 ±2 mm diameter prior to coming to a point. The spring is adjusted to require 150 ±25 N of force to activate the punch. Only once at each mark location, apply pressure to activate the spring in the center punch in a direction which is perpendicular to the tangent of the window surface at the point of contact, within ±10 degrees. Apply the pressure only once at each mark location, even if the glazing does not break or no hole results.

(b) Use a 100 ±10 mm × 100 ±10 mm piece of plywood with a minimum thickness of 18 mm as a reaction surface on the opposite side of the glazing to prevent to the extent possible the window surface from deforming by more than 10 mm when pressure is being applied to the hole-punch.

(c) Continue the procedure with the center punch by moving rearward in the grid until the end of a row is reached. When the end of a row is reached, move to the forward-most mark on the next higher row and continue the procedure. Continue in this pattern until the procedure is conducted at each marked location on the inside surface of the glazing.

(d) Repeat the process on the outside surface of the window.

(e) If punching a hole causes the glazing to disintegrate, halt the breakage procedure and proceed with the headform impact test.

S5.5 *Impact speeds and time delays.* The ejection impactor speeds specified below must be achieved after propulsion has ceased.

(a) *Vehicles with or without an ejection mitigation countermeasure that deploys in a rollover.* For a vehicle with an ejection mitigation countermeasure that deploys in a rollover, using the ejection propulsion mechanism, propel the ejection impactor such that it first strikes the countermeasure, while aligned with any target location specified in S5.2 of this standard, 1.5 ±0.1 seconds after activation of the ejection mitigation countermeasure that deploys in the event of a rollover, and at a speed of 20 ±0.5 km/h. For a vehicle without an ejection mitigation countermeasure that deploys in a rollover, propel the ejection impactor at any time such that it first strikes the countermeasure, while aligned with any target location specified in S5.2 of this standard, at a speed of 20 ±0.5 km/h.

(b) *Vehicles with an ejection mitigation countermeasure that deploys in a rollover.* For a vehicle with an ejection mitigation countermeasure that deploys in a rollover, remove or fully retract any movable glazing from the side daylight opening. Using the ejection propulsion mechanism, propel the ejection impactor such that it first strikes the countermeasure, while aligned with any target location specified in S5.2 of this standard, 6.0 ±0.1 seconds after activation of an ejection mitigation countermeasure that deploys in the event of a rollover, and at a speed of 16 ±0.5 km/h.

(c) An ejection mitigation countermeasure that deploys in the event of a rollover is described as such in the vehicle's owner manual or in other written information provided by the vehicle manufacturer to the consumer.

S5.6 *Ejection impactor orientation.*

S5.6.1 If the targets for the side daylight opening being impacted were determined by the procedure specified in S5.2.2 through S5.2.5.1 only, the ejection impactor orientation is as follows. At the time of launch of the ejection impactor the x, y and z axes of the ejection headform must be aligned within ±1 degree of the vehicle longitudinal, transverse and vertical axes, respectively.

S5.6.2 If the targets for the side daylight opening being impacted were determined by the procedure specified in S5.2.5.2, the ejection impactor orientation is as follows. At the time of launch the ejection impactor is rotated by 90 degrees about the ejection headform y axis, from the orientation specified in S5.6.1, resulting in the headform positive z axis pointing in the direction of the vehicle positive x axis.

S5.6.3 If the targets for the side daylight opening being impacted were determined by the procedure specified in S5.2.5.3, the ejection impactor orientation is as follows. At the time of launch the ejection impactor is rotated about the y axis of the ejection headform by rotating the headform positive z axis towards the vehicle positive x axis, in the increment determined to be necessary in S5.2.5.3 to fit the target within the side daylight opening.

S5.6.4 After any test, extend the ejection impactor to the zero plane and determine that x, y and z axes of the ejection headform remain aligned within ±1 degree of its orientation at launch as specified in S5.6.1—5.6.3.

S6 *General test conditions.*

S6.1 *Vehicle test attitude.* The vehicle is supported off its suspension at an attitude determined in accordance with S6.1(a) through (f).

(a) The vehicle is loaded to its unloaded vehicle weight.

(b) All tires are inflated to the manufacturer's specifications listed on the vehicle's tire placard.

(c) Place vehicle on a level surface.

(d) Pitch: Measure the sill angle of the ~~driver~~**left front** door sill and mark where the angle is measured.

(e) Roll: Mark a point on the vehicle body above the left and right front wheel wells. Determine the vertical height of these two points from the level surface.

