SEVENTH ANNUAL REPORT OF MICHIGAN'S OVERALL HIGHWAY SAFETY IMPROVEMENT PROGRAM

August 31, 1980

This report was prepared by the Traffic and Safety, Local Government, and Maintenance Divisions, and the Railroad Contact Section, Bureau of Highways.

The opinions, findings, and conclusions expressed in this publication are those of the author and not necessarily those of the Federal Highway Administration.

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Introduction

This is the seventh annual report describing Michigan's overall highway safety improvement program activities. Comparisons are made of each program relative to last year's status. Projects of a special nature within each program are discussed as are evaluations of completed projects.

Section 1 contains the status of each subprogram of the Categorical Safety Program. Evaluations of completed projects in the various subprograms are included where data is available.

Section 2 includes Michigan's 100 percent state funded Safety (Ms) Program and evaluations of completed projects.

Section 3 includes other state and federally funded activities involving safety. Also included is a discussion on the status of the Michigan Accident Location Index (MALI) system.

Sections 4 and 5 discuss updates of new developments in highway safety and special studies that were identified in last year's report.

Michigan State Safety Commission

The Michigan State Safety Commission, which was established by the legislature in 1941, has three primary accomplishments annually: (1) improved awareness and liaison among persons affiliated with the commission who have a continuing professional interest in traffic safety, (2) discussion among the commissioners on pending or proposed traffic safety legislation, and (3) monthly monitoring of crash trends. During the past year the commission's major accomplishment involved a 2-day conference on the problems and issues surrounding alcohol, drugs, and highway safety. The conference evolved from the seeming inability of state programs to make an impact on the number of annual traffic fatalities attributable to drinking and driving. The conference brought together decision makers and policy makers from a broad range of vocations and interests to discuss the issues and seek resolutions. The two major areas that surfaced as a result of this conference that highlight the failures of our present system of dealing with the problems of alcohol, drugs, and driving were:

1. In spite of our efforts, most people do not seem to understand the mechanisms of impairment or their consequences; and

2. The traffic law system for dealing with the alcohol or drug abusing driver makes it difficult to force individuals into treatment/ rehabilitation programs at an appropriate (early) stage in their abuse problem.

The recommendations relating to these problem areas and to other issues raised during the conference were submitted to the commission's steering committee with the responsibility to develop an action plan for implementation of these recommendations; to proceed with implementation together with other agencies; and to report periodically to the commission on progress.

Other commission activities during the past year involved the Michigan Traffic Safety Information Council which is an affiliate of the commission responsible for the development of cooperative public information and education efforts between public and private sector agencies. Some of the activities implemented by the Information Council included public service announcements on bicycle safety, motorcycle safety, construction zone 45 mph speed limit, and the 55 mph speed limit. In addition, a tourist brochure was developed on Michigan laws for visitors; an ambitious program designed to improve railroad safety called "Operation Lifesaver" began in April, and efforts have continued to promote the use of vehicle occupant restraint systems.

The regional steering committees which were developed by the commission as a means for disseminating information and coordinating traffic safety programs on a statewide basis, implemented many safety oriented programs during the past year. One innovative program involved a controlled drinking demonstration project for law enforcement personnel, judges, and prosecutors to demonstrate the effect of alcohol consumption on driving skills. Another program implemented during the past year involved a public awareness campaign of problem traffic locations through the distribution of traffic brochures. Many of the regions are currently planning

programs to encourage the use of occupant restraints in the business community.

The State Safety Commission and its organizational components are a unique concept to the state of Michigan. The commission is promoting highway safety in Michigan through the cooperation of the commissioners and their departments or agencies and such other public and private organizations as may be interested in highway safety. The principle intent of the commission is to move toward the greatest possible level of transportation safety for citizens and visitors in the state of Michigan.

PROGRAM SUMMARY
FISCAL YEAR 1979-80

		Total Costs
FEDERAL CATEGORICAL SAFETY FUNDS-OBLIGATED		
Rail-Highway Crossings		$ 7,268,572
Pavement Marking Demonstration Program		2,325,213
High Hazard Obstacle		5,815,028
Safer Off-System Safety		2,123,427
Special Bridge Replacement		4,382,698
Transitional Quarter Funds		6,013,229
	Total	$ 27,928,167
OTHER FEDERAL FUNDS		
Interstate Safety (Is)		3,275,000
Yellow Book Program		14,952,000
Urban Programs		21,810,493
Federal Aid Primary Program		15,474,719
Federal Aid Secondary Program		6,690,756
Federal Aid Off System		32,559
	Total	$ 62,139,527
STATE FUNDED SAFETY PROJECTS		
Ms - safety program		$ 3,717,000
OTHER STATE FUNDED PROJECTS (Safety Items Only)		
Mb - bituminous resurfacing		$ 7,404,000
Mbr - bituminous reconstruction		5,872,000
M - miscellaneous construction		18,316,000
Mnm - nonmotorized vehicle facility		132,000
Msh - shoulder edge treatment		2,009,000
Mbd - bridge deck		1,226,000
Mtb - turnback		3,639,000
	Total	$38,598,000
SPECIAL PROJECTS		
Impact Attenuators (cost included in Ms and HH totals)		$ 331,269
STATE-LOCAL MATCHING MONIES		13,566,631
	Total Safety Expenditures	$145,949,325

SECTION 1

THE 1978

HIGHWAY SAFETY ACT IN MICHIGAN

PART 1

CATEGORICAL SAFETY PROGRAM

FISCAL YEAR 1979-80

Michigan obligated over 59 percent of the funds apportioned by the 1978 Highway Safety Act between July 1, 1979, and June 30, 1980. If $10,833,411 of SOS funds which we do not have obligational authority for is not considered as part of the total safety program, the percentage of funds obligated changes to 77 percent.

