

Effect of Edge Striping on Traffic Operations

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During 1956, the Louisiana Department of Highways, in conjunction with the Bureau of Public Roads conducted a number of research studies on US 71 near LeBeau to determine the effect of pavement edge striping on the lateral placement of vehicles on 24-ft tangent highways. Results of the study indicated that a continuous edge stripe or line had no effect on vehicle placement during the day, but at night the continuous line tended to move vehicles slightly toward the centerline.

During the summer of 1957, the department, again in cooperation with the Bureau of Public Roads, repeated the placement study on 24-ft tangent highways in a different part of the state in an effort to verify findings of the initial study.

In addition, the scope of the study was broadened to include a study of a section of tangent 20-ft roadways, a section of 20-ft roadways on a 4-deg curve, and a section of 4-lane divided highway with 12-ft lanes in one direction and 10-ft lanes in the other. In all cases, shoulders were in color contrast to the through roadways.

●THE BUREAU of Public Roads furnished the department an electromechanical speedometer and placement detector with technicians to supervise collection of field data. This device recorded vehicle speeds by use of electrical circuits wired to pens recording on a tape moving at a constant rate. Lateral placement of vehicles was measured by electrical contacts placed across the roadway spaced at 1-ft intervals. Placement of vehicles was measured to within 6-in. maximum, and generally within 3 in.

In the 24-ft tangent roadway study, a 4-mi section of US 190, bituminous surfaced, located just east of Albany was selected for sampling. The study was limited to the hours 12 noon to 12 midnight with the exception of the twilight hour which was not studied. The study location was approximately midway the 4-mi section. All equipment and personnel were off the highway and hidden from the motorists.

The "before" study was conducted with the roadway marked along the centerline with a 15-ft white-reflectorized 4-in. wide centerline on 40-ft centers. A total of 7,939 veh was sampled in all of the "before" studies. Vehicle placement was observed by type of vehicle; direction of travel; and maneuver (free moving, meeting, etc.).

The "after" study was conducted with all of the conditions listed above plus a 4-in. wide reflectorized stripe or line placed 6 in. from the outside edge of both sides of the pavement. A total of 9,480 veh was sampled in the "after" study. Both the "before" and "after" study were conducted for three consecutive weekdays.

VEHICLE PLACEMENT ON 24-FT TANGENT ROADWAYS

Figure 1 shows the average distance from the centerline to the nearest edge of the vehicle for free flowing passenger cars and for commercial vehicles by each direction of travel during the day and night.

Again, in this study as in the initial study, the trend for free flowing vehicles to travel nearer the centerline after painting of the continuous outside edge line is noted. As expected, commercial vehicles, because of their increased size, travel closer to the center line than passenger cars.

A comparison of the results found during the 1956 and 1957 study for both directions of travel combined for passenger cars and commercial vehicles is shown in Figure 2.

A study of this figure shows the findings during the 1956 study are repeated almost identically by the 1957 findings. It is interesting to note that in all cases the presence of the continuous line along the outside edge of the pavement moved the vehicles slightly toward the centerline. These two studies conducted on Louisiana highways in different parts of the State and separated by a time interval of a year indicate strongly that free flowing vehicles on a 24-ft highway marked with both a centerline and an outside continuous line will, of their own free will, travel several inches closer to the centerline.

Figure 3 shows the clearance between inner edge of meeting vehicles. Here again, both passenger cars meeting passenger cars, or passenger cars meeting commercial vehicles have less clearance between the passing vehicle after the continuous line had been installed. Noteworthy is the finding that there is a greater distance between passenger cars meeting at night than those meeting in the daytime. This is true with or without the continuous edge line. However, meeting vehicles traveling during the day or night after the highway had been marked with a continuous stripe are some 6 to 8 in.

