

PHYSICAL SEPARATION OF OPPOSING STREAMS OF TRAFFIC

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SYNOPSIS

The before and after accident experience on the dividing of a four-lane highway in New Jersey by a method of jacking apart the adjacent slabs presents pertinent data that are necessary in evaluating the benefits of divided highway construction.

The years of 1933 and 1934 are compared to 1937 and 1938 for the 10.64 miles of this section. There was a decrease in fatal accidents of 83.3 per cent, a decrease of 48.5 per cent in non-fatal injuries and a 17.6 per cent decrease in property damage accidents. The total reduction in accidents of all kinds was 40.4 per cent. Comparing these reductions to State-wide data for the same period, it is found that there was an increase of 6.7 per cent in total accidents, a decrease of 21.4 per cent in fatal accidents, and a 5.3 per cent decrease in non-fatal injury accidents. These changes occurred while the total traffic in the State was increasing 44 per cent as measured by the total gasoline consumption.

Further breakdowns of the data indicate that there was little change in total accidents at intersections, but a considerable reduction between intersections. It would seem that a wider dividing island would be a better accident preventive at intersections. The reduction of accidents was greater for the night than for the day, being 47.2 per cent at night and 31.4 per cent in the day.

The cost of this reconstruction was about \$50,000 per mile. By applying National Safety Council figures to the reduction in accidents, it is found that savings in accident costs will pay for this conversion in slightly over 3 years.

Advanced thinking coached by continued and extensive researches in the causes and prevention of highway accidents has more and more convinced authorities that the "human side" of the accident problem can be effectively and economically dealt with through the application of appropriate roadway design principles—design features that lessen the importance of human failures—design features that make it less possible for drivers to have accidents because of improper driving practices.

A feature of highway design that has had a favorable trend in use in recent years is that of the divided roadway or dual type of highway.

The functional purpose of the divisional or center island is of course that of separating opposing flows of traffic, making it difficult or almost impossible for vehicles traveling in opposite directions to collide head-on. Some traffic authorities are of the opinion that the center island too might curtail other

types of accidents such as collisions between vehicles traveling in the same direction, pedestrian accidents and others.

Have divided roadways brought about a decrease in accidents?

In the words of one of our more prominent citizens—"Let us look at the record."

In the year 1935, the New Jersey State Highway Department, convinced of the value of segregating opposing flows of traffic on heavily traveled four-lane highways, began a program of highway dualization along the important trans-state route between Trenton and Newark.

The first stretch of this roadway so converted has been completed long enough to indicate with some degree of accuracy the results in accident reduction which might be expected from highway dualization, other factors remaining the same.

The section concerned is that portion of State Highway Route No. 26 in the

Townships of North Brunswick, South Brunswick and Plainsboro, extending for a distance of 10.64 miles. The years 1935 and 1936 represent the construction period; 1933 and 1934 the "before" period and 1937 and 1938 the "after" period.

This section is substantially rural with little roadside development except occasional billboards, gasoline stations, garages and small buildings primarily used for commercial purposes. Intersection frequency is slightly more than one intersection per mile of roadway.

the conversion, gives the results in Table 1.

Because of the improvement in the general accident situation throughout the State in the past few years, particularly fatal accidents, it is possible that the accident experience along Route 26 in the years 1937 and 1938 would have improved more or less comparably to that of the entire State, assuming the roadway had remained as an undivided four-lane highway. On the other hand, if because of the conversion to a divided roadway, accident experience along Route 26 in the

TABLE 1
ACCIDENT EXPERIENCE STATE HIGHWAY ROUTE NO. 26 BEFORE (1933 AND 1934) AND
AFTER (1937 AND 1938) THE CONVERSION TO A DUAL HIGHWAY,
ACCORDING TO SEVERITY

Accident Severity	No. Brunswick		So. Brunswick		Plainsboro		Total accidents		Change, %
	Before	After	Before	After	Before	After	Before	After	
Fatal.....	7	..	18	4	5	1	30	5	83.3 Dec.
Non-fatal injury..	30	13	81	45	31	15	142	73	48.5 Dec.
Property damage..	26	17	63	49	19	23	108	89	17.6 Dec.
Total accidents...	63	30	162	98	55	39	280	167	40.4 Dec.
Change, %.....	52.4 Dec.		39.5 Dec.		29.1 Dec.		40.4 Dec.		

The highway cross section before the improvement included 39 ft. 6 in. of pavement, 16 ft. total shoulder area and 45 ft. sidewalk area, making a total of 100 ft. of right of way. After the improvement, which consisted in sliding one lane of concrete to the side for a sufficient distance to permit the construction of a 12-ft. island, the cross section included 24 ft. 6 in. of pavement each side of the 12-ft. center island, 10 ft. 6 in. total shoulder area and a 28-ft. 6-in. sidewalk area.

"BEFORE" AND "AFTER" ACCIDENT
EXPERIENCE

A comparison of the number of accidents by severity "before" and "after"

years 1937 and 1938 improved considerably over that for the entire State, it is reasonable to assume that the physical separation of opposing streams of traffic is largely responsible for the improvement.

Table 2 gives a comparison of the change in motor vehicle registration, gasoline consumption and accident experience in the years 1937 and 1938 over 1933 and 1934 for the entire State and the change in accident experience along the section of Route 26 concerned for the same period.

