A TRAFFIC ACCIDENT ANALYSIS
OF HIGH ACCIDENT LOCATIONS
IN ST. JOSEPH COUNTY

Report TSD-SS-140-70

TRAFFIC and SAFETY DIVISION

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OF HIGH ACCIDENT LOCATIONS
IN ST. JOSEPH COUNTY

Report TSD-SS-140-70

by

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INTRODUCTION

The Highway Safety Act of 1966 was enacted by the Congress of the United States in order to promote highway safety programs. Subsequently, various Highway Safety Standards were developed to assure the orderly implementation of the Act.

Highway Safety Standard 4.4.9, Identification and Surveillance of Accident Locations, is one of those standards. The purpose of Standard 4.4.9 is to identify specific locations or sections of streets and highways which have high or potentially high accident experience as a basis for establishing priorities for improvement, selective enforcement or other operational practices that will eliminate or reduce accidents and potential hazards at the location so identified.

The State of Michigan carries out a program of this type on the State trunkline system; however, many of the State's city and county agencies lack the financial and technical prerequisites necessary to pursue similar programs with similarly defined objectives. To insure that this Highway Safety Standard is met and to improve the overall evaluation of the accident picture in Michigan, the Michigan Department of State Highways requested and received through the Office of Highway Safety Planning in the...
Executive Office of the Governor a federally funded project entitled "Traffic Accident Analysis for Cities and Counties". The intent of this new project is to provide a special traffic engineering field service for cities and counties. In cooperation with participating cities and counties, the proposed service under the direction of Department personnel will make a traffic engineering evaluation of the factors causing traffic accidents and will recommend engineering corrections to those conditions which may be contributing to accidents.

SCOPE

As highway engineers, we have very little influence on changing or correcting the motorist's ability to drive (driver education, experience and enforcement) or for the condition of the vehicle (manufacturer's design and owner responsibility). We do have, however, the responsibility to construct, operate and maintain the roadway environment within feasible economic and design limits so that the driver and vehicle can function safely within the environment.

The intent of the "Traffic Accident Analysis for Cities and Counties" program is to improve traffic safety on all Michigan streets and roads by expanding the traffic engineering evaluation of factors causing accidents. This
is accomplished by conducting a traffic accident analysis of locations which experience high accident frequencies and then summarizing recommendations for corrective action.

STUDY PROCEDURES

The study procedures for the subject project involve several distinct phases. They may be described as follows: basic data collection, identifying and locating high accident locations, a traffic engineering analysis of accidents, technical evaluation of previously compiled facts and consequent recommendations for improvements.

Since a portion of the data collection phase involves accident records and reports, and since the Michigan Department of State Police is responsible for keeping all accident records in Michigan, the task of identifying and locating high accident locations in St. Joseph County (and providing an inventory of those locations) was designated as State Police responsibility. Because a modern and automatic system of locating accidents on the county road system has not yet been established, the high accident locations for St. Joseph County were determined by manually extracting and compiling those locations with the highest number of accidents from the 1968 county accident reports. The year 1968 was considered the base year for our study. From this list, the 14 highest accident locations were selected.
Once the problem locations were identified, additional accident information for the years 1966, 1967 and 1969 was compiled in order to expand the accident base at each location. Upon completion of this portion of the data collection, the Department of State Police documented and transmitted to the Traffic and Safety Division of the Department of State Highways a list, along with the accident reports, of the high accident locations for St. Joseph County.

The second portion of the data collection phase, which is the responsibility of the Department of State Highways, involves preparation of collision diagrams and, if necessary, physical condition diagrams and traffic counts for selected locations.

The accident analysis and traffic engineering evaluation phases involve the detailed analysis of the summarized facts and field data and prescribing the proper corrective treatment.

**STUDY AREA**

St. Joseph County is located in southern Michigan (see map following page). It is bordered on the north by Kalamazoo County, the west by Cass County, the east by Branch County and on the south by the Indiana counties of Elkhart and LaGrange.

