

# Semitrailer Rear Impact Guard Quasi-Static Test Protocol

## Version II

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## DOCUMENT REVISION HISTORY

Revisions to Version II of the protocol compared with Version I:

- Clarified the **TOUGHGUARD** award criteria when performing quasi-static testing.

## OVERVIEW

The quasi-static test described in this protocol supplements the requirements of Canadian Motor Vehicle Safety Standard (CMVSS) 223 for purposes of assigning IIHS's **TOUGHGUARD** award to semitrailer rear impact guards (RIGs).

The background research that we conducted to support this quasi-static test was published in 2020 (Brumbelow & O'Malley).

The section numbers specified in the following text refer to sections in Transport Canada's requirements for RIGs, titled *Test Method 223; Rear Impact Guard* (2003).

## TEST CONDITIONS

In addition to the RIG meeting the requirements of CMVSS 223, it must also pass an additional 20° quasi-static test meeting the conditions outlined below. All quasi-static RIG testing is performed on a complete trailer or with a section of the trailer that includes all trailer chassis components to which the guard is attached.

### 20° QUASI-STATIC

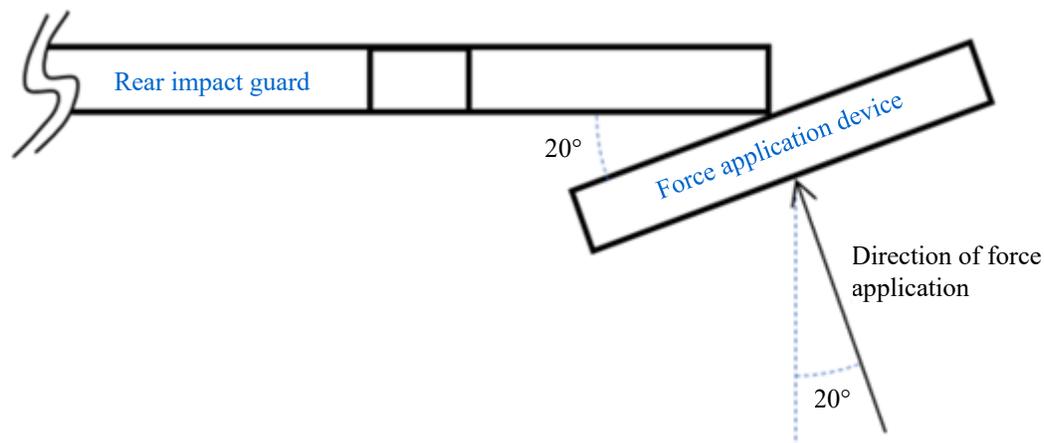
*RIG mounting.* RIGs must meet the specified requirements when tested on a complete trailer (section 3.3[b]) or with a representative section of the trailer that includes all trailer chassis components to which the guard is attached. If the RIG is mounted on a representative section of the trailer, it must be attached using the same method and hardware used in trailer production.

*Force application device.* The force application device must meet the requirements of the CMVSS 223 “uniform load” application device (section 5.1) with the exception that the width is only required to exceed the minimum necessary to avoid loading the RIG with either edge of the device during the test.

*Positioning.* Position the force application device so that its front surface is oriented at a 20° ( $\pm 1^\circ$ ) angle from the rear surface of the RIG and makes initial contact with either outboard corner of the RIG. See Figure 1.

**Figure 1**

Top view of rear impact guard and force application device position



*Load application.* Apply the load in a direction that is perpendicular to the front surface of the load application device while guiding the device to prevent rotation. The loading rate should meet the CMVSS 223 criteria (section 5.3.1) and be applied until displacement of the force application device has reached 125 mm. The force should then be reduced until the guard no longer resists the force application device.

*Force deflection diagram.* Record the force and deflection values and calculate energy absorption according to CMVSS 223 (sections 6.2, 6.4, and 6.5).

## TEST REQUIREMENTS

Two performance criteria must be met for a RIG to be considered for the IIHS **TOUGHGUARD** award:

1. The RIG must sustain a peak load of 100 kN or greater within the first 75-mm displacement of the force application device; and
2. The calculated energy absorption from the force deflection diagram must be equal to or greater than 10 kJ within 125 mm of plate displacement.

## REFERENCES

Brumbelow, M. L., & O'Malley, S. P. (2020). A proposed quasi-static test for improving the crash performance of trailer rear underride guards. *International Journal of Crashworthiness*, 26(6), 628–635. <https://doi.org/10.1080/13588265.2020.1766642>

Transport Canada. (2003, December). *Test method 223: Rear impact guard*. [https://tc.canada.ca/sites/default/files/migrated/223\\_tm\\_dec\\_2003r.pdf](https://tc.canada.ca/sites/default/files/migrated/223_tm_dec_2003r.pdf)