

Results of Speed Zoning on Rural Highways

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● THIS report presents a survey of several before-and-after studies covering traffic-accident experience and motor-vehicle speeds on sections of speed-zoned state trunk highways in Wisconsin.

The survey was made to provide factual information for evaluating the effectiveness of speed zoning for the control of traffic speeds and for the reduction of accidents on the rural state highway system of Wisconsin.

The 1947 Wisconsin legislature granted authority to the highway commission for the establishment of reasonable and safe speed limits on the state highway system to be applied when those limits had been determined upon the basis of engineering and traffic investigations after existing speed limits or the actual speed of vehicles had been found to be greater or less than was reasonable. The speed zoning performed under this statute was and currently is largely confined to relatively short sections of highway having a high accident record or accident potential. To date 690 separate declarations for speed zones on the state highway system have been approved by the highway commission. These declarations represent 792 miles of state highway that have been officially posted as speed zones.

That portion of Section 85.40, Wisconsin Statutes, which pertains to speed restrictions and the authority for speed zoning, as altered by the 1953 Legislature, will be found in the appendix.

DESCRIPTION AND HISTORY OF SPEED-ZONE SECTIONS

This survey included before-and-after studies at six separate speed-zone locations on the state highway system. Two of the locations were on three-lane sections of highway and four were on two-lane sections. The six sections represented 24.83 miles of official speed zoning. Sections of speed zoned highways with comparatively high accident experience which had been speed zoned for at least 2 years were chosen in order to provide adequate statistical samples for reliable analyses. The sections chosen for this study

ranged in length from 1.92 to 10.05 miles, as compared to the average length of 1.15 miles for all speed zones on the state highway system. All six locations were chosen for this survey before any of the results in terms of an increase or decrease in speed or accidents were known.

Location 1

The speed-zone section described as Location 1 for the purposes of this report is 10.05 miles of US 51 between Beloit and Janesville in the south-central part of Wisconsin. This is a three-lane highway which carried an annual 24-hour average traffic volume of 5,175 motor vehicles in 1952. This section was speed zoned, because it had a high traffic fatality record and because the residential development along both sides of the highway, especially at the ends of the section, provided a pedestrian accident potential. After an investigation, speed-zone signs were erected on January 12, 1949.

Location 2

This location covers the section of State Highway 32 from the south city limits of Racine to the Racine-Kenosha county line. The section is a three-lane highway, 2.80 miles long, in the southeastern part of the state. In 1952 this road had an annual 24-hour average traffic volume of 5,270 vehicles.

An investigation revealed that the traffic and physical conditions along the highway and the frequency of accidents on it warranted the establishment of a speed zone along its length. A limited right-of-way and a large number of turning movements as a result of the many private entrances and side roads helped to determine the need for a speed zone at this location. Signs for the approved speed-zone declaration (see appendix) were erected on October 8, 1948.

Location 3

That stretch of Route 42 between Manitowoc and Two Rivers in the east central part



Figure 1. Location 1(a): Looking north on US 51 between Beloit and Janesville about 2 miles north of Beloit.



Figure 4. Location 2(b): Looking north on State 32 about 1½ miles south of Racine.



Figure 2. Location 1(b): Looking south on US 51 about ½ mile south of Janesville.



Figure 5. Location 3(a): Looking north on State 42 between Two Rivers and Manitowoc about 2 miles north of Manitowoc.



Figure 3. Location 2(a): Looking north on State 32 about a mile south of Racine.

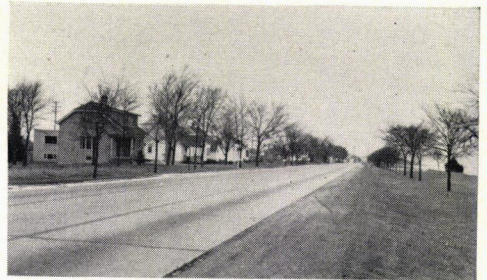


Figure 6. Location 3(b): Looking north on State 42 about ½ mile south of Two Rivers.

of the state along the shores of Lake Michigan is referred to in this report as Location 3. This section is a three-lane highway which is 3.08 miles long with a reported 1952 annual 24-hour average traffic volume of 4,965 vehicles. One of the chief reasons for speed zoning this stretch of highway was the fact that it had a high pedestrian traffic-accident experience. In addition the park facilities along the lake side of the roadway help to

create a pedestrian-accident potential. After an investigation, the speed zone declaration listed for Location 3 in the appendix was approved. Signs for the zone were erected on December 3, 1948.

Location 4

Location 4 in this report pertains to the section of US 12 through the unincorporated village of Lake Delton and northerly to the

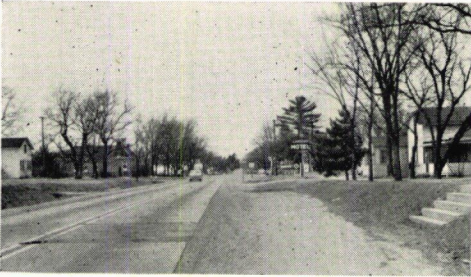


Figure 7. Location 4(a): Looking north on US 12 at Lake Delton.

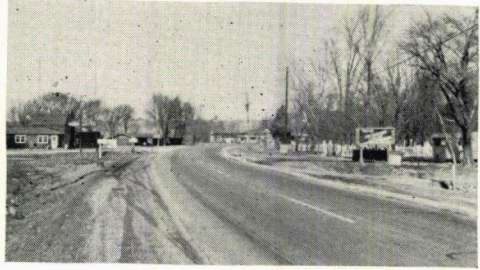


Figure 9. Location 5(a): Looking north on US 51 at Lake Kegonsa between Madison and Stoughton about 12 miles southeast of Madison.

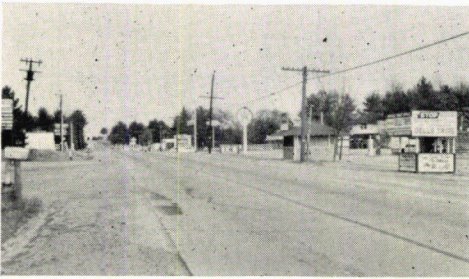


Figure 8. Location 4(b): Looking north on US 12 about 1 1/2 miles north of Lake Delton.

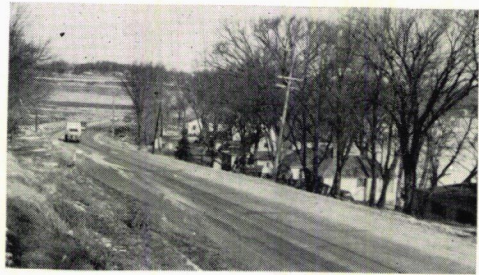


Figure 10. Location 5(b): Looking north on US 51 about 11 1/2 miles southeast of Madison.

south junction of US 16 near Wisconsin Dells in the south-central part of Wisconsin. US 12 is a two-lane road at this location which carried an annual 24-hour average traffic volume of 4,855 vehicles during 1952. The speed-zoned portion of the highway covers 3.98 miles.

The highly concentrated business development of the summer resort and amusement-row type along this portion of US 12 and the pedestrian-traffic-accident potential on it warranted the establishment of the present speed zone. Signs for the speed zone were erected on June 24, 1949.

Location 5

The two-lane section of speed-zoned highway covers 1.92 miles of US 51 at Lake Kegonsa in the south-central part of Wisconsin. In 1952 the annual 24-hour traffic volume on this road was reported to be 3,100 vehicles. A high accident potential caused by a heavy concentration of summer-resort development was the reason for recommending a speed zone along this highway. The large number of turning movements onto and off of the road

at the many private entrances along this stretch is a traffic hazard. Signs were erected and the speed-limit declaration became effective on November 15, 1950.

Location 6

Old US 41 (now State 175) from Menomonee Falls to the Milwaukee-Waukesha county line will be known as Location 6 for the pur-

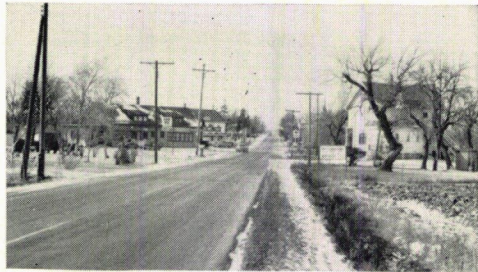


Figure 11. Location 6(a): Looking north on Old US 41 at Fussville about 2 1/2 miles southeast of Menomonee Falls.

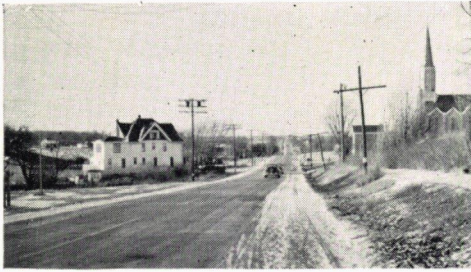


Figure 12. Location 6(b): Looking north on Old US 41 about 2 miles southeast of Menomonee Falls.

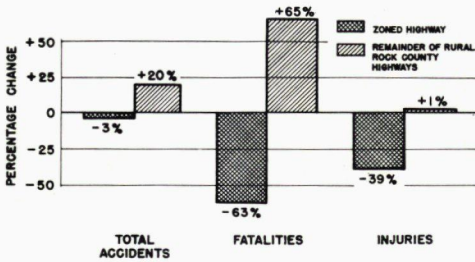


Figure 13. Comparison of experience from 2 years before to 2 years after zoning, US 51, Janesville to Beloit.