The county is divided into 16 townships with an inland water area of 10 square miles and a total area of 508
The county's 1960 population was 42,332. This was a 20.7 percent increase over the 1950 census. Part of this large increase in population is accounted for by a net migration to the county equivalent to 7.8 percent in the period 1950 to 1960. Population projections for the next two decades or so indicate that St. Joseph County will continue to grow but at a smaller rate than in the past. The projection indicates an expected increase of 29.1 percent in the period 1960-1990 (see Table I, Appendix I, p. 84). The 1960 census shows that 37.8 percent of the population was urban. The majority of the urban population was concentrated in the cities of Sturgis and Three Rivers.

St. Joseph County is primarily an agricultural county with 75.2 percent of its land area in farms (according to 1964 statistics, U. S. Department of Commerce). Production of natural resources is very limited and directed mainly to sand, gravel, peat and stone.

The employed labor force of St. Joseph County was 16,361 in 1960 with small manufacturing accounting for 42 percent of the total employment. In 1960 there were 140 establishments in the county covering a wide variety of manufacturing industries.

According to the Eighteenth Annual Progress Report, as compiled by the Local Government Division of the Michigan Department of State Highways, St. Joseph County has 1,107.76 miles of highways excluding city and incorporated
village streets and roads. This includes 111.25 miles of state trunkline, 317.28 miles of county primary and 679.23 miles of local roads. Of the 996.51 miles of county roads, 544.86 miles are hard surfaced and the remaining mileage is either gravel, graded and drained earth or unimproved road (see county map following page).

Traffic congestion is not a problem in St. Joseph County. The total number of accidents had a sharp increase in 1968. However, this can be attributed to increased exposure. From 1968 to 1969 the increase in the number of accidents on county roads was 2.79 percent compared to a statewide increase of 8.42 percent for the same period.
STATE TRUNKLINE
COUNTY PRIMARY
COUNTY LOCAL

ST. JOSEPH COUNTY
MICHIGAN
STATE HIGHWAY COMMISSION
DEPARTMENT OF STATE HIGHWAYS

HIGHWAY PLANNING SURVEY
U.S. DEPARTMENT OF TRANSPORTATION

PLANS COMMISSION
COUNTY OFFICE

MAP 2
GLOSSARY

The term "Manual" when used in this report will refer to the "Michigan Manual of Uniform Traffic Control Devices"; publication prepared by the Michigan Department of State Highways in conjunction with the Michigan State Police.

Excerpts of the Manual are included in Appendix II.
TRAFFIC ENGINEERING ANALYSIS

Compared to the millions of vehicle miles traveled, accidents are very rare events. However, they are the only present means available to indicate a failure in the driver-road-vehicle environment. Any of these three may be a major contributor to an accident.

In our analysis, we examined the contributing factors from the viewpoint of a highway traffic engineer with special attention to the effect which the highway environment may have had on the accident. At each high accident location, individual accident reports were reviewed in detail and the accident facts were tabulated and grouped in various tables. It was apparent that no unusually high concentration of accidents existed at any one location. In fact, the highest total at any one location for the four-year study period was 20 accidents and this location included two intersections (see Location 1, pp. 13 - 20).

The first step in the traffic engineering analysis phase of St. Joseph County's high accident locations was the preparation of collision diagrams. At each location, accidents were grouped in order to locate the accident in relation to the intersection, approaches to the intersection or section of roadway. The various methods of accident analysis are intended to probe into the detailed
aspects of the accidents to determine the reasons for their occurrence.

To further document the various facts present at the 14 high accident locations in St. Joseph County, the following tables were prepared to analyze the specific data.

4. Annual Accident Summary
5. Monthly and Daily Accident Occurrence
6. Daily and Hourly Accident Occurrence
7. Weather Conditions at Scene of Accidents
8. Pavement Conditions at Scene of Accidents
9. Age of Drivers Involved in Accidents
10. Residence of Drivers Involved in Accidents

This report will discuss in detail the high accident locations in St. Joseph County. Collision diagrams and photographs for each location will be found on the page following the discussion. A map showing the 14 locations within the county is included on the following page.

