

# Pavement Edge Lines on Twenty-Four Foot Surfaces in Louisiana

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● THE MAINTENANCE SECTION of the Louisiana Department of Highways, since May 1955, has used pavement edge stripes on a limited mileage of 2-lane rural roads with 24-ft bituminous surfaces. The stripes are reflectorized 4-in. solid white lines placed approximately 12 in. from the edge of the pavement. No effort has been made previously to determine the effect, if any, of the stripes on the lateral placement of vehicles.

Some advocates of edge striping contend that the stripes tend to move vehicles to the center of the travel lane or toward the outer edge of the surface; others insist that the solid line acts as a barrier and moves vehicles toward the center line, or at best, has no effect on their lateral placement and are an expensive investment without dividends. Proponents of this latter position contend that it does not make sense to paint 1,980 linear feet of line to mark a mile of center line and then add 10,560 linear feet of line as edge delineators. All of these opinions are well represented among the department's engineering staff.

Regardless of the controversy among the engineers the reaction of the public and the press was extremely favorable to the experimental stripes. So much so that the Board of Highways by resolution indicated a desire that the department adopt edge lines as a standard.

## THE STUDY

The problem of reconciling the divergent department views was given the Traffic and Planning Section. Fortunately, the Bureau of Public Roads had available in an adjoining state an electro-mechanical speedmeter and placement detector which, with the operating technician, could be borrowed for a short time.

The primary purpose of the study was to determine the effect, if any, that a broken or continuous line at various distances from the pavement edge has on the lateral placement of vehicles. A secondary objective was to find a pattern of broken line giving maximum contrast to the standard center line with minimum cost. The study was conducted on four test sections each being on tangent alignment in a rural area with little or no adjacent culture. There were three 4-mi sections and one 2.5-mi section. Observations were made at approximately the midpoint of each section with test equipment concealed from the approaching motorist. Locations were on U. S. 71 (Fig. 1).

Figure 2 shows the roadway cross-section representative of each of the study locations. The cross-sections of Locations 2, 3 and 4 are in general comparable and the cross-section of Location 1 is a high embankment with deep borrow pits on each side. This section is representative of Location 1 from a point approximately 1.5 mi south of the guide levee of West Atchafalaya Spillway and continuing southeasterly on U. S. 71 to the junction of U. S. 190.

The study was made on weekdays (Monday through Friday) between May 28 and June 14, 1956. Hours of observation were 12 noon to 12 midnight excluding the twilight hour from 7 to 8 p. m.

Placement and speed by type of vehicle were observed separately during day light and darkness by various maneuvers (free moving, meeting, passing, etc.) at each of the locations. All stripes were 4 in. wide, white, and reflectorized.

Observations were made under the following conditions:

Location 1. (Fig. 3)

- (a) No pavement edge stripes.
- (b) Continuous stripe 18 in. from pavement edge.

Location 2. (Fig. 4)

- (a) No pavement edge stripe.
- (b) 5-ft stripe on 40-ft centers, 12 in. from pavement edge.