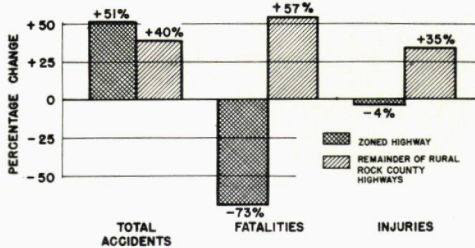


Figure 14. Comparison of experience from 2 years before to second 2 years after zoning, US 51, Janesville to Beloit.

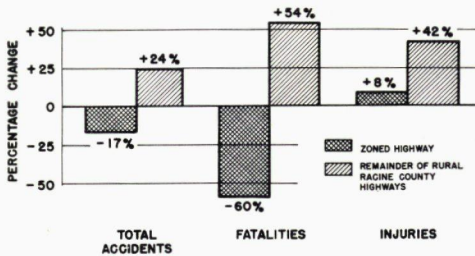


Figure 15. Comparison of experience from 2 years before to 2 years after zoning, State 32, Racine to Racine-Kenosha county line.

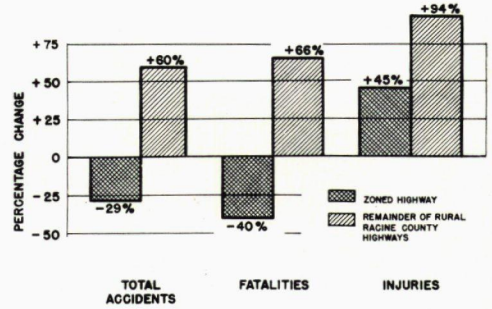


Figure 16. From 2 years before to second 2 years after zoning, State 32, Racine to Racine-Kenosha county line.

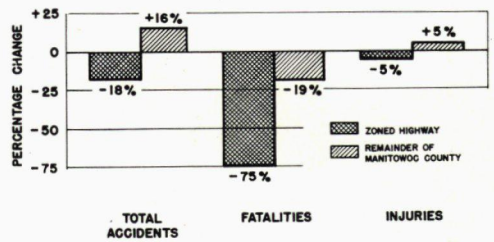


Figure 17. From 2 years before to 2 years after zoning, State 42, Manitowoc to Two Rivers.

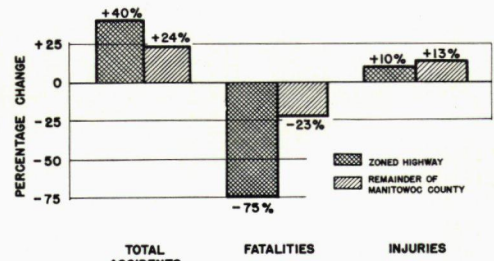


Figure 18. From 2 years before to second 2 years after zoning, State 42, Manitowoc to Two Rivers.

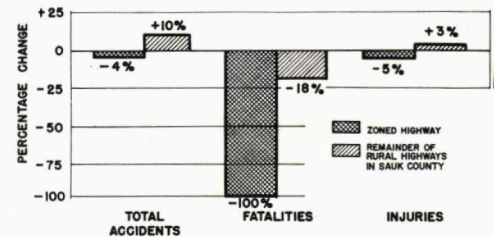


Figure 19. From 2 years before to 2 years after zoning, US 12, Lake Delton to south junction of US 16.

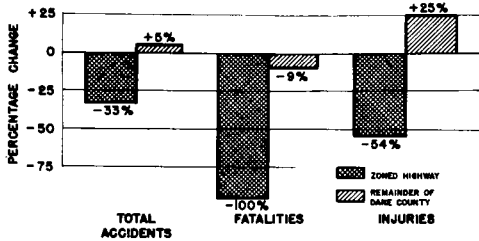


Figure 20. From 2 years before to 2 years after zoning, US 51 at Lake Kegonsa.

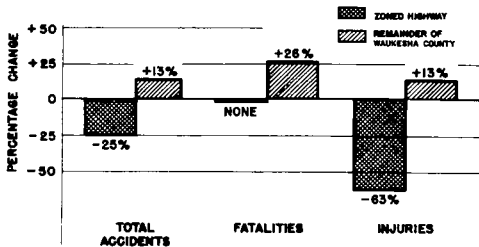


Figure 21. From 2 years before to 2 years after zoning, Old US 41, Menomonee Falls to Milwaukee-Waukesha county line.

poses of this report. This highway is a two-lane road which carried the high annual 24-hour-average traffic of 7,400 vehicles in 1952. The speed zone, which is 3 miles long, was established and marked on July 19, 1949, after engineering and traffic investigations. The concentrated business and residential development along this highway, the narrow road and shoulders, the limited sight distances, the high traffic volumes, the limited passing opportunities, and a high accident rate warranted the declaration of a speed zone.

PROCEDURE

The accident experience on the zoned portions of each of the highway locations for this study was obtained from the accident files of the local enforcement agencies. Checks made previous to this study showed that the files and records in the local agencies were usually more complete than those of the state agency with which every driver who is involved in a reportable motor-vehicle traffic accident is required by law to file a written report. All accident reports were photographed for convenience of future study.

Two methods were employed in obtaining speed data for each of the locations. The data

TABLE 1
LOCATION 1: BEFORE-AND-AFTER STUDY
COVERING SPEED ZONING ON US 51 BETWEEN
BELOIT AND JANESVILLE

(Three-Lane Highway)

Signs erected—January 12, 1949. Length of zone—10.05 miles. 1952 annual 24 hour average traffic volume—5,175 vehicles.

	Total Accidents	Fatalities	Injuries
Accident Experience on Zoned Highway*			
(a) 2-yr. period before zoning	111	11	108
(b) First 2-yr. period after zoning	108	4	66
(c) Second 2-yr. period after zoning	168	3	104
Percentage change (b) over (a)	-3%	-63%	-39%
Percentage change (c) over (a)	+51%	-73%	-4%
Accident Experience of Remainder of Rural Highways in Rock County*			
(a) 2-yr. period before above zoning	1096	23	782
(b) First 2-yr. period after above zoning	1316	38	788
(c) Second 2-yr. period after above zoning	1509	36	1054
Percentage change (b) over (a)	+20%	+65%	+1%
Percentage change (c) over (a)	+40%	+57%	+35%

Comparison of Accident Experience on Zoned Highway with Accident Experience on Remainder of Rural Highways in Rock County

(a) Percentage change from 2 yr. before to first 2 yr. after zoning on zoned highway	-3%	-63%	-39%
(b) Percentage change during the same periods of time as (a) for the remainder of rural highways in Rock County	+20%	+65%	+1%
(c) Percentage change from 2 yr. before to second 2 yr. after zoning on zoned highway	+51%	-73%	-4%
(d) Percentage change during the same periods of time as (c) for the remainder of rural highways in Rock County	+40%	+57%	+35%

* Source of data—Rock County Sheriff's Dept.

at most of the locations were secured by use of an S1 radar speed meter. The other method employed was the enoscope, or mirror, method. All elements of the speed check location on the highway, the actual setup of the radar transmitter-receiver unit or the enoscopes, and the position of the observer and the observer's car were always such as not to interfere with the normal speed of vehicular traffic.

All factors were favorable for obtaining normal speeds during 29 of the 31 separate speed surveys in which the speeds of 12,661 vehicles were recorded. Rain and wet pavements were recorded for only two of the 31 speed checks.

TABLE 2

LOCATION 2: BEFORE-AND-AFTER STUDY COVERING SPEED ZONING ON STATE 32 FROM CITY OF RACINE TO RACINE-KENOSHA COUNTY LINE (Two-Lane Highway)

Signs erected—October 8, 1948. Length of zone—2.80 miles. 1952 annual 24 hour average traffic volume—5,270 vehicles.

	Total Accidents	Fatalities	Injuries
Accident Experience on Zoned Highway*			
(a) 2-yr. period before zoning	100	5	38
(b) First 2-yr. period after zoning	83	2	41
(c) Second 2-yr. period after zoning	71	3	55
Percentage change (b) over (a)	-17%	-60%	+8%
Percentage change (c) over (a)	-29%	-40%	+45%

Accident Experience on Remainder of Rural Highways in Racine County*

(a) 2-yr. period before zoning	1044	35	580
(b) First 2-yr. period after zoning	1304	54	824
(c) Second 2-yr. period after zoning	1665	58	1125
Percentage change (b) over (a)	+24%	+54%	+42%
Percentage change (c) over (a)	+60%	+66%	+94%

Comparison of Accident Experience on Zoned Highway with Accident Experience on Remainder of All Highways in Racine County

(a) Percentage change from 2 yr. before to first 2 yr. after zoning on zoned highway	-17%	-60%	+8%
(b) Percentage change during the same periods of time as (a) for the remainder of rural highways in Racine County	+24%	+54%	+42%
(c) Percentage change from 2 yr. before to second 2 yr. after zoning on zoned highway	-29%	-40%	+45%
(d) Percentage change during the same periods of time as (c) for the remainder of rural highways in Racine County	+60%	+66%	+94%

* Source of data—Racine County Sheriff's Dept.