(f) Support the vehicle off its suspension such that the ~~driver~~**left front** door sill angle is within ±1 degree of that measured at the marked area in S6.1(d) and the vertical height difference of the two points marked in S6.1(e) is within ±5 mm of the vertical height difference determined in S6.1(e).

S6.2 *Doors.*

(a) Except as provided in S6.2(b) or S6.2(c), doors, including any rear hatchback or tailgate, are fully closed and latched but not locked.

(b) During testing, any side door on the opposite side of the longitudinal centerline of the vehicle from the target to be impacted may be open or removed.

(c) During testing, any rear hatchback or tailgate may be open or removed for testing any target.

S6.3 *Steering wheel, steering column, seats, grab handles, and exterior mirrors.* During targeting and testing, the steering wheel, steering column, seats, grab handles and exterior mirrors may be removed from the vehicle or adjusted to facilitate testing and/or provide an unobstructed path for headform travel through and beyond the vehicle.

S6.4 *Other vehicle components and structures.* During targeting and testing, interior vehicle components and vehicle structures other than specified in S6.2 and S6.3 may be removed or adjusted to the extent necessary to allow positioning of the ejection propulsion mechanism and provide an unobstructed path for the headform travel through and beyond the vehicle.

S6.5 *Temperature and humidity.*

(a) During testing, the ambient temperature is between 18 degrees C. and 29 degrees C., at any relative humidity between 10 percent and 70 percent.

(b) The headform specified in S7.1.1 of this standard is exposed to the conditions specified in S6.5(a) for a continuous period not less than one hour, prior to the test.

S7. *Ejection mitigation test device specifications.* The ejection mitigation test device consists of an ejection impactor and ejection propulsion mechanism with the following specifications. The ability of a test device to meet these specifications may be determined outside of the vehicle.

S7.1 *Ejection impactor.* The ejection impactor consists of an ejection headform attached to a shaft. The ejection impactor has a mass of 18 kg ±0.05 kg. The shaft is parallel to the y axis of the headform.

S7.1.1 *Ejection headform dimensions.* The ejection headform has the dimensions shown in Figure 1 and is depicted in the "Parts List; Ejection Mitigation Headform Drawing Package," December 2010, and the "Parts List and Drawings; Ejection Mitigation Headform Drawing Package," December 2010 (incorporated by reference; see §571.5).

S7.2 *Static deflection.* The ejection impactor targeting point must not deflect more than 20 mm in the x-z plane when a 981 N ±5 N force is applied in a vehicle vertical longitudinal plane, through the y axis of the headform and no more than 5 mm rear of the posterior surface of the headform. The force is applied once in each of the following headform axes: + z, −z, + x, −x. The static deflection measurement is made with the ejection impactor extended 400 mm outboard of the theoretical point of impact with the countermeasure and attached to the ejection propulsion mechanism, including any support frame and anchors.

S7.3 *Frictional characteristics.*

(a) Measure the dynamic coefficient of friction of the ejection impactor and any associated bearings and bearing housing in a test ready orientation. Repeat the measurement in three more orientations with the ejection impactor and any associated bearings and bearing housing rotated

90, 180 and 270 degrees about the headform y axis. Perform the measurement five consecutive times at each orientation.

(b) Measure the average force necessary to move the ejection impactor 200 mm rearward into the ejection propulsion mechanism at a rate of 50 (±13) mm per second, starting at a point 400 mm outboard of the theoretical point of impact with the countermeasure. Measure the force to an accuracy of ±5 N. The measurement excludes the force measured over the first 25 mm of travel and is recorded at a minimum frequency of 100 Hz. During the test a 100 kg ±0.5 kg mass is attached to the impactor with its center of gravity passing through the axis of motion of the impactor and no more than 5 mm rear of the posterior surface of the headform.

(c) Take the five force level averages made at each impactor orientation in S7.3(a) and average them. Take the maximum of the force average values and divide by 9.81 times the combined mass of the ejection impactor and mass added in S7.3(b). The resulting value must not exceed 0.25.

S7.4 *Targeting accuracy.* Determine that the ejection mitigation test device can deliver the ejection impactor targeting point through a zone defined by a cylinder with a 20 mm diameter and 100 mm length, when the ejection impactor is moving at the speed specified in S5.5. The projection of the long axis of the cylinder is normal to the target and passes through the target center. The long axis of the cylinder is bisected by a vehicle vertical longitudinal plane passing through the theoretical point of impact with the countermeasure.

