DIAGRAMMATIC SIGN STUDY

FINAL REPORT

BY

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RESEARCH REPORT NO. 103
RESEARCH PROJECT NO. 72-2SS(B)
LOUISIANA HPR 1 (13)

Conducted by
LOUISIANA DEPARTMENT OF HIGHWAYS
Research and Development Section
In Cooperation with
U. S. Department of Transportation
FEDERAL HIGHWAY ADMINISTRATION

APRIL, 1976

R & D IMPLEMENTATION DATA SHEET

PART A

REPORTING STATE LOUISIANA

NOTE - The receiving office will code card Col. 3 thru 7, and 17 thru 25.

1 2	3	4 6	7	8	9 16	17 23	24	25	26 31	32 37	38 43
State	Yr	Id.Num.	UD	Cd	State Project No.	FCP Code	AP	Fnd	Proj. Start Date	Proj. Compl. Date	Date This Report
22					72-2SS				090173	030175	041076

44 47
STUDY COST TO DATE ($1000's)
0014

PART B

48	49	50	51	52	53	54
IS	IO	IP	IA	TA	RU	NI
1	3					

IMPLEMENTATION STATUS = (IS) in Col. 48
1 Implemented (ing) - Code Col. 49 & 42
2 Implementable - Code Col. 49, 50 & 51
3 No implementation planned - Code Col. 53 or 54

NOT IMPLEMENTABLE = (NI) in Col. 54
1 Negative findings
2 Confirms present practice
3 Additional evaluation or study needed
4 Findings too complex
5 " impractical
6 " inconclusive
7 " unreliable
8 Other (Explain)

IMPLEMENTABLE BY OTHERS = (IO) in Col. 49
1 By most other states 3 No other states
2 Some other states 4 Other (Explain)

RESULTS POTENTIALLY USEFUL = (RU) in Col. 53
1 A phase, or one of a group of studies
2 Points up need for further research
3 Findings are theoretical in nature
4 Exploratory
5 Findings valuable in decision making
6 Other (Explain)

IMPLEMENTATION PLANS = (IP) in Col. 50
1 Will be implemented or underway in next 12 months
2 Will be implemented or underway in next 24 months
3 Implementation is planned, subject to action noted, in Col. 51

TRAINING AIDS USED, PLANNED OR NEEDED =
1 Workshops
2 Movies
3 Slides
4 Other
5 None used, but some are needed(Explain

IMPLEMENTATION ACTION NEEDED = (IA) in Col. 51
1 Equipment changes or modifications needed
2 Administrative decision required
3 Need new or revised procedures, guidelines, manual, &/or standards or specifications
4 Training aids need to be prepared
5 Other (Explain)

PART C

55 56	57 62	63 64	65	66 67	68 69	70 73	74 77	78 79	80
Rep. State	Benefit End Date	Num. Mo	SB	Accid Prev	Lives Saved	Cash&Saved	User&Saved	Ben/C	Yes No

DID RESEARCH PAY OFF - Col. 80
If no estimate is possible, do you feel that benefits substantially exceeded the cost? Enter code, Yes = 1, No = 2

State Reporting Implement.

BENEFIT/COST RATIO (For reporting period)
Enter in Col's. 78 & 79, to nearest unit $, the benefits per research dollar invested

TIME PERIOD OF SAVINGS & BENEFITS
Period ending date - Col's. 57 - 62
Total period in months - Col's. 63 & 64

BEST EST. OF $ SAVINGS THRU IMPLEMENTATION
Enter agency savings ($1000) in Col's 70-73
Enter user savings ($1000) in Col's 74 - 77

TYPE OF SAVINGS OR BENEFITS = (SB) in Col. 65
1 Cash savings to agency
2 Highway user savings (monetary)
3 Savings probable but difficult to assess
4 Improved safety or convenience
5 Improved aesthetics, environmental aspects

ESTIMATED No. of ACCIDENTS PREVENTS & NO. OF LIVES SAVED
No. of Accidents in Col's 66 & 67
No. of Lives saved in Col's 68 & 69

For combination benefits, see manual for codes.

