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Standards and Regulations Division

TEST METHOD 223

Rear Impact Guard

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1. Introduction

Test Method 223 — Rear Impact Guard (December 2003) is to be used for demonstrating compliance with the requirements of Section 223 of Schedule IV to the *Motor Vehicle Safety Regulations* (MVSR).

Director, Standards Research and Development
for the Minister of Transport
Ottawa, Ontario

2. Definitions

Chassis means the load supporting frame structure of a trailer.
(*Châssis*)

Note: Directional terms such as *bottom*, *centre*, *height*, *horizontal*, *longitudinal*, *transverse*, and *rear* refer to directions relative to the vehicle's orientation when the guard is installed.

3. General Requirements

3.1 *Test Conditions and Measurements*

- 3.1.1 Where a range of conditions is specified, a rear impact guard must be capable of meeting the requirements at all points within the range.
- 3.1.2 Each sample rear impact guard shall be subject to testing only once.
- 3.1.3 All measurements are to be taken with the trailer unloaded, resting on level ground, with its full capacity of fuel, its tires inflated, and its air suspension, if so equipped, pressurized in accordance with the manufacturer's recommendations.

3.2 *Hydraulic Guards*

For hydraulic guards, prior to completing the tests specified in subsections 223(9) to (12) of Schedule IV to the MVSR, the

horizontal member of the guard must be 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.

3.3 *Testing Alternatives*

The strength and energy absorption tests may, at the option of the manufacturer, be conducted using either:

- a) **A rigid test fixture:** The rear impact guard may be tested by mounting it on a rigid test fixture in the same manner as it would be attached to the trailer and using the same mounting hardware, or
- b) **A complete trailer:** A guard and trailer may be tested as a complete assembly, if the trailer chassis is rigidly secured so that it behaves essentially as a fixed object during the test.

If using a rigid test fixture, it must be designed to resist the forces applied to the rear impact guard without significant deformation, and it shall absorb no significant amount of energy during these tests.

4. **Point Load Test Procedure**

4.1 *Point Test Locations*

With the guard mounted on the rigid test fixture or attached to a complete trailer, determine the test locations as follows (see Figure 1).

- 4.1.1 **Test location P1** is the point on the rearmost surface of the horizontal member of the guard that:
 - a) is located at a distance of $\frac{3}{8}$ the width of the guard from the longitudinal vertical plane passing through the centre of the horizontal member,
 - b) lies on either side of the centre of the horizontal member, and
 - c) is 50 mm above the bottom of the horizontal member.

- 4.1.2 **Test location P2** is the point on the rearmost surface of the horizontal member of the guard that:
- a) lies in the longitudinal vertical plane passing through the centre of the horizontal member, and
 - b) is 50 mm above the bottom of the horizontal member.
- 4.1.3 **Test location P3** is the point on the rearmost surface of the horizontal member of the guard that:
- a) in the case of a guard that has only two attachment points to the horizontal member, lies at the junction of the support and the tested portion of the horizontal member, or
 - b) in the case of a guard that has more than two attachment points to the horizontal member, is located not less than 355 mm and not more than 635 mm from the longitudinal vertical plane passing through the centre of the horizontal member, and
 - c) is 50 mm above the bottom of the horizontal member.

4.2 *Force Application Device to be Used for the Point Load Tests*

The force application device to be employed for the point tests consists of a rectangular solid block of steel that:

- a) is 203 mm in height, 203 mm in width, and 25 mm in thickness, with each edge of the contact surface of the block having a radius of curvature of $5 \text{ mm} \pm 1 \text{ mm}$, and
- b) whose 203-mm-by-203-mm face is used as the contact surface for application of the specified forces.

4.3 *Positioning of the Force Application Device for the Point Load Tests*

Before applying a force to the guard, position the force application device so that:

- a) the centre point of the contact surface is aligned with and touching the guard test location, as defined in subsection 4.1,
- b) its longitudinal axis passes through the test location and is perpendicular to the transverse vertical plane that is tangent to the rearmost surface of the horizontal member, and

- c) it is guided to prevent rotation and so that the location of its longitudinal axis remains constant at all times during the application of force.

4.4 *Application of the Forces for the Point Load Tests*

After the force application device has been positioned, apply the necessary force in the following manner:

- a) to the guard in a forward direction, at a rate such that the test is completed within five minutes from the application of the force, but without the average displacement rate of the force application device exceeding 90 mm per minute, and
- b) until the force requirements have been exceeded or until the displacement of the force application device has reached at least 125 mm, whichever occurs first.

5. Uniform Load Test Procedure

5.1 *Uniform Load Test Force Application Device*

The force application device to be employed in applying the uniform test load is to be unyielding, have a height of 203 mm, and have a width that exceeds the distance between the outside edges of the outermost supports to which the tested portion of the horizontal member is attached, as shown in Figure 2.