Individual subprograms of the Categorical Safety Program, when compared to last fiscal year, show the following results. Rail Highway Crossings obligations decreased by less than 1 percent, Pavement Marking Demonstration obligations increased by 22.6 percent, Hazard Elimination obligations increased by 58 percent, and Special Bridge Replacement obligations decreased 11.8 percent. The greatest changes occurred in the Safer Off-System and Transition Quarter Funds with decreases of 77.5 percent and 38 percent respectively.

Evaluations of completed Categorical Safety Program projects included in this report show a time of recovery (TOR) factor of 21 years. Evaluations of completed Michigan Safety (Ms) projects have a TOR of 4.3 years. Anticipated National Safety Council figures for 1979, the last calendar year in the after period, were used for both types of projects.

Administrative responsibilities for the categorical safety subprograms included in the 1976 Highway Safety Act are assigned to the Michigan Department of State Highways and Transportation's Local Government and Traffic and Safety Divisions. The Local Government Division processes most requests that originate for off-trunkline projects. The Traffic and Safety Division processes all geometric and operational trunkline projects and those that are submitted through the division's Community Assistance Program for off-trunkline projects. The Office of Highway Safety Planning and the Michigan Department of State Police act as advisors due to a federally funded Section 402 grant for the Community Assistance Program.

The Transition Quarter (TQ) funds that Michigan received when the fiscal year was changed from a July 1 to June 30 period to an October 1 to September 30 period, has allowed Michigan to obligate an additional $23 million towards safety related work items. This fund has allowed Michigan greater flexibility for completing more projects within a shorter time frame.

The following is a more detailed discussion of each subprogram of the Categorical Programs and an evaluation of completed projects.

Rail Highway Crossings Subprogram

This subprogram of the Categorical Safety Program is divided into Rail-Highway Crossing Protection (RRP) and Rail-Highway Crossing Safety (RRS).

The purpose of RRP is to eliminate hazards associated with rail-highway crossing through separation, reconstruction of existing structures, or the elimination of grade crossings by consolidating railways.

Construction costs may qualify for 100 percent federal funds while right-of-way costs are limited to a maximum of 70 percent federal funds. The cost to the railroad cannot exceed 5 percent. Title 23 Section 104 requires that 10 percent or less of all funds apportioned to a state during any fiscal year may be used.

The purpose of RRS is directed at reducing accident severity through the installation of standard signs, pavement markings, train-activated warning devices, crossing illumination, improvements of the crossing surface, and the consolidation or separation of crossings. All signing and pavement markings must conform to the MMUTCD. All improvements are to be determined from a priority listing in accordance with methodology in the Federal Aid Highway Program Manual. At least 50 percent of authorized funds are available for the above project types.

The department's Traffic and Safety Division initiated a special project for replacement of certain nonelectrical crossbuck supports. The existing supports consisted of every imaginable material except one of a forgiving nature. Seven of the state's nine districts were involved. The new supports, 4" x 6" wood posts, were placed at 32 at-grade railroad crossings in three of Michigan's upper four districts by force account procedures with RRP funds. Formal contract lettings were used to place the wood posts at 56 crossings in four of the five remaining districts in lower Michigan.

The Rail-Highway Crossing Improvement Program review for fiscal year 1980 indicate $7,268,572 of 1978 HSA monies was obligated. Since enactment of the 1973 HSA, the department has obligated a total of $29.6 million.

Pavement Marking Demonstration Subprogram

The purpose of this subprogram is to show that vehicle and pedestrian safety can be increased through the standard application of pavement markings.

This subprogram provides 100 percent federal funding for surveying no passing zones and the marking of any paved public highway except for interstate routes. All costs for materials, labor, equipment rental or depreciation charges required to place markings initially and renew markings over a two-year period for evaluation purposes are funded. Higher type pavement markings such as hot applied thermoplastic materials are eligible but require a complete cost-effectiveness analysis.

The department's Local Government Division has administrative responsibility for this program with the Traffic and Safety Division acting in an advisory capacity.

Conventional pavement marking materials have not provided an effective year-round delineation on high volume roadways in Michigan. Extensive research and development has been conducted to evaluate the use of epoxy and polyester resins as durable pavement marking materials on both asphaltic and Portland cement concrete surfaces. New equipment development and material formulations have been reported with various degrees of success in providing pavement markings with increased life expectancy (two years or more), particularly on high volume urban roadways.

These products have been tested in Michigan with limited field installations and have shown sufficient promise in both performance and durability to merit further testing. To satisfy this need for further testing an experimental project was developed using PMS funds.

This experimental project involves evaluation of material formulations, as well as application techniques and equipment necessary for the development of a durable pavement marking system. The project is an extension of research with limited field installations in Michigan to a large scale field evaluation. Continuity in material formulation and expertise and application techniques is therefore critical to the research study.

This additional research will provide the data to make direct comparisons of the performance characteristics and cost effectiveness of each product as well as thoroughly document the application techniques and equipment necessary for development and implementation of a statewide delineation system using longer life materials.

By June 30, 1979, a total of $9,929,096 in PMS funds had been obligated, $2,325,213 during fiscal year 1980.

High Hazard Obstacle/Roadside Obstacle Subprogram

Sections 152 and 153 of Title 23 United States Code provide funding to reduce the hazards at locations on the federal aid system identified as high-accident locations and to eliminate or shield potentially hazardous roadside obstacles.

The types of projects eligible for Section 152 funding include, but are not limited to, intersection improvements, cross section modifications, skid resistance treatments, and alignment changes. It is intended that these projects be spot improvements, not major reconstruction of lengthy sections of roadway.

This department's Local Government Division has the administrative responsibilty for locations that are off the state trunkline system with the Traffic and Safety Division acting in an advisory capacity. Projects on the state trunkline system are administered and engineered by the Traffic and Safety Division.

