

Figure 7. Upper Torso Restraint and Torso Harness Anchorage Loading Location

[41 FR 4018, Jan. 28, 1976, as amended at 41 FR 28528, July 12, 1976; 41 FR 36027, Aug. 26, 1976; 41 FR 54945, Dec. 16, 1976; 42 FR 64120, Dec. 22, 1977; 43 FR 9150, Mar. 6, 1978; 44 FR 18675, Mar. 29, 1979; 48 FR 12386, Mar. 24, 1983; 54 FR 46268, Nov. 2, 1989; 58 FR 4593, Jan. 15, 1993; 58 FR 46876, Sept. 3, 1993; 63 FR 28948, 28950, May 27, 1998]

**§ 571.223 Standard No. 223; Rear impact guards.**

S1. *Scope.* This standard specifies requirements for rear impact guards for trailers and semitrailers.

S2. *Purpose.* The purpose of this standard is to reduce the number of deaths and serious injuries that occur when light duty vehicles collide with

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the rear end of trailers and semitrailers.

S3. *Application.* This standard applies to rear impact guards for trailers and semitrailers subject to Federal Motor Safety Standard No. 224, *Rear Impact Protection* (§ 571.224).

### S4. *Definitions.*

In this standard, directional terms such as *bottom*, *center*, *height*, *horizontal*, *longitudinal*, *transverse*, and *rear* refer to directions relative to the vehicle orientation when the guard is oriented as if it were installed on a vehicle according to the installation instructions in S5.5 of this section.

*Chassis* means the load supporting frame structure of a motor vehicle.

*Guard width* means the maximum horizontal guard dimension that is perpendicular to the longitudinal vertical plane passing through the longitudinal centerline of the vehicle when the guard is installed on the vehicle according to the installation instructions in S5.5 of this section.

*Horizontal member* means the structural member of the guard that meets the configuration requirements of S5.1.1 through 5.1.3 of § 571.224, *Rear Impact Protection*, when the guard is installed on a vehicle according to the guard manufacturer's installation instructions.

*Hydraulic guard* means a guard designed to use fluid properties to provide resistance force to deformation.

*Rear impact guard* means a device installed on or near the rear of a vehicle so that when the vehicle is struck from the rear, the device limits the distance that the striking vehicle's front end slides under the rear end of the impacted vehicle.

*Rigid test fixture* means a supporting structure on which a rear impact guard can be mounted in the same manner it is mounted to a vehicle. The rigid test fixture is designed to resist the forces applied to the rear impact guard without significant deformation, such that a performance requirement of this standard must be met no matter how small an amount of energy is absorbed by the rigid test fixture.

### S5. Requirements.

S5.1 *Projected Vertical Height.* The horizontal member of each guard, when viewed from the rear as it would be in-

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stalled on a trailer pursuant to the installation instructions or procedures required by S5.5 of this standard, shall have a vertical height of at least 100 mm at each point across the guard width, when projected horizontally on a transverse vertical plane. Those installation instructions or procedures shall specify that the guard is to be mounted so that all portions of the horizontal member necessary to achieve a 100 mm high projected vertical height are located not more than 305 mm forward of the vehicle's rear extremity, as defined in S4 of 49 CFR 571.224, *Rear Impact Protection*. See Figure 1 of this section.

S5.2 *Strength and Energy Absorption.* When tested under the procedures of S6 of this section, each guard shall comply with the strength requirements of S5.2.1 of this section at each test location and the energy absorption requirements of S5.2.2 of this section at test location P3, as specified in S6.4 of this section. However, a particular guard (i.e., test specimen) need not be tested at more than one location.

S5.2.1 *Guard Strength.* The guard must resist the force levels specified in S5.2.1 (a) through (c) of this section without deflecting by more than 125 mm.

(a) A force of 50,000 N at test location P1 on either the left or the right side of the guard as defined in S6.4(a) of this section.

(b) A force of 50,000 N at test location P2 as defined in S6.4(b) of this section.

(c) A force of 100,000 N at test location P3 on either the left or the right side of the guard as defined in S6.4(c) of this section.

S5.2.2 *Guard Energy Absorption.* A guard, other than a hydraulic guard, shall absorb by plastic deformation within the first 125 mm of deflection at least 5,650 J of energy at each test location P3. See Figure 2 of this section.