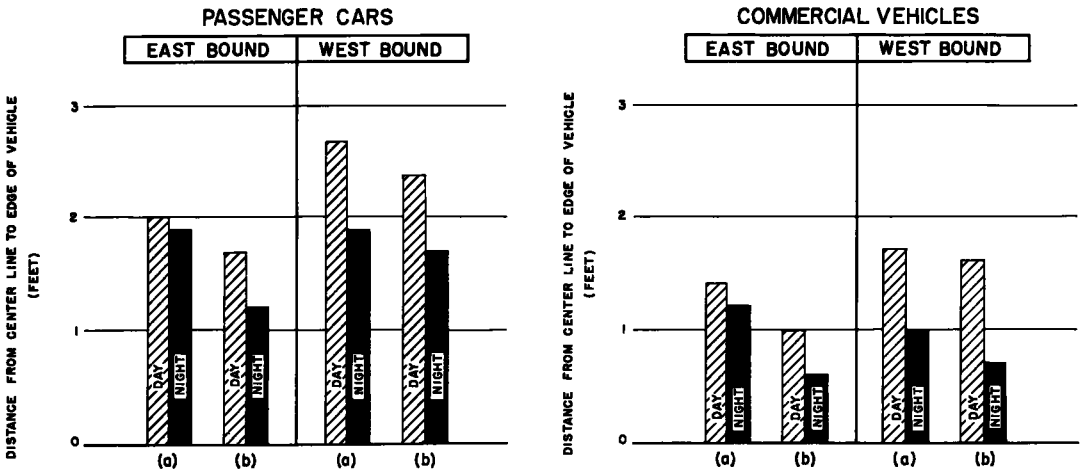


Figure 1. Lateral placement of free moving vehicles on 24-ft tangent highway; (a) no edge stripe; (b) continuous edge stripe.

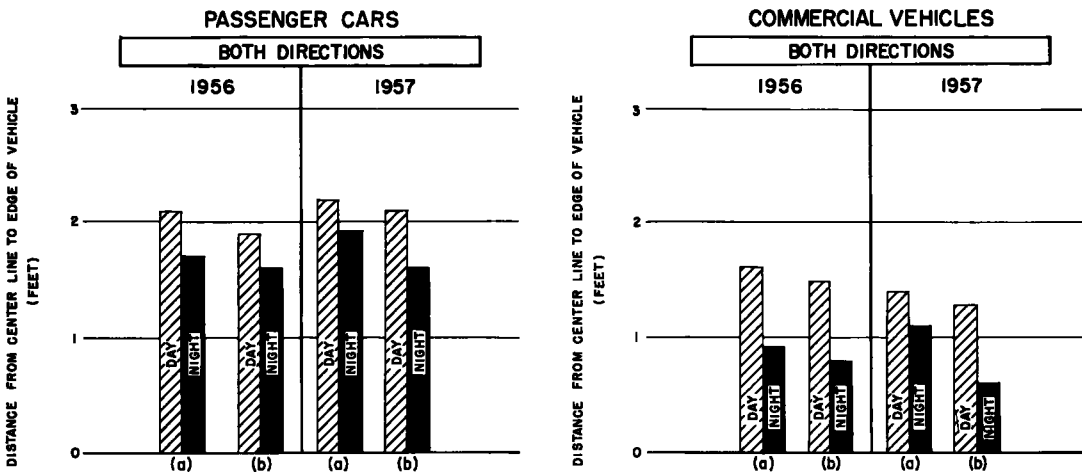


Figure 2. Comparison of lateral placement of free moving vehicles on 24-ft tangent highway 1956-1957; (a) no edge stripe; (b) continuous edge stripe.

nearer each other than those meeting on the highway prior to placement of the stripe.

VEHICLE PLACEMENT ON 20-FT TANGENT ROADWAYS

The second phase of the study was conducted on a 20-ft tangent bituminous highway in a manner similar to that described for the 24-ft section. Results for free flowing vehicles found in this study which are shown in Figure 4 are almost identical to those observed on the 24-ft study sections. The vehicles are traveling nearer to the centerline since the roadway is narrower, but the trend to move toward the centerline after painting of the continuous edge line is noted by both the free moving passenger cars and commercial vehicles.