Project selection on all roadway systems is improving because of the availability of more computerized accident data. With the development of computerized correctable accident pattern data, we can be more selective in choosing various types of improvements. The average cost TOR (time of return) for projects on the trunkline system is approximately nine years. See the completed evaluations of projects on pages 14 and 15. The reason for the low TOR can be attributed to a screening process which takes the following factors into consideration:

A. Number and severity of accidents.
B. Presence of "correctable patterns" and reoccurring patterns.
C. Practicality - potential for improvement, size of project, consideration of potential right-of-way and/or drainage problems, and necessity of securing participation from municipalities.

D. Operational considerations such as increased capacity, providing for left and right turns, roadside control, and removal of obvious "bottlenecks."
E. Area factors - potential growth, traffic generators, and uniformity of treatment with a route.
F. Consideration is given to expanding an intersection to its "ultimate cross section" in selecting appropriate treatment and project limits.
G. Operational changes rather than reconstruction, such as signs, signals, or pavement markings.

A total of $5,815,028 was obligated during Fiscal Year 1980.

Safer Off-Systems Subprogram

Sections 101(e) 219 and 315 of Title 23 United States Code makes provisions which enable state and local road officials to construct and improve off-system roads and bridges. Projects which significantly contribute to the safety of the traveling public are considered high priority.

The selection of projects is low cost corrections of high hazard locations, elimination of roadside obstacles, structure widening, or the installation and upgrading of traffic control devices. The Michigan Department of Transportation distributes available funds throughout the state and cooperates with local road officials in the selection of projects to maximize the funds available.

The department's Local Government Division has the administrative responsibilities for this subprogram. The Traffic and Safety Division provides traffic engineering consultation as needed.

During fiscal 1980 $2,123,427 of SOS funds were obligated which represented the remaining balance of Michigan's 1976 HSA allocation. Additionally the Railroad Off-System Program (RRO) accounted for another $277,648 which has been included with the Rail-Highway Crossing Program.

We currently have a backlog of $9 million of projects eligible for SOS funding. Approximately $4 million of this total has already been submitted for federal approval. The remaining $5 million has not been submitted for federal approval because Congress did not make an allocation as part of the 1978 HSA. We strongly urge that this type of inaction does not continue.

Special Bridge Replacement Subprogram

Section 144 of Title 23 of the United States Code provides financial assistance to replace bridges over waterways or other topographical barriers that are considered significantly important and are unsafe because of structural deficiencies, physical deterioration or functional obsolescence. The program in Michigan is administered by the department's Local Government Division.

Bridges under local jurisdiction have been surveyed for structural adequacy and are ranked for priority of replacement in accordance with critical need based on the local agency's financial resources, importance of the bridge to the area, and the structural condition of the existing bridge. . From 1972 through June 30, 1979, $24,522,392 in Federal Aid funds have been obligated. During fiscal 1980 a total of $4,382,698 was obligated.

Transition Quarter Funds

Michigan extended the 1975-76 fiscal year from June 30, 1976, to September 30, 1976 to coincide with the October 1 to September 30 federal fiscal year. As a result of this extension, Michigan received a fifth quarter allotment (Transition Quarter TQ) of federal funds to be used as needed. During fiscal 1980 Michigan obligated $6,013,229 of TQ funds for a 4-year total of $50,828,783. This money was mainly directed to safety type projects.

TABLE 1

STATE Michigan | M | i | FIPS CODE (Alpha)

HIGHWAY SAFETY IMPROVEMENT PROGRAM
ANNUAL REPORT 1980
PROCEDURAL AND STATUS INFORMATION

Line	Highway System	HIGHWAY LOCATION REFERENCE SYSTEM		TRAFFIC RECORDS SYSTEM		HAZARDOUS LOCATIONS	
		Miles Covered (Percent) (1)	Expected Completion (Year) (2)	Volume Data (Percent) (3)	Highway Data Correlation (Y,N,U) (4)	Location Criteria *(5)	Project Priority Selection *(6)
101	Interstate	100		100	U	AELRS	CEIPR
102	State - F.A.	100		100	Y	AELRS	CEIPR
103	State - Non-F.A.	100		100	Y	AELRS	CEIPR
104	Local - F.A.	100		100	U	AERS	CEPR
105	Local - Non-F.A.	100		100	U	AERS	CEPR

Line	Highway System	ROADSIDE OBSTACLES Project Priority Selection *(7)	SKID IMPROVEMENT Project Selection *(8)	HAZARDOUS BRIDGES Project Selection *(9)	RAILROAD-GRADE CROSSINGS					
					Inventory Update *(10)	Project Priority Selection *(11)	Compliance With MUTCD: Crossings Upgraded **7/1/73-6/30/80 (12)	Not Complying Number (13)	Not Complying % (14)	Compliance Target Date (15)
201	Interstate	AEIRSV	AEGIPRSVW							
202	State - F.A.	AEIRSV	AEGIPRSVW	ABDGRSW	None	Y	N/A#	0	0	N/A
203	State - Non-F.A.	AEIRSV	AEGIPRSVW	ABDGRSW	None	Y	N/A#	0	0	N/A
204	Local - F.A.	AEISV	AEPRSW	ABDSW	None	1PTVW	ALL	0	0	N/A
205	Local - Non-F.A.	AEISV	AEPRSW	ABDSW	None	1PTVW	ALL	0	0	N/A

F.A. = Federal-Aid
* = If more than one code applies, show all appropriate codes.
** = See instructions.
Describe "Y" Codes on separate sheet and attach to this table.

