

# I-43 Speed Warning Sign Evaluation



Performed for the  
**Wisconsin Department of Transportation**

By

Alex Drakopoulos  
Associate Professor  
Department of Civil and Environmental Engineering  
Marquette University  
[Alexander.Drakopoulos@Marquette.edu](mailto:Alexander.Drakopoulos@Marquette.edu)  
[www.eng.mu.edu/~drakopoa](http://www.eng.mu.edu/~drakopoa)

Sharad Uprety  
and  
Georgia Vergou  
Research Assistants  
Department of Civil and Environmental Engineering  
Marquette University



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## FOREWORD

Based on the data we collected in the field, the sign had a speed reduction effect on the drivers that triggered the sign; speeds of all other drivers (“background” speeds) displayed very minor variations between the period before the sign display was operational and the period following sign display unveiling.

Given the sign speed and vehicle weight thresholds in place during this evaluation, 1.8% of the drivers actuated the sign display. More than half of these actuations were related to semi-trucks. Although the emphasis at the outset of this evaluation was placed on larger trucks, an effort was made to collect information on smaller vehicles, as well.

A speed reduction of 3.2 mph at the North Avenue curve in the period following sign unveiling was documented for semi-truck drivers who actuated the sign. Tentative findings for other vehicle sizes are documented in the report.

A special subsection describes the report organization. The body of the report addresses sign speed reduction effect. Supporting information is organized in four appendices. Appendix A presents sign and study site information. Appendix B discusses general traffic and violator characteristics. It contains a number of tables and figures that are introduced and summarized in the self-contained narrative. You may find this information useful in deciding sign threshold values. Appendix C contains all statistics relating to sign speed reduction effectiveness. Appendix text explains where statistics that relate to each of the four tested hypotheses can be found. A detailed explanation of how statistics can be interpreted is presented in the discussion of small vehicle findings on pp. 11-12. Appendix D is a self-contained crash analysis that includes a bullet summary of findings.

I am grateful for the help of Marquette University Graduate students: Sharad Uprety who helped with data collection and Georgia Vergou who helped in the preparation of this report. This work would have not been possible without funding from the Wisconsin Department of Transportation and the help of a great number of WisDOT employees: John Corbin, Mike Hardy, John Mishefske, Don Schell, Dick Lange, Mike Bub; and Brian Scharles of TAPCO Inc.

In reviewing this report, please keep in mind that we had to overcome the following **limitations** :

- No information was available about vehicle classification or speed distribution by vehicle class at the outset of this evaluation.
- Only two weeks were available for “before” data collection; frequent lane closures due to construction and maintenance activities during this period dramatically reduced the opportunities to collect data during hours when free-flow speeds were present.
- Sign thresholds had not been decided during the before period (since no speed data by vehicle class was available on which to base any decisions).
- Our efforts during the before period focused on collecting the largest data samples we could, so we would have adequate sample sizes for vehicles that would exceed any chosen sign trigger speed (sign trigger speeds would be chosen *following* our before period data collection).
  - More than 40 field visits were made to download detailed information about each vehicle that crossed the sign detectors: speed, lane, time, vehicle class, GVW was saved for more than a month—CPU memory would overflow in less than 48 hours, if data was not downloaded. (Just 584,512 of these observations were used in Table B3.)
  - We manually collected vehicle information at the curve PC: speed, lane, time and vehicle class for 1,334 vehicles before, and 1,496 vehicles after the sign was unveiled, monitoring one vehicle at a time, using a laser gun, because we trusted the instrument’s accuracy, we knew precisely which vehicle we were targeting, and we could set the instrument to monitor speeds at the curve PC (not before, nor after that point).

- The original goal of this evaluation, to compare average and 85<sup>th</sup> percentile speeds at the curve PC before and after sign operation, was abandoned when it became obvious that only 1.8% of the traffic triggered the sign: targeted traffic speeds would not have a noticeable effect on the remaining 97.2% of the traffic, even if the sign induced drivers to slow down by 10 mph in the after period.
- The remaining option was to manually match the speeds of 31,151 vehicles that crossed the sign detectors during our field data collection efforts, with the 2,830 vehicles that we observed at the PC (using the laser gun) during these times. Fortunately, we had detailed information for each vehicle—this task was extremely time-consuming, but provided the best evidence of sign effectiveness:
  - **Although the sign addressed just 1.8% of all traffic, our chosen method showed unequivocally that the sign had an effect on speeds;** the method also showed that speeds of drivers who did not see the sign activated remained unchanged for all analyzed vehicle classes.
  - The added benefit of collecting this detailed database is that the number of drivers within any given vehicle class that exceeded any given speed at any day of the week or any time of the day is precisely known for the before period. If new sign speed thresholds are decided in the future, the number of would-be violators and their average speeds at the detector and the PC in the before period can be accurately calculated and compared with the violator statistics corresponding to the new sign threshold settings.

I hope you find this report useful and informative. Please do not hesitate to contact me by telephone at (414) 288 5430 or by e-mail at Alexander.Drakopoulos@Marquette.edu

Alex Drakopoulos  
Associate Professor

## ABSTRACT

An excessive speed warning device was installed on a sign bridge over the southbound lanes of I-43 in Milwaukee County, between the Wright Street and the North Avenue overpasses. The device has the ability to detect the vehicle class, speed and weight of vehicles approaching in a particular lane. If an approaching vehicle exceeds (violates) preset maximum speed and weight thresholds for its vehicle class, the message "TOO FAST FOR CURVE" is illuminated over the lane in which the violating vehicle was detected. The message remains illuminated for a few seconds, after which the sign face remains blank, until another violating vehicle is detected.

The purpose of the installed device was to induce speeding drivers to reduce their speeds before entering the North Avenue curve, identified as a site of numerous speed-related crashes. The speed limit was 50 mph which was also the curve design speed. The sign bridge was installed 345 feet upstream of the curve point of curvature. System detectors were embedded in the pavement 860 feet before the curve where vehicular information was gathered and evaluated in relation to sign thresholds.

Sign evaluation was based on a before-after (sign operation) speed comparison at the curve point of curvature (PC) where a total of 2,830 speed observations were gathered. The sign display was inoperative and veiled, but system detectors were operational during the before period. Information on 584,512 vehicles was recorded by the detectors during the before and after periods.

Background speeds remained unchanged at the study site in the period following sign unveiling. Speeds at the PC were lower by 3.2 mph for semi-trucks who activated the sign (this speed change was statistically significant at the 0.05 level of significance, with a 95% confidence interval of 2.5 to 3.9 mph). Speed reductions were also identified for small vehicles (autos, pickup trucks, vans and SUVs) and single-unit trucks and buses, but these findings were tentative because they were based on very small data samples.