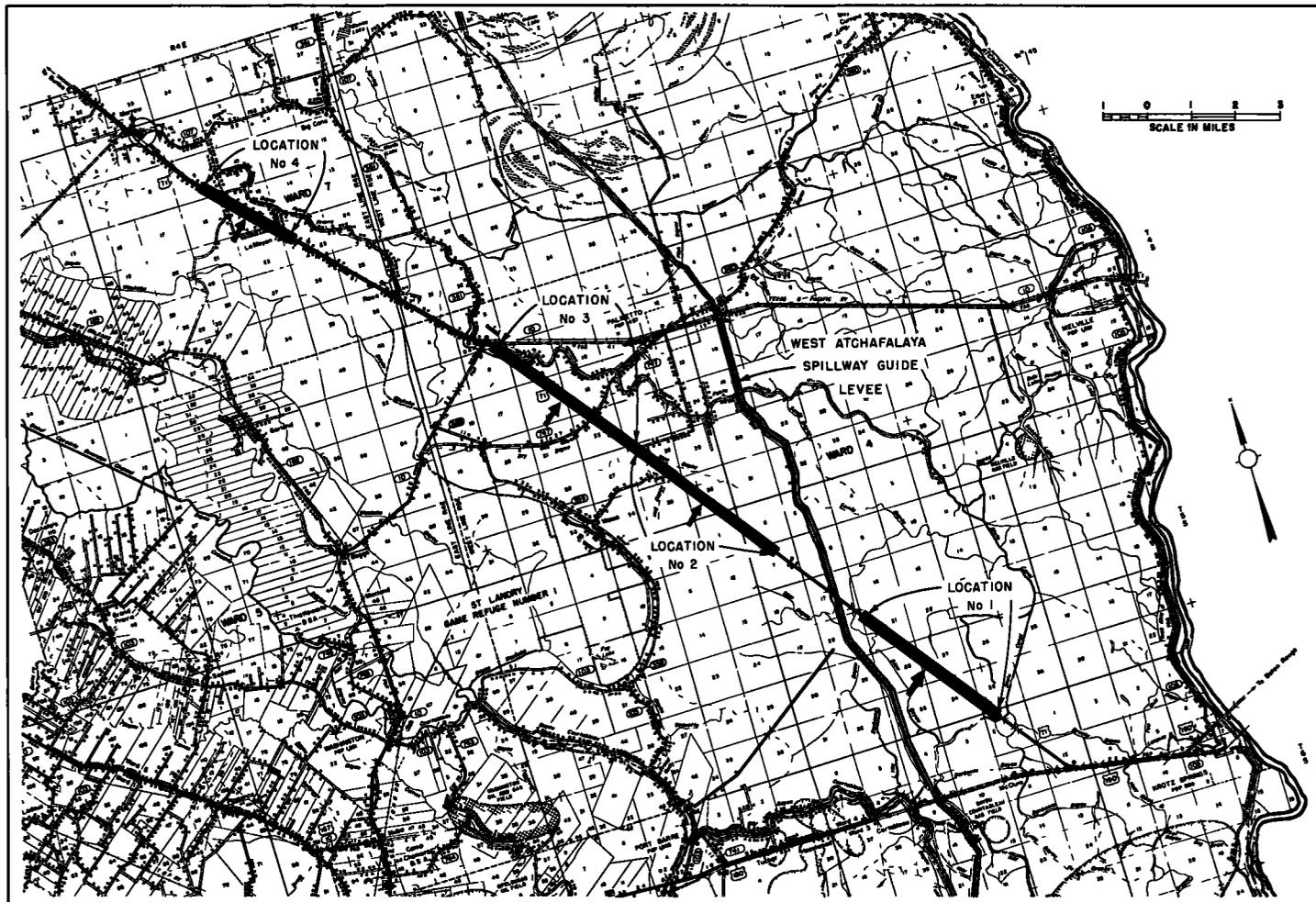


Figure 1. Map showing location of vehicle placement studies (Louisiana Department of Highways, 1956).

