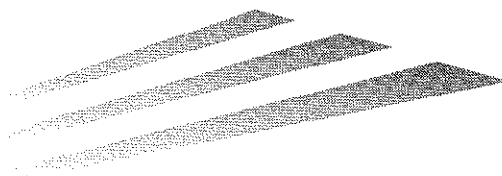


KENTUCKY TRANSPORTATION CENTER

College of Engineering

**PRELIMINARY EVALUATION:
ARTIMIS REFERENCE POINT SIGNS**



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**Research Report
KTC-95-11**

**PRELIMINARY EVALUATION:
ARTIMIS REFERENCE POINT SIGNS**

by

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in cooperation with

Kentucky Transportation Cabinet

Ohio Department of Transportation

and

**Federal Highway Administration
United States Department of Transportation**

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16. Abstract The objectives of the preliminary evaluation were to determine if the installation of reference signs at intervals more frequent than one-mile increments would improve the ability of emergency personnel to respond to incidents or accidents on the freeway system in the Cincinnati-northern Kentucky area. A short-term evaluation was conducted of white on blue and white on green reference signs on a three-mile section of I-275 in Cincinnati. Based on field observations and supplemented with subjective opinions of emergency response personnel, the reference signs were determined to be a beneficial addition to the location information available to the driving public. The blue signs placed in the median appeared to be more prominent than the green signs placed on the shoulders. Spacing of the signs did not create an impression of unnecessary clutter and eight-inch number size was appropriate. A recommendation was made to install the white on blue reference signs in the median at one-tenth mile intervals on all interstates in the ARTIMIS Project.					
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INTRODUCTION

The Advanced Regional Traffic Interactive Management and Information System (ARTIMIS) for the Cincinnati-Northern Kentucky Urbanized Area is scheduled to become operational in October 1996. The management system includes a wide range of traffic control and operational components. Among those considered for early testing and development are the following: 1) highway advisory radio, 2) changeable message signs, 3) freeway service patrols, 4) closed circuit television cameras, and 5) traveler advisory telephone service. Another component being considered for implementation is a reference point system to assist in locating incidents/accidents for prompt and effective response by emergency personnel. The highway system to be affected by ARTIMIS includes approximately 88 miles of freeway in the Cincinnati and northern Kentucky area. Presented in Figure 1 is a map showing the Ohio-Kentucky-Indiana (OKI) Regional Council of Governments area where the ARTIMIS project is being implemented.

A critical link in the emergency response process is the timeliness and accuracy of location information provided to responding personnel. The report of an incident or accident is typically initiated by the driving public and the responsiveness of emergency personnel is dependent upon the accuracy of location information. In addition, dispatch centers must make decisions about the location information and determine the appropriate emergency units to notify. In order to improve the emergency response process in Cincinnati and northern Kentucky, an experimental feature of the ARTIMIS project will be reference point signs at tenth of a mile increments to supplement the milepoint referencing system. The increased frequency of the reference markers will allow accurate identification of an incident or accident on the freeway system.

OBJECTIVES

The objective of this preliminary evaluation is to determine if the installation of reference markers at intervals more frequent than one-mile increments will improve the ability of emergency personnel to respond to incidents or accidents on the freeway system in the Cincinnati-northern Kentucky area. The evaluation will involve two phases. The objective of Phase 1, which is the subject of this report, will be to conduct a short-term evaluation of an experimental section of both white on blue and white on green signs to determine their effectiveness in providing location information for emergency response. The two types and colors of signs have been installed on a three-mile section of I-275 in Cincinnati between I-75 and I-71. The objective of Phase 2 will be to conduct a long-term evaluation to determine the effectiveness of the enhanced reference marker system which will be installed throughout the 88 miles of Cincinnati and northern Kentucky as part of the ARTIMIS project.

PROJECT SCOPE

Experimental reference point signs were installed on I-275 between Mosteller Road and US 42 in March 1995. The installation involved two types of signs which could be used for location of incidents or accidents. One type of experimental sign consisted of white letters on a blue background for westbound traffic on I-275; with the signs containing information related to direction of travel, interstate route number, milepoint number, and a number representing the tenth of a mile segment between milepoints. The white on blue signs are 14 inches by 48 inches and mounted in the median on the concrete barrier wall where practical. For grass medians, the signs have been initially installed on square tubing posts with one sign per post; however, future plans will be for back-to-back signs on one post in the grass medians. An installation of the white on blue sign mounted on a median light pole is shown in Figure 2.