#Crossbuck supports of a forgiving nature are currently being placed at designated non electrical crossings on the trunkline system. Crossbuck signs are also being upgraded to high intensity reflectorized backgrounds as part of the seven projects. Other signs are being upgraded on an individual crossing project basis where flashing light signals exist.

Indicate reporting period:
7/1/73-6/30/80 ___
7/1/79-6/30/80 ___

STATE _____ FIPS CODE (Alpha)

PAVEMENT MARKING DEMONSTRATION PROGRAM

ANNUAL REPORT 1980

QUANTITIES AND COST OF MARKINGS PLACED

TYPE OF MARKINGS PLACED	QUANTITIES AND COST ($1,000) OF MARKINGS PLACED, *JULY 1, 1979 TO JUNE 30, 1980										Total Quantities and Cost of Markings Placed July 1, 1979 To June 30, 1980		Cumulative Total Miles and Cost of Markings Placed to June 30, 1980	
	FEDERAL-AID SYSTEM						OFF THE FEDERAL-AID SYSTEM							
	Urban		Primary		Secondary		State Jurisdiction		Local Jurisdiction					
	Miles	Cost	Miles	Cost	Miles	Cost	Miles	Cost	Miles	Cost	Miles	Cost	Miles	Cost
Centerlines Only					4523	600425.			2050	271795.	6573	872220.	38826	5323515.
Edgelines Only					2369	542323.			750	154036.	3119	696359.	32547	3133970.
Both Centerlines and Edgelines					6892	1142748.			2800	425831.	9692	1568579.	13257.	2145307.
Sub-Total					6892	1142748.			2800	425831.	9692	1568579.		8457485.
	Quantity	Cost	Quantity	Cost	Quantity	Cost	Quantity	Cost	Quantity	Cost	Quantity	Cost		
Railroad-highway Grade Crossings			Reg Paint		160	16130.			132	12845.	292	28975.	2978	250324.
Pedestrian Crossings 1/														
Other (Describe) School Markings			Reg Paint		15	1305.			9	755.	24	2060.	1376	279922.
NPZ Survey					203	5684.			142	3976.	345	9660.		9078077.
GRAND TOTAL						1165867.				443407.		1609274.		

*If reporting period is other than July 1, 1979 to June 30, 1980 indicate dates: _____

1/ Show number of intersections in "Quantity" column.

What percent of the total miles marked during the year ending June 30, 1980 was marked for the first time? _____%

12

SECTION 1

PART 2

EVALUATION DATA SUBMITTED FOR THE

CATEGORICAL SAFETY PROGRAM

Evaluation Data for HH Projects

Evaluation data for ten High Hazard projects completed during 1976 is shown on the following page.

Accident costs for 1979 have not been received from the National Safety Council. But based on increases in accident costs in prior years, we can anticipate approximate costs of $155,000 per fatal accident, $6,000 per injury accident, and $1,000 per property damage only accident. Applying these adjusted figures to the accident severity in both the before and after periods, the savings per 3-year period would be $206,000 or $73,571 per year after adjusting for the 24-month evaluation. This annual savings indicates the time of recovery (TOR) would be over 21 years.

TABLE 4

Page ___ of ___

STATE Michigan | M | I | FIPS CODE (Alpha)

HIGHWAY SAFETY IMPROVEMENT PROGRAM AND
PAVEMENT MARKING DEMONSTRATION PROGRAM
ANNUAL REPORT 1980
EVALUATION DATA FOR COMPLETED IMPROVEMENTS

Line		Safety Improvement Program (1)	Safety Classification Code (2)	Total Cost of Evaluated Improvements ($1000) (3)	Quantity of Improvements (4)	Units (5)	NUMBER OF ACCIDENTS										Evaluation Status (16)	Exposure (Millions)			Rural or Urban (20)	Number of Lanes (21)	Divided or Undivided (22)
							Before					After						Before (17)	After (18)	Units (19)			
							Mos. (6)	Fat. (7)	Inj. (8)	PDO (9)	Tot. (10)	Mos. (11)	Fat. (12)	Inj. (13)	PDO (14)	Tot. (15)							
01		HH	10	536.2	2	X	36	0	75	166	241	36	2	56	155	213	F	36.38	39.19	V	U	4	U
02		HH	10	144.7	1	X	24	0	33	73	106	24	0	9	36	45	F	22.14	22.9	V	U	2	U
03		HH	11	2.2	1	X	36	0	4	10	14	36	0	7	14	21	F	15.33	16.42	V	R	2	U
04		HH	11	8.8	4	X	36	0	39	53	92	36	1	24	59	83	F	25.18	26.28	V	R	4	U
05		HH	12	909.8	2	x	36	1	95	200	296	36	0	70	202	272	F	44.67	48.6	V	U	4	U
06																							
07				1601.7	10			1	246	502	749		3	166	466	636							
08																							
09		ACCIDENT COSTS						155	1476	502			465	996	466								
10																							
11									2133					1927									
12																							
13												206											
14																							
15																							

SECTION 2

THE 1979-80

MICHIGAN SAFETY (Ms) PROGRAM

Michigan Spot Safety (Ms) Program

The spot safety improvement program continues to focus on the identification and improvement of statistically high accident locations on the state trunkline highway network. The principal activities include, but are not limited to, an annual review of accident data in order to define correctable accident patterns, analyze appropriate corrective treatments, develop recommendations for operational modifications and/or minor and major geometric safety improvements, request programming of either state or federal funds, and conduct evaluation studies to determine the effectiveness of the corrective measures in terms of accident reduction and injury avoidance. The Safety Programs Unit operating within the Traffic and Safety Division is responsible for the administration, development, implementation, and evaluation of this program.