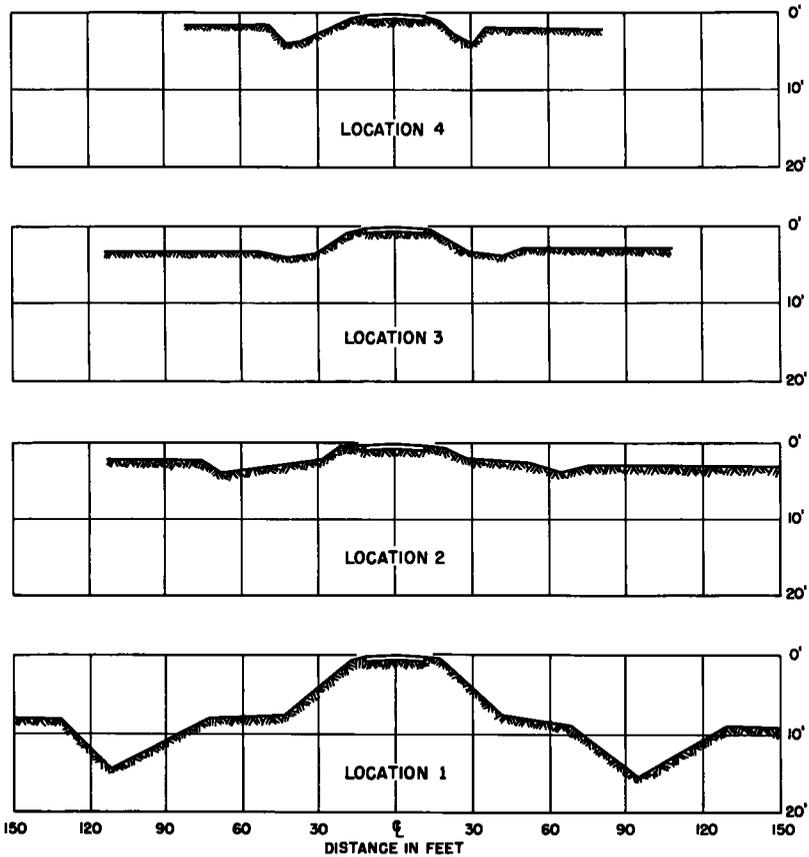


Figure 2. Cross-section of roadways at 4 study locations (U.S. 71 near Lebeau, La.).

- (c) 10-ft stripe on 40-ft centers, 12 in. from pavement edge.
- (d) Continuous stripe 12 in. from pavement edge.

**Location 3. (Fig. 5)**

- (a) No pavement edge stripe.
- (b) 10-ft stripe on 40-ft centers, 6 in. from pavement edge.
- (c) Continuous stripe 6 in. from pavement edge.

**Location 4. (Fig. 6)**

- (a) No pavement edge stripe.
- (b) 2-ft stripe on 12-ft centers, 12 in. from pavement edge.
- (c) Continuous stripe, 12 in. from pavement edge.

Figures show the test sections without edge stripes and with various types of edge striping.

### STUDY RESULTS

Results of the observations are shown graphically in the two sets of placement charts for Locations 1 through 4 (Figs. 7-14). The first set shows the lateral placement of free moving passenger cars under the various striping conditions for each direction of travel during day and night. The second set of charts shows the same information on free moving trucks. Lateral placement shown are the distance of the inside edge of the vehicle from the pavement center line. Width of the composite passenger car being considered as 6 ft and the truck as 8 ft.

Examination of these charts indicates the following:

1. Vehicle placement during daytime is not appreciably affected by edge striping.



Figure 3. Study location No. 1—(a) Normal, with centerline only; (b) Continuous stripe 18 in. from edge of pavement.

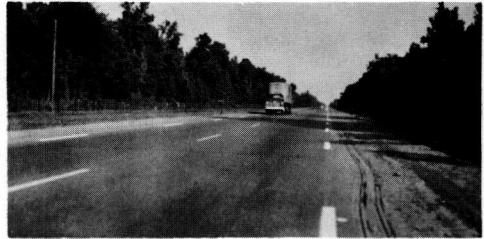
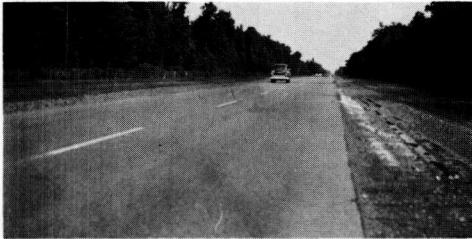


Figure 4. Study location No. 2—(a) Normal, with centerline only; (b) 10 ft stripe 12 in. from edge of pavement.

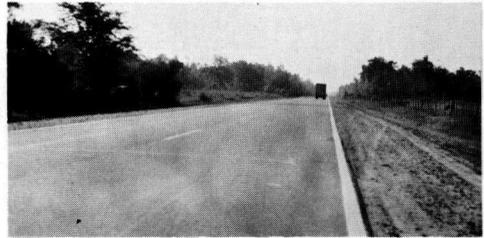
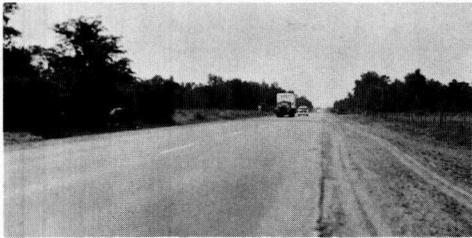


Figure 5. Study location No. 3—(a) Normal, with centerline only; (b) Continuous stripe 6 in. from edge of pavement.