Card	8 9 — R & D Study Title — 30	NOTE
B	DIAGRAMMATIC SIGN STUDY	Type no more than 72 characters (Elite) per line including all spaces and punctuation. Use ALL CAPS
C		
D		

NOTE - Type no more than 72 characters (Elite) per line, including all spaces and punctuation. Use all CAPS

8	9	80
Card	Study Objectives	
G	THE OBJECTIVE OF THIS STUDY WAS TO EVALUATE THE EFFECTIVENESS OF A	
H	DIAGRAMMATIC SIGN AS COMPARED TO EXISTING CONVENTIONAL SIGNS IN	
I	IMPROVING TRAFFIC OPERATIONS AT A PARTICULAR LOCATION.	
J		

8	9	80
Card	Study Findings	
M	THE BASIC FINDINGS OF THE STUDY WAS THAT A DIAGRAMMATIC SIGN WAS	
N	NOT WARRANTED AT THE SUBJECT LOCATION.	
O		
P		
Q		
R		

8	9	80
Card	Implementation - How Done	
V	THE STUDY FINDINGS WHICH SHOWED THAT THERE WAS NO NEED FOR A	
W	DIAGRAMMATIC SIGN WAS IMPLEMENTED.	
X		
Y		
Z		
Ø		
1		
2		
3		

Indicate who to contact for any followup information.

DENNIS W. BABIN
Name

JAMES W. LYON, JR.
Name

TECHNICAL REPORT STANDARD TITLE PAGE

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16. Abstract

This research was undertaken to evaluate the effectiveness of a diagrammatic sign as compared to a conventional sign at a particular location. The measure selected for determining sign effectiveness was erratic traffic maneuvers. It was assumed that any significant differences in the proportion of erratic maneuvers "before" and "after" the diagrammatic sign was installed would be directly attributable to the change in signing. Videotape equipment was used to collect the erratic movement data.

On the basis of the data collected it was concluded that a diagrammatic sign was not warranted at the subject location. The project was terminated after the "before" portion of the study.

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ABSTRACT

Recently the concept of diagrammatic guide signing has been developed with the intention of improving information transmission to the motorist. The Louisiana Department of Highways recently had plans to replace an existing conventional sign with a diagrammatic sign at a particular location where they believed operational problems were occurring.

The research was undertaken in order to determine the effectiveness of the signing change by making "before" and "after" studies. The measure selected for determining sign effectiveness was erratic traffic maneuvers. It was assumed that any significant differences in the proportion of erratic maneuvers before and after the diagrammatic sign was installed would be directly attributable to the change in signing.

Erratic maneuver data for the "before" portion of the study was collected in April and June 1974. Data concerning accidents and the proportion of nonlocal traffic was also collected. Videotape equipment was used to collect the erratic movement data.

On the basis of the data collected it was concluded that a diagrammatic sign was not warranted at the subject location. The project was terminated after the "before" portion of the study.

IMPLEMENTATION

This study was undertaken to determine the effectiveness of a diagrammatic sign in improving traffic operation at a particular location. The findings of the study showed that there was no need for a diagrammatic sign at the subject location. The results were implemented.

INTRODUCTION

In certain problem locations conventional signing has been found lacking in its ability to convey required information to the motorist. Recently the concept of diagramatic guide signing has been developed with the intention of improving information transmission.

A diagrammatic guide sign is a sign which graphically depicts the configuration of the roadway which lies ahead. Generally this could involve an exit ramp, a major fork, or a lane drop. An example of a diagrammatic guide sign is shown in Figure 1.

A major study has recommended that diagrammatic guide signs should not generally be used at all interchanges but should be limited to those locations where conditions violate the expectancy of the driver.[1] This may involve such conditions as left-hand exits or major splits where through-traffic lanes continue on the right.

A particular problem location at the interchange of I-10 and I-110 in Baton Rouge, Louisiana, appeared to meet the criteria, as suggested by previous studies, for the use of diagrammatic signing. There were indications that operational problems were occurring at this location. It was hypothesized that operational problems were being caused by the geometrics of the interchange. The problem stems from the fact that motorists on I-10 westbound must keep to the left and take what appears to be a left-hand exit to remain on I-10. At this juncture what appears as the through lanes becomes I-110 North. A schematic of the interchange is shown in Figure 2.

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[1] T. M. Mast and G. Kolsrud, Recommendations for Diagrammatic Guide Signs (Vol. I of Diagrammatic Guide Signs for Use On Controlled Access Highways, Bio Technology, Inc. Falls Church, Virginia: December 1972), pp. 2-2 & 2-3.

The Department, therefore, intended to replace the existing conventional signing, located approximately 1000 feet (304.9m.) in advance of the gore, with a diagrammatic sign. It was decided, however, that "before" and "after" studies should be made in order to determine the effectiveness of the signing change.