TABLE 3

LOCATION 3: BEFORE-AND-AFTER STUDY COVERING SPEED ZONING ON STATE 42 BETWEEN MANITOWOC AND TWO RIVERS (Three-Lane Highway)

Signs erected—December 3, 1948. Length of zone—3.08 miles. 1952 annual 24 hour average traffic volume—4,965 vehicles.

	Total Accidents	Fatalities	Injuries
Accident Experience on Zoned Highway*			
(a) 2-yr. period before zoning	60	4	42
(b) First 2-yr. period after zoning	49	1	40
(c) Second 2-yr. period after zoning	84	1	46
Percentage change (b) over (a)	-18%	-75%	-5%
Percentage change (c) over (a)	+40%	-75%	+10%

Accident Experience on Remainder of All Highways in Manitowoc County†

(a) 2-yr. period before zoning	1448	31	764
(b) First 2-yr. period after zoning	1677	25	805
(c) Second 2-yr. period after zoning	1800	24	862
Percentage change (b) over (a)	+16%	-19%	+5%
Percentage change (c) over (a)	+24%	-23%	+13%

Comparison of Accident Experience on Zoned Highway with Accident Experience on Remainder of All Highways in Manitowoc County

(a) Percentage change from 2 yr. before to first 2 yr. after zoning on zoned highway	-18%	-75%	-5%
(b) Percentage change during the same periods of time as (a) for the remainder of all highways in Manitowoc County	+16%	-19%	+5%
(c) Percentage change from 2 yr. before to second 2 yr. after zoning on zoned highway	+40%	-75%	+10%
(d) Percentage change during the same periods of time as (c) for the remainder of all highways in Manitowoc County	+24%	-23%	+13%

* Source of data—Manitowoc County Sheriff's Dept.

† Source of data—Safety Division, State Motor Vehicle Department.

PRESENTATION AND ANALYSIS OF ACCIDENT DATA

Comparisons of accident experiences before and after zoning on each speed zoned highway included in this report are shown in Tables 1 to 6, inclusive, and are also illustrated by graphs in Figures 13 through 21.

In those counties in which the accident experience on rural highways was available, the above-mentioned tables and graphs show the relationship between the accident experience on the zoned highway and the accident experience on the remainder of the rural highways in the respective counties. In those counties in which the accident experience on

only rural highways was not available, the tables and graphs show the relationship between the accident experience on the zoned highway and the accident experience on the remainder of all roads, urban and rural, in the respective counties.

Table 1, summarizing the accident experience at Location 1, shows that the total number of traffic accidents, the total number of resulting fatalities and the total number of resulting injuries which occurred on the zoned highway during the 2-year period before zoning was decreased 3 percent, 63 percent, and 39 percent, respectively, during the first

TABLE 4

LOCATION 4: BEFORE-AND-AFTER STUDY COVERING SPEED ZONING ON US 12 BETWEEN LAKE DELTON AND SOUTH JCT. US 16

(Two-Lane Highway)

Signs erected—June 24, 1949. Length of zone—3.98 miles. 1952 annual 24 hour average traffic volume—4,855 vehicles.

	Total Accidents	Fatalities	Injuries
Accident Experience on Zoned Highway*			
(a) 2-yr. period before zoning	69	2	59
(b) 2-yr. period after zoning	66	0	56
Percentage change (b) over (a)	-4%	-100%	-5%
Accident Experience on Remainder of Rural Highways in Sauk County*			
(a) 2-yr. period before above zoning	800	17	678
(b) 2-yr. period after above zoning	882	14	695
Percentage change (b) over (a)	+10%	-18%	+3%

Comparison of Accident Experience on Zoned Highway with Accident Experience on Remainder of Rural Highways in Sauk County

(a) Percentage change from 2 yr. before to 2 yr. after zoning on <i>zoned highway</i>	-4%	-100%	-5%
Percentage change during the same periods of time as (a) for the <i>remainder of rural highways</i> in Sauk County	+10%	-18%	+3%

* Source of data—Sauk County Traffic Dept.

2 years after zoning. During the same periods of time the total number of traffic accidents, the total number of resulting fatalities and the total number of resulting injuries on the remainder of rural highways in the county increased 20 percent, 65 percent, and 1 percent respectively.

Similar data shown in Tables 2 to 6, inclusive, covering accident experience on the other test sections, indicate the same general marked decrease in frequency and severity of traffic accidents on the speed-zoned highways as compared to the general increase in frequency and severity of traffic accidents on the remainder of the rural highways or, when the data for only rural highways was not available, on the remainder of all highways, both urban and rural, in the respective counties.

In one case there was an increase in the number of resulting injuries on the zoned highway during the 2-year period after zoning as compared to the 2-year period before zoning, and in two instances there was an in-

TABLE 5

LOCATION 5: BEFORE-AND-AFTER STUDY COVERING SPEED ZONING ON US 51 AT LAKE KEGONSA (FROM 0.5 MI. N. TO 1.0 MI. S. OF N. JCT. C.T.H. "B")

(Two-Lane Highway)

Signs erected—November 15, 1950. Length of zone—1.92 miles. 1952 annual 24 hour average traffic volume—3,100 vehicles.

	Total Accidents	Fatalities	Injuries
Accident Experience on Zoned Highway*			
(a) 2-yr. period before zoning	42	1	35
(b) 2-yr. period after zoning	28	0	16
Percentage change (b) over (a)	-33%	-100%	-54%
Accident Experience on Remainder of All Highways in Dane County†			
(a) 2-yr. period before zoning	3991	80	1515
(b) 2-yr. period after zoning	4175	73	1889
Percentage change (b) over (a)	+5%	-9%	+25%

Comparison of Accident Experience on Zoned Highway with Accident Experience on Remainder of All Highways in Dane County

(a) Percentage change from 2 yr. before to 2 yr. after zoning on <i>zoned highway</i>	-33%	-100%	-54%
(b) Percentage change during the same periods of time as (a) for the <i>remainder of all highways</i> in Dane County	+5%	-9%	+25%

* Source of data—Dane County Traffic Dept.

† Source of data—Safety Division, State Motor Vehicle Dept.

crease in the number of resulting injuries on the zoned highway during the second 2-year period after zoning as compared to the 2-year period before zoning. In each of these cases however, the increase on the zoned highway was considerably less than the comparative increase on the remainder of the rural highways or on the remainder of all roads, urban and rural, as the case may be in the particular county.

In three cases there was also a decrease in the number of resulting fatalities on the remainder of the rural or total highways in the corresponding county. In each instance, however, this decrease in fatalities was exceeded by the decrease in fatalities on the zoned highway.

It may also be noted that in only two instances did the record on the zoned highway test section fail to show an improvement over

TABLE 6
LOCATION 6: BEFORE-AND-AFTER STUDY
COVERING SPEED ZONING ON OLD US 41 FROM
MENOMONEE FALLS TO MILWAUKEE-
WAUKESHA COUNTY LINE
(Two-Lane Highway)

Signs erected—July 19, 1949. Length of zone—3.00 miles.
1952 annual 24 hour average traffic volume—7,400 vehicles.

	Total Accidents	Fatal- ities	Inju- ries
Accident Experience on Zoned Highway*			
(a) 2-yr. period before zoning	53	1	41
(b) 2-yr. period after zoning	40	1	15
Percentage change (b) over (a)	-25%	None	-63%

Accident Experience on Remainder of All Highways in Waukesha County†			
(a) 2-yr. period before zoning	2207	66	1151
(b) 2-yr. period after zoning	2499	83	1295
Percentage change (b) over (a)	+13%	+26%	+13%

Comparison of Accident Experience on Zoned Highway
with Accident Experience on Remainder of All Highways
in Waukesha County

(a) Percentage change from 2 yr. before to 2 yr. after zoning on zoned highway	-25%	None	-63%
(b) Percentage change during the same periods of time as (a) for the remainder of all highways in Waukesha County	+13%	+26%	+13%

(No speed survey made before zoning)
* Source of data—Waukesha County Sheriff's Dept.
† Source of data—Safety Division, State Motor Vehicle Dept.

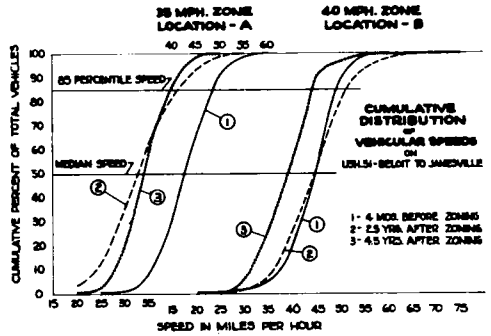


Figure 22.

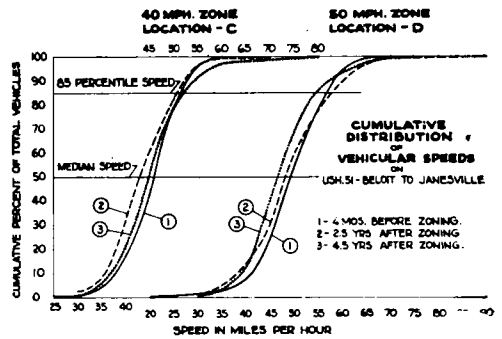


Figure 23.

