Mr. Paul Pisano  
Federal Highway Administration (FHWA)  
1200 New Jersey Avenue, S.E.  
Washington, DC 20590.

Subject: Request for Experimentation

Dear Mr. Pisano:

Please consider this request for experimentation for the purpose of studying the effectiveness of elongated pavement marking signs as part of Task Order 11 of the FHWA Traffic Control Devices Pooled Fund Study (TCD-PFS) for which the FHWA MUTCD Team is the lead agency. This request is consistent with the requirements of Paragraph 11 of Section 1A.10 of the MUTCD.

A. Nature of the Problem: The Manual on Uniform Traffic Control Devices (MUTCD) states that regulatory and warning signs should be placed on posts or mountings and located on the right-hand side of the roadway where they are easily recognized and understood by road users (MUTCD, 2009). In certain geometric layouts, post-mounted signs may not be easily recognized or provide adequate information for passing motorists. One way to provide stronger emphasis of warning or regulatory signs is to include complementary pavement markings.

B. Rationale, Development and Description of Proposed Change: Drivers spend most of the time looking at the roadway directly ahead. Any object on the side of the road is first detected in the peripheral vision and requires a head/eye movement to gather information. Several studies have shown that post-mounted signs have a low registration rate and their registration can be further hampered by presence of heavy vehicles and other traffic as well as visual clutter in urban environments. All factors being equal, pavement marking signs are more likely to be detected by drivers than post-mounted signs. Past studies have shown that pavement marking signs are effective both from operations and safety perspectives. Curve warning and speed limit pavement marking signs were reported in the literature as well as practices of agencies. Pennsylvania Department of Transportation has been using an Advance Curve Warning Marking for over a decade at curves on two-lane rural highways. In the United Kingdom (UK), speed limit pavement marking signs are regularly used and are recommended in their policy.

Owing to the oblique angle at which pavement marking signs are viewed by drivers, pavement marking signs placed at the specified sign dimensions appear shortened. Therefore, elongated pavement marking signs have been used and shown to significantly improve the recognition distance when compared to non-elongated pavement marking signs. Elongated pavement marking signs are widely used in Europe and Australia.
Based on the literature and state of the practice review, the research team recommended that elongated pavement marking signs of the following signs be evaluated in the TCD-PFS project:

1. Turn warning sign (W1-1)
2. Curve warning sign (W1-2)
3. Speed limit sign (R2-1)

The device is an elongated full color image of a corresponding sign and placed directly in the lane of traffic to which it applies. Based on driving simulator study, the research team recommended using a ratio of 1:5 for the elongated pavement marking sign. This treatment was recommended to be studied by the Traffic Control Device Consortium Pooled-fund Study at its 2011 annual TAC meeting in Portland. This application of a traffic control device does not appear to be addressed in Section 3B.19 of the 2009 MUTCD.

C. **TCD Illustration:** A sample of elongated W1-2 and R2-1 is attached.

D. **Copyright/Patent:** The elongated pavement marking signs fall under the category of pavement markings. We are not aware of any copyrights or patents for the device.

E. **Time Period:** The treatment will be installed in summer 2014. The treatment will remain in place for three years.

F. **Locations:** In Missouri, one location has been identified for Elongated Pavement Marking Speed Limit (R2-1) sign.

   **Location:**
   Southbound MO 13 in Stone County, MO.

   There is a speed reduction from 60 to 50 mph here and data indicates compliance issues. Figure 1 shows the location and Figure 2 shows the Google StreetView image.
Figure 1. R1-2 Location in Stone Co, MO.

Figure 2. Google StreetView Image of R1-2 Location in Stone Co, MO.
G. Evaluation Plan: In order to determine the effect of elongated pavement marking signs in conjunction with post mounted signs, a ‘before and after’ experimental approach will be employed. Research team members, with support from the participating states, will collect data before and after the installation of the elongated pavement marking signs. Mean and 85th percentile speeds will be compared for the before and after periods. The number of vehicles exceeding the posted speed limit by 5, 10, 15, or 20 mph will also be compared.

Multiple days of data will be collected in both the before and after conditions especially at locations where both commuter and recreational drivers use the roadway. Weather data will be obtained for the duration of data collection, with data from days with inclement weather likely excluded from the analysis. Data collection after the installation of the pavement marking signs will not commence for up to two weeks (a minimum of one week) after the installation to eliminate any potential novelty effect in the data. The research team will ensure that the post mounted signs at the data collection sites are in compliance with the MUTCD standards to insure that results are due to the pavement markings themselves and not the change from a non-compliant to a compliant post-mounted sign.

Vehicle speed, vehicle type (heavy truck or passenger vehicle) data will be collected at multiple locations using pneumatic tubes, Nu-metrics pads, radar, or any suitable equipment. It is anticipated that speed data will be collected at an upstream location (about 1,000 ft upstream of post-mounted sign), at the post-mounted sign, and a downstream location. Figure 3 shows the spots for the aforementioned zones. For the ‘Speed Limit’ sign, the downstream location will likely be 400 to 500 feet inside the speed zone. The exact locations will be site dependent.

![Diagram of speed data collection zones](image)

**Figure 3. Zones for Speed Data Collection.**

Following quality checks, data analysis will be performed to quantify the effect of signs on driver speed. It is hypothesized that the ‘Speed Limit’ pavement marking sign will lead to decreased operating speeds at both the post-mounted sign location and downstream data...
collection location. This analysis will be performed by vehicle type and time of day. At sites which may have both commuters and recreational drivers, day of the week will also be considered to determine if weekday and weekend data varies. Fundamental statistical analyses will be performed to determine the statistical significance of the change in speeds. A statistically significant decrease in speed would mean that the elongated pavement marking sign was effective in reinforcing the message (warning or regulatory) to drivers.

H. Site Restoration: We understand that if the experiment demonstrates an improvement, the device or application may remain in place until an official rulemaking action occurs. Otherwise, we agree to restore the experimental site to a condition that complies with the provisions of the MUTCD within 3 months following completion of the experiment. We also agree to terminate the experiment at any time if we determine that the experiment directly or indirectly causes significant safety hazards.

I. Reporting: The contractor for the TCD-PFS study will submit the final results to the FHWA's Office of Transportation Operations within three months of the conclusion of the experiment.

Thank you for consideration of this request. Should you have any comments or questions regarding this correspondence, please contact Tom Honich, Sign and Marking Engineer, at 573-526-0122 or Thomas.Honich@modot.mo.gov or Jeannie Hoff, Senior Traffic Studies Specialist, at 573-751-1097 or Jeannie.Hoff@modot.mo.gov.

Sincerely,

Michael Curtit for E.R.

Eileen Rackers, PE
State Traffic & Highway Safety Engineer

Attachments
Copies: Marc Thornsberry
Madhav Chitturi
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