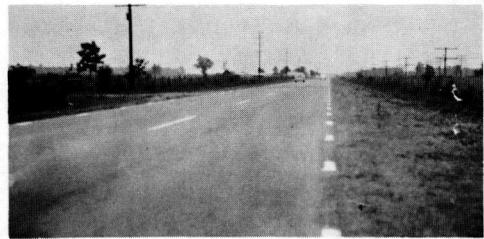
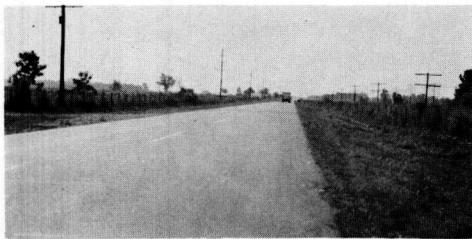
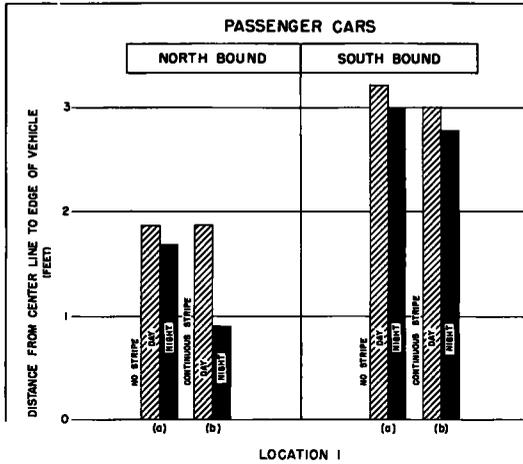
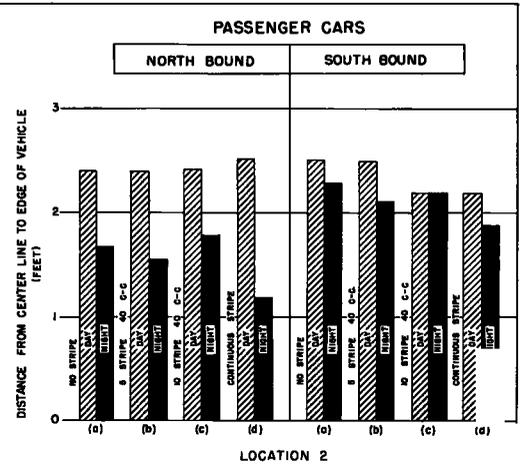


Figure 6. Study location No. 4—(a) Normal, with centerline only; (b) 2 ft stripe 6 in. from edge of pavement.

2. Vehicle placement on edge striped sections, as compared to unstriped sections, is little if any affected by the position of the edge stripe in any of the 3 positions studied.
3. The pattern of broken edge stripes has little or no effect on vehicle placement.



LATERAL PLACEMENT OF FREE MOVING PASSENGER CARS  
 (a) NO EDGE STRIPE  
 (b) WITH CONTINUOUS STRIPE 18" FROM EDGE OF PAVEMENT



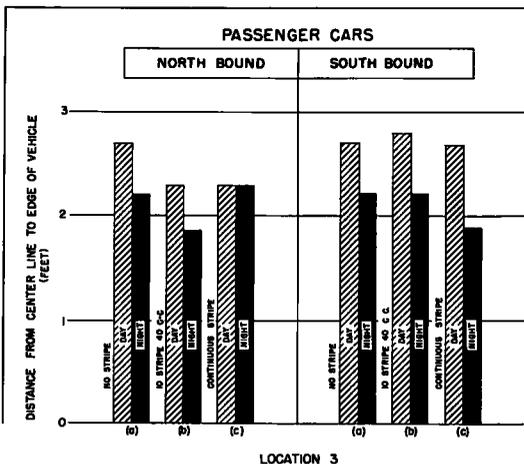
LATERAL PLACEMENT OF FREE MOVING PASSENGER CARS  
 (a) NO EDGE STRIPE  
 (b) WITH 5' STRIPE ON 40' CENTERS 12" FROM EDGE  
 (c) WITH 10' STRIPE ON 40' CENTERS 12" FROM EDGE  
 (d) WITH CONTINUOUS STRIPE 12" FROM EDGE OF PAVEMENT

Figure 7.

Figure 8.