Figure 5 indicates that this tendency to move nearer the centerline after painting of the continuous edge line is also present when passenger cars meet other passenger cars and commercial cars.

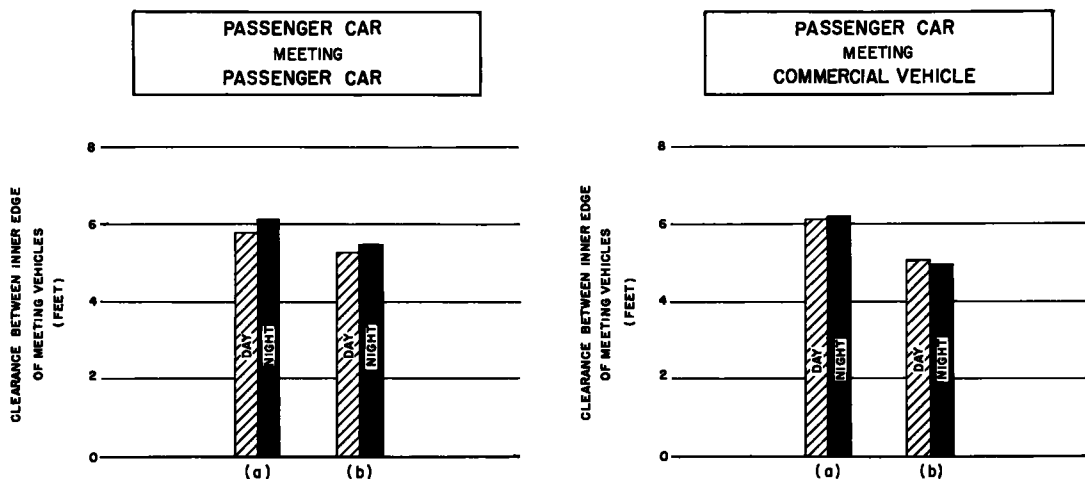


Figure 3. Clearance between inner edge of meeting vehicles on 24-ft tangent highway; (a) no edge stripe; (b) continuous edge stripe.

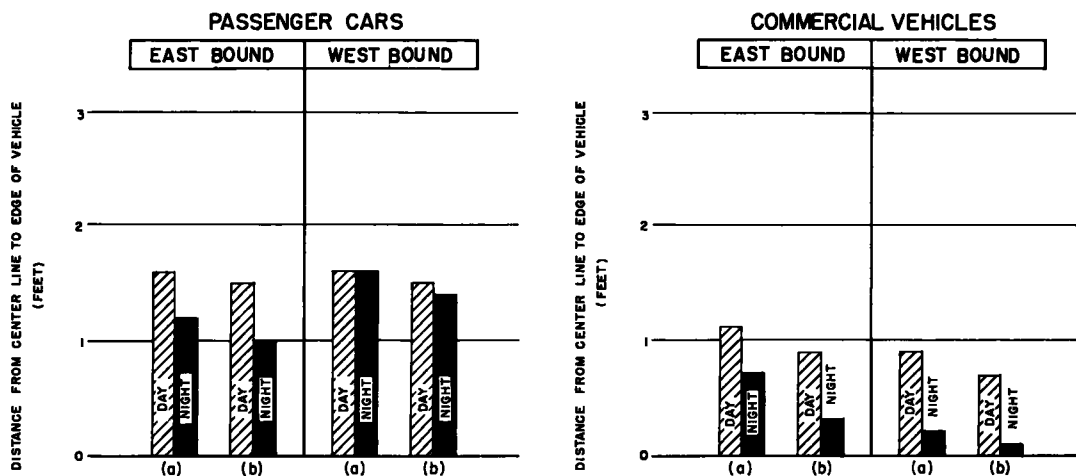


Figure 4. Lateral placement of free moving vehicles on 20-ft tangent highway; (a) no edge stripe; (b) continuous edge stripe.