S5.3 *Labeling.* Each guard shall be permanently labeled with the information specified in S5.3 (a) through (c) of this section. The information shall be in English and in letters that are at least 2.5 mm high. The label shall be placed on the forward-facing surface of the horizontal member of the guard, 305 mm inboard of the right end of the guard.

(a) The guard manufacturer's name and address.

(b) The statement: "Manufactured in \_\_\_\_\_" (inserting the month and year of guard manufacture).

(c) The letters "DOT", constituting a certification by the guard manufacturer that the guard conforms to all requirements of this standard.

**S5.4 Guard Attachment Hardware.** Each guard, other than a guard that is to be installed on a vehicle manufactured by the manufacturer of the guard, shall be accompanied by all attachment hardware necessary for installation of the guard on the chassis of the motor vehicle for which it is intended.

**S5.5 Installation Instructions.** The manufacturer of rear impact guards for sale to vehicle manufacturers shall include with each guard printed instructions in English for installing the guard, as well as a diagram or schematic depicting proper guard installation. The manufacturer of a rear impact guard for one of its own vehicles shall prepare and keep a copy of installation procedures applicable to each vehicle/guard combination for a period of one year from the date of vehicle manufacture and provide them to NHTSA on request. The instructions or procedures shall specify:

(a) Vehicles on which the guard can be installed. Vehicles may be designated by listing the make and model of the vehicles for which the guard is suitable, or by specifying the design elements that would make any vehicle an appropriate host for the particular guard (e.g., vehicles with frame rails of certain spacing and gauge of steel).

(b) A description of the chassis surface to which the guard will be attached, including frame design types with dimensions, material thickness, and tire track width. This description shall be detailed enough to permit the agency to locate and duplicate the chassis surface during compliance testing.

(c) An explanation of the method of attaching the guard to the chassis of each vehicle make and model listed or to the design elements specified in the instructions or procedures. The principal aspects of vehicle chassis configuration that are necessary to the proper

functioning of the guard shall be specified. If the chassis strength is inadequate for the guard design, the instructions or procedures shall specify methods for adequately reinforcing the vehicle chassis. Procedures for properly installing any guard attachment hardware shall be provided.

**S6. Guard Test Procedures.** The procedures for determining compliance with S5.2 of this section are specified in S6.1 through S6.6 of this section.

**S6.1 Preparation of Hydraulic Guards.** For hydraulic guards, the horizontal member of the guard is deflected in a forward direction until the hydraulic unit(s) have reached the full extent of their designed travel or 610 mm, whichever occurs first. The hydraulic units are compressed before the application of force to the guard in accordance with S6.6 of this section and maintained in this condition throughout the testing under S6.6 of this section.

**S6.2 Guard Installation for Strength and Energy Absorption Tests.**

(a) The rear impact guard is attached to a test device.

(b) The test device for the compliance test will be whichever of the following devices, if either was used, the manufacturer used as a basis for its certification of the guard in S5.3(c) of this section. If the manufacturer did not use one of these devices or does not specify a device when asked by the agency, the agency may choose either of the following devices—

(1) A rigid test fixture. In the case of testing on a rigid test fixture NHTSA will consult the installation instructions or procedures to determine the surface or structure that the guard is supposed to be mounted to and mount it to the rigid test fixture in the same way.

(2) A complete trailer for which installation of the guard is suitable, as provided in the manufacturer's installation instructions or procedures required by S5.5 of this section. The trailer chassis is secured so that it behaves essentially as a fixed object during the test, such that the test must be passed no matter how little it moves during the test.

(c) The guard is attached in accordance with the instructions or procedures for guard attachment provided

by the guard manufacturer for that guard as required by S5.5 of this section.

**S6.3 Force Application Device.** The force application device employed in S6.6 of this section consists of a rectangular solid made of rigid steel. The steel solid is 203 mm in height, 203 mm in width, and 25 mm in thickness. The 203 mm by 203 mm face of the block is used as the contact surface for application of the forces specified in S5.2.1 (a) through (c) of this section. Each edge of the contact surface of the block has a radius of curvature of 5 mm plus or minus 1 mm.

**S6.4 Test Locations.** With the guard mounted to the rigid test fixture or to a complete trailer, determine the test locations P1, P2, and P3 in accordance with the procedure set forth in S6.4 (a) through (c) of this section. See Figure 1 of this section.

(a) Test location P1 is the point on the rearmost surface of the horizontal member of the guard that:

(1) Is located at a distance of  $\frac{3}{4}$  of the guard width from the vertical longitudinal plane passing through center of the guard;

(2) Lies on either side of the center of the guard's horizontal member; and

(3) Is 50 mm above the bottom of the guard.

