



## SAFETY MEASUREMENT SYSTEM (SMS) METHODOLOGY FOR THE VEHICLE MAINTENANCE BASIC\*

### 3.5 Vehicle Maintenance BASIC Assessment

This section describes the calculation of carrier measures and percentile ranks in the Vehicle Maintenance BASIC. This BASIC is defined as:

Failure to properly maintain a CMV. Example violations: brakes, lights, and other mechanical defects, and failure to make required repairs. See Appendix A for a complete list of roadside inspection violations used in the CSMS.

The CSMS assesses the Vehicle Maintenance BASIC using relevant violations recorded during roadside inspections to calculate a measure of each BASIC for individual motor carriers. These measures are used to generate percentile ranks that reflect each carrier's safety posture relative to carriers with similar numbers of relevant inspections.

#### 3.5.1 Calculation of BASIC Measure

The equation used for calculating Vehicle Maintenance BASIC measures is as follows:

$$\text{BASIC Measure} = \frac{\text{Total of time and severity weighted applicable violations}}{\text{Total time weight of relevant inspections}}$$

**Equation 3-6**

In this equation, the terms are defined as follows:

An Applicable Violation is defined as any violation recorded in any level roadside inspection that matches the FMCSR cites listed for Vehicle Maintenance (Table 5, Appendix A) during the past 24 months. In cases of multiple counts of the same violation, the CSMS only uses each violation cite once per inspection.

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\* Excerpted from "Safety Measurement System (SMS) Methodology," Version 2.1, December 2010, prepared for the FMCSA by the Volpe Center, pages 3-11 to 3-13. [Click here](#) to view the entire document.

A Relevant Inspection is any Vehicle Inspection (Level 1, 2, 5, or 6), including those that do **not** result in a violation in the BASIC, or any other inspection resulting in applicable BASIC violation.

A Severity Weight is assigned to each applicable violation with a value dependent on two parts: (i) the level of crash risk relative to the other violation cites used in the BASIC measurement, and (ii) whether or not the violation resulted in an OOS condition.

- (i) The level of crash risk is assigned to each applicable violation ranging from 1 (less severe) to 10 (most severe); see the Vehicle Maintenance table (Table 5, Appendix A) for the corresponding severity weights of each violation cite.
- (ii) An OOS weight of 2 is then added to the severity weight of OOS violations. In cases of multiple counts of the same violation, the OOS weight of 2 applies if any of the counts of the violation are OOS.

The sum of all violation severity weights for any one inspection in any one BASIC is capped at a maximum of 30. This cap of 30 is applied *before* the severity weights are multiplied by the time weight.

*Note:* The severity weights of violations outside of the BASIC being calculated **do not** count towards the violation cap.

A Time Weight of 1, 2, or 3 is assigned to each applicable violation and each relevant inspection based on its age. Violations/inspections recorded in the past 6 months receive a time weight of 3. Violations/inspections recorded between 6 and 12 months ago receive a time weight of 2. All violations/inspections recorded earlier (older than 12 months but within the past 24 months) receive a time weight of 1. This time weighting places more emphasis on results of recent inspections relative to older inspections.

*Note:* The time weight is applied to all relevant inspections, including those that do **not** result in a violation in the BASIC.

A Time and Severity Weighted Violation is a violation's severity weight multiplied by its time weight.

### ***3.5.2 Calculation of BASIC Percentile Rank***

Based on the BASIC measures, the CSMS applies data sufficiency standards and safety event grouping to assign a percentile rank to carriers that can then potentially receive a CSA intervention or detrimental SFD. The calculation is as follows:

- A. Determine the number of relevant vehicle inspections and the number of inspections with at least one BASIC violation. Remove carriers with (1) less than five relevant inspections or (2) no inspections resulting in at least one BASIC violation. For the remaining carriers, place each carrier into one of five groups based on the number of relevant inspections:

<b>Safety Event Group</b>	<b>Number of Relevant Inspections</b>
<b>1</b>	5-10
<b>2</b>	11-20
<b>3</b>	21-100
<b>4</b>	101-500
<b>5</b>	501+

- B. Within each group, rank all the carriers' BASIC measures in ascending order. Transform the ranked values into percentiles from 0 (representing the lowest BASIC measure) to 100 (representing the highest BASIC measure). Eliminate carriers that meet both of the following criteria: (1) no violation was recorded in the BASIC during the previous twelve months, and (2) no violation in the BASIC was recorded during the latest relevant inspection. For the remaining carriers with five or more relevant inspections resulting in a Vehicle Maintenance BASIC violation, assign the percentile values to each carrier's BASIC.