S8 *Phase-in Schedule for Vehicle Certification.*

S8.1 *Vehicles manufactured on or after September 1, 2013 and before September 1, 2016.* At anytime during the production years ending August 31, 2014, August 31, 2015, and August 31, 2016, each manufacturer shall, upon request from the Office of Vehicle Safety Compliance, provide information identifying the vehicles (by make, model and vehicle identification number) that have been certified as complying with this standard. The manufacturer's designation of a vehicle as a certified vehicle is irrevocable.

S8.2 *Vehicles manufactured on or after September 1, 2013 and before September 1, 2014.* Subject to S8.9, for vehicles manufactured on or after September 1, 2013 and before September 1, 2014, the number of vehicles complying with S4.2 shall be not less than 25 percent of:

(a) The manufacturer's average annual production of vehicles manufactured in the three previous production years; or

(b) The manufacturer's production in the current production year.

S8.3 *Vehicles manufactured on or after September 1, 2014 and before September 1, 2015.* Subject to S8.9, for vehicles manufactured on or after September 1, 2014 and before September 1, 2015, the number of vehicles complying with S4.2 shall be not less than 50 percent of:

(a) The manufacturer's average annual production of vehicles manufactured in the three previous production years; or

(b) The manufacturer's production in the current production year.

S8.4 *Vehicles manufactured on or after September 1, 2015 and before September 1, 2016.* Subject to S8.9, for vehicles manufactured on or after September 1, 2015 and before September 1, 2016, the number of vehicles complying with S4.2 shall be not less than 75 percent of:

(a) The manufacturer's average annual production of vehicles manufactured in the three previous production years; or

(b) The manufacturer's production in the current production year.

S8.5 *Vehicles manufactured on or after September 1, 2016 and before September 1, 2017.* Subject to S8.9, for vehicles manufactured on or after September 1, 2016 and before September 1, 2017, the number of vehicles complying with S4.2 shall be not less than 100 percent of the manufacturer's production in the current production year.

8.6 *Vehicles produced by more than one manufacturer.* For the purpose of calculating average annual production of vehicles for each manufacturer and the number of vehicles manufactured by each manufacturer under S8.1 through S8.4, a vehicle produced by more than one manufacturer shall be attributed to a single manufacturer as follows, subject to S8.7.

(a) A vehicle that is imported shall be attributed to the importer.

(b) A vehicle manufactured in the United States by more than one manufacturer, one of which also markets the vehicle, shall be attributed to the manufacturer that markets the vehicle.

S8.7 A vehicle produced by more than one manufacturer shall be attributed to any one of the vehicle's manufacturers specified by an express written contract, reported to the National Highway Traffic Safety Administration under 49 CFR part 585, between the manufacturer so specified and the manufacturer to which the vehicle would otherwise be attributed under S8.5.

S8.8 For the purposes of calculating average annual production of vehicles for each manufacturer and the number of vehicles manufactured by each manufacturer under S8, do not count any vehicle that is excluded by this standard from the requirements.

*S8.9 Calculation of complying vehicles.*

(a) For the purposes of calculating the vehicles complying with S8.2, a manufacturer may count a vehicle if it is manufactured on or after March 1, 2011 but before September 1, 2014.

(b) For purposes of complying with S8.3, a manufacturer may count a vehicle if it—

(1) Is manufactured on or after March 1, 2011 but before September 1, 2015 and,

(2) Is not counted toward compliance with S8.2.

(c) For purposes of complying with S8.4, a manufacturer may count a vehicle if it—

(1) Is manufactured on or after March 1, 2011 but before September 1, 2016 and,

(2) Is not counted toward compliance with S8.2 or S8.3.

(d) For purposes of complying with S8.5, a manufacturer may count a vehicle if it—

(1) Is manufactured on or after March 1, 2011 but before September 1, 2017 and,

(2) Is not counted toward compliance with S8.2, S8.3, or S8.4.

(e) For the purposes of calculating average annual production of vehicles for each manufacturer and the number of vehicles manufactured by each manufacturer, each vehicle that is excluded from having to meet this standard is not counted.

