Michigan Department of Transportation - M•DOT

Mates

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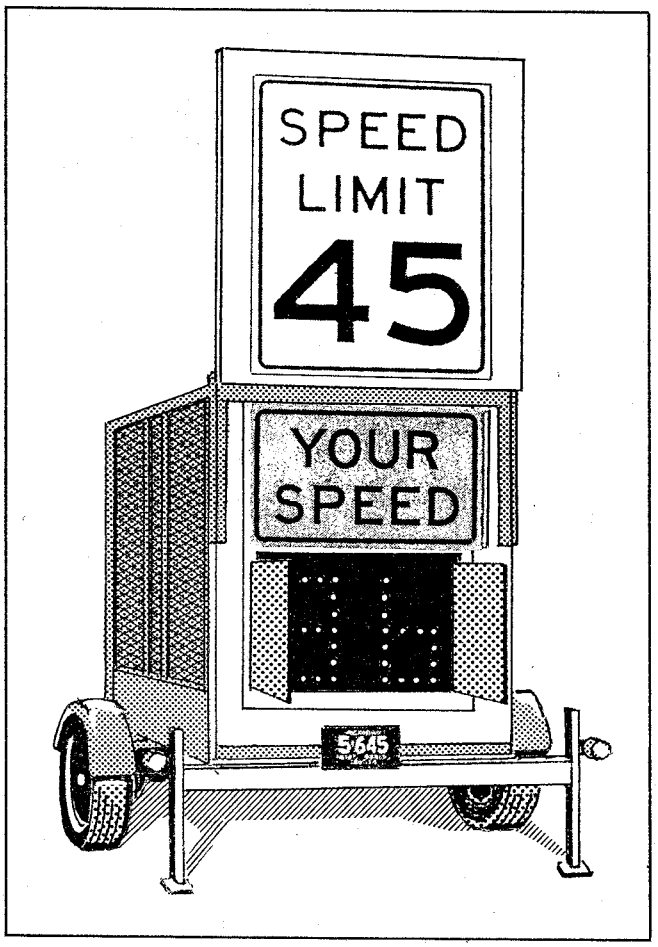
RADAR-CONTROLLED SPEED SIGN

For many years, a Michigan statute mandated that speeds through highway construction zones be set at 45 mph. This restriction hampered our efforts to maintain a safe environment for our workers, as many times a slower speed was more appropriate. On the other hand, in areas in long construction zones where it was clear that a slightly faster speed could be maintained, motorists became irritated when confined to the 45 mph limit. A change in the law permits the Department to set different speeds within construction areas, so that the limit is appropriate to the situation. As part of a program to more closely control speeds in construction zones, the Materials and Technology Division's Instrumentation and Data Systems Unit was asked to develop a speed limit sign that would also warn motorists if they were exceeding the posted limit.

If motorists are aware that their speeds are being monitored, the presumption is that they will be more apt to pay attention to their speeds when traveling through a construction area. For this purpose, a radar-controlled speed sign was developed. As the drawing shows, the trailer-mounted sign has both a static message and a changeable message. The static message consists of a standard roadway speed limit sign, with the appropriate posted speed limit for the area. Directly below that is a fixed panel that reads YOUR SPEED in black letters on an orange background. Below this panel is the changeable message portion of the sign. The sign trailer is parked at the side of the road and oriented such that the signs are clearly visible to approaching motorists.



An on-board computer controls the changeable message which is registered in miles-per-hour. The computer obtains the vehicle speed from a radar system that is also part of the package. As a vehicle approaches the sign, a radar detector determines its speed as the vehicle passes a fixed point, and sends this information to the computer. The computer than sends the speed to the display thus informing motorists how fast they are traveling.

The changeable message display consists of two digits, formed by clusters of super-bright light emitting diodes (LEDs). These diode clusters are about 2 in. in diameter. The digits formed by the LEDs are 18 in. high by 12 in. wide, which makes them readable at a distance of about 800 ft.

Although LED technology has been around for a number of years, only recently have units bright enough for outdoor use become available. The use of LEDs provides a bright, illuminated message while using about the same amount of energy as a 25-watt light bulb. This low power consumption enables the entire sign to run on four, deep-cycle automotive-type batteries. An on-board generator allows the batteries to be recharged on site. The sign will operate for about 16 hours on a full battery charge.

The sign has been field tested in several construction zones resulting in significant speed reductions, particularly when workers were present. The sign was featured recently in the Department's kickoff of the "Give 'Em A Brake" campaign, which is a major publicity effort to make motorists aware of the dangers that exist in construction zones. A question that remains to be answered concerns the long-term effect of the sign on driver conformance to construction zone speed limits. Once they become familiar with the sign, they may begin ignoring it. Long-term testing will evaluate this possibility before general use is considered. The sign has now been turned over to the Department's Construction Division for use at appropriate sites throughout the State, so you may see it the next time you are traveling through one of MDOT's construction zones.

-Frank Spica

THE EAGLE RIVER TIMBER BRIDGE

A recent point of pride in the town of Eagle River, on Michigan's beautiful Keweenaw Peninsula, is a glue-laminated timber bridge which carries M 26 over the Eagle River. Aesthetically, the new bridge blends in well with the scenic Copper Country, and structurally it was designed to carry the same traffic loads as our State trunkline concrete and steel bridges.

The total length of the wooden bridge is just over 152 ft, and it stands 50 ft above the Eagle River. Supported

by two, side-by-side arches spanning 74 and 79 ft, the bridge is primarily made of timber, with the connecting components fabricated of steel. An asphalt wearing course carries traffic across the wooden deck. All wood components were pressure treated with a preservative (pentachlorophenol in oil) and include the pedestrian railing and posts and deck support columns, wheel guards, beams and stringers, deck, and the arches themselves. Enough lumber was used in the bridge to build three or four average sized houses.