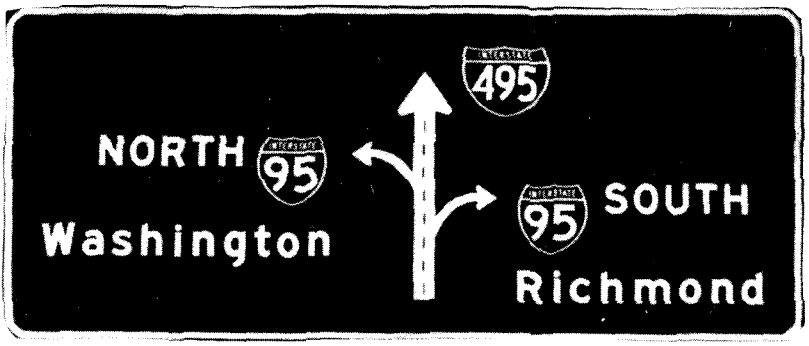

Fig. 1 Example of a Diagrammatic Sign

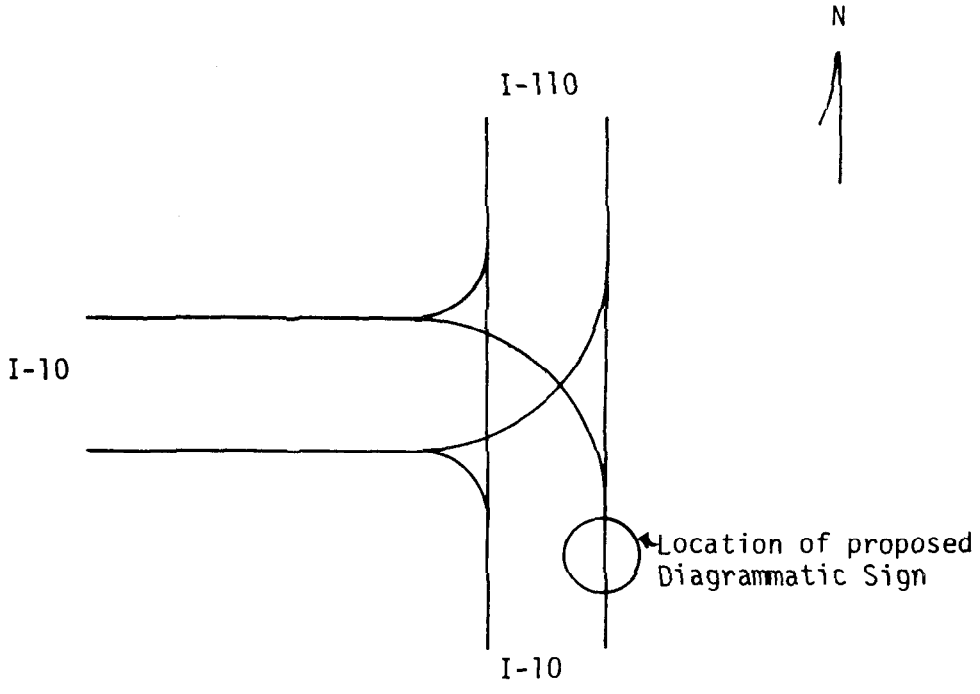

Fig. 2 Schematic of I-10, I-110 Interchange Baton Rouge, La.

PURPOSE AND SCOPE

The purpose of this project was to evaluate the effectiveness of a diagrammatic sign as compared to existing conventional signs in improving traffic operations. Specifically the evaluation was to be limited to one particular problem location where conditions seemingly warranted an improvement in signing.

METHOD OF PROCEDURE

It was originally intended that the effectiveness of the diagrammatic sign would be determined by conducting studies before and after an existing conventional sign was replaced by a diagrammatic sign. As will be seen later, only the "before" portion of the study was completed.

The measure selected for determining sign effectiveness was erratic traffic maneuvers. For the purpose of this study the term erratic maneuvers was defined as follows:

1. Abnormal weaves (weaves over gore areas, crossing more than one lane, etc.)
2. Stopping and/or backing
3. Other unusual maneuvers (hesitations, partial weaves or abnormal braking)

It was assumed that any significant differences in the rate of erratic maneuvers before and after the diagrammatic sign was installed would be directly attributable to the change in signing.