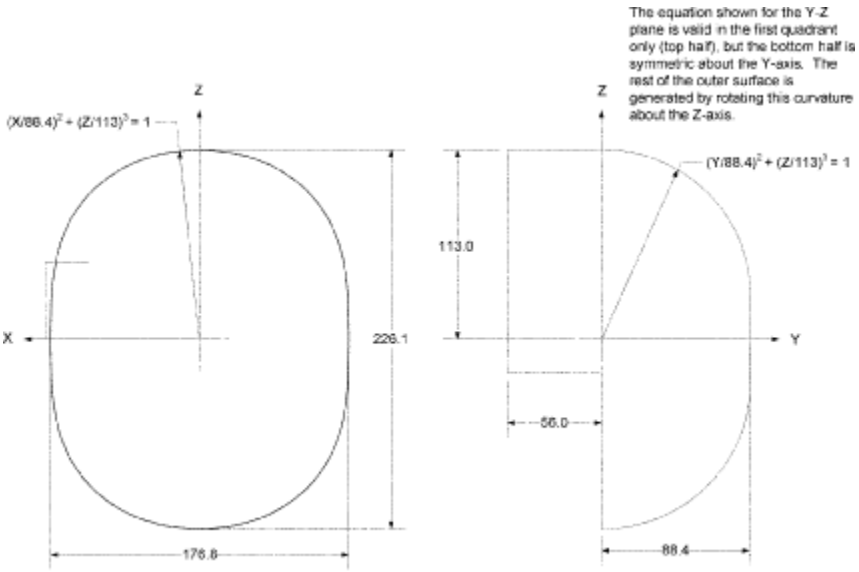


**Figure 1 – Ejection Headform Face. All dimensions are millimeters.**

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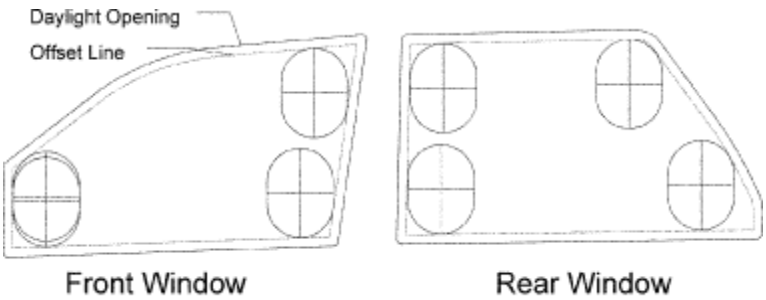


**Figure 2**

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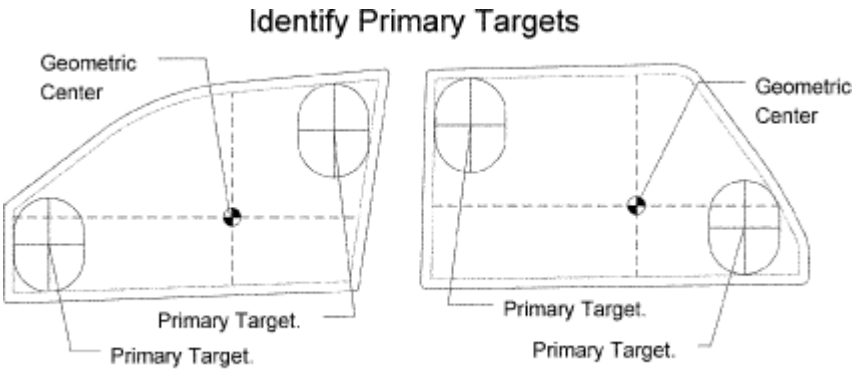


**Figure 3**

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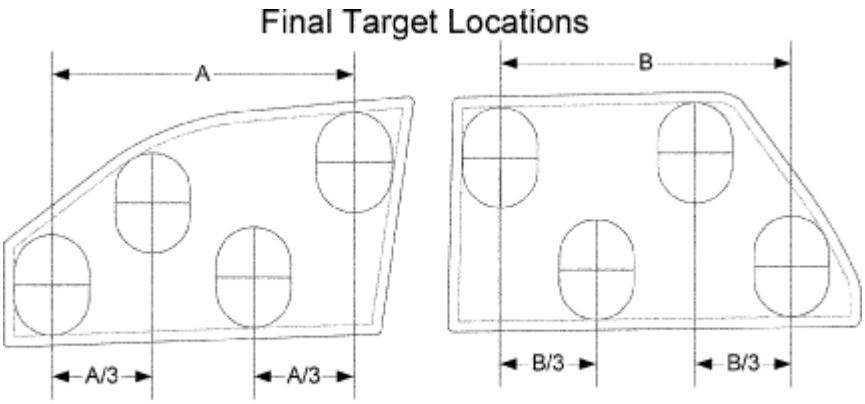