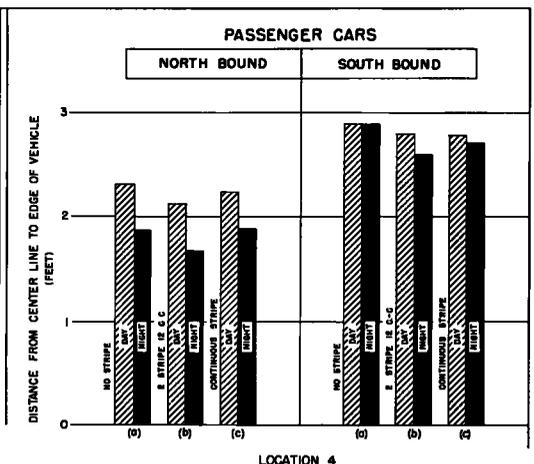
On the basis of these conclusions comparable data was combined from Locations 2, 3 and 4 to obtain the summary chart (Fig. 15). Data from Location 1 is not included in the summary chart since the lateral placement chart for Location 1 shows an abnormal variation in the lateral placement of northbound and southbound vehicles. This is attributed to the distance these traffic streams travel on the high embankment in reaching the point of observation. Southbound traffic has been on the 15-ft embankment for about 1,000 ft while northbound traffic has been on the fill for over 4 mi.

Examination of Figure 15 indicates that there is no difference in the effect of dashed and solid edge lines. Both tend to move the vehicles toward the center line of the pavement, however the movement does not appear sufficient to be hazardous on 24-ft pavements.



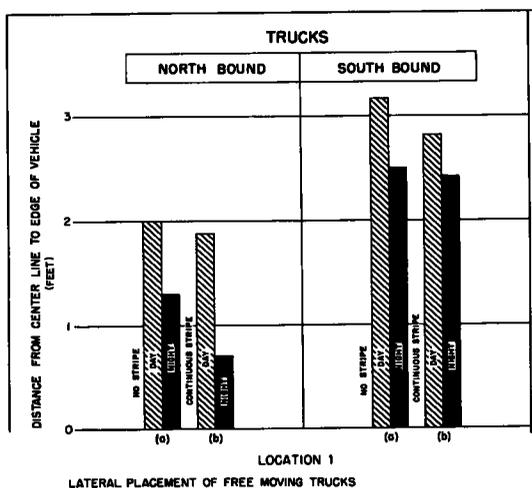
LATERAL PLACEMENT OF FREE MOVING PASSENGER CARS  
 (a) NO EDGE STRIPE  
 (b) WITH 10' STRIPE ON 40' CENTERS 6" FROM EDGE  
 (c) WITH CONTINUOUS STRIPE 6" FROM EDGE OF PAVEMENT

Figure 9.

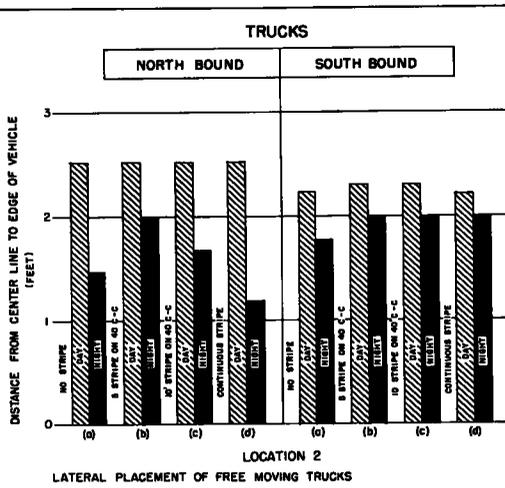


LATERAL PLACEMENT OF FREE/MOVING PASSENGER CARS  
 (a) NO EDGE STRIPE  
 (b) WITH 2' STRIPE ON 12' CENTERS 12" FROM EDGE  
 (c) WITH CONTINUOUS STRIPE 12" FROM EDGE OF PAVEMENT

Figure 10.