The second type of sign has been installed in the eastbound direction; consisting of white letters on a green background. The size of the sign is 12 inches by 48 inches and placement is on the right side of the road; generally consistent with the standard milepoint sign. The white on green reference signs have the word MILE in 4-inch letters at the top, with vertically stacked 8-inch numbers indicating the milepoint and tenth of a mile segment. An installation of the white on green sign adjacent to the right shoulder is shown in Figure 3.

A special type of reference sign is being used on ramps to provide direction and location information. An example of this type of sign is shown in Figure 4. The sign color is white letters on a blue background and the size is 30 inches by 30 inches. The spacing is one sign per ramp, approximately midway along the length.

EVALUATION PROCEDURE

Subjective evaluations have been performed to determine if size, color, placement, and content of one type and color of reference point sign is more effective than the other. Interviews have been conducted with the following agencies and towing companies to determine if the enhanced reference marker signing has beneficially affected the emergency response process;

- 1) Hamilton County Communications,
- 2) Sharonville Police Department,
- 3) Ohio DOT, and
- 5) Road service/towing companies.

Listed below are the general types of subjective information solicited from the emergency response and other highway-related personnel responsible for the section of I-275 where experimental reference markers have been installed.

- 1) Frequency of use of the reference signs by motorists to report an incident.
- 2) Benefit to the communication unit in the identification of locations and dispatch of emergency response personnel.
- 3) Opinions of dispatch personnel concerning expansion of the reference sign system.
- 4) Benefit to road service companies in the use of reference signs to assist in the location of disabled vehicles.

RESULTS FROM EVALUATIONS

The reference signs were installed on the three-mile section of I-275 in March 1995. As noted previously, green signs with white letters were installed on the right shoulder in the eastbound direction and blue signs with white letters were installed in the median in the westbound direction. The primary means of conducting the interim evaluation were subjective evaluations and field observations.

Field Observations

The field observations were made on March 16, 1995 during daylight conditions and on March 27, 1995 during nighttime conditions. Issues to be addressed were the comparative conspicuity of the green versus blue signs, the placement of the signs, and the frequency of spacing of the signs. From a subjective viewpoint, it appeared that the blue signs were more conspicuous to a driver traveling through the section. Part of the difference may be related to the color blue versus green. It was noted in the preliminary investigation that for those with impaired abilities to distinguish colors that red/green color weakness was more common than blue/yellow. Another factor may be the background of green grass when the green signs were placed on the shoulder as compared to the grey/black background in the concrete and asphalt medians where the blue signs were placed. In addition, there appeared to be more clutter in the background when the signs were placed on the shoulder. A possible negative factor related to placement of the signs in the median rather than on the shoulder is the expectancy of drivers to see reference markers on the right shoulder, as has traditionally been the case with standard milepoint markers.

Related to the spacing of the reference signs, there was a concern that the signs may be unnecessarily close and that spacing at one-tenth mile intervals was not beneficial and would only add to the existing roadway clutter. For a relatively open section of road such as I-275 between US 42 and Reed Hartman, this may be more of a problem than in the congested downtown areas with more lanes of traffic and more ramps. However, the size and frequency of spacing of the signs seem to become much less of a factor when traveling along the freeway at speeds of 55 mph. Even at slower speeds in the downtown areas, the frequency of the signs is not

likely to add significantly to the existing clutter of a typical metropolitan freeway.

Results from nighttime observations did not change the impressions made during daylight conditions. The reference signs were clearly visible and did not appear to be too large or spaced too frequently. It should be noted that the signs were installed with engineering grade sheeting material rather than standard high-intensity sheeting which will be used for installations on the 88-mile system.

Overall, the signs appeared to be offer additional location information without creating an impression of unnecessary size and frequency of spacing. The blue signs in the median were generally more pleasing to the viewer and appeared to stand out from the background more than the green signs. As noted earlier, this impression may have been partially related to the location of the blue signs in the median and the slightly larger size of the blue sign than the green sign (14 inches wide compared to 12 inches wide).

Subjective Evaluations

Following is a summary of subjective opinions offered by emergency response and highway-related personnel who have had exposure to the reference signs on I-275.

Greg Wenz - Hamilton County Communications

Mr. Wenz noted that several calls had been received in the three-month period of March through May 1995 by the dispatch unit with the signs referred to as an indication of the location where assistance was needed. He also noted that the primary benefit is expected to be the traveler unfamiliar with the study section of I-275. He felt that most local travelers still refer to the road names as their reference points. Mr. Wenz indicated that he preferred the blue signs and felt that the interstate shield made the sign appear more prominent than the green sign. A concern was also expressed relative to the cost and maintenance of reference signs.