(b) Test location P2 is the point on the rearmost surface of the horizontal member of the guard that:

(1) Lies in the longitudinal vertical plane passing through the center of the guard's horizontal member; and

(2) Is 50 mm above the bottom of the guard.

(c) Test location P3 is any point on the rearmost surface of the horizontal member of the guard that:

(1) Is not less than 355 mm and not more than 635 mm from the vertical longitudinal plane passing through center of the guard;

(2) Lies on either the right or left side of the horizontal member of the guard; and

(3) Is 50 mm above the bottom of the guard.

**S6.5 Positioning of Force Application Device.** Before applying any force to the guard, locate the force application device such that:

(a) The center point of the contact surface of the force application device is aligned with and touching the guard test location, as defined by the specifications of S6.4 of this section.

(b) The longitudinal axis of the force application device passes through the test location and is perpendicular to the transverse vertical plane that is tangent to the rearmost surface of the guard's horizontal member.

**S6.6 Force Application.** After the force application device has been positioned according to S6.5 of this section, apply the loads specified in S5.2.1 of this section. Load application procedures are specified in the S6.6 (a) through (d) of this section.

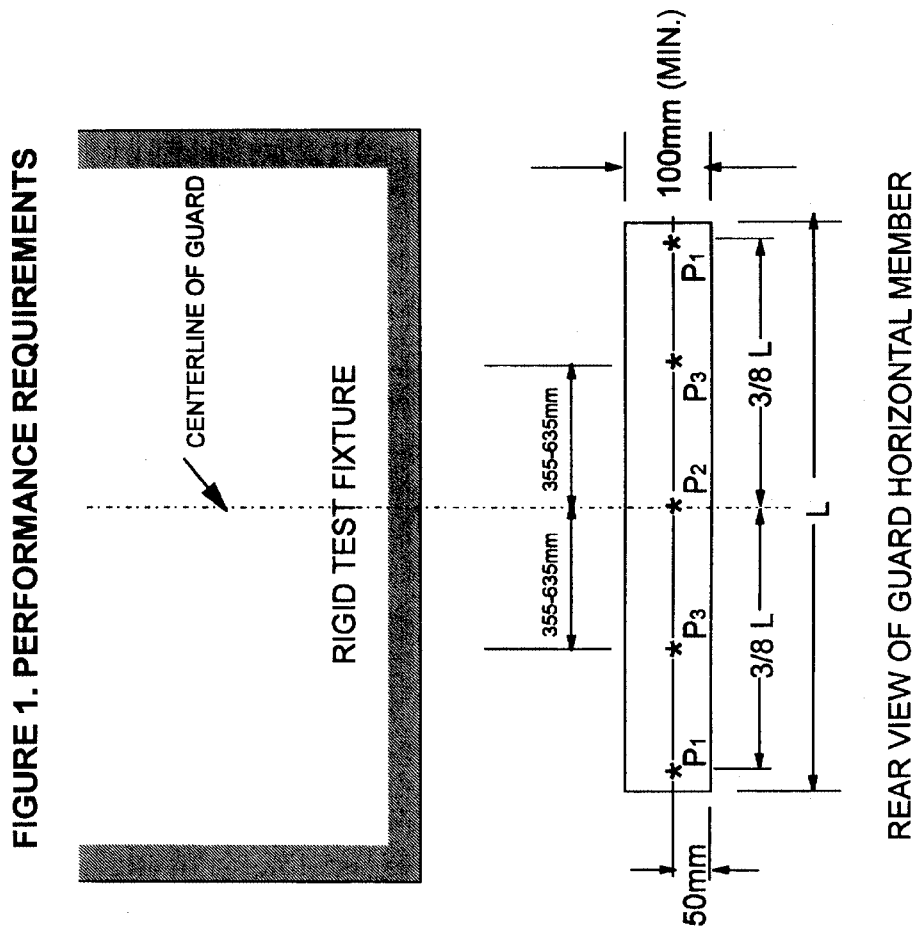
(a) Using the force application device, apply force to the guard in a forward direction such that the displacement rate of the force application device is the rate, plus or minus 10 percent, designated by the guard manufacturer within the range of 2.0 cm per minute to 9.0 cm per minute. If the guard manufacturer does not designate a rate, any rate within that range may be chosen.