The Michigan Accident Location Index (MALI) system is a computerized statewide accident location system which is used for the accident data generation. The Michigan Dimensional Accident Surveillance (MIDAS) model provides computer-generated printout listings which are categorized by various geometric, environmental, and traffic characteristics. The output report is in the form of a histogram which is a graphical illustration of the accident frequency distribution for 20 possible accident codes. An English description of those locations exceeding all upper confidence limit (95%) is provided along with highway control section number, mileage point, number of accidents, route, crossroad name, local governmental agency, and county. This report provides a ranking of locations exhibiting similar characteristics as well as the ready identification of outliers in terms of statistical significance. A second computer output report is also generated in order to simplify and expedite the review and analysis process. This report, referred to as the MIDAS x-y-z-n listing, identifies abnormal accident patterns on the state trunkline system categorized by district, control section, mileage point along with English description. The x-y-z-n factors refer to geometry, environment, cross section, and accident type characteristics which are defined on a code sheet (see Exhibit 1).

Projects typical of the Spot Safety (Ms) Program include intersection modifications and/or widenings to provide for additional through capacity and for protected turn lanes, improved roadside control, protective guardrail and median barrier, friction resistant treatments, and sign maintenance. Evaluation studies of past projects are conducted annually to determine the effectiveness of the various treatments which are then used to forecast expected reductions for future candidate improvement projects. The National Safety Council (NSC) values are used for estimating the cost of motor vehicle accidents.

The utilization of new computer techniques and programs are being incorporated into the surveillance review process in order to improve the effectiveness of the Spot Safety Improvement Program. Recently the Safety Programs Unit, in cooperation with the department's Computer Services Division, developed a computer program which allows statewide Traffic and Safety personnel to access a secured data file containing information on the status of current spot safety improvement studies and/or programmed projects. The forms display feature available on the computer terminals allows authorized personnel to add, delete, or change records and allow all

division personnel to find information and obtain hard copy reports if desired. Refer to Exhibits 2 and 3 for the computer forms display of the studies and projects files and to Exhibits 4 and 5 for the respective study and project output status reports. This information allows unit personnel to monitor and coordinate activities with other units to better facilitate the analysis, design, and evaluation process of candidate improvement locations.

A new adaptation of the MIDAS model involves the development of a computer program which outputs a variety of traffic and accident data. This system, known as the Intersection Profile Analysis, will enable a thorough review of an intersection on an approach-by-approach basis. The information supplied is rather comprehensive and can be considered one step short of a collision diagram. This report is nearing final completion and will be available for use within the near future. For a more complete discussion of this and other features of the MIDAS model, refer to pages 44 through 58.

X
Geometry

1. 2 lane - 2 way/Tangent/No Passing Zone
2. 2 lane - 2 way/Tangent/Passing Zone
3. 2 lane - 2 way/Curve 35/No Passing Zone
4. 2 lane - 2 way/Curve 35/Passing Zone
5. 2 lane - 2 way/Curve 30/No Passing Zone
6. 2 lane - 2 way/Curve 30/Passing Zone
7. 2 lane - 2 way/Curve 45/No Passing Zone
8. 2 lane - 2 way/Curve 45/Passing Zone
9. 2 lane - 2 way/Curve 40/No Passing Zone
10. 2 lane - 2 way/Curve 40/Passing Zone
11. 3 lane - 2 way/Tangent/No Passing Zone
12. 3 lane - 2 way/Tangent/Passing Zone
13. 3 lane - 2 way/Curve/No Passing Zone
14. 3 lane - 2 way/Curve/Passing Zone
15. 4 lane - 2 way/Tangent
16. 4 lane - 2 way/Curve
17. 5 lane - 2 way/Tangent
18. 5 lane - 2 way/Curve
19. 6 lane - 2 way/Tangent
20. 6 lane - 2 way/Curve
21. 7 lane - 2 way/Tangent
22. 7 lane - 2 way/Curve
23. 2 lane - 1 way/Tangent
24. 2 lane - 1 way/Curve
25. 3 lane - 1 way/Tangent
26. 3 lane - 1 way/Curve
27. 4 lane - 1 way/Tangent
28. 4 lane - 1 way/Curve
29. 4 lane Divided/Tangent
30. 4 lane Divided/Curve
31. 6 lane Divided/Tangent
32. 6 lane Divided/Curve
33. 8 lane Divided/Tangent
34. 8 lane Divided/Curve

Y
Environment

1. Urban/Mid Block
2. Urban/No Signal/No Turn
3. Urban/No Signal/Right Turn
4. Urban/No Signal/Left Turn
5. Urban/No Signal/Right & Left Turn
6. Urban/Flasher/No Turn
7. Urban/Flasher/Right Turn
8. Urban/Flasher/Left Turn
9. Urban/Flasher/Right & Left Turn
10. Urban/Signal/No Turn
11. Urban/Signal/Right Turn
12. Urban/Signal/Left Turn
13. Urban/Signal/Right & Left Turn
14. Urban/Left Turn Phase
15. Urban/Turn Prohibited
16. Urban/All Red
17. Rural/Mid Block
18. Rural/No Signal/No Turn
19. Rural/No Signal/Right Turn
20. Rural/No Signal/Left Turn
21. Rural/No Signal/Right & Left Turn
22. Rural/Flasher/No Turn
23. Rural/Flasher/Right Turn
24. Rural/Flasher/Left Turn
25. Rural/Flasher/Right & Left Turn
26. Rural/Signal/No Turn
27. Rural/Signal/Right Turn
28. Rural/Signal/Left Turn
29. Rural/Signal/Right & Left Turn
30. Rural/Left Turn Phase
31. Rural/Turn Prohibited
32. Rural/All Red
33. Fringe-Strip/Mid Block
34. Fringe-Strip/No Signal/No Turn
35. Fringe-Strip/No Signal/Right Turn
36. Fringe-Strip/No Signal/Left Turn
37. Fringe-Strip/No Signal/Right & Left
38. Fringe-Strip/Flasher/No Turn
39. Fringe-Strip/Flasher/Right Turn
40. Fringe-Strip/Flasher/Left Turn
41. Fringe-Strip/Flasher/Right & Left Turn
42. Fringe-Strip/Signal/No Turn
43. Fringe-Strip/Signal/Right Turn
44. Fringe-Strip/Signal/Left Turn
45. Fringe-Strip/Signal/Right & Left Turn
46. Fringe-Strip/Left Turn Phase
47. Fringe-Strip/Turn Prohibited