5.2 *Positioning of the Force Application Device for the Uniform Load Test*

Before applying a force to the guard, position the force application device so that:

- a) when applying the uniform test load, the centre of the contact surface is aligned with the longitudinal vertical plane passing through the centre of the horizontal member,
- b) the uniform load is applied in a direction that is perpendicular to the transverse vertical plane that is tangent to the rearmost surface of the horizontal member, and
- c) it is guided to prevent rotation.

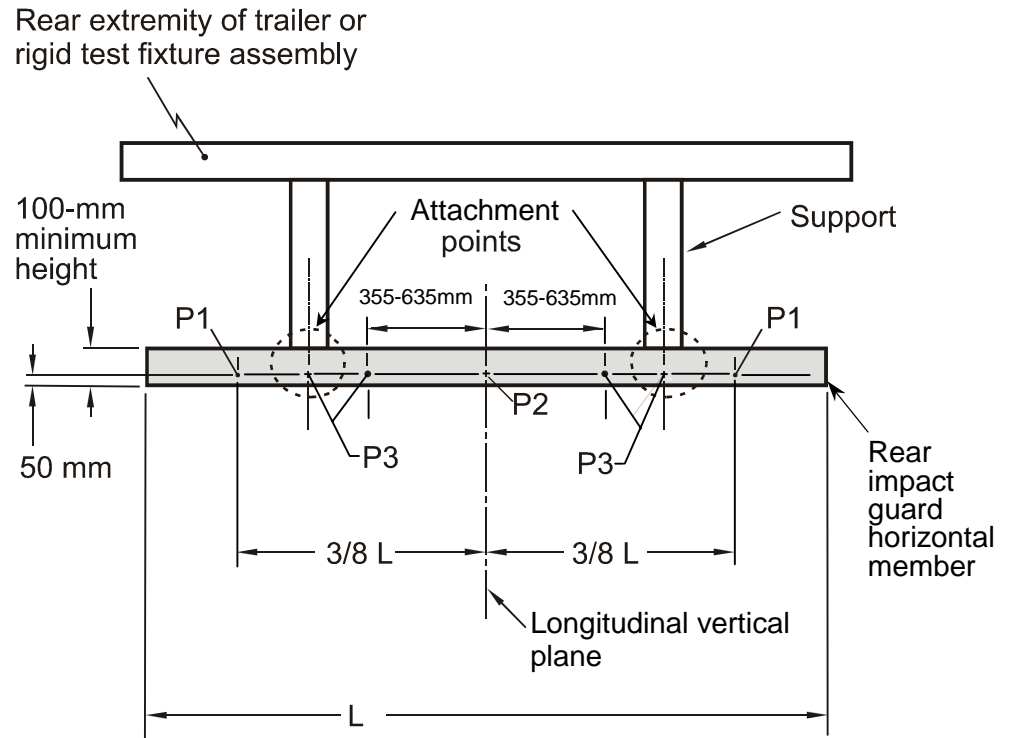
5.3 *Application of the Uniform Test Load*

- 5.3.1 At the option of the manufacturer, apply the load in a forward direction, at a rate such that the test is completed within five minutes from the application of the load, but without the average displacement rate of the force application device exceeding 90 mm per minute.
- 5.3.2 The load is to be applied until the load requirements have been exceeded or until the displacement of the force application device has reached at least 125 mm, whichever occurs first.

6. Energy Absorption Test Procedure

The calculation of energy absorption that is required by section 223 of Schedule IV to the MVSR must be based on measurements taken during the uniform load test specified in section 5 or the P3 point load test specified in section 4 of this Test Method, at the option of the manufacturer, and must be carried out in accordance with the following.

- 6.1 The force is to be applied to the guard until displacement of the force application device has reached 125 mm.
- 6.2 The value of the force is to be recorded at least ten times per 25 mm of displacement of the contact surface of the force application device.
- 6.3 The force is to be reduced until the guard no longer offers resistance to the force application device.
- 6.4 A force-vs.-deflection diagram of the type shown in Figure 3 is to be generated using the above information.
- 6.5 The energy absorbed by the guard is to be determined by calculating the shaded area bounded by the curve and the abscissa (X-axis) in the force-vs.-deflection diagram.