Our analysis of the accident problem on county roads in St. Joseph County in relationship to spot or high accident locations reveals that at this time there are no critical problems which cannot be eliminated by the modest engineering means related to a spot improvement program.

The accident information summarized in Tables 4 through 10 may yield some basic information needed by those agencies interested in highway safety from the standpoint of driver education, law enforcement and street patrol activities.
1. Michigan Avenue and Silver Street Intersections, Mendon and Park Townships

This location consists of two "T" intersections. One intersection is formed by Michigan Avenue and Silver Street with Michigan Avenue under stop control. It will be referred to as the "west" junction. A second intersection is formed by Silver Street and Michigan Avenue with Silver Street under stop control. It will be considered the "east" junction. The intersections are located 0.75 miles apart.

Michigan Avenue in the vicinity of the west junction is 20 ft bituminous with no shoulders. Silver Street and the section of roadway between the west and the east junctions are 22 ft bituminous with five foot shoulders and centerline markings.

Traffic controls for the Michigan Avenue approach to the west junction are a 30 in. stop ahead sign, a 30 in. stop sign and a 24 in. x 48 in. bi-directional target arrow.

The north approach to the west junction has a 30 in. side road warning sign in advance of the intersection.

Traffic controls for the Silver Street approach to the east junction are a 36 in. stop ahead sign, a 30 in. stop sign and a second 30 in. stop sign on target with a 10 ft x 10 ft lattice background. There are also two 30 in. side road signs between the two junctions. One gives advance warning of the west junction and the other warns of the
proximity of the east junction. The curve between the two intersections is properly signed. It has 24 in. x 48 in. target arrows and 30 in. curve signs with 45 mph advisory speed panels for each direction.

The majority of the accidents occurred at the east junction. Eleven vehicles ran off the roadway at the end of this "T" intersection. The rural nature of the area contributes to high vehicular speeds. During 1969, an additional stop sign (on lattice background) was erected in target position at the end of the south approach to the east intersection. However, it is felt that the location of a stop sign in this location could mislead the motorists. The accident rate decreased at this intersection during 1969.

The west intersection was considered to be properly signed and no recommendations for any changes were deemed necessary.

Recommendations:

We recommend that the existing 30 in. stop sign erected on lattice background at the end of the south approach (east intersection) be replaced by a four by eight foot bi-directional target arrow (Wl-7-96, Appendix II, p. 105). Furthermore, we recommend that the existing lattice background be maintained in position to provide background for the recommended bi-directional target arrow.
We also recommend that the existing 36 in. stop ahead sign on Silver Street (south approach to the east junction) be supplemented with a lattice background (left directional W12-10, Appendix II, p. 114).

We further recommend that the existing 30 in. stop ahead sign on eastbound Michigan Avenue (west approach to the west junction) be replaced by a 36 in. stop ahead sign (W3-1-36, Appendix II, p. 109).
FIGURE 1

MICHIGAN DEPARTMENT OF STATE HIGHWAYS
TRAFFIC AND SAFETY DIVISION

Location: MICHIGAN AVE. ET SILVER ST.
MENNON PARK TWP.
ST. JOSEPH CO.

C.S. __________ Miles
Drawn D J M Date 9-9-70
Plan No. LOCATION I

Form 1547 (Rev. 5/69) Sheet ______ of ______

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MICHIGAN AVE.

WEST JUNCTION

EAST JUNCTION

REMIXS

1966
1967
1968
1969

Stop & Go Signal Stop Sign
Flash Beacon Yield Sign

Accident Study
collision diagram

Period: 1966 THRU 1969

Accidents - Total: 20

P.D. __________ ADT __________

Fatal __________ Pedestrian __________
Injury __________ Tree __________
Skidding __________ Out of Control __________
Jackknife __________ Driver Intent __________
Overturned __________ Deer __________
Backing __________ Violator __________

Rate __________ /100 mvm

Rate __________ / mvm

Form 1547 (Rev. 5/69) Sheet ______ of ______

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state highways
LANSING

MICHIGAN AVE.