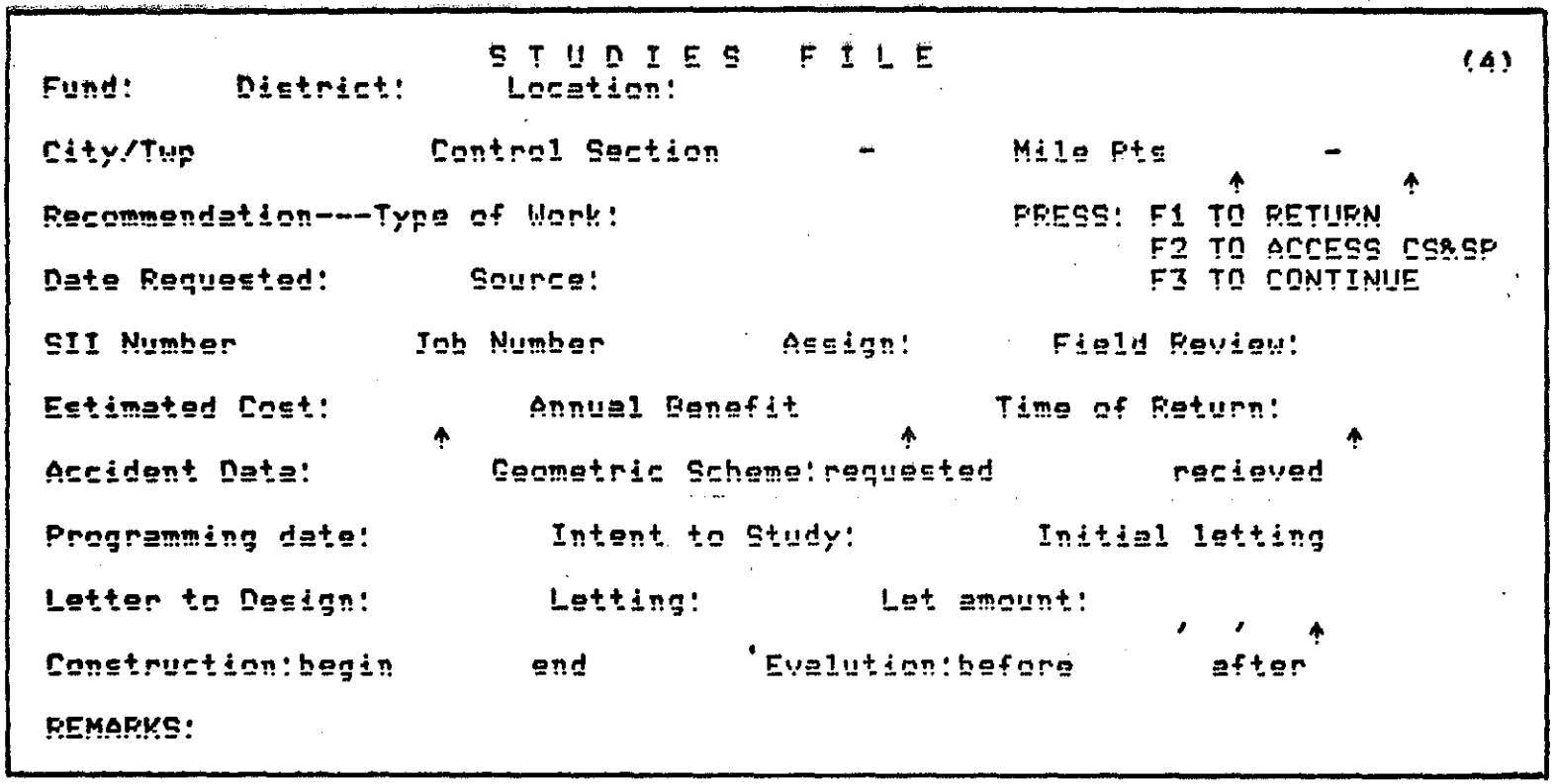
N
Cross Section

1. 10 ft. lane/curb
2. 10 ft. lane/0-4' shoulder
3. 10 ft. lane/4-8' shoulder
4. 10 ft. lane/8-10' shoulder
5. 10 ft. lane/10-12' shoulder
6. 11 ft. lane/curb
7. 11 ft. lane/0-4' shoulder
8. 11 ft. lane/4-8' shoulder
9. 11 ft. lane/8-10' shoulder
10. 11 ft. lane/10-12' shoulder
11. 12 ft. lane/curb
12. 12 ft. lane/0-4' shoulder
13. 12 ft. lane/4-8' shoulder
14. 12 ft. lane/8-10' shoulder
15. 12 ft. lane/10-12' shoulder

Z
Accidents

1. Total
2. Right Angle
3. Rear End
4. Left Turn
5. Right Turn
6. Head-On
7. Ran off Roadway
8. Ran Off Roadway Hit Guardrail
9. Ran Off Roadway Hit Sign
10. Ran Off Roadway Hit Pole
11. Ran Off Roadway Hit Culvert or Ditch
12. Ran Off Roadway Hit Abutment
13. Ran Off Roadway Hit Tree
14. Parking
15. Pedestrian
16. Dry Surface
17. Wet Surface
18. Icy Surface
19. Light
20. Non Light
21. Mean Accident Rate