Each of the two arches supporting the structure is actually made of two arched segments, joined at the top with a crown hinge, and measure 60 in. deep and 14 in. wide. The largest of the four segments is 42 ft from end-to-end, with a crown height of 25 ft, and weighs about 10,600 lb. The other three segments are 37 ft long, 18 ft to the crown, and weigh about 8,700 lb each. The base hinges that attach the arches to the concrete abutments, and the two crown hinges, pivot on 4-in. diameter steel pins which are chrome plated to provide corrosion protection and lower friction resistance to any rotational movement of the arches.

All the steel in the structure (except the hinge pins) was hot-dipped galvanized, then covered with a tie-coat, an intermediate epoxy coating, and a brown urethane top coat. This coating system is designed to protect the steel for 30 years. Any timber members that were cut or drilled during construction were treated with two coats of copper naphthenate to protect the cut areas. The entire structure's wooden members will be recoated with preservative every three years, and at that time all bolts will be checked and retightened if necessary.

The timber bridge at Eagle River provides motorists with an aesthetically pleasing, functional structure. To one side is the vast expanse of Lake Superior and on the other side are splendid trees with a cascading waterfall. The bridge's appearance blends into the surrounding environment and was an ideal choice for such a scenic location.

— Brian Ness

TECHADVISORIES

The brief information items that follow here are intended to aid MDOT technologists by advising or clarifying, for them, current technical developments, changes or other activities that may affect their technical duties or responsibilities.

MDOT RESEARCH PUBLICATIONS

An Evaluation of A Highway Advisory Radio System in Rest Areas, Research Report No. R-1309, by Leo DeFrain, Janet Foran, and Fred Harwood. Highway advisory radio systems were installed in three rest areas in southwestern Michigan along eastbound I 94 during the 1988 construction season, in a project conducted by MDOT in cooperation with the Federal Highway Administration. The purpose of the project was to inform drivers of highway construction ahead and to reduce traveler's frustrations when experiencing construction delays along the route. This was done by using radio broadcast messages to inform motorists of construction sites ahead. The traveler could then alter the route and/or schedule or at least be aware of what delays lay ahead and be able to make an estimate as to how many minutes of delay might exist. In order to evaluate the effectiveness of the radio system, motorists were interviewed by MDOT staff at the rest areas. Motorists indicated that they had seen the signs installed to introduce the system, but only 11 percent used the service. They thought the radio system would be a beneficial service and that broadcasting tourist information would also be useful. Since few motorists had used the system in 1988, the experimental advisory radio system was discontinued.

Evaluation of Ice Detection and Weather Information Systems: Progress Report, Research Report No. R-1308, by J. H. DeFoe and M. H. Close. This project, conducted in cooperation with the Maintenance Division and the Federal Highway Administration, is intended to assess the usefulness, effect on highway safety, and cost savings of ice detection and weather information systems now used by MDOT. The MODT weather information system consists of pavement condition sensors, a pavement forecast service, weather radar, and a cable weather channel. MDOT has condition sensors at eight locations, which give surface temperature, moisture, and deicing chemical concentrations, thus allowing accurate predictions of the presence of frost or ice. The information from the sensors is transmitted to central processing units which can be scanned by the Maintenance Division central office in Lansing or by garage foremen using lap-top data terminals in their offices and homes. Pavement forecasting is provided by a contract agency, which provides forecasts of pavement temperature and moisture plus a complete weather forecast, and are obtainable on the lap-top terminals. An X-band radar unit at the Capital City Airport in Lansing is another piece of the system, providing storm movement and other weather data. Further information is provided by television sets locked into the weather channel. So far, evaluation of the system has been based on information reported on winter maintenance event forms that are provided to the snow removal equipment oeprators, along with interviews with key personnel in winter maintenance areas. At the end of the study, accident records will be summarized and analyzed to look for reductions in pavement-surface-based accidents. Savings in manpower, equipment costs, and chemicals will be reviewed. At this time, there are some problems associated with discrepancies between reports, problems in getting the event forms filled out properly, and concern involving the reliability of the system's components. Solutions for these problems have been addressed, and evaluation will continue.

Evaluation of MDOT Maintenance Division Seal Coat Projects: Final Report, Research Report No. R-1306, by V. T. Barnhart. Before 1986, MDOT restricted the use of bituminous seal coat treatments to spot and strip applications. In that year, 13 full-width seal coat applications were approved on low-volume state highways. Both slag and natural aggregates were used with a high-float anionic asphalt emulsion blended with a polymer. A pavement condition survey was made prior to application of the seal coat, and inspections since then have evaluated the performance of the treatments based on the following distress factors: aggregate loss, flushing or bleeding of the emulsion, streaking of the emulsion, blackening of the wheelpath, closed or open reflective cracking. Our observations showed that, in general, the seal coats appear to keep the pavement from breaking up and provide a waterproof seal for the roadway that is effective for two to three years. Seal coats are also able to fill in the larger cracks and remain intact. The full-width seal coat treatments appear to perform well as a temporary measure to defer placement of bituminous overlays on low volume roads.

This document is disseminated as an element of MDOT's technical transfer program. It is intended primarily as a means for timely transfer of technical information to those MDOT technologists engaged in transportation design, construction, maintenance, operation, and program development. Suggestions or questions from district or central office technologists concerning MATES subjects are invited and should be directed to M&T's Technology Transfer Unit.

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