(b) If conducting a strength test to satisfy the requirement of S5.2.1 of this section, the force is applied until the forces specified in S5.2.1 of this section have been exceeded, or until the displacement of the force application device has reached at least 125 mm, whichever occurs first.

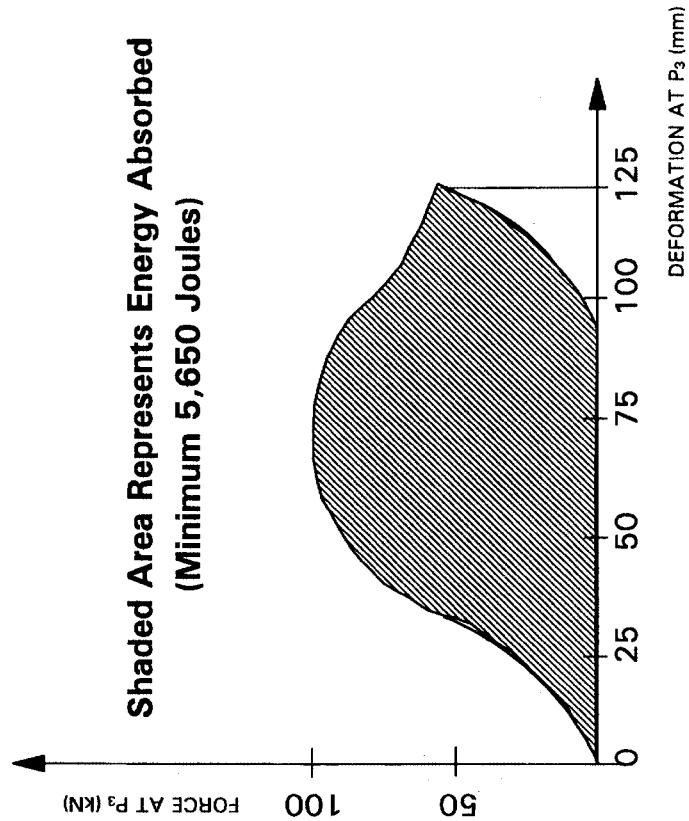
(c) If conducting a test to be used for the calculation of energy absorption levels to satisfy the requirement of S5.2.2 of this section, apply the force to the guard until displacement of the force application device has reached 125 mm. For calculation of guard energy absorption, the value of force is recorded at least ten times per 25 mm of displacement of the contact surface of the loading device. Reduce the force until the guard no longer offers resistance to the force application device. Produce a force vs. deflection diagram of the type shown in Figure 2 of this section using this information. Determine the energy absorbed by the guard by calculating the shaded area bounded by the curve in the force vs. deflection diagram and the abscissa (X-axis).

(d) During each force application, the force application device is guided so

that it does not rotate. At all times during the application of force, the location of the longitudinal axis of the force application device remains constant.



**FIGURE 2. GUARD ENERGY ABSORPTION  
(TYPICAL FORCE-DEFLECTION CURVE AT P<sub>3</sub>)**



[61 FR 2030, Jan. 24, 1996, as amended at 63 FR 3662, Jan. 26, 1998]

**§ 571.224 Standard No. 224; Rear impact protection.**

S1. *Scope.* This standard establishes requirements for the installation of rear impact guards on trailers and semitrailers with a gross vehicle weight rating (GVWR) of 4,536 kg or more.

S2. *Purpose.* The purpose of this standard is to reduce the number of deaths and serious injuries occurring when light duty vehicles impact the rear of trailers and semitrailers with a GVWR of 4,536 kg or more.

S3. *Application.* This standard applies to trailers and semitrailers with a GVWR of 4,536 kg or more. The standard does not apply to pole trailers, pulpwood trailers, special purpose vehi-

cles, wheels back vehicles, or temporary living quarters as defined in 49 CFR 529.2. If a cargo tank motor vehicle, as defined in 49 CFR 171.8, is certified to carry hazardous materials and has a rear bumper or rear end protection device conforming with 49 CFR part 178 located in the area of the horizontal member of the rear underride guard required by this standard, the guard need not comply with the energy absorption requirement (S5.2.2) of 49 CFR 571.223.

**S4. Definitions.**

*Chassis* means the load supporting frame structure of a motor vehicle.

*Horizontal member* means the structural member of the guard that meets the configuration requirements of S5.1 of this section when the guard is installed on the vehicle according to the