TABLE 7
COMPARISON BY TYPE OF MOTOR VEHICLE TRAFFIC ACCIDENTS FOR BEFORE AND AFTER PERIODS
ON ZONED HIGHWAYS IN WISCONSIN

Type of Accident	Location—1		Location—2		Location—3		Location—4		Location—5		Location—6				
	Before	1-After	2-After	Before	1-After	2-After	Before	1-After	Before	1-After	Before	1-After			
1. Medial															
(a) Head-on	9	6	13	0	3	1	1	1	2	7	5	6	4	6	2
(b) Sideswipe	24	30	26	34	24	8	73	14	12	5	7	10	6	8	11
2. Internal stream															
(a) Rear end	26	36	40	10	12	10	13	7	18	17	16	7	9	11	3
(b) Overtaking	0	0	3	0	0	1	0	1	11	2	0	0	0	0	0
3. Marginal															
(a) Ran off road	21	10	26	6	4	11	11	7	14	14	12	10	4	15	13
(b) Hit parked vehicle	3	1	3	1	1	6	0	0	2	3	3	2	2	3	2
(c) Fixed object	7	10	17	12	10	15	5	7	10	0	4	1	1	1	0
4. Intersection															
(a) Right angle	2	6	11	2	7	2	2	1	3	12	2	1	0	1	1
(b) Rear end	11	4	3	3	4	1	0	2	4	1	1	2	0	3	4
(c) One or more turning	3	4	16	17	9	2	10	3	1	5	5	0	0	1	2
(d) Single vehicle	0	1	0	0	2	0	0	2	1	0	0	0	0	0	0
5. Pedestrian															
(a) Intersection	1	0	0	3	2	1	1	0	3	1	0	0	0	0	0
(b) Between intersection	3	0	4	7	2	2	3	3	1	0	0	1	0	1	2
6. Miscellaneous	1	0	6	5	3	11	1	1	2	2	1	2	2	3	0
Total Accidents	111	108	168	100	83	71	60	49	84	69	66	42	28	53	40

Note: "Before" means 2 yr. period before zoning. "1-After" means first 2 yr. period after zoning. "2-After" means second 2 yr. period after zoning.

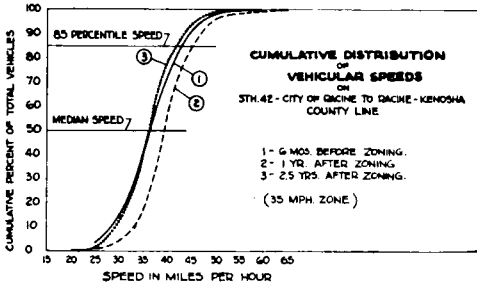


Figure 24.

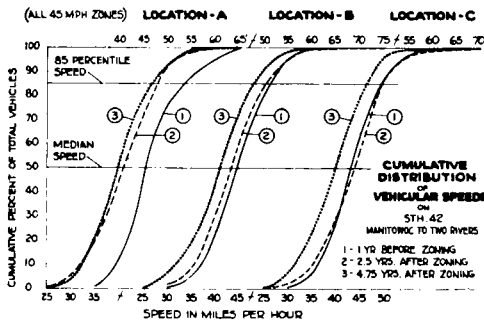


Figure 25.

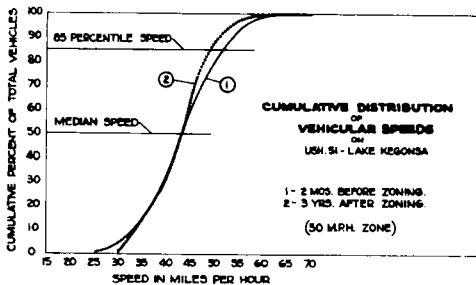


Figure 26.

TABLE 8
LOCATION 1: BEFORE-AND-AFTER STUDY COVERING SPEED ZONING ON US 51 BETWEEN BELOIT AND JANESVILLE (Three-Lane Highway)

	Number Vehicles Checked	Zone Speed Limits	Recorded Average Speed	Recorded 85% Speed
Location 1				
(4 mos. before zoning)....	353	—	42.6	48.7
(2.5 yr. after zoning)....	332	35 MPH	33.1	41.3
(4.5 yr. after zoning)....	302	35 MPH	34.1	36.0
Location 2				
(4 mos. before zoning)....	396	—	44.0	49.4
(2.5 yr. after zoning)....	300	40 MPH	44.5	51.8
(4.5 yr. after zoning)....	272	40 MPH	38.8	44.2
Location 3				
(4 mos. before zoning)....	428	—	45.4	51.5
(2.5 yr. after zoning)....	387	40 MPH	43.3	50.7
(4.5 yr. after zoning)....	262	40 MPH	45.1	52.1
Location 4				
(4 mos. before zoning)....	453	—	49.3	57.0
(2.5 yr. after zoning)....	332	50 MPH	48.8	58.1
(4.5 yr. after zoning)....	244	50 MPH	47.3	54.5

* Source of data—Traffic Section, Engineering Division, State Hwy. Comm.

TABLE 9
LOCATION 2: BEFORE-AND-AFTER STUDY COVERING SPEED ZONING ON STATE 32 FROM CITY OF RACINE TO RACINE-KENOSHA COUNTY LINE (Two-Lane Highway)

	Number Vehicles Checked	Zone Speed Limits	Recorded Average Speed	Recorded 85% Speed
Location 1				
(6 mo. before zoning)....	619	—	36.4	43.2
(1 yr. after zoning)....	435	35 MPH	39.7	45.4
(2.5 yr. after zoning)....	896	35 MPH	36.2	42.0

* Source of data—Traffic Section, Engineering Division, State Hwy. Comm.

the record on the remainder of only the rural highways or on the remainder of all highways, as the case may be for comparison in that particular county. Both of these were in the comparison of the number of accidents during the second 2-year period after zoning to the number of accidents during the period before zoning. In no case, however, did the severity of accidents on the zoned sections fail to show

an improvement over the corresponding severity of accidents on the remainder of highways as indicated in the respective counties.

The consistently general improvement in frequency and severity of traffic accidents after speed zoning on each of the test sections provides some measure of positive evidence that some factor other than chance was responsible.

TABLE 10
LOCATION 3: BEFORE-AND-AFTER STUDY
COVERING SPEED ZONING ON STATE 42 BE-
TWEEN MANITOWOC AND TWO RIVERS
(Three-Lane Highway)
Comparison of Recorded Vehicular Speeds on
Zoned Highway*

Signs erected—December 3, 1948. Length of zone—3.08 miles. 1952 annual 24 hour average traffic volume—4,965 vehicles.

	Number Vehicles Checked	Zone Speed Limits	Recorded Average Speed	Recorded 85% Speed
Location 1				
(1 yr. before zoning).....	480	—	46.6	53.7
(2.5 yr. after zoning).....	298	45 MPH	40.7	48.1
(4.75 yr. after zoning).....	288	45 MPH	40.1	47.1
Location 2				
(1 yr. before zoning).....	473	—	44.6	51.5
(2.5 yr. after zoning).....	648	45 MPH	43.5	50.2
(4.75 yr. after zoning).....	405	45 MPH	40.8	48.0
Location 3				
(1 yr. before zoning).....	446	—	43.4	49.5
(2.5 yr. after zoning).....	712	45 MPH	43.8	49.6
(4.75 yr. after zoning).....	640	45 MPH	39.7	46.4

* Source of data—Traffic Section, Engineering Division, State Hwy. Comm.

TABLE 11
LOCATION 4: BEFORE-AND-AFTER STUDY
COVERING SPEED ZONING ON US 12 BETWEEN
LAKE DELTON AND SOUTH JCT. US 16
(Two-Lane Highway)
Comparison of Recorded Vehicular Speeds on
Zoned Highway*

Signs erected—June 24, 1949. Length of zone—3.98 miles. 1952 annual 24 hour average traffic volume—4,855 vehicles.

	Number Vehicles Checked	Zone Speed Limits	Recorded Average Speed	Recorded 85% Speed
Location 1				
(4 yr. after zoning).....	341	35 MPH	30.4	34.9
Location 2				
(4 yr. after zoning).....	375	35 MPH	29.1	34.5
Location 3				
(4 yr. after zoning).....	433	45 MPH	38.3	44.6

(No speed survey made before zoning)
* Source of data—Traffic Section, Engineering Division, State Hwy. Comm.

CLASSIFICATION OF ACCIDENTS ON TEST SECTIONS

Table 7 provides a summary of the type of traffic accidents which occurred on the test sections during the periods before and after zoning. Although it might seem logical to conclude that slower speeds would tend to lessen the number of rear-end and run-off-road types of traffic accidents on a given section of highway, the tabulation does not in-

TABLE 12
LOCATION 5: BEFORE-AND-AFTER STUDY
COVERING SPEED ZONING ON US 51 AT LAKE
KEGONSA (FROM 0.5 MI. N. TO 1.0 MI. S. OF N.
JCT. C.T.H. "B")
(Two-Lane Highway)
Comparison of Recorded Vehicular Speeds on
Zoned Highway*

Signs erected—November 15, 1950. Length of zone—1.92 miles. 1952 annual 24 hour average traffic volume—3,100 vehicles.

	Number Vehicles Checked	Zone Speed Limits	Recorded Average Speed	Recorded 85% Speed
Location 1				
(2 mo. before zoning)....	238	—	43.3	51.8
Location 1				
(3 yr. after zoning).....	304	50 MPH	42.7	49.3

* Source of data—Traffic Section, Engineering Division, State Hwy. Comm.

