

# **Trailer Mounted Portable Changeable Message Sign Evaluation 11/30/2005**

## **Introduction**

This evaluation of trailer mounted portable changeable message signs (PCMSs) was prompted by the decision of our Regional Traffic Management Center to purchase a minimum of ten of these devices. Aside from the possibility of bad weather late in the year, that provided a great opportunity to stage a review of PCMSs. The obvious lure of a large sale would attract vendors, and having the various devices at one site would provide an unique appraisal opportunity for Mn/DOT, and specifically the Office of Traffic Security and Operations.

The MnRoad Facility was chosen for the outdoor review, and Arden Hills Training Center as the location for oral presentations of remote accessing capabilities of the units. This report deals with the outdoor portion only. MnRoad is ideally set up for this project. It has the enclosed loop, free of traffic, and a long straight section of 5800 feet.

Invitations were sent out to all the PCMS manufacturers on our present Approved Products List (APL) and any additional ones on the National Transportation Product Evaluation Program (NTPEP) evaluation list. We did not specify full matrix, line matrix, or character matrix displays, just that they be capable of three lines of 18" characters, eight characters per line. There would be no testing of remote accessing. The result was eight PCMSs from seven manufacturers. As a point of comparison only, ADDCO also delivered a flip disk LED sign. This was deployed on our course, but was not part of the evaluation.

## **Setup and Procedure**

The evaluations were twofold: An opportunity to appraise fabrication details, ease of programming, accessories, and generally "kick the tires", and secondly, to assess the performance of the units. The MnRoad Layout file shows the setup we used. Each tube delineator was spaced at 50 feet intervals and numbered consecutively, starting with 0 at the start. An eight character message, consisting of variations "CMWDOGUVU", was programmed on the middle line of the PCMS displays. Eight characters were chosen to fill the line without resorting to compressed fonts, and to compress the character spacing to the minimum on any full matrix boards in the test. The letters were selected because of their similarities to each other. Our aim was to find the actual legibility distance, as opposed to the longer distances when more intuitive standard messages like "ROAD WORK AHEAD" are used. We considered using the standard messages for subsequent runs through our course, as a comparison with our gibberish lines, but time constraints didn't allow for this. When possible to determine, brightness levels of the displays were set on automatic. Incidentally, no nighttime reviews were run. Our past experiences show all boards dim adequately, and legibility distances are good. The critical test of a PCMS is in direct sunlight, particularly angled sun, which can cause glare. The MnRoad straightaway orientation works well for this.

## **Evaluation**

On the morning of November 30 we had 35 attendees. The sky was cloudy to partly sunny. Before and after the legibility test the evaluators were given opportunities to review the equipment up close. For the legibility test they were given a form (Visitor Eval Form file) and asked to drive slowly, starting at the 0 point, until the first display became legible. Then they were to write down the number on the next tube delineator they came to. This process was repeated through the course. Some evaluators went around twice, receiving new forms at the 0 point. This tallied to between 56 and 58 responses for each device. A few readings were omitted because they were too far out of line with the others. Additionally, we took angularity readings to determine when the messages became illegible as the vehicle came alongside the displays. This is detailed on the MnRoad Layout page. Note that the Daktronics PCMS did not arrive at MnRoad until the afternoon of the 30<sup>th</sup>, missing the primary review period.

## Results and Summary

The Performance Test Results Table (Test Results file) compares our numbers with those achieved by NTPEP. Our shorter legibility distances are to be expected because of the difficulty involved in reading our message sets. What is disappointing is that the distances are not proportionally lower. For example, the Wanco numbers are close to each other while the ADDCO's are more than 200 feet apart. Additionally, the angularity values vary too much. Admittedly, our measurements are probably not as precise as NTPEP's, and we sighted the displays to the horizon center of the roadway, not perpendicular to the roadway, but that does not explain the Wanco, American Signal, and Solar Technology angularity variances. One possibility is that there are LED angularity differences between the PCMSs we and NTPEP reviewed, even though the models were the same. Manufacturers don't always reveal what degree LEDs they use, and NTPEP didn't record it.

We have provided information on each PCMS which we hope is useful. Some specifications are hard to come by:

- Wind loading. The National Electrical Manufacturers Association (NEMA) standards cite a three second wind gust of 72 mph as a "maximum overturning loading". Should this be an industry standard?
- LED specifics. It would be helpful if manufacturers provided specifics as to the chemical makeup and angularity of their LEDs.
- Battery performance data. A number of the battery banks we looked at had no labeling as to the amp hour ratings or the battery model. The batteries in all the units were of an open cell lead acid type which require maintenance of the liquid level. The absorbed glass matt (AGM) battery, while more expensive, may be a more cost efficient choice for Mn/DOT. AGM batteries are maintenance free, deep discharge, hold their charge extremely well when not in use, don't need ventilation, and are a good choice for solar backup. They could be made a requirement in our purchasing specifications.

These three items, particularly the last two, are important to know when deciding what to purchase and what options to select.

From the standpoint of gathering purchasing information, updating our Approved Products List (APL), and gaining overall knowledge of the operation and construction of PCMSs, our evaluation was a success. We will consider using NTPEP data for future updates to our APL, but there is valuable knowledge to be gained from hands-on review. We will have photos available on the OTSO website in due time.

As previously mentioned, the Daktronics arrived late. It was also inoperable. Once repaired, we did a cursory review. There appeared to be something wrong with the brightness level of the display, which may account for the large discrepancy with NTPEP's results. We are planning an additional evaluation at a later date.