VEHICLE PLACEMENT ON CURVES ON 20-FT ROADWAYS

A third phase of the study deals with lateral placement of vehicles on a 20-ft roadway in a 4-deg curve. Conditions for the study were the same as those described for the other two phases. The westbound traffic moved over the inside of the curve while eastbound traffic was on the outside of the curve. The entire curve was in a marked no passing zone, utilizing standard double yellow markings.

Figure 6 shows the lateral placement of free moving passenger cars before and after outside edge markings were applied.

The minus values recorded during the night observations indicate that vehicles in the outside or eastbound lane are crossing the no passing stripe and the centerline stripe when negotiating this curve. The continuous outside edge stripe at night moved these eastbound vehicles slightly to the left, increasing the distance that they crossed the centerline by 0.1 of a foot. This move to the left was even greater in the daytime, averaging 0.6 ft. However, in the daytime the vehicles on the outside of the curve did stay in their lane, evidently obeying the yellow no passing line; even though they were nearer the centerline

The same general pattern was followed by eastbound commercial vehicles, except that the movement to the left was even more pronounced, with vehicles crossing the centerline in the daytime.

Westbound traffic also showed a tendency to move away from the edge of the roadway and toward the centerline. However, this movement for passenger cars averaged only 0.2 ft during the day and 0.1 ft at night. The lateral movement for commercial vehicles during the day was also slight; however, at night this movement toward the centerline after edge striping was almost a foot.

VEHICLE PLACEMENT ON 4-LANE DIVIDED HIGHWAYS

The final phase of the study was conducted to determine the effect continuous edge line striping has on vehicle placement on 4-lane divided highways.

PASSENGER CAR MEETING PASSENGER CAR

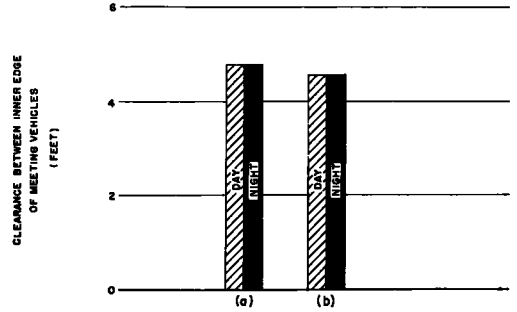
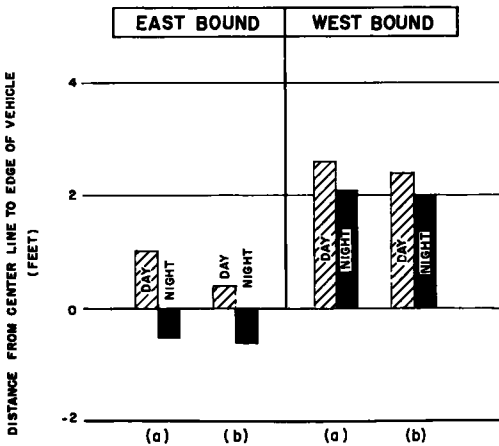


Figure 5. Clearance between inner edge of meeting vehicles on 20-ft tangent highway; (a) no edge stripe; (b) continuous edge stripe.

PASSENGER CARS



COMMERCIAL VEHICLES

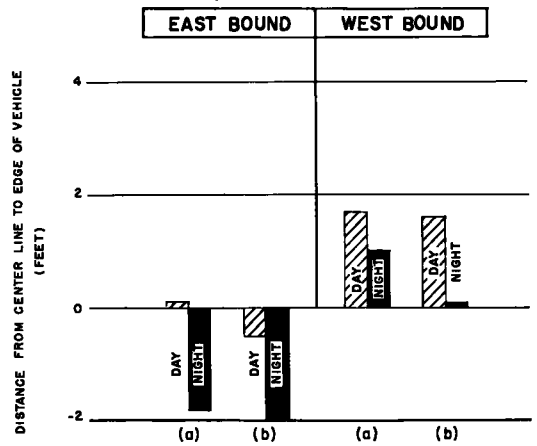


Figure 6. Lateral placement of free moving vehicles on 20-in. highway in 4-deg curve; (a) no edge stripe; (b) continuous edge stripe.