TABLE 13
LOCATION 6: BEFORE-AND-AFTER STUDY
COVERING SPEED ZONING ON OLD US 41 FROM
MENOMONEE FALLS TO MILWAUKEE-
WAUKESHA COUNTY LINE
(Two-Lane Highway)
Comparison of Recorded Vehicular Speeds on
Zoned Highway*

Signs erected—July 19, 1949. Length of zone—3.00 miles. 1952 annual 24 hour average traffic volume—7,400 vehicles.

	Number Vehicles Checked	Zone Speed Limits	Recorded Average Speed	Recorded 85% Speed
Location 1				
(4 yr. after zoning).....	250	50 MPH	47.0	56.4
Location 2				
(4 yr. after zoning).....	357	35 MPH	38.7	44.6

* Source of data—Traffic Section, Engineering Division, State Hwy. Comm.

dicade any such trends. The number of accidents in each classification appears to be insufficient for formulating any opinions regarding trends or causation.

PRESENTATION AND ANALYSIS OF SPEED DATA

The results of all speed studies at these six sections of speed-zoned highways on the state system are shown in Tables 8 to 19, inclusive, and are also illustrated in Figures 22 to 26 inclusive by the usual cumulative percentage curves.

Results of comparative speed studies at nine stations at four of the speed zone locations, completed before and after the erection of

TABLE 14
SPEED SUMMARIES. LOCATION 1: US 51 BETWEEN BELOIT AND JANESVILLE

Speed Range mph.	Percentage of Total Vehicles in Speed Range											
	Location—A			Location—B			Location—C			Location—D		
	(1)	(2)	(3)*	(1)	(2)	(3)*	(1)	(2)	(3)*	(1)	(2)	(3)*
	%	%	%	%	%	%	%	%	%	%	%	%
15-19.9	—	3.3	0.3	0.5	—	—	—	—	—	0.2	—	—
20-24.9	0.9	9.2	2.3	0.5	0.3	0.4	—	—	0.4	0.2	—	—
25-29.9	0.0	23.0	18.5	1.0	2.0	6.2	0.9	2.8	0.4	0.9	1.2	0.4
30-34.9	7.9	27.0	36.9	3.0	5.3	20.6	3.5	5.9	6.1	1.1	4.2	3.7
35-39.9	22.4	19.4	28.5	15.7	18.7	28.2	13.6	23.8	15.3	5.3	9.0	8.6
40-44.9	35.4	11.8	12.2	32.1	25.0	35.7	25.9	29.3	30.5	16.6	16.0	34.0
45-49.9	24.6	5.3	1.3	36.6	29.1	4.8	36.0	21.4	27.5	30.9	29.6	18.9
50-54.9	7.4	1.0	—	9.6	13.3	3.3	16.8	13.4	11.5	23.6	17.8	21.3
55-59.9	1.4	—	—	1.0	4.3	0.4	3.3	2.8	5.3	15.9	11.7	4.5
60-64.9	—	—	—	—	1.0	0.0	—	0.3	1.1	4.4	7.5	5.7
65-69.9	—	—	—	—	1.0	0.0	—	0.3	0.8	0.9	2.7	2.5
70-74.9	—	—	—	—	—	0.4	—	—	0.0	—	0.0	0.4
75-79.9	—	—	—	—	—	—	—	—	1.1	—	0.0	—
80-84.9	—	—	—	—	—	—	—	—	—	—	0.0	—
85-89.9	—	—	—	—	—	—	—	—	—	—	0.3	—
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Ave. speed, MPH	42.6	33.1	34.1	44.0	44.5	38.8	45.4	43.3	45.1	49.3	48.8	47.3
85% speed, MPH	—	41.3	39.7	49.4	51.8	44.2	51.5	50.7	52.1	57.0	58.1	54.5
Zone speed limits	—	35	35	—	40	40	—	40	40	—	50	50
No. vehicles checked	353	304	302	396	300	272	428	387	262	453	332	244

* Note: (1) Indicates speed survey 4 mos. before zoning. (2) Indicates speed survey 2.5 yr. after zoning. (3) Indicates speed survey 4.5 yr. after zoning.

TABLE 15
SPEED SUMMARIES. LOCATION 2: STATE 32
FROM CITY OF RACINE TO RACINE-
KENOSHA COUNTY LINE

Speed Range mph.	Total Vehicles in Speed Range		
	(1)	(2)	(3)*
	%	%	%
15-19.9	—	—	0.3
20-24.9	3.7	0.2	0.8
25-29.9	11.2	3.7	11.3
30-34.9	26.5	12.9	28.4
35-39.9	30.9	39.6	37.7
40-44.9	19.6	27.6	15.6
45-49.9	6.8	12.4	4.8
50-54.9	1.0	1.8	1.1
55-59.9	0.3	1.6	—
60-64.9	—	0.2	—
Total	100.0	100.0	100.0
Ave. speed, MPH	36.4	39.7	36.2
85% speed, MPH	43.2	45.4	42.0
Zone speed limits	—	35	35
No. vehicles checked	619	435	896

* Note: (1) Indicates speed survey 6 mos. before zoning. (2) Indicates speed survey 1 yr. after zoning. (3) Indicates speed survey 2.5 yr. after zoning. Summaries (1), (2), and (3) for same location.

the erection of speed indications in 12 out of 17 checks at the above-mentioned nine speed-study stations. There was no speed survey made before zoning at two of the locations. Speed checks after zoning at these locations revealed excellent compliance to speed-zone signs (see Tables 11, 13, 17, 19).

The percentage of vehicles exceeding the zoned limit decreased at seven out of ten speed-study stations when checks were made approximately 2 years after the erection of the speed-zone signs. The percent of vehicles exceeding a speed 5 mph. above the zoned limit decreased considerably at all but one station. Speed summaries for all locations are shown in Tables 14 to 19.

It may also be noted that the 10-mile speed range (or pace) was lower by 5 mph. at each station after the erection of the signs. The speed data also indicate that the general decrease in the average speed and in the 85-percentile speed at most of the check stations after the erection of the signs was the result of fewer fast vehicles and an increase in the percentage of slower vehicles.

It should be noted that the general decrease

speed-zone signs, show that the average speeds after the erection of the speed zone signs were lower in 14 out of 17 checks. Values of the 85-percentile speed were found to be lower after

TABLE 16
SPEED SUMMARIES. LOCATION 3: STATE 42 BETWEEN MANITOWOC AND TWO RIVERS

Speed Range mph	Percentage of Total Vehicles in Speed Range								
	Location—A			Location—B			Location—C		
	(1)	(2)	(3)*	(1)	(2)	(3)*	(1)	(2)	(3)*
	%	%	%	%	%	%	%	%	%
20-24.9	—	0.7	0.3	—	0.3	0.4	—	0.6	0.3
25-29.9	—	5.0	3.1	0.4	1.4	5.7	0.7	1.8	6.6
30-34.9	1.0	14.4	17.7	4.2	6.5	13.8	4.7	7.3	16.7
35-39.9	11.2	25.2	31.0	17.8	22.5	22.5	22.4	19.2	26.9
40-44.9	32.4	27.2	27.8	32.2	30.5	32.1	36.4	27.7	29.8
45-49.9	32.0	20.5	13.2	26.0	23.2	17.5	23.3	30.7	16.4
50-54.9	11.7	5.4	5.9	15.2	10.5	6.7	10.3	9.1	2.3
55-59.9	6.7	1.3	0.7	3.6	4.3	0.9	2.0	2.4	0.6
60-64.9	5.0	0.3	0.3	0.6	0.6	0.4	0.2	0.6	0.2
65-69.9	—	—	—	—	0.0	—	—	0.6	0.2
70-74.9	—	—	—	—	0.2	—	—	—	—
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Ave. speed, MPH	46.6	40.7	40.1	44.6	43.5	40.8	43.4	43.8	39.7
85% speed, MPH	53.7	48.1	47.1	51.5	50.2	48.0	49.5	49.6	46.4
Zone speed limits	—	45	45	—	45	45	—	45	45
No. vehicles checked	480	298	288	473	648	405	446	712	640

* Note: (1) Indicates speed survey 1 yr. before zoning. (2) Indicates speed survey 2.5 yr. after zoning. (3) Indicates speed survey 4.75 yr. after zoning.

TABLE 17
SPEED SUMMARIES. LOCATION 4: US 12 BETWEEN LAKE DELTON AND SO. JCT. US 16

Speed Range mph	Total Vehicles in Speed Range		
	Loca- tion—A	Loca- tion—B	Loca- tion—C*
	%	%	%
15-19.9	1.2	0.3	—
20-24.9	10.6	21.3	0.5
25-29.9	32.3	38.7	5.1
30-34.9	42.1	27.7	22.9
35-39.9	10.3	0.9	36.4
40-45.9	3.2	1.3	21.9
45-49.9	0.3	0.8	10.9
50-54.9	—	—	2.3
Total	100.0	100.0	100.0
Ave. speed, MPH	30.4	29.1	38.3
85% speed, MPH	34.9	34.5	44.6
Zone speed limits	35	35	45
No. vehicles checked	341	375	433

* Note: All speed surveys 4 yr. after zoning.