Lt. Dan Haas - Sharonville Police Department

Lt. Haas expressed the opinion that the signs spaced at one-tenth mile intervals were not a significant factor for the police because they were already familiar with the reference locations. He noted that they typically do not have problems finding locations after being dispatched. He felt that the frequently spaced signs should be helpful to the driving public; particularly non-local drivers. He was not personally aware of the signs being used by drivers to identify a location for assistance; however, he noted that the calls for assistance usually go directly to Hamilton County Communications where the dispatch message is issued.

Larry Heit - Ohio Department of Transportation

Mr. Heit has been involved with and supportive of the concept of frequently spaced signs since they were initially discussed as part of the ARTIMIS project. He expressed the opinion that major benefits from the reference signs could be gained when they are installed on the mainline and ramps in the downtown areas. He felt that areas with numerous ramps are typically more confusing for the driving public and will likely create more difficulty when attempting to identify a location. Mr. Heit noted that in the three-month period after installation of the signs there had not been any maintenance problems and only one mowing operator had complained of difficulty mowing around the frequently spaced signs. Obviously, this would only be a problem for shoulder installations and in grass medians. This is another factor supporting use of median installations; which are typically concrete and asphalt medians rather than grass in the metropolitan areas of Cincinnati. For installations in the grass medians, Mr. Heit recommended that the signs should be installed back-to-back on square tubing posts to eliminate the need for multiple posts to support signs for opposite directions of traffic.

Bob Bross - Smart Route

Mr. Bross indicated that he liked the frequently spaced signs and felt that they would result in beneficial results from the freeway travelers attempting to identify locations where assistance was being requested. He noted that the benefits would be more likely to surface when the signs are installed in the downtown areas with numerous ramps. Through contact with other highway users, he had been made aware of the usefulness of the signs for both highway personnel and tow company operators.

Mitch Nichols - Nick's Towing Company

Mr. Nichols indicated that he had not received any calls from stranded motorists who had used the reference signs. However, he had noticed the signs and felt that the blue signs in the median were much more visible than the green signs on the shoulder. He expressed the opinion that the grass in the background and the sign clutter diminished the effect of the green signs on the shoulder. He also noted that the signs could be spaced less frequently and serve the same benefit.

Mr. Perkins - Tri-County Towing Company

Mr. Perkins had not yet received a call where a motorist had used the signs to reference their location. However, he had seen the signs when traveling I-275 and felt that the greatest need for improved location identification was on ramps. In his towing operation, ramps create the most problems. Whether on ramps or on the

mainline, he noted that it would be necessary to have a reference log to indicate where the reference numbers were relative to familiar interchanges or other well-known points. He noted that most people involved with emergency response are familiar with interchange names but are not always sure where milepoints or other reference numbers are located.

Steven Conn - Colerain Township Fire Department

An unsolicited letter was received from Mr. Conn outlining the problems associated with incorrectly dispatched emergency personnel due to erroneous information being provided by the person in need of help. Mr. Conn noted that his department was very interested in participating in any project which might offer better location information to the driving public. He suggested that labeling overpasses with street names might be a relatively inexpensive means of providing more location information without overlap of the intent of the reference sign project. He also noted that the cellular telephone call boxes installed on I-275 and I-74 have helped to improve responses, but a need for more accurate dispatch information remained.

PROPOSED EVALUATION OF SYSTEMWIDE INSTALLATION

The focus of Phase 2, or the systemwide installation, will be expansion of the evaluation to include all reference markers installed on the entire 88-mile section of ARTIMIS. In addition, signs 30 by 30 inches will be installed on ramps as reference markers. It is anticipated that more than 1,000 signs will be installed on mainlines and ramps throughout the freeway system of Cincinnati and northern Kentucky. A subjective evaluation procedure similar to that used for the three-mile test section will be employed to assess the effectiveness of the enhanced reference markers. Subjective opinions of agency personnel responsible for selected sections on the ARTIMIS project will be solicited to address the frequency of use and benefit of the reference marker system. A survey form will be prepared and distributed to emergency personnel to determine their subjective opinions of the reference markers related to response times. As part of the survey, an attempt will be made to determine if the frequently spaced referenced signs have had an aesthetic impact. In addition, an attempt will be made to quantitatively document the benefit of the reference markers by collecting data from accident reports and fire department records for selected sections. The focus will be to determine if the incident location process and subsequent response times have been positively affected. An assessment of the sign durability and maintenance issues will be addressed through review of highway department records.