Initial data was collected in late 1973 and early 1974. However, about this time the energy crisis brought on by the Arab oil embargo was beginning to take effect. It was uncertain at that time what effects the energy crisis would have on the composition of the traffic stream then and in the future. Since it was believed that traffic composition (proportion of nonlocal traffic) would have a major impact on the percentage of erratic maneuvers, data collection was suspended for a time with the hope that the effects of the energy crisis would be more predictable. When this did not occur, it was decided to discard the data collected previously and collect new erratic maneuver data. Accompanying data on the proportion of nonlocal traffic was also collected. It was believed that knowing the proportion of nonlocal traffic would provide a basis for comparing the before and after data.

The Site

The site of the proposed diagrammatic sign was the junction of I-10 West and I-110 North in Baton Rouge, Louisiana. The I-10 West approach to the interchange consists of four lanes with no shoulders. At the bifurcation of I-10 and I-110, I-10 West becomes two lanes and I-110 North, three lanes. The entire interchange is elevated on structure (See Fig. 3). Signing consists of conventional overhead guide signs. The defined gore area is very long and narrow and is delineated by pavement markers. There is also a moderate horizonal curvature of I-10 on the immediate approach to the bifurcation.

Data Collection

Because of the lack of shoulders or other safe areas available for observers, it was realized that some type of automated means of data collection would be required. Time-lapse videotape equipment and television cameras were available and could be used; thus this means was selected.

The television camera, enclosed in a weatherproof housing, was installed on an overhead sign truss located approximately 1000 feet (304.9m.) in advance of the gore, The camera was aimed toward the gore area in order to tape the vehicles from the rear as they approached the gore. Remote pan and tilt controls were also used to adjust the camera view.

Cables were run from the camera to a ground location adjacent to I-10. A converted traffic signal box was used to house the plug-in connections for the camera and the remote controls for the pan and tilt unit. The box was mounted on a utility pole next to a service road adjacent to I-10.

The television camera used was a special low-light camera which allowed taping operation at night with only the street lights as a light source. The camera was turned on only during those periods when traffic operations were to be taped.

Figure 3 I-110 West at I-110 North
Baton Rouge, La.

When traffic operations were to be taped, a vehicle with the videotape recorder and monitor was parked next to the subject utility pole. The videotape recorder was connected to the camera cable in the signal box. The monitor was connected to the tape recorder in order to monitor the data that was being recorded and make any necessary adjustments. Generally a taping operation would last 1-1/2 to 2 hours.

During certain periods when erratic movement data was being collected, manual counts of vehicles were also being performed. Vehicles were classified according to their license plates as either local, out-of-area, or out-of-state. These counts were made at a location approximately 1/2 mile (.8 km.) in advance of the subject location. Accident data was collected for a seventeen month period.

Data Analysis

Once traffic operations were taped, the tapes were replayed and analyzed in the office. Traffic volumes and erratic movement data were tabulated separately for both through and exiting vehicles. Through vehicles were defined as those vehicles which continued straight on I-110 North while exiting vehicles were those that continued on I-10 West. Each erratic maneuver was further classified by type.

Based on the erratic movement data obtained, the percent of erratic maneuvers for both through and exiting vehicles was calculated. The percent of nonlocal traffic for certain selected periods was also calculated from the manual traffic counts.

DISCUSSION OF RESULTS

A summary of the erratic movement data collected for the month of April 1974 is shown in Table 1. This summary presents data collected during the weekday peak and off-peak morning and afternoon hours, nighttime hours, and weekend hours. As can be seen in Table 1, the highest percentage of erratic maneuvers for exiting traffic (traffic proceeding west on I-10) is, in this order, night, midafternoon, weekend, and midmorning. The peak morning and afternoon hours had the lowest percent of erratic maneuvers.

Additional erratic movement data was collected during the month of June 1974 and is shown in Table 2. This data was collected only for the midmorning and midafternoon periods.

It has been suggested that erratic maneuvers in excess of 3 percent suggest route negotiation difficulty.[2] As can be seen in Tables 1 and 2, only the nighttime period had erratic maneuvers in excess of 3 percent. The average rate of erratic maneuvers over all periods for exiting traffic was approximately 2 percent. Thus the percent of erratic maneuvers was well below the value used for establishing if operational problems were occurring.

More than 99% of all erratic maneuvers tabulated involved crossing the gore area. Approximately 52% of the erratic movements for exiting vehicles were technical violations by definition but were minor and in some cases possibly intentional. This involved vehicles crossing the tip of the gore area. As mentioned earlier, the gore area at this location is very long and narrow. No major operational problems could be detected by viewing the videotapes.