TABLE 18
SPEED SUMMARIES. LOCATION 5: US 51—LAKE KEGONSA

Speed Range mph	Total Vehicles in Speed Range	
	(1)	(2)*
	%	%
20-24.9	0.8	—
25-29.9	3.4	1.0
30-34.9	10.5	13.8
35-39.9	18.1	16.8
40-44.9	26.8	33.2
45-49.9	20.2	23.7
50-54.9	13.9	9.2
55-59.9	5.0	1.0
60-64.9	1.3	1.0
65-69.9	—	0.3
Total	100.0	100.0
Ave. speed, MPH	43.3	42.7
85% speed, MPH	51.8	49.3
Zone speed limits	—	50
No. vehicles checked	238	304

* Note: (1) Indicates speed survey 2 mos. before zoning. (2) Indicates speed survey 3 yr. after zoning. Summaries (1) and (2) for same location.

in speeds over the test sections after zoning was accomplished while the average and 85-percentile speeds on the unzoned highways in Wisconsin had increased, as shown by Tables 20, 21, and 22 and Figures 27 through 31.

ENFORCEMENT OF ZONE LIMITS

A survey of enforcement activities by the local enforcement agencies at the six locations

CONCLUSIONS

The following conclusions may be drawn from the before-and-after studies on speed-

included in this report reveals that no special enforcement was applied after the erection of the speed-zone signs to produce the reported reduction in speed and accidents.

TABLE 19
SPEED SUMMARIES, LOCATION 6: OLD US 41
MENOMONEE FALLS TO MILWAUKEE-
WAUKESHA COUNTY LINE

Speed Range mph	Total Vehicles in Speed Range	
	Location—A	Loca- tion—B*
	%	%
20-24.9	—	0.3
25-29.9	1.2	7.6
30-34.9	3.6	17.0
35-39.9	17.6	35.9
40-44.9	23.2	26.6
45-49.9	18.8	9.2
50-54.9	18.0	2.5
55-59.9	9.6	0.3
60-64.9	5.6	0.6
65-69.9	2.0	—
70-74.9	0.4	—
Total	100.0	100.0
Ave. speed, MPH.	47.0	38.7
85% speed, MPH.	56.4	44.6
Zone speed limits	50	35
No. vehicles checked	250	357

* Note: All speed surveys 4 yr. after zoning.

zoned highways which are included in this report:

1. Review of the data indicates that speed zoning on rural highways, where the speed-zone limits are determined upon the basis of engineering and traffic investigations and where adequate speed-limit signs are provided and carefully located, may be expected to result generally in a substantial reduction in frequency and severity of motor-vehicle traffic accidents. This reduction in frequency and severity of accidents on the zoned highways which were included in this report was usually accomplished while the number of fatalities, injuries, and accidents increased on the remainder of the rural or total highways, as indicated, in the respective counties.

2. Review of the data also indicates that when speed limits on rural highways are reasonably lowered through properly applied

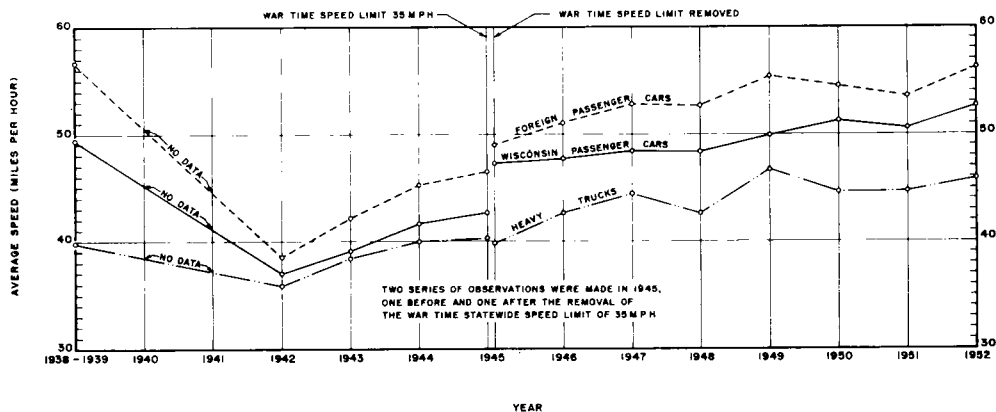


Figure 27. Average speed of vehicles observed at typical locations on rural state trunk highways.

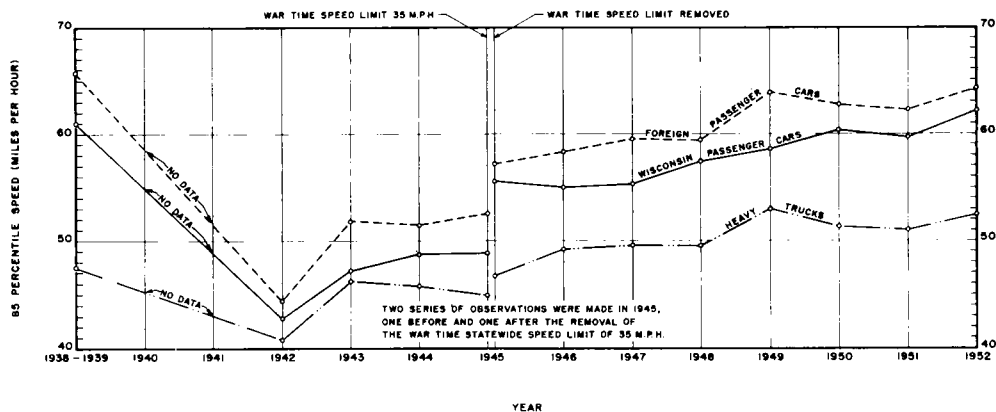


Figure 28. The 85-percentile speed of vehicles observed at typical locations on rural state trunk highways.

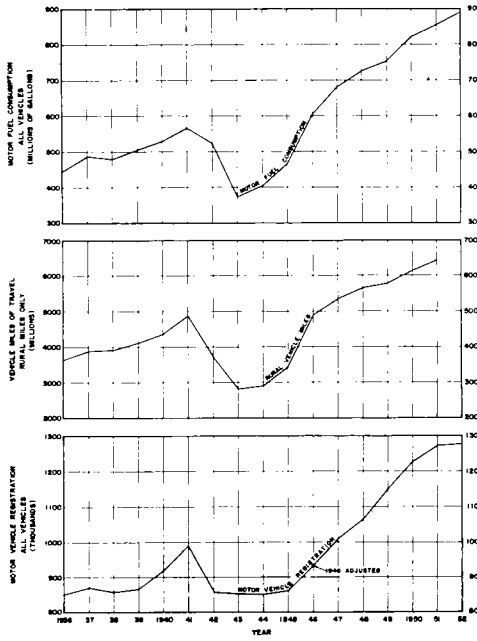


Figure 29. State-wide trends showing annual motor-vehicle registration, miles of travel, and fuel consumption.

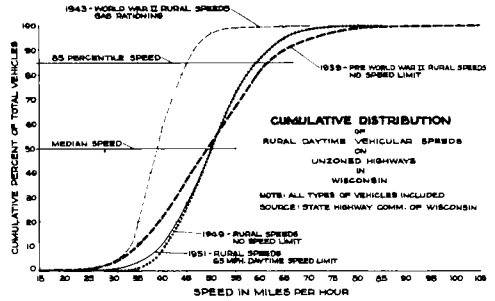


Figure 30.

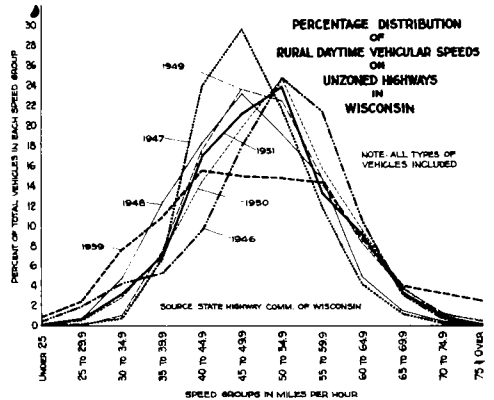


Figure 31.

speed zoning, there is generally a substantial reduction in the average and 85-percentile speeds of vehicles using those highways.

3. These reductions, it appears, took place without the benefit of special enforcement activities.

APPENDIX

Wisconsin Statutes

85.40 *Speed restrictions.* (1) Except as otherwise provided in this section, the speed of any vehicle shall not be in excess of the following:

(a) 25 miles per hour in any business or residence district.

(b) 35 miles per hour in outlying districts within any city, village or unincorporated village where on each of both sides of the highway there is an average distance of not less than 500 feet between buildings fronting thereon.

(c) 15 miles per hour when passing a schoolhouse at those times when children are going to or from school or are playing within the sidewalk area at or about the school.

(d) 15 miles per hour when passing an intersection properly marked with a "School Crossing" sign of a type approved by the state highway commission when children are crossing or are about to cross the highway.

(e) 15 miles per hour when passing a safety zone.

(g) 55 miles per hour during nighttime except as provided in (i).

(h) 65 miles per hour except as provided in (i).

(i) 45 miles per hour for any commercial vehicle or combination of commercial vehicles, except busses, having a gross weight of more than 10,000 pounds.

(2) (a) No person shall operate a vehicle at a speed greater than is reasonable and prudent under conditions and having regard for the actual and potential hazards then existing and the speed of the vehicle shall be so controlled as may be necessary to avoid colliding with any object, person, vehicle or other conveyance on or entering the highway in compliance with legal requirements and using due care.