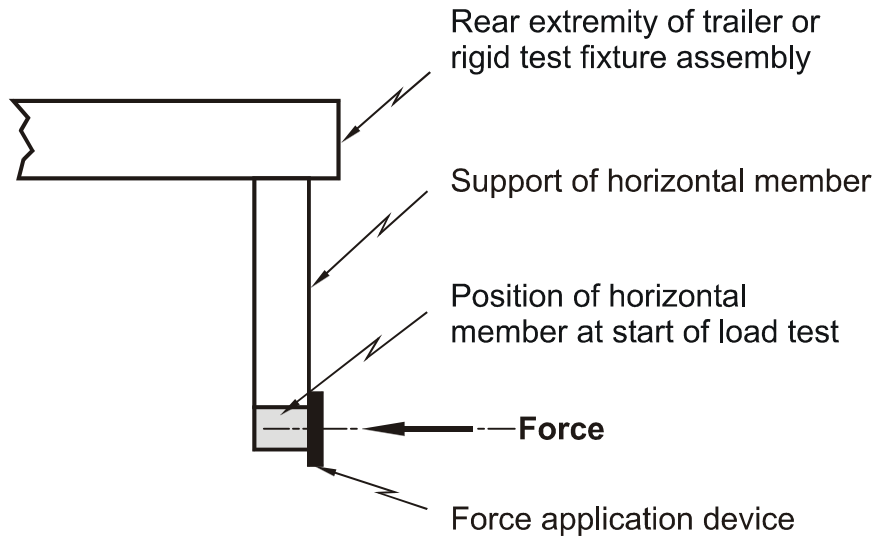


Notes:

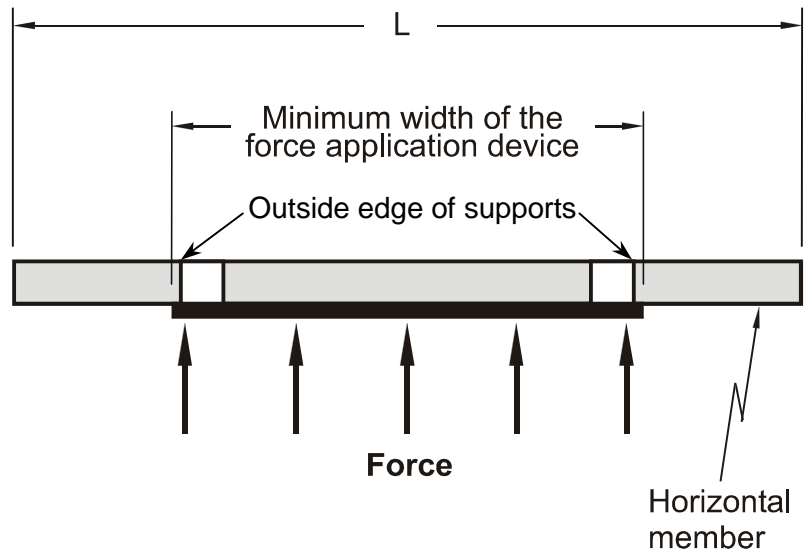
1. L means width of the horizontal member.
2. Drawing not to scale

Figure 1: Rear View of the Rear Impact Guard

SIDE VIEW



TOP VIEW



Notes:

1. L means width of the horizontal member.
2. Drawings not to scale

Figure 2: Typical Application of the Uniform Test Load

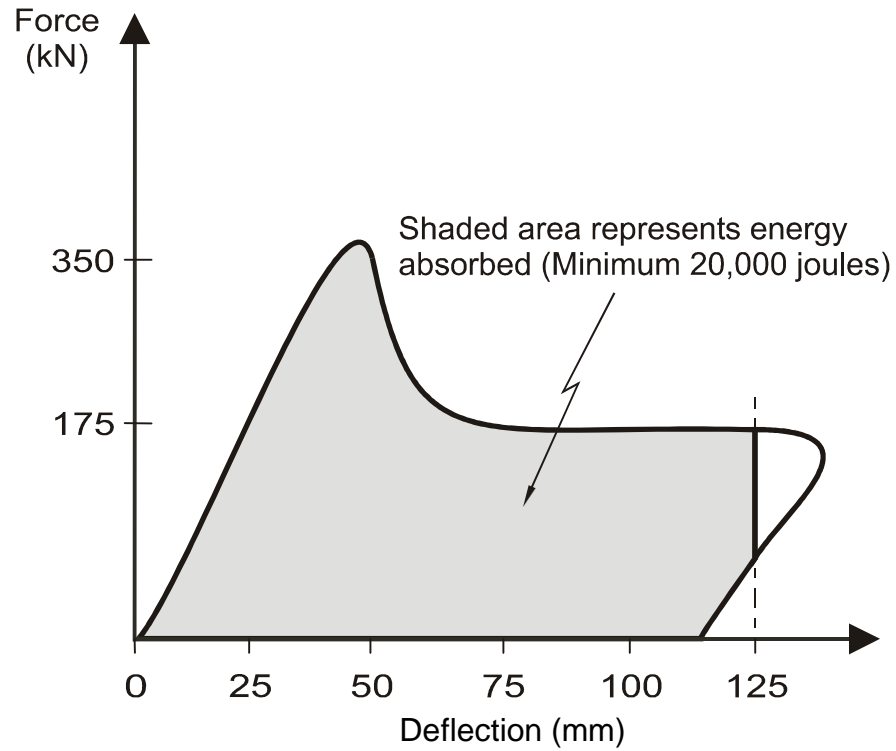


Figure 3: Typical Force-Deflection Diagram