LATERAL PLACEMENT OF FREE MOVING TRUCKS  
 (a) NO EDGE STRIPE  
 (b) WITH CONTINUOUS STRIPE 18" FROM EDGE OF PAVEMENT



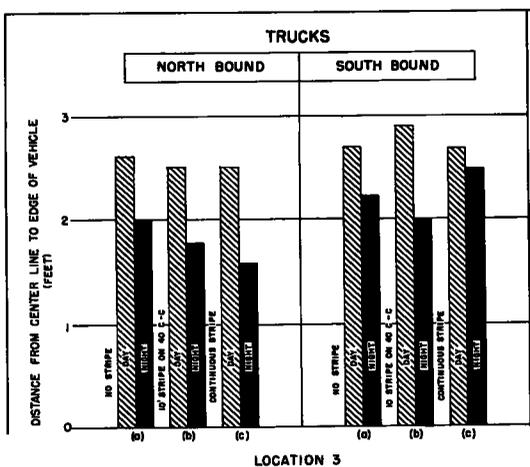
LATERAL PLACEMENT OF FREE MOVING TRUCKS  
 (a) NO EDGE STRIPE  
 (b) WITH 5' STRIPE ON 40' CENTERS 12" FROM EDGE  
 (c) WITH 10' STRIPE ON 40' CENTERS 12" FROM EDGE  
 (d) WITH CONTINUOUS STRIPE 12" FROM EDGE OF PAVEMENT

Figure 11.

Figure 12.

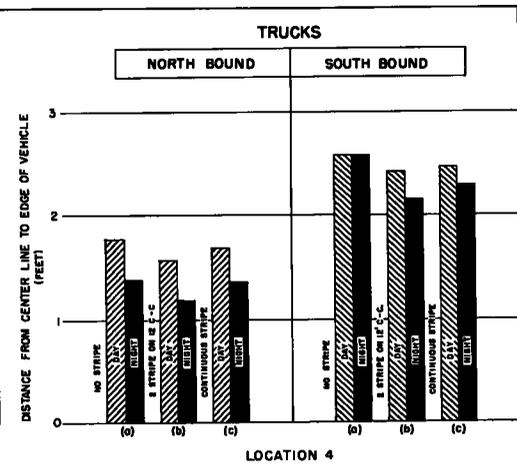
The consistency of vehicle placement under all conditions is obvious when speed is related to placement as shown in Table 1 for all passenger cars. Results are shown for passenger cars only by day and by night under each condition studied. In this table the average placement represents the distance from the center of the vehicle to the center-line of the surface. The composite passenger car is assumed to be 6 ft in width.

Previous studies by others have shown that as speeds increase there is a tendency for the vehicle to move toward the center line. Figure 16 shows a scatter diagram of passenger car placement as found by this study with a center of gravity drawn by observation which indicates a definite movement toward the center line as speeds increase.



LATERAL PLACEMENT OF FREE MOVING TRUCKS  
 (a) NO EDGE STRIPE  
 (b) WITH 10' STRIPE ON 40' CENTERS 6" FROM EDGE  
 (c) WITH CONTINUOUS STRIPE 6" FROM EDGE OF PAVEMENT

Figure 13.



LATERAL PLACEMENT OF FREE MOVING TRUCKS  
 (a) NO EDGE STRIPE  
 (b) WITH 2' STRIPE ON 12' CENTERS 12" FROM EDGE  
 (c) WITH CONTINUOUS STRIPE 12" FROM EDGE OF PAVEMENT

Figure 14.