It is anticipated that the systemwide reference signs will be installed in the fall of 1995 and evaluated over a two-year period through December 1997. The systemwide evaluation will focus on the potential for use of the reference signs as a

national standard. Within the constraints of the study, as much attention as possible will be given to evaluation variables which could distinguish the reference signs as a national standard. A final report will be prepared by June 30, 1998, to document the results of the Phase 2 evaluation.

SUMMARY

Overall, the reference signs appear to be a beneficial addition to the location information available to the driving public. The blue reference signs placed in the median were generally more prominent than the green signs placed on the shoulder. The spacing of the signs at one tenth mile intervals did not create an impression of unnecessary clutter. At freeway speeds, the eight-inch number size for the signs appeared to be appropriate. Inspection of the signs at night confirmed the impression that the signs were not too large or spaced too frequently.

Subjective opinions of the signs offered by emergency response and highway-related personnel were supportive of the concept of reference signs at one-tenth mile intervals. Even though the signs have been used rather infrequently by the driving public during the three-month preliminary evaluation period, there appears to be a consensus that the signs will benefit the emergency response process. All who expressed an opinion concerning color indicated that the blue signs placed in the median were more effective than the green signs on the shoulder. In general, it was felt that the white letters on blue background were more prominent, and the addition of the interstate shield made the sign stand out even more. There was at least one concern expressed about the cost and maintenance of signs spaced at one-tenth mile intervals. In addition, the potential problem of mowing around more signs placed on the shoulder was noted. The need for signs on ramps was suggested as a priority for assisting motorist in providing location information. Another suggestion was made for labeling overpasses with street names to supplement the reference sign installations.

RECOMMENDATIONS

Based on evaluation of the test sections of reference signs, it is recommended that white on blue signs be installed in medians with back-to-back signs used where practical (mounting height approximately 4 feet above near roadway edge). Also, signs should be spaced at one-tenth mile on all sections of interstates in the ARTIMIS Project. Future consideration should be given to elimination of signs as part of routine maintenance if sign clutter and aesthetics become issues. The objective should be to install a sufficient number of signs to insure visibility of one sign at all points (one-tenth mile on curves and two-tenths mile on tangent sections may be an option). The sign size of 14 by 48 inches with 8-inch numbers should be maintained, except where larger signs may be required for three-digit milepoints.

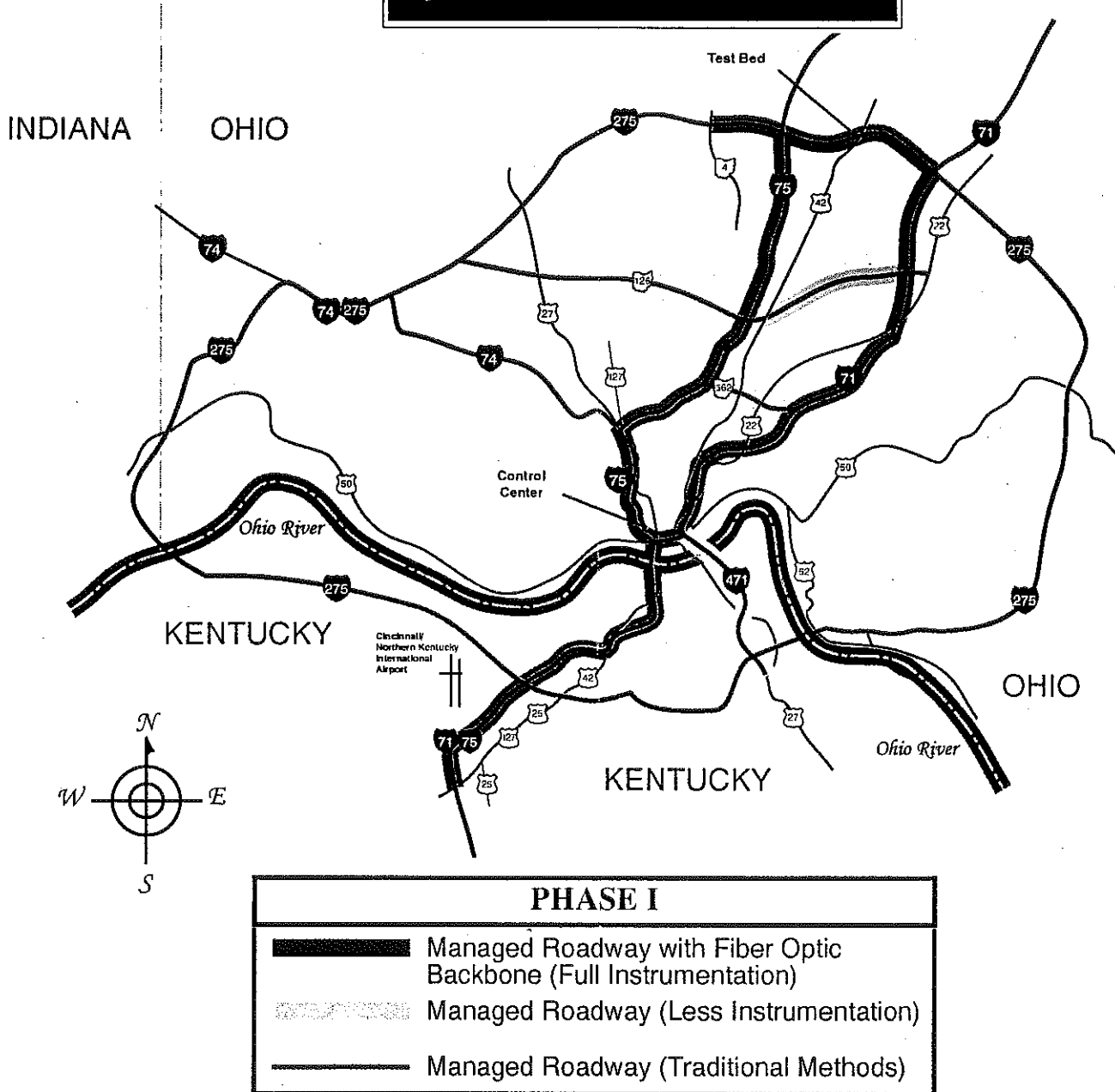
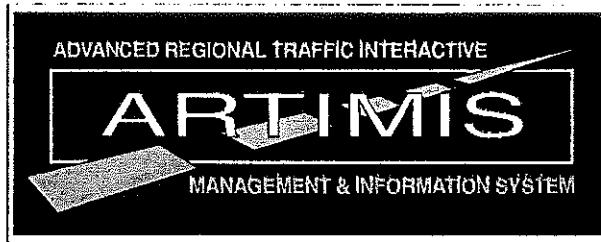


