

# **I-95 Corridor Mile Marker and Ramp Designation Signing**

Jeffrey Konz  
Operators Performance Laboratory  
University of Iowa  
116 Engineering Research Facility  
Iowa City, IA 52242  
konz@engineering.uiowa.edu

Carl Richey  
Operators Performance Laboratory  
University of Iowa  
116 Engineering Research Facility  
Iowa City, IA 52242  
chrichey@engineering.uiowa.edu

Thomas Schnell  
Operators Performance Laboratory  
University of Iowa  
116 Engineering Research Facility  
Iowa City, IA 52242  
tschnell@engineering.uiowa.edu

## **ABSTRACT**

Mile marker signs on interstates are both a convenience and a safety measure in that they provide travel progress information to motorists and essential location information for 911 emergency procedures. Motorists who report accidents need to be able to identify the location of a crash so that first responders will be able to deploy help from the appropriate facility as fast as possible. Providing crash location information becomes more difficult on complex urban highway interchanges. Inadequate ramp designation signing may lead to incorrect locations being called into the 911 dispatcher. This may cause delays in providing aid. The goal of the research performed in this study was to determine mile marker and ramp designation sign effectiveness using TarVIP, a computer-based sign comprehension analysis, and a test road validation. TarVIP is a traffic sign legibility modeling program that simulates visibility from an automobile with specified headlamps driving toward a sign at a specified speed and for specified driver characteristics such as driver eye position and driver age. The program also incorporates the sign size, letter height, font, background, and legend sheeting materials. TarVIP provided the letter height and the legibility distance of the mile marker and ramp signs, while the comprehension analysis provided the design, content, and layout of the signs. The test track validated the results from TarVIP and the comprehension analysis.

The purpose of this research project was to find the best design/deployment of mile markers and to find the best design for ramp designation signs so that motorists can pinpoint their location and relay it to first responders.

A number of parameters that possibly affect mile marker and ramp sign legibility during nighttime driving conditions were investigated in this study. Among these parameters are available/required

preview time, recognition distance, and legibility distance. The first and second phases of this study were conducted inside a laboratory at the University of Iowa. The third phase was conducted on a public county road.

In the first phase, a TarVIP model was built to compare the nighttime legibility performance of American Society for Testing and Materials Type III and full cube corner sheeting materials under automobile low-beam headlamp illumination. Parameters for the driver eye position in relation to the sign and headlamp locations were obtained from a previous study performed by Zwahlen and Schnell. The benchmark for the minimum required legibility distance (MRLD) was obtained from a study done by Zwahlen. The results generated with TarVIP were legibility distance estimates for the different sign designs. By comparing the MRLD with the computed legibility distance, it was possible to determine the required sign legend font, letter height, and overall sign size. TarVIP results demonstrated that a traffic sign legend with Series D font has a longer legibility distance than Series B font. However, using the larger Series D font is not always possible due to sign size trade-offs. The Federal Highway Administration has seven different fonts, “A” (the narrowest), “B,” “C,” “D,” “E(M),” and “F” (the widest). TarVIP results also demonstrated that if a full cube corner sheeting material was used on the legend and background, the maximum legibility distance was increased. Thus, TarVIP was helpful in evaluating the extent to which one may be able to overcome smaller fonts by using sheeting materials with higher retroreflectivity.

The second phase of this study was a traffic sign comprehension analysis to evaluate the information motorists were able to recall about a simulated sign shown for three seconds. The conceptual idea is that a motorist might have to recall the last mile marker or ramp designation sign when making a call to first responders. After viewing each sign on a computer screen, the subjects were asked a series of questions probing sign comprehension. The three-second presentation time for the sign stimuli was selected using a pilot run based on an 85th percentile correct response level. Participants were seated in front of a computer while the program ran through the presentation and answer sequence.

The third phase, the test road study, was used to validate what was found from the TarVIP model and comprehension analysis. This phase of the study was only run during nighttime with low-beam headlamp illumination. Participants drove at 15 mph throughout the study. A Ford Taurus SE (2000) instrumented car was equipped with an audio and video recorder and a distance measurement instrument system to measure the legibility distance to the signs. Participants were asked to identify the color of the sign and to read out loud whatever they could read when the sign’s legend would come into view. After the participants were done driving through the test section, a post-survey was administered to evaluate the comprehension of the signs and to rank the quality of the information presented on the signs.

**Key words: legibility distance—mile markers—ramp signs—TarVIP—traffic signs**