A comparison of the April and June data with the corresponding percentage of out-of-state and out-of-area traffic is shown in Table 3.

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[2] Ibid,. p. 3-13

TABLE I

SUMMARY OF ERRATIC MANEUVERS

I-10 AT I-110

BATON ROUGE, LOUISIANA

APRIL, 1974

Period of Study	Time (Hours)	Volume of Traffic		No. of Erratic Maneuvers		Percent Erratic Maneuvers	
		Exit	Thru	Exit	Thru	Exit	Thru
Peak Morning	7:00 - 8:30 a.m. (3 hours)	1869	9423	15	36	0.80	0.4
Peak Afternoon	4:00 - 5:30 p.m. (3 hours)	1568	3748	22	20	1.40	0.5
Mid Morning	9:30 - 11:30 a.m. (4 hours)	1619	3851	29	27	1.79	0.7
Mid Afternoon	1:30 - 3:30 p.m. (4 hours)	1758	4464	46	25	2.62	0.6
Night	8:00 - 9:30 p.m. (3 hours)	727	1764	29	2	3.98	0.1
Weekend	1:30 - 3:30 p.m. (2 hours)	1051	1663	27	5	2.57	0.3
TOTAL	Hours - 19	8592	24913	168	115	1.95	0.5

TABLE II

SUMMARY OF ERRATIC MANEUVERS

I-10 AT I-110

BATON ROUGE, LOUISIANA

JUNE, 1974

Period of Study	Time (Hours)	Volume of Traffic		No. of Erratic Maneuvers		Percent Erratic Maneuvers	
		Exit	Thru	Exit	Thru	Exit	Thru
Mid Morning	9:30 - 11:30 (4 hours)	2065	4208	54	27	2.62	.64
Mid Afternoon	1:30 - 3:30 (4 hours)	2238	4595	40	26	1.78	.57
TOTAL	8 Hours	4303	8,803	94	53	2.18	.60

TABLE III

ERRATIC MANEUVERS VS PERCENT

NONLOCAL TRAFFIC

Date	Time	% Erratic Maneuvers		% Non-Local Traffic	
		Exit	Thru	Out-of- State	Out-of-Area*
4/2/74	9:30 - 11:30 a.m.	.87	.73	12.1	26.7
4/3/74	9:30 - 11:30 a.m.	2.68	.68	8.5	26.0
4/3/74	1:30 - 3:30 p.m.	2.31	.62	12.3	32.2
4/3/74	1:30 - 3:30 p.m.	2.91	.49	10.8	27.5
	Totals	2.22	.63	10.8	28.0
6/10/74	9:30 - 11:30 a.m.	2.72	.78	14.9	36.5
6/18/74	1:30 - 3:30 p.m.	2.04	.59	12.9	35.5
6/26/74	9:30 - 11:30 p.m.	2.53	.49	13.6	40.1
6/27/74	1:30 - 3:30 p.m.	1.55	.51	12.7	34.3
	Totals	2.18	.60	13.5	36.5

*Note: The figures for out-of-area traffic includes out-of-state traffic.

The percentages of out-of-state and out-of-area traffic is given for the total traffic stream (exiting plus through) approaching the subject location. Although there was a higher overall percentage of nonlocal traffic in the June data, there was no corresponding increase in the percent of erratic maneuvers. Based on this limited data there appeared to be no correlation between erratic maneuvers and percent of nonlocal traffic.

Traffic accident statistics at the subject location were collected for the 17-month period of January, 1973, to June 1, 1974. These statistics revealed that during this period there were ten accidents causing three injuries. Five of the accidents were sideswipe collisions and five were out-of-control accidents. Only one of the accidents occurred at night. The accident rate does not appear to be excessive when the volume of traffic at this location is taken into account.

Generally the data gathered at the subject location does not support the view that operational problems were occurring. The data indicated, that the installation of a diagrammatic sign was not warranted. Thus the study was concluded with only the "before" portion of the study completed.

CONCLUSIONS AND RECOMMENDATIONS

The basic conclusion of the study was that a diagrammatic sign was not warranted at the subject location.

Based on this study the following recommendations are made:

1. Before studies of this nature are undertaken in the future it is recommended that a pilot study be conducted where feasible.

2. Videotape equipment should be considered for use in determining the cause of traffic operational problems.