Comparable traffic counts along the section of Route 26 concerned for the "before" and "after" period are not

available. However, the increase in traffic volume in the 1937-1938 period over the 1933-1934 period, is equal to at least the increase in gasoline consumption in the entire State.

The effect of the conversion of this sec-

small number of intersections within this 10-mile area of highway and also due to the influence of factors of chance because of the low number of accidents at intersections. Possibly, too, because the center island is only 12 ft. wide, the influ-

TABLE 2

	Increase, %	Decrease, %
Motor vehicle registration.....	17.3	....
Gasoline consumption.....	44.0	....
Total accidents in state.....	6.7	....
Fatal accidents in state.....	....	21.4
Non-fatal injury accidents in state.....	....	5.3
Total accidents along Route 26.....	....	40.4
Fatal accidents along Route 26.....	....	83.3
Non-fatal injury accidents along Route 26.....	....	48.5

TABLE 3

ACCIDENT EXPERIENCE STATE HIGHWAY ROUTE 26 BEFORE (1933 AND 1934) AND AFTER (1937 AND 1938) THE CONVERSION TO A DUAL HIGHWAY, AT AND BETWEEN INTERSECTIONS

Type of accident	At intersection		Between intersection		Total		Change, %
	Before	After	Before	After	Before	After	
Right angle.....	8	11	2	2	10	13	30.0 Inc.
Same direction.....	13	21	129	86	142	107	24.6 Dec.
Opposite direction (left-turn).....	3	2	1	..	4	2	50.0 Dec.
Opposite direction (head-on).....	5	..	42	4	47	4	91.5 Dec.
Fixed object.....	2	2	28	20	30	22	26.6 Dec.
Pedestrian.....	1	..	18	5	19	5	73.7 Dec.
Other types.....	3	1	25	13	28	14	50.0 Dec.
Total.....	35	37	245	130	280	167	40.4 Dec.
Change, %.....	5.7 Inc.		46.9 Dec.		40.4 Dec.		

tion of Route 26 to a divided highway on accident experience at "at and between intersection" locations and also the effect on accidents of different types, are shown in Table 3.

It is noted that the entire improvement along this stretch of roadway is confined to "between intersection" locations. This is undoubtedly due to the

ence as an accident preventive is not so great as if the island had been wider.

It is noted that accidents of all types, with the exception of right angle collisions, decreased along this stretch of roadway after the conversion. The percentages of decreases are indicated in the tabulation.

A detailed analysis of pedestrian acci-

dents for both the "before" and "after" period indicates not only a decrease in pedestrian accidents when the pedestrian was crossing the highway but also in pedestrian accidents when the pedestrian was walking along the highway.

For the "before" period, 6 of the 19 pedestrian accidents concerned persons walking along the highway, while for the "after" period, 2 of the 5 accidents concerned pedestrians walking along the highway.

Table 4 gives the results of the conversion on accident experience separated

driving, suffering and sorrow which inevitably accompany traffic accidents.

From the standpoint of accident reduction alone, the economic saving after a comparatively few years more than equals the initial cost of construction. For example, the approximate cost of the conversion of this section of roadway to a divided highway is approximately \$50,000 per mile of road. The saving in accident costs, computed on the basis of the National Safety Council's figures of \$11,500 for each death, \$425 for each person injured and \$125 for each prop-

TABLE 4
DAY AND NIGHT ACCIDENT EXPERIENCE STATE HIGHWAY ROUTE 26 BEFORE (1933 AND 1934)
AND AFTER (1937 AND 1938) THE CONVERSION TO A DUAL HIGHWAY.

Type of accident	Day		Night		Total		Change, %
	Before	After	Before	After	Before	After	
Right angle.....	8	7	2	6	10	13	30.0 Inc.
Same direction.....	49	49	93	58	142	107	24.6 Dec.
Opposite direction (left-turn).....	1	..	3	2	4	2	50.0 Dec.
Opposite direction (head-on).....	20	3	27	1	47	4	91.5 Dec.
Fixed object.....	18	15	12	7	30	22	26.6 Dec.
Pedestrian.....	5	2	14	3	19	5	73.7 Dec.
Other types.....	20	7	8	7	28	14	50.0 Dec.
Total.....	121	83	159	84	280	167	40.4 Dec.
Change.....	31.4 Dec.		47.2 Dec.		40.4 Dec.		

by hours of daylight and hours of darkness.

ECONOMIC SAVING

The fundamental characteristics of dual highways result in favorable operating conditions, all of which have a definite bearing on the economics of this type of construction.

These include tangible items, the money value of which can at least be partially computed or estimated, such as smoother operation and accident reduction; and intangible items, the money value of which cannot be readily computed, such as decreased mental and physical exertion and irritation while

erty damage accident, amounts to \$188,500 per year.

At this rate, the saving in accident costs resulting from the conversion of this roadway to a divided roadway will pay for the total cost of construction, plus interest charges at the rate of 6 per cent, in slightly more than three years.

CONCLUSIONS

It is apparent that the physical separation of opposing streams of traffic has a substantial, favorable effect on accident experience. Whenever it is physically and economically possible, therefore, highways of four or more lanes in width should be of the divided type.