(b) The operator of every vehicle shall, consistent with the requirements of paragraph (a), operate at an appropriate reduced speed when approaching and crossing an intersection

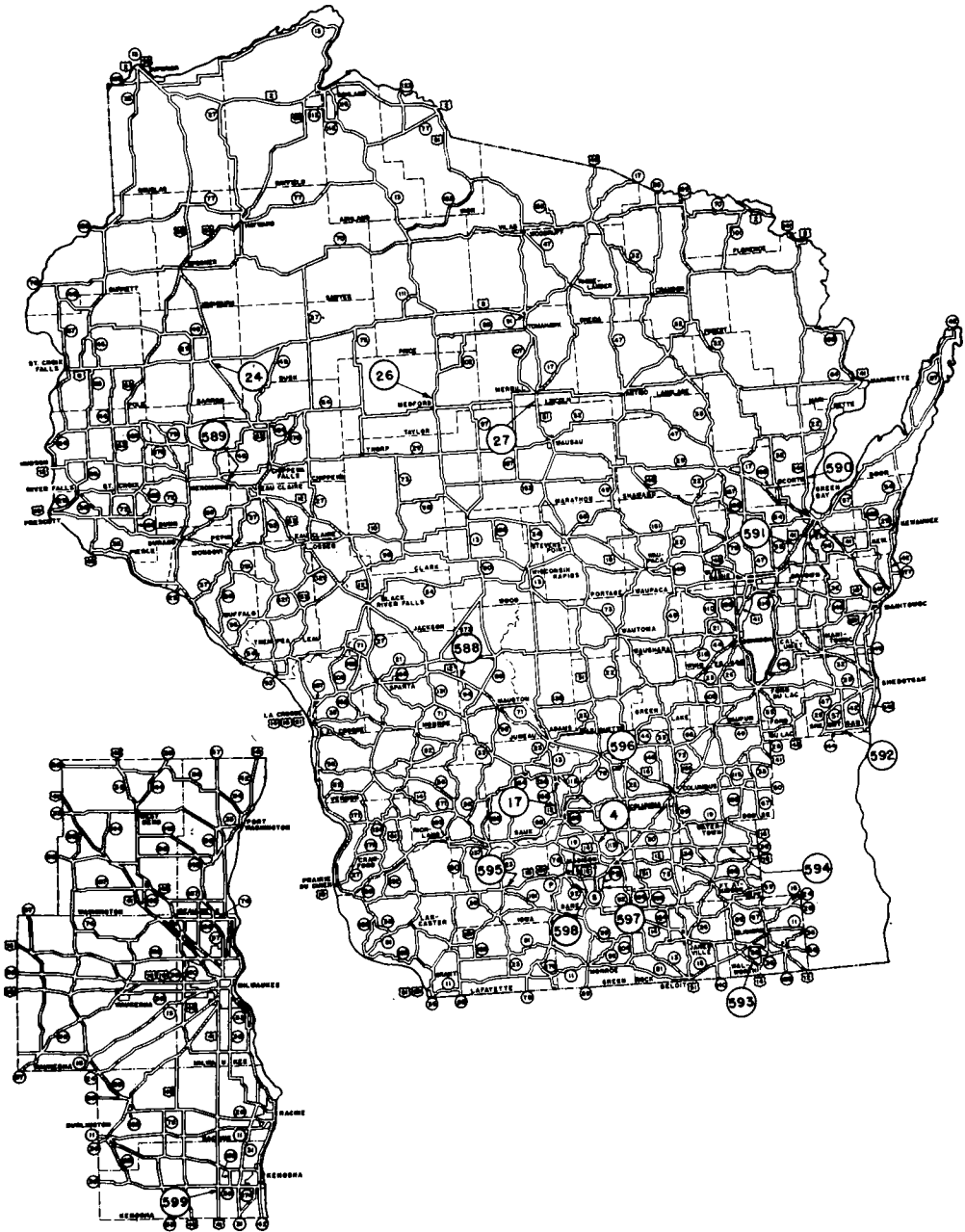


Figure 32. Location of speed-study stations in 1952.

or railway grade crossing, when approaching and going around a curve, when approaching a hill crest, when traveling upon any narrow or winding roadway, when passing school children or other pedestrians, and when special hazard

exists with regard to other traffic or by reasons of weather or highway conditions.

(c) The speed of all vehicles equipped with metal or solid rubber tires shall not exceed 15 miles per hour.

TABLE 20
TRAFFIC SPEED STUDY. COMPOSITE DATA SHOWING THE AVERAGE SPEED OF VEHICLES AT TYPICAL LOCATIONS ON RURAL STATE TRUNK HIGHWAYS BY YEARS
(Source of Data: Traffic Department, State Highway Commission)

Year	Month	Number of Locations	Wisconsin Passenger Cars		Foreign Passenger Cars		Light Trucks		Heavy Trucks		Busses		All Vehicles	
			No. of Vehicles	Ave. Speed	No. of Vehicles	Ave. Speed	No. of Vehicles	Ave. Speed	No. of Vehicles	Ave. Speed	No. of Vehicles	Ave. Speed	No. of Vehicles	Ave. Speed
1938-39		6	7,641	49.5	1,856	56.7	—	—	990	39.9	—	—	10,199	49.8
1942	November	7	3,821	37.1	753	38.6	—	—	670	35.9	—	—	5,244	37.1
1943	June-July	15	4,212	39.2	674	42.2	407	38.5	1,101	38.5	70	42.6	6,464	39.4
1944	March-April	15	3,876	41.7	502	45.3	395	40.9	973	40.0	53	43.2	5,799	41.6
1945	May	13	4,271	42.7	734	46.5	342	40.9	979	40.3	72	45.0	6,398	42.7
1945	Sept.-Oct.	4	1,167	47.3	648	49.0	115	42.8	244	39.8	9	50.3	2,183	46.8
1946	May	15	4,447	47.8	1,895	51.1	344	44.6	1,074	42.7	41	46.8	7,801	47.8
1947	May	15	5,327	48.4	2,307	52.8	736	45.7	1,403	44.4	68	54.6	9,841	48.7
1948	May	15	5,217	48.3	1,609	52.7	382	44.9	1,316	42.6	55	49.0	8,579	48.1
1949	May-June	13	3,342	49.9	1,430	55.4	365	47.9	765	46.7	13	53.7	5,915	50.7
1950	May-June	7	1,699	51.3	922	54.5	179	46.1	476	44.6	15	54.8	3,291	50.9
1951	June	7	1,633	50.6	992	53.5	197	45.2	527	44.7	13	52.5	3,362	50.2
1952	May	15	3,327	52.7	1,295	56.2	340	47.6	975	45.9	26	57.1	5,963	52.1

Two series of observations were made in 1945, one before and one after the removal of the war-time state-wide speed limit of 35 mph.

TABLE 21
TRAFFIC SPEED STUDY. COMPOSITE DATA SHOWING THE 85 PERCENTILE SPEED OF VEHICLES AT TYPICAL LOCATIONS ON RURAL STATE TRUNK HIGHWAYS BY YEARS
(Source of Data: Traffic Department, State Highway Commission)

Year	Month	Number of Locations	Wisconsin Passenger Cars		Foreign Passenger Cars		Light Trucks		Heavy Trucks		Busses		All Vehicles	
			Number of Vehicles	85 Percentile Speed	Number of Vehicles	85 Percentile Speed	Number of Vehicles	85 Percentile Speed	Number of Vehicles	85 Percentile Speed	Number of Vehicles	85 Percentile Speed	Number of Vehicles	85 Percentile Speed
1938-1939	—	6	7,641	61.0	1,856	65.8	—	—	990	47.5	—	—	10,199	61.5
1942	November	7	3,821	42.8	753	44.4	—	—	670	40.8	—	—	5,244	42.9
1943	June-July	15	4,212	47.3	674	51.9	407	46.5	1,101	46.3	70	49.9	6,464	47.7
1944	March-April	15	3,876	48.8	502	51.5	395	46.8	973	45.8	53	49.7	5,799	48.4
1945	May	13	4,271	48.9	734	52.5	342	45.8	979	45.0	72	50.1	6,398	48.9
1945	Sept.-Oct.	4	1,167	55.6	648	57.2	115	50.2	244	46.8	9	58.3	2,183	55.4
1946	May	15	4,447	55.0	1,895	58.3	344	51.8	1,074	49.3	41	55.7	7,801	55.3
1947	May	15	5,327	55.3	2,307	59.6	736	50.3	1,403	49.6	68	57.6	9,841	56.0
1948	May	15	5,217	57.4	1,609	59.4	382	53.4	1,316	49.5	55	58.5	8,579	57.2
1949	May-June	13	3,342	58.5	1,430	63.9	365	56.0	765	53.0	13	62.6	5,915	59.4
1950	May-June	7	1,699	60.4	922	62.7	179	54.9	476	51.3	15	59.8	3,291	59.9
1951	June	7	1,633	59.7	992	62.2	197	55.6	527	51.0	13	51.7	3,362	59.5
1952	May	15	3,327	62.1	1,295	64.2	340	56.4	975	52.5	26	63.4	5,963	61.6

Two series of observations were made in 1945, one before and one after the removal of the war time statewide speed limit of 35 mph.