WEST JUNCTION

EAST JUNCTION

REMIXS

1966
1967
1968
1969
NORTHBOUND SILVER STREET APPROACHING MICHIGAN AVENUE (EAST INTERSECTION)

NORTHBOUND SILVER STREET AT MICHIGAN AVENUE (EAST INTERSECTION)

EASTBOUND MICHIGAN AVENUE AT SILVER STREET (EAST INTERSECTION)

FIGURE 1A
WESTBOUND MICHIGAN AVENUE
AT SILVER STREET
(EAST INTERSECTION)

WESTBOUND MICHIGAN AVENUE
(APPROACHING THE CURVE)

WESTBOUND MICHIGAN AVENUE
(AT THE CURVE)

FIGURE 1B
SOUTHBOUND SILVER STREET
AT MICHIGAN AVENUE
(WEST INTERSECTION)

SOUTHBOUND SILVER STREET
(APPROACHING THE CURVE)

SOUTHBOUND SILVER STREET
(AT THE CURVE)

FIGURE 1D
2. Covered Bridge Road @ Schweitzer Road, Lockport and Nottawa Townships

Covered Bridge Road carries traffic over Langley Bridge, more often known as "the covered bridge". This bridge is the largest of its kind in Michigan and is an important historical site. The approach to the bridge from the south is a sharp curve which has been the scene of 14 accidents in the period 1966-1969.

Schweitzer Road intersects Covered Bridge Road just south of the bridge entrance. The geometrics of the intersection are not considered critical and Schweitzer Road will be considered only as a reference point for the description of this accident location.

Covered Bridge Road (south of the bridge) is 22 ft wide bituminous with five to seven foot grass shoulders and centerline markings. North of the bridge the roadway is only 18 ft wide with two foot shoulders and guardrail on both sides. Traffic control for southbound Covered Bridge Road is a 30 in. narrow bridge sign. Traffic controls for northbound Covered Bridge Road are a 30 in. curve sign (W1-2-30, Appendix II, p. 100), a 30 in. narrow bridge sign and an oversize four by eight foot target arrow on a 10 ft by 10 ft lattice background. Guardrail is present on the east side of the northbound approach and on both sides of the southbound approach.

Thirteen of the 14 accidents during the study period
were the run-off roadway type while the remaining accident was a head-on collision at the bridge entrance. Ten of the 14 accidents occurred when the pavement was snowy or wet. Only three of the accidents occurred during the day with the remaining accidents occurring at dusk (1) or at dark (10 accidents). All of the accidents were reportedly caused by excessive speed. It seems from the accident data that the curve came too unexpectedly for the drivers involved.

Since the bridge is covered, it is difficult to see any oncoming traffic without reducing the speed considerably at the bridge entrance. Traffic should go slow through the bridge since it is a one-lane bridge with a clear roadway width of only 15 ft.

The existing guardrail (at the approach from the south) does not extend far enough to protect a vehicle leaving the roadway on the tangent. This is considered hazardous since a safe landing area is not provided and the vehicles leaving the roadway could hit the existing trees or land in the St. Joseph River.

Recommendations:

We recommend that the northbound curve sign be replaced by a turn sign, W1-1-30 (see Appendix II, p. 99). Also, we recommend that the existing northbound narrow bridge sign be replaced by a one-lane bridge sign (W5-3-36, Appendix
II, p. 110). The new signs should be erected in the same location as the signs they are replacing. Furthermore, we recommend that the guardrail (on the approach from the south) be extended beyond the target arrow.
NORTHBOUND COVERED BRIDGE ROAD APPROACHING CURVE

FIGURE 2A
SOUTHBOUND COVERED BRIDGE ROAD

WESTBOUND SCHWEITZER ROAD
3. **Coon Hollow Road @ Ferguson Road, Fabius Township**

Coon Hollow Road is characterized by sharp horizontal and vertical curves throughout this location. Ferguson Road doglegs with Coon Hollow Road. The two intersections formed are considered as "Y" type intersections. Both the north and south legs of Ferguson Road intersect Coon Hollow Road at sharp curves. Coon Hollow Road is 22 ft bituminous with centerline markings but no shoulders.