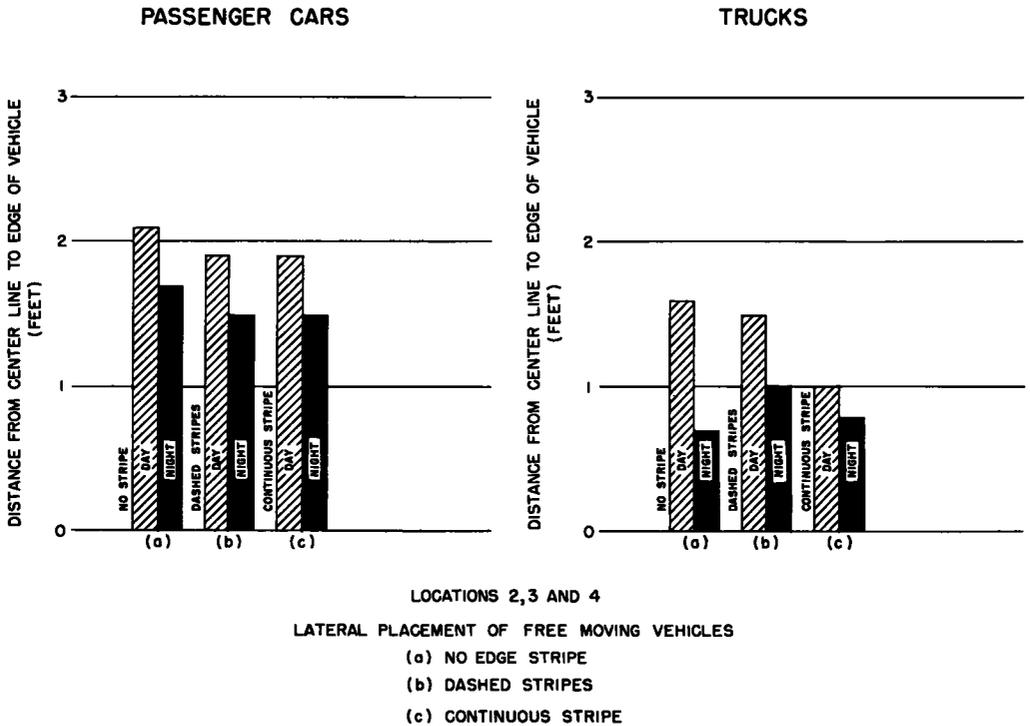


Figure 15.

### ACCIDENTS

Among the sections experimentally edge-striped are 65.5 mi, in lengths of 2 mi and more, on which a comparison of accidents can be made for periods of 6 months before and after the edge stripes were applied. The sections are all 24-ft bituminous surfaced and the edge stripes are reflectorized 4-in. solid white lines applied 12 in. from the edge of the pavement.

In the "before" study 12 head-on or sideswipe accidents were reported; the "after" period showed 14 such accidents. Accidents involving vehicles out of control and running off roadway were 15 in "before" and 22 in the "after" study.

Although it cannot be said that the edge stripes caused the increase in accidents, it can be said that edge stripes did not improve the accident picture.

### PSYCHOLOGICAL EFFECT

The study up to this point has dealt with the behavior of the vehicle; however, the psychological effect of edge striping on the driver is an important consideration. In order to determine if drivers are aware of the stripe, and their opinion of striping, a driver interview study was conducted at two points on U. S. 71 from 12 noon to 12 midnight excluding the 7 to 8 twilight hour. Northbound motorists had been traveling 12 mi over an edge-striped section while southbound motorists had been traveling 6 mi over a striped section prior to entering the non-striped zone where they were interviewed. Edge striped were reflectorized 4-in. white solid lines in the outer 12 in. of the surface.

All motorists were stopped and asked: (a) Were you aware of the line painted on the edge of the pavement on the highway from Bunkie south or from U. S. 190 to LeBeau; (b) do you know the purpose of these lines; and (c) are these lines of any help to you in driving?

A total of 1,417 motorists were interviewed, 1,141 in daytime and 276 at night, of these, 89 percent were aware of the lines while 11 percent stated they had not noticed

TABLE 1  
 AVERAGE SPEED AND AVERAGE PLACEMENT OF ALL PASSENGER CARS (PASSING VEHICLES EXCLUDED)  
 UNDER ALL CONDITIONS STUDIED AT FOUR LOCATIONS BY DIRECTION DURING DAYLIGHT AND DURING DARKNESS

Study Location No	Type of Marking	Average Speed (mph)				Average Placement <sup>a</sup>			
		Northbound		Southbound		Northbound		Southbound	
		Day	Night	Day	Night	Day	Night	Day	Night
1	No stripe	62.1	65.4	59.1	56.1	4.6	4.3	5.9	5.6
1	Continuous stripe 18 in. from edge	58.7	59.8	61.6	59.8	4.5	3.6	5.6	5.5
2	No stripe	56.0	58.2	59.0	59.4	5.0	4.3	5.0	4.8
2	5-ft stripe on 40-ft centers 12 in. from edge	59.6	54.1	61.0	60.2	5.1	4.3	5.2	4.9
2	10-ft stripe on 40-ft centers 12 in. from edge	58.2	59.4	60.7	60.0	5.0	4.4	5.0	4.7
2	Continuous stripe 12 in. from edge	59.4	57.9	59.0	59.9	5.1	3.8	4.8	4.5
3	No stripe	61.2	66.0	61.1	59.5	5.3	4.8	5.4	4.8
3	10-ft stripe on 40-ft centers 6 in. from edge	60.6	59.7	59.5	55.5	4.9	4.5	5.4	4.7
3	Continuous stripe 6 in. from edge	59.2	58.8	62.8	59.8	5.0	4.9	5.3	4.5
4	No stripe	57.4	56.0	59.0	54.8	5.0	4.5	5.5	5.4
4	2-ft stripe on 12-ft centers 12 in. from edge	57.2	57.0	58.0	53.3	4.7	4.4	5.4	5.3
4	Continuous stripe 12 in. from edge	58.3	58.6	57.3	53.3	4.9	4.5	5.4	5.2

