

# Evaluation of Selected Messages and Codes for Real-Time Motorist Information Displays

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As a part of an overall freeway information and control system in the Gulf Freeway corridor in Houston, Texas, the Texas Department of Highways and Public Transportation (formerly the Texas Highway Department) installed three lamp matrix changeable message signs in the fall of 1973. These signs were installed as a result of recommendations from a previous systems analysis study by Messer, Dudek, and Loutzenheiser (1). One of the major objectives of the project was to evaluate the understandability and usefulness of the real-time visual information displays. Questionnaire responses were used to evaluate existing and potential improvements in traffic operations and to evaluate the communicative nature of the messages employed. This paper addresses the results obtained in the questionnaire surveys and the inferences that may be drawn from them.

## PROJECT DESIGN

The three changeable message signs were installed adjacent to the Gulf Freeway; one large sign (sign A) was adjacent to the freeway main lanes, and one smaller sign (sign B or C) was at each of two major entrance ramps. Because of unexpected circumstances, data obtained applied largely to the freeway sign.

Each sign had three lines of matrix insert. The top line carried the fixed message, FWY CONDITION, which was illuminated whenever the sign was turned on. Adjacent to the fixed message was a single changeable lamp module capable of displaying any single alphanumeric character. The two lower lines of each sign were designed to be capable of displaying any one of three preselected messages.

An initial step in sign design was the development of the required messages. An extensive study of driver information needs and preferences was conducted by Dudek, Messer, and Jones in 1970 (2, 3). That study

revealed that qualitative measures (location and length of congestion and degree of congestion) were preferred to quantitative measures (average speed and travel time). On this basis, messages were selected to reflect these qualitative measures (Table 1). To supplement the degree of congestion descriptors (OK, SLOW TRAFFIC, LANE BLOCKED), a series of letter grades forming a rating scale was developed (Table 1). These letter grades were designed to correspond to certain freeway conditions and were displayed on the same line with FWY CONDITION.

The letter-grade rating scale was used to determine whether a simple display could be used to convey the message of the various traffic states. If the letter grades were readily understood, then the cost of a display could be reduced. The letter grades chosen were standard academic grades. The research staff reasoned that the grades would be more readily understood than a number scale.

## STUDY DESIGN

Questionnaires designed to measure motorists' attitudes regarding the changeable message signs were distributed to motorists observed passing the freeway sign. These questionnaires were patterned after questionnaires developed in previous research studies conducted on the Gulf Freeway (4) and were distributed under various sign message and traffic flow conditions. A large volume of data was obtained from the three sets of questionnaire studies conducted; additional results are reported in another publication (5).

## EVALUATION OF STUDY RESULTS

### Motorist Diversion

Several questions on the distributed questionnaire were diversion-related. A total of 428 respondents (69 percent of the total) understood the sign. Eighty-two percent of those drivers (57 percent of the total) indicated that they used the information. Only 12 percent of the total respondents understood the signs but did not use the information.

**Table 1. Messages used on Gulf Freeway changeable message sign system.**

Sign	Information on Congestion	Location and Length of Congestion	Motorist Guidance	Letter Grade Rating Scale
A (On Freeway)	OK SLOW TRAFFIC LANE BLOCKED	3 MI. AHEAD 2 MI. AHEAD 1 MI. AHEAD	KEEP LEFT KEEP RIGHT	A, B, C, D, F, X
B (Griggs Entrance Ramp)	OK SLOW TRAFFIC LANE BLOCKED	3 MI. AHEAD 2 MI. AHEAD 1 MI. AHEAD	USE FRONTAGE ROAD	A, B, C, D, F, X
C (Telephone Entrance Ramp)	OK SLOW TRAFFIC LANE BLOCKED	3 MI. AHEAD 2 MI. AHEAD 1 MI. AHEAD	RAMP CLOSED USE NEXT RAMP	A, B, C, D, F, X

In general, responses to the diversion-related questions showed that the majority of the motorists desired the information and found it useful but that a smaller proportion actually used it to opt for an alternative route. These responses seem realistic and to be expected given the quality of alternate routes available inbound from the sign location.

### Sign Design and Communications

Several questions were included to determine whether the sign (and message) actually communicated the intended meaning and whether improvements could be made. A vast majority of the respondents indicated that all of the freeway condition messages were useful. Especially important was the 94 percent affirmative response to the usefulness of lane blocked message. Nearly 200 of the respondents who indicated that the lane blocked message was useful had never seen it displayed, indicating that motorists in general desire this information. The 83 and 90 percent affirmative responses to the usefulness of the off-peak OK and slow traffic messages respectively indicate a confirmation of the hypothesis of the desirability of positive signing.

One of the primary objectives of the study was to determine whether the motoring public would learn the freeway condition and letter grade relationship without an educational program. Under the conditions in which the study was performed, the public as a whole did not learn the relationship. Responses showed that the motorists did not understand the letter grade rating scale. Current Texas Transportation Institute research indicates that the lack of anchoring may have caused driver confusion. Anchoring implies defining the range of scale so that drivers are fully aware of the limits. Because only one letter grade was displayed at a time, the motorist had no way of knowing whether the scale was 6 letters long or 26 letters long. Therefore, there was no way of knowing whether FREEWAY CONDITION C was midway between free flow and heavy congestion (as was the case) or whether it was very near free flow (as would be the case in an A through Z scale). This problem could be alleviated in future installations by appropriately anchoring the scale on the sign.

### SUMMARY

The results of this study suggest that changeable message signs may be an effective tool for communicating with urban freeway drivers. Through motorist diversion, they contribute to the reduction in overall delay to the motorist as well as the reduction in total demand on the freeway. Especially important was the significantly positive reaction to the signs and toward the Texas Department of Highways and Public Transportation for their attempts at reducing congestion. Five specific findings are drawn from the results of this research. First, the freeway sign was visible and had a

high target value (96 percent of the motorists responding to questionnaires had seen the signs). Second, a majority of motorists understood the signs and the several messages. Of those who understood, 82 percent used the information. Third, the motoring public did not satisfactorily learn the letter grade and freeway condition relationship. Lack of anchoring of the rating scale may have been a contributing factor. Fourth, a majority (78 percent) of the respondents rated the system useful or very useful, including a slight majority (51 percent) who indicated that the system could be improved. Fifth, the analysis of motorist comments revealed that the indication of which lane is blocked when LANE BLOCKED is displayed is highly desirable.

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