**Figure 4**

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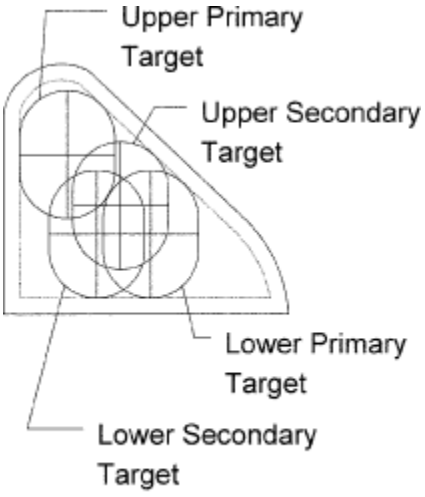


**Figure 5**

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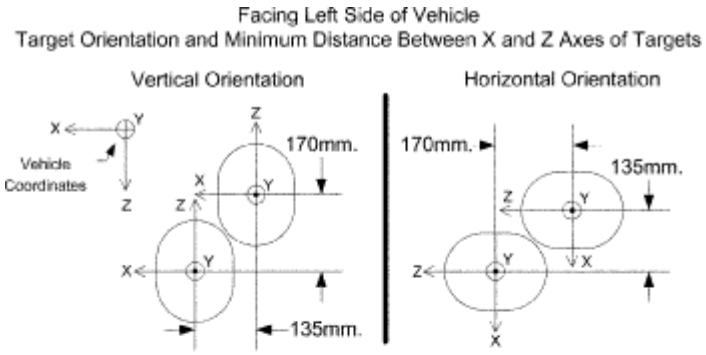


**Figure 5a**

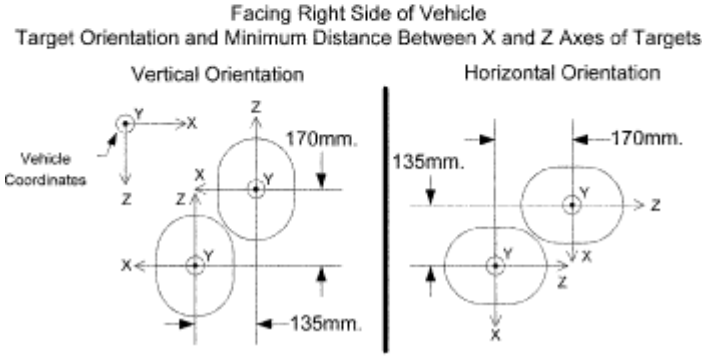


**Figure 5b**

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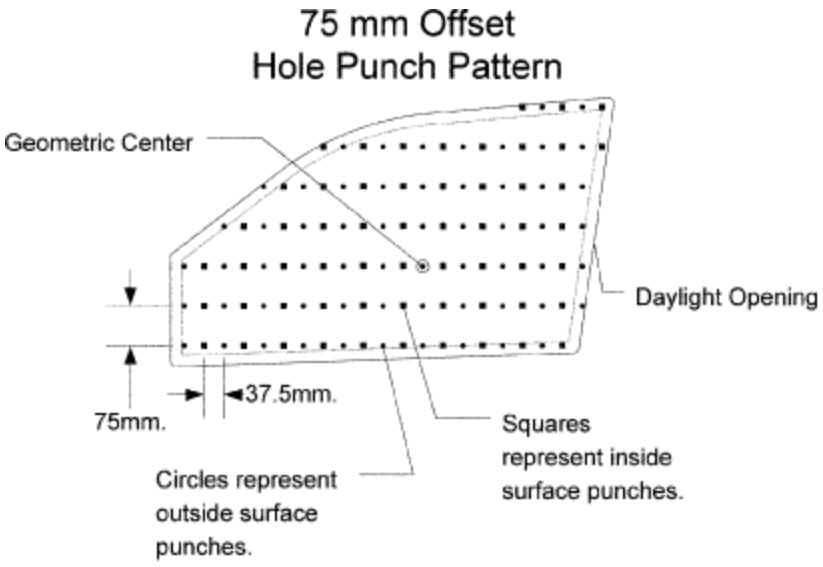


**Figure 6**

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[76 FR 3296, Jan. 19, 2011; 76 FR 10524, Feb. 25, 2011, as amended at 78 FR 55165, Sept. 9, 2013]