Figure 1. Map Showing the Ohio-Kentucky-Indiana Area Where the ARTIMIS Project is Being Implemented.



Figure 2. Blue Reference Marker Sign Recommended for ARTIMIS Project.



Figure 3. Green Reference Sign With Tenth of a Mile Increments.

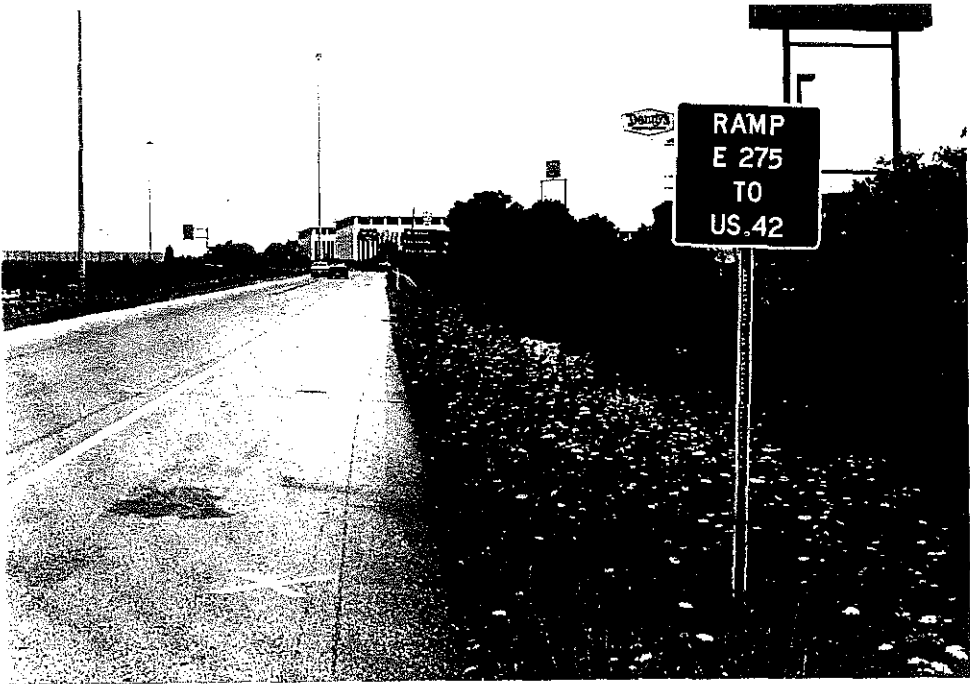


Figure 4. Ramp Reference Marker Sign Recommended for ARTIMIS Project.