Traffic controls for westbound Coon Hollow Road are a 24 in. curve sign and a 24 in. x 48 in. target arrow. For eastbound Coon Hollow Road there is a 24 in. x 48 in. target arrow.

Traffic controls for Ferguson Road are three yield signs. Two of these yield signs are on southbound Ferguson Road (north leg, west junction) and the other on northbound Ferguson Road (south leg, east junction).

The north leg of Ferguson Road is a 22 ft gravel road and the south leg is 20 ft wide gravel. Ferguson Road has channelized lanes for each direction of traffic with a grass island separating the lanes.

There were 14 accidents at this location over the study period 1966 through 1969. Two of the accidents were car-deer and all the others were of the ran off the roadway variety. The majority of the accidents were for westbound traffic. Six of the accidents occurred just west
of the east junction and were due to speed too fast for conditions. These six vehicles either landed in the swamp or hit the bridge railings. However, it is worthwhile to note that 12 out of the 14 accidents occurred when the light condition was dark. Although the accident experience does not justify major reconstruction (as easing the curves), we should recognize this possibility as the ultimate solution to the problem, and it should be considered in the county's long range planning. At the present time some changes in signing are necessary to make the motorist aware of the existing conditions.

The yield signs at this location (on north and southbound Ferguson Road) are smaller than the minimum size required by the Manual and consideration should be given to bringing these signs up to standard whenever the condition of the signs requires their replacement.

Recommendations:

We recommend that the existing curve sign for westbound Coon Hollow Road be replaced by a reverse turn sign (W1-3-30, Appendix II, p. 101) and that an additional reverse turn sign be erected for westbound traffic just west of the bridge location. These signs should be supplemented with 25 mph advisory speed panels. The appropriate speed panel legend was determined by using a devil level indicator and the criteria outlined in Appendix II, pps. 111 - 112. The following averages were obtained during field investigation.
Devil Level Readings

<table>
<thead>
<tr>
<th>MPH</th>
<th>Curve at East Intersection</th>
<th>Curve at West Intersection</th>
</tr>
</thead>
<tbody>
<tr>
<td>23</td>
<td>12°</td>
<td>10°</td>
</tr>
<tr>
<td>30-32</td>
<td>22°</td>
<td>15°</td>
</tr>
</tbody>
</table>

Westbound Curves

We also recommend that new WI-3-30 reverse turn signs be erected for eastbound traffic on Coon Hollow Road. One of these signs should be erected approximately 500 ft in advance of the target arrow existing at the first curve encountered by eastbound traffic. The second sign should be erected in advance of the second series of curves and just west of the bridge location. The first sign should be supplemented with a 25 mph advisory speed panel.

The following devil level reading averages were obtained during field investigation.

Devil Level Readings

<table>
<thead>
<tr>
<th>MPH</th>
<th>Curve at West Intersection</th>
<th>Curve at East Intersection</th>
</tr>
</thead>
<tbody>
<tr>
<td>23</td>
<td>12°</td>
<td>9°</td>
</tr>
<tr>
<td>32</td>
<td>18°</td>
<td>12°</td>
</tr>
</tbody>
</table>

Eastbound Curves

The second reverse turn sign for eastbound traffic should be supplemented with a 30 mph speed panel legend.

This location will further benefit with the use of target arrows. We recommend that target arrows (WI-6-48,
Appendix II, p. 104) be erected at each curve in target position. This may require the erection of some signs in the traffic islands formed by the intersection of Ferguson Road and Coon Hollow Road. However, if this is not practical, these signs should be placed as near to target position as the configuration of the intersection will allow.