<sup>a</sup> Center of vehicle to centerline of highway (in feet)

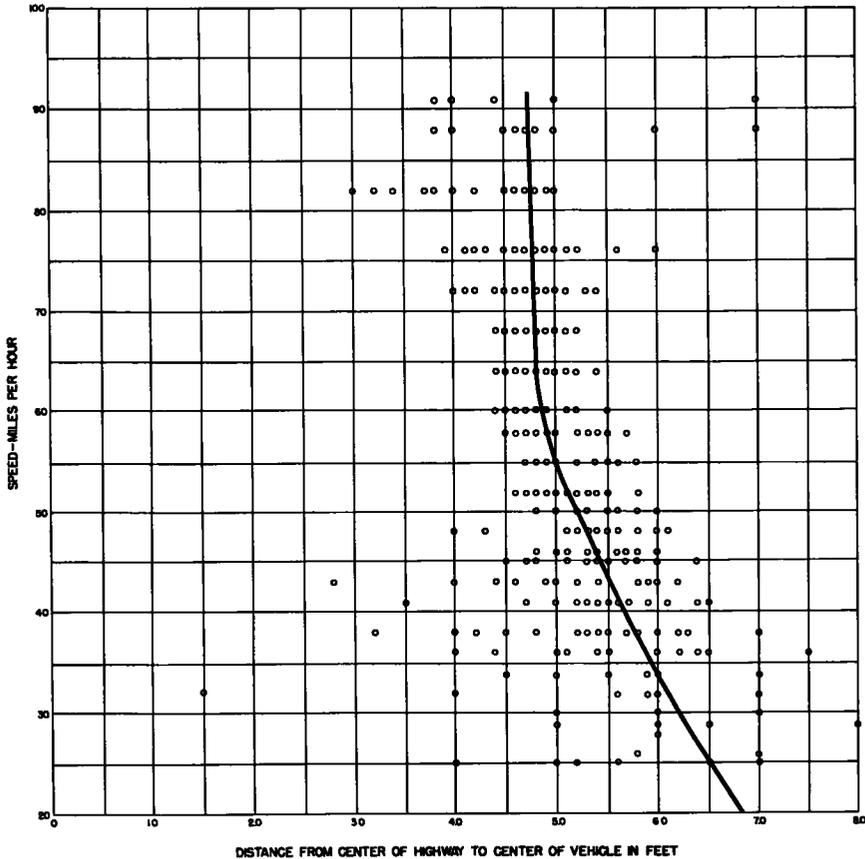


Figure 16. Placement of free-moving passenger cars at various speeds on 24 ft highways, 1956.

them. During daylight 88 percent observed the stripe, while at night 93 percent of the drivers saw them.

Of those observing the line, 97 percent were of the opinion that the stripe helped them in driving. A majority of the drivers volunteered the comment that the edge stripe was especially helpful at night and during rain or under other adverse driving conditions. Considering all motorists, including those who did not notice the line and were not qualified to give an opinion of its effect, 86 percent of the drivers believed they derived some benefit from the edge striping. The motoring public seemed to have a good idea of the purpose of the stripe. Almost all of those who noticed it thought that its purpose was to help the driver stay in his lane, or to act as a guide line for his protection.

#### CONCLUSIONS

1. The psychological effect on a majority of vehicle drivers is the only benefit from pavement edge lines found by this study.

2. The tendency of vehicles to move toward the center of edge striped pavements does not appear sufficiently large to create any abnormal hazard on a 24-ft surface however this may not be applicable to narrower pavements.