EXHIBIT 1



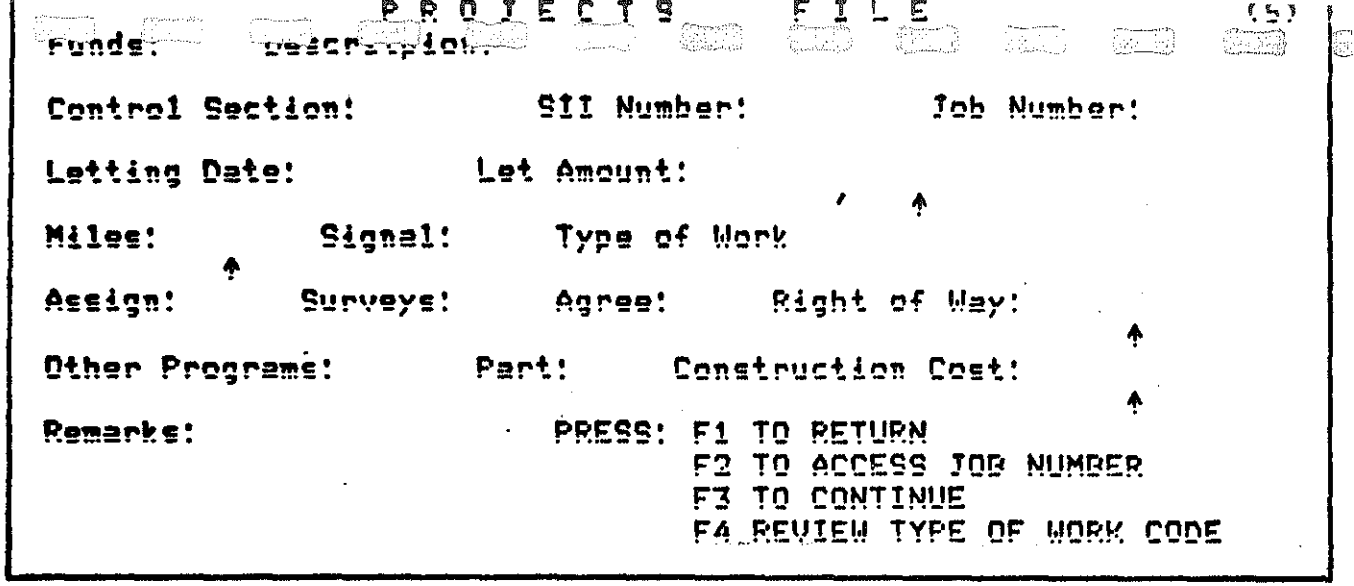
This form displays all information on the studies file.

If F1 is selected and you picked review studies (F3) on Form 2, Form 2 will be displayed.
If F1 is selected and you picked CS & Spot (F5) on Form 3, Form 3 will be displayed.
If F2 is selected, Form 8 will be displayed.
If F3 is selected, Form 8 or additional information (if appropriate) will be displayed.

This form is displayed:

After entering control section and spot on Form 8.
If F1 on Form 2 is selected.

EXHIBIT 2



This form displays all information on the projects file.

If F1 is selected and you picked review projects (F4) on Form 2, Form 2 will be displayed.
If F1 is selected and you picked Job Number (F6) on Form 3, Form 3 will be displayed.
If F2 is selected, Form 7 will be displayed.
If F3 is selected, Form 7 or additional information (if appropriate) will be displayed.
If F4 is selected, Form 10 will be displayed.

This form is displayed: After entering Job Number on Form 7.

EXHIBIT 3

MICHIGAN DEPARTMENT

OF

TRANSPORTATION

STATUS AS OF MARCH 17, 1980

****
* *
* STUDY STATUS *
* *
****

PREPARED BY
TRAFFIC & SAFETY DIVISION
SAFETY PROGRAMS UNIT

EXHIBIT 4

LOCATION DESCRIPTION / RECOMMENDATION / TYPE OF WORK	SII #	ASSIGN	EST COST	TIME RETURN	GEO SCHEME	PROG DATE	INIT'L LET	ACTUAL LET	CONST PERD	EVAL PERD	REMARKS
CTY/TWP CONT SEC BEG-END MI PT / DATE REQ/SOURCE	JOB #	FIELD REVIEW	AN'UL BENE'T	ACC DATA	REQST REC'D	INTENT STUDY	TO DESIGN	LET COST	BEGIN END	DEF'R AFTER	
MS FUND DISTRICT S											
US-27,NORTHCREST HLY TO STOLL	4-5 LANE WIDEN	1541R	DAD	390.0	8.9	11-79	11-79	8-81	8-81		
DEWITT T 19031- 1.500- 2.000	11-79/DISTRICT	17647		43.7	76-78		12-79		0.0		
M-46(MONROE RD)@LUMBERJACK RD	TYPE 4 FLARE	1549R	DAD	110.0	2.6	10-79	1-80	4-80	4-80		
SEVILLE 29041- 0.38 - 0.52	10-79/DISTRICT	17750	10-79	42.3	76-79	11-79	1-80		0.0		
US-27AR(MISSION) @ M-20(PICKARD	4-5 LANE WIDEN	1276R	DAD	45.0		3-75	5-75	8-76	12-78		RUN READ
MT PLSAN 37012- 3 1.120-		9600			72-77	2-76		4-76	135.1		
M-20 (HIGH) @ LINCOLN	INT FLARE	1495R	DAD	85.0	7.5		2-79	7-79	5-80		
MT PLSAN 37021- 14.000-	10-78/DISTRICT	16598		11.3	75-77		5-79	4-79	0.0		
M-20 @ LEATON RD	INT FLARE	1382R	DAD	51.0	2.9		8-76	2-77	3-80		RUN READ
CHIPWA T 37022- 2 2.950-	6-76/DISTRICT	11539		17.8	73-78		11-77	9-76	0.0		
M 11(28TH),BURLINGAME-CLYDE PK	BOULV & X OVERS		DAD			8-79					
TOWING 41062- -	6-79/DIST & CTY		12-79		78-78				0.0		
M-11(28TH) @ BUCHANAN	INT RECONST		DAD								ESU STUDY
GR RAPID 41063- 2 3.910-	3-78/DISTRICT								0.0		SIGNAL SPACG