PASSENGER CARS

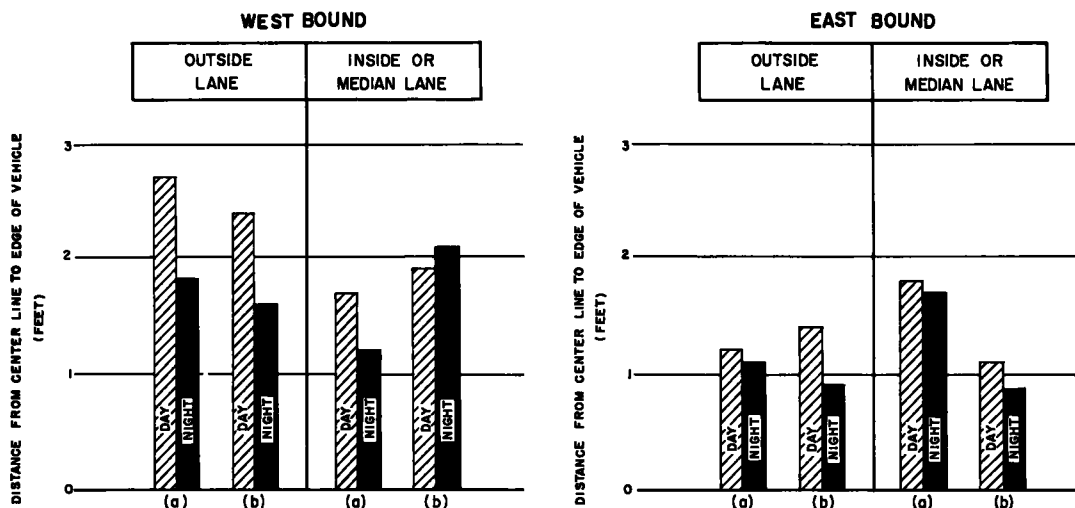


Figure 7. Lateral movement of free moving passenger cars on 4 lane divided highway; (a) no edge stripe; (b) continuous edge stripe.

A tangent 4-mi section of US 190 some 8 mi west of Baton Rouge was selected for study. The westbound lanes were 12-ft concrete while the eastbound lanes were 10-ft bituminous overlay. Roadways were separated by a 4-ft raised concrete median. Ten-ft grass shoulders were provided on each side. The statutory speed limit of 60 mph for passenger cars and 45 mph for trucks was in effect. This section of highway served an average traffic volume of 9,000 veh daily.

In the "before" study, the only marking was standard lane lines—15-ft white 4-in. reflectorized line on 40-ft centers. For the "after" study continuous edge lines were applied along the outside edge of the pavement and along the edge of the median.

Figure 7 shows results of the study dealing with free flowing passenger cars; it is interesting to note that completely different findings were observed for vehicles moving in the 12-ft lanes as compared to those in the 10-ft lanes.

With the 12-ft lanes, the continuous edge stripe moved vehicles in the outside or right hand lane toward the lane line; however, the continuous line along the median moved the vehicles away from the lane line and toward the median. This movement was quite significant at night, measuring almost a foot.

On the 10-ft lanes, the edge stripes along the outside edge of the pavement and along the median moved both the inside and outside lanes of night traffic toward the lane line; that is, the center of the travelway for that direction of travel; and although the movement in the median lane was almost a foot, it was just the reverse of that found on the 12-ft lanes.

Based on results of these studies, it has been recommended and the Louisiana Department of Highways has adopted a policy of edge striping all 24-ft, 2-lane highways, but will not mark 2-lane highways that are narrower than 24 ft.

Four-lane divided highways with 12-ft lanes are edge striped only under certain conditions of high traffic volumes, high speed in suburban or urban areas. Edge striping will be applied on all divided highways where stabilized shoulders with little or no color contrast are provided.