(3) (a) Whenever the state highway commission with respect to the state trunk highway system, or the local authorities with respect to highways under their jurisdiction, shall determine upon the basis of an engineering and traffic investigation that any speed limit hereinafter set forth, except in subsection (1) (c) to (e), or the actual speed of vehicles on such highways, is greater or less than is reasonable or safe under the conditions found to exist at any intersection or other place or upon any part of a highway, said commission with respect to the state trunk highway system or local authorities with respect to highways under their jurisdiction may determine and declare a reasonable and safe speed limit thereat, which

shall not exceed the limits set forth in subsection (1) (g) and (h), and which shall be effective at all times, or at such times as may be determined and indicated by appropriate signs giving notice thereof. The speed limits determined as the result of such engineering surveys shall be applicable to not more than 2,000 miles of state trunk highways. The first mile outside of and immediately adjacent to any incorporated municipality shall not be counted in computing such 2,000 miles.

(b) Local authorities may increase speed limits as provided by this section, but may not decrease speed limits set forth in subsection (1) (a), (b), nor increase the speed limits set forth in subsection (1) (g) and (h), nor establish

TABLE 22
STATE-WIDE TRENDS IN POPULATION, MOTOR VEHICLE REGISTRATION, MILES OF TRAVEL, AND MOTOR FUEL CONSUMPTION

Year	Population (U.S. Census)	Motor Vehicle Registration (All Vehicles) ¹	Annual Vehicle Miles of Rural Travel (Thousands) ²	Motor Fuel Consumption (Thousands of Gallons) ³
1930	2,939,006	—	—	—
1936	—	850,680	3,637,357	444,197
1937	—	871,592	3,886,800	486,641
1938	—	857,794	3,898,132	479,534
1939	—	865,982	4,102,104	505,869
1940	3,137,587	921,149	4,345,737	528,730
1941	—	991,770	4,889,996	567,105
1942	—	855,477	3,705,491	522,416
1943	—	851,767	2,810,281	373,941
1944	—	849,863	2,900,935	405,255
1945	—	860,031	3,427,863	466,966
1946	—	934,575 ²	4,906,660	603,589
1947	—	1,009,920	5,359,931	680,381
1948	—	1,065,623	5,665,889	725,993
1949	—	1,148,405	5,793,279	754,336
1950	3,434,575	1,226,683	6,139,123	819,914
1951	—	1,272,627	6,412,739	852,857
1952	—	1,276,428	—	890,997

¹ Source of data: State Motor Vehicle Department.
² Many automobiles were registered twice in 1946 due to the beginning of the staggered system of registration. An estimate of 73.54% has been used as an adjustment of the figure for this year which results in 934,575 total all vehicles.
³ Vehicle miles of travel for 1936 and for 1948 to 1950 were developed by the Highway Planning Survey. Vehicle miles for all other years were estimates obtained by the application of nation-wide factors used in expanding the data for the three years 1936, 1948, and 1949.
⁴ Accounting Department—State Highway Commission. Record based on strictly cash basis. This differs slightly from Gas Tax report submitted annually.

speed limits at any location set forth in subsection (2) without the approval of the state highway commission, nor shall signs giving notice thereof be erected before such approval.

(c) All speed limit signs erected under the provisions of this section shall be of a type approved by the state highway commission.

(d) No liability shall attach to the state highway commission nor to the local authorities by reason of the posting of a speed limit under this section, nor shall such posting constitute a guarantee that it is reasonable and safe under all conditions.

(f) Local authorities shall place and maintain upon all highways where the permissible speed is increased or decreased by them in the manner provided in this subsection, standard signs giving notice of such speed.

(g) For the purposes of this section, the term local authorities shall mean county boards with respect to county trunk highways, town boards with respect to town highways, village boards with respect to village streets and city councils with respect to city streets.

Speed Zone Declaration—Location No. 1, U. S. Highway 51—Between Cities of Beloit and Janesville.

(a) Forty miles per hour from Bayliss Street in the City of Beloit northerly to a point 2.90 miles north of said street;

(b) Fifty miles per hour from a point 2.90 miles north of Bayliss Street in the City of Beloit northerly to a point 5.20 miles north of said street;

(c) Forty miles per hour from a point 5.20 miles north of Bayliss Street in the City of Beloit northerly to a point 5.85 miles north of said street;

(d) Fifty miles per hour from a point 5.85 miles north of Bayliss Street in the City of Beloit northerly to a point 700 feet south of the town road on a line common to the north and south halves of Section 12, Township 2 North, Range 12 East;

(e) Thirty-five miles per hour from a point 700 feet south of the town road on a line common to the north and south halves of Section 12, Township 2 North, Range 12 East, northerly to the south construction limits of the City of Janesville, except that the speed limit for northbound traffic only shall be 25 miles per hour from a point 500 feet south of said construction limits.

Speed Zone Declaration—Location No. 2, S. T. H. 32—From City of Racine to Racine-Kenosha County Line.

(a) Twenty-five miles per hour on State Trunk Highway 32 from the south limits of the City of Racine southerly to a point 0.10 of a mile south of its junction with County Trunk Highway "E";

(b) Thirty-five miles per hour from a point 0.10 of a mile south of its junction with County Trunk Highway "E" southerly to a point 1.90 miles south of the south limits of the City of Racine;

(c) Forty-five miles per hour from a point 1.90 miles south of the south limits of the City of Racine southerly to the north limits of the City of Kenosha.

Speed Zone Declaration—Location No. 3, S. T. H. 42—Between Cities of Manitowoc and Two Rivers.

(a) Thirty-five miles per hour on State Trunk Highway 42 from the south limits of the City of Two Rivers, southwesterly to a point 0.35 of a mile southwest of its intersection with Roosevelt Avenue at the south limits of the City of Two Rivers;

(b) Forty-five miles per hour from a point 0.35 of a mile southwest of its intersection with Roosevelt Avenue at the south limits of the City of Two Rivers, southwesterly to the north limits of the City of Manitowoc.

Speed Zone Declaration—Location No. 4, U. S. Highway 12—Between unincorporated Village of Lake Delton and S. Jct. U. S. H. 16.

(a) Thirty-five miles per hour from a point 0.50 of a mile southeast of the west end of the bridge over Dell Creek, northerly to the west end of said bridge;

(b) Twenty-five miles per hour from the west end of the bridge over Dell Creek, westerly

and northerly to a point 0.10 of a mile north of State Trunk Highway 23:

(c) Thirty-five miles per hour from a point 0.10 of a mile north of State Trunk Highway 23, northerly to a point 0.80 of a mile north of State Trunk Highway 23;

(d) Forty-five miles per hour from a point 0.80 of a mile north of State Trunk Highway 23, northerly to a point 0.15 of a mile south of County Trunk Highway "A";

(e) Thirty-five miles per hour from a point 0.15 of a mile south of County Trunk Highway "A", northerly to a point 0.10 of a mile north of U. S. Highway 16;

(f) Forty miles per hour from a point 0.10 of a mile north of U. S. Highway 16, northerly to a point 0.35 of a mile north of U. S. Highway 16.

Speed Zone Declaration—Location No. 5, U. S. Highway 51—At Lake Kegonsa (Dane County)

Fifty miles per hour from a point 0.22 of a mile southeast of its intersection with the town road on the line common to Sections 22 and 23, Township 6 North, Range 10 East, southerly to a point 400 feet southeast of its intersection with the town road on the line common to Sections 25 and 26 of Said Township, except that the stated speed limit for northbound traffic only shall terminate at a point 0.29 of a

mile southeast of its intersection with the town road on the line common to Sections 22 and 23 of said Township.

Speed Zone Declaration—Location No. 6, Old U. S. Highway 41—From Village of Menomonee Falls to Milwaukee-Waukesha County Line

(a) Fifty miles per hour from the Waukesha-Milwaukee county line northerly to a point 1,000 feet southeast of County Trunk Highway "W";

(b) Thirty-five miles per hour from a point 1,000 feet southeast of County Trunk Highway "W" northerly to a point 800 feet southeast of the town road on the line common to Sections 13 and 14, T 8 N, R 20 E;

(c) Forty-five miles per hour from a point 800 feet southeast of the town road on the line common to Sections 13 and 14, T 8 N, R 20 E, northerly to a point 600 feet northwest of said town road;

(d) Fifty miles per hour from a point 600 feet northwest of the town road on the line common to Sections 13 and 14, T 8 N, R 20 E, northerly to a point 350 feet southeast of County Trunk Highway "YY";

(e) Thirty-five miles per hour from a point 350 feet southeast of County Trunk Highway "YY" northerly to the south corporate limits of the Village of Menomonee Falls.

Driver Performance on Horizontal Curves

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THIS report deals with the performance of passenger cars on horizontal curves having a range in minimum sight distances from 200 to 655 feet and in curvature from 3 to 29 degrees. The locations studied were on two-lane highways primarily in New York and Maryland, supplemented by locations in Illinois, Minnesota, and South Carolina. A total of 8,400 free-moving passenger car speeds were observed on the inside lanes of 35 different curves and on the outside lanes of 33 of these curves.

The analyses include investigations of the coefficient of side friction that vehicles actually develop in traversing horizontal curves; the effect of superelevation on driver behavior; sight distance as related to curvature; speed as related to sight distance and curvature; and passenger-car speeds as compared to various standards for safe speeds as based on stopping distances.

● EXISTING highway systems are conglomerations of varied geometric designs. Some sections are designed in accordance with the most-modern standards to accommodate large volumes of traffic at relatively high speeds, but these are by far in the minority. The

largest mileage of our highway system is of two-lane design, often inadequate for the volume of traffic carried. In many areas the most-common deficiency is insufficient sight distance for safe operation at desired speeds on vertical and horizontal curves.