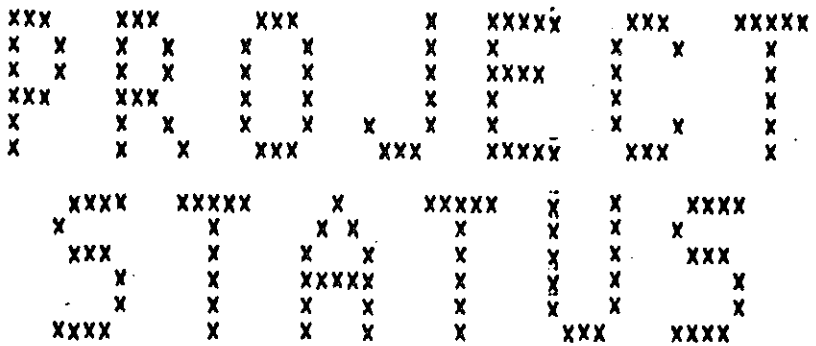
MICHIGAN DEPARTMENT

OF

TRANSPORTATION

FISCAL 1980 SAFETY PROGRAM

STATUS AS OF MAY 7,1980



MICHIGAN (MS), HAZARD ELIMINATION, INTERSTATE (IS), HIGH HAZARD, ROADSIDE OBSTACLE

PREPARED BY
TRAFFIC & SAFETY DIVISION
SAFETY PROGRAMS UNIT

EXHIBIT 5

F	S	I	C	S	J	N		M	S				A	S	A	R	O	W	O	P	P	C	C	L	D	L	A		
U	I	T	O	E	O	U		T	I				S	U	G	I	F	A	T	R	A	O	O	E	A	E	M		
N	I	E	N	C	D	M		L	G				S	R	R	G		Y	H	O	R	N	S	T	T	T	O		
D		M	T	T		R	DESCRIPTION	E	N	TYPE OF WORK			I	V	E	H			E	C	T	S	T	T	F		U	REMARKS	
S	N		R	I		E		S	A				G	E	E	T			R			T		I			N		
		D	N	O		R			L				N	Y										N			T		
			O	L										S										G					

MS	1523R	70014	16935	US-31(BEACON BLVD)@ TAYLOR ST	0.0	EMED LT LANE		GR		0.0		175.0	11-80		0.00	SB RT LANE	
MS	1487R	70023	14373	BL-96 @ US-31 & 120 TH ST	0.0	AINT IMPR		SC	C	0.0		105.0	10-80		0.00		
MS	1562R	70041	70000	M-45(LK MICHIGAN DR) @ 68TH	0.0	4-5 LANE WID				0.0		0.0	4-81		0.00		

DISTRICT 6

DISTRICT 6

MS	1383R	9012	16056	M-247 @ OLD KAMKALIN RD	0.0	INT IMPR		S		R	0.0	MB	X	182.0	2-80		138556.46	MERC&PERM MK	
MS	1387R	9033	9931	M-13 @ 5TH ST	0.0	E4-5 LANE WID		WA	C		41.0			99.0	4-81		0.00	THERMO MARKG	
MS	942R	25091	4741	M-15(STATE) @ OLD M-21(FLINT)	0.2	E4-5 LANE WID		SC		R	5.0	MU	X	209.0	6-81		0.00		
MS	1487R	25091	15927	M-15,DAVISON NLY TO LEXINGTON	0.5	A4-5 LANE WID		SC	C		5.0			350.0	6-81		0.00		
MS	1434D	25092	13185	M-15 @ RICHFIELD RD	0.0	A2-3 LANE WID				E	0.0	CO		60.0	10-81		0.00	W/COUNTY	
MS	1469S	32011	17835	M-25 FM SEDEWAING RD S.0600 F	0.9	ROADSIDE CON					0.0	MSH		35.0	10-80		0.00	MSH# 17373	
MS	1515R	56021	16786	M-20(ISABELLA) @ COLEMAN RD	0.0	2-3 LANE WID		S	C		0.0			180.0	10-80		0.00	PAVT MARKG	
MS	1471R	73032	15055	M-47 @ M-58 (STATE ROAD)	0.0	AINT IMPR		S	C		2.0			91.0	10-79		95117.40	THERMO MARKG	
MS	1473R	73033	15072	M-84 @ TITTABAWASSEE RD	0.0	EINT IMPR		T			1.0			2.0	4-81		0.00	PE & ROW	
MS	1345R	73062	10764	M-46(GRATIOT),MILLER TO RIVER	1.5	E4-5 LANE WID		GE	C		0.0			815.0	10-79		807592.35		
MS	1479R	73062	15801	M-46 @ FROST DR	0.0	ACLLT		S		R	0.0		X	131.0	3-80		177276.00		
MS	1529H	73131	17011	M-83 @ PROP RIVER ST	0.0	FA-5 LANE WID		S			0.0			70.0	12-80		0.00	WDN RV-CLLT	
MS	1497R	74071	16572	M-25,GARDNER NLY TO MORTIMER	0.0	ROADSIDE CON		S			0.0	FRR		25.0	7-80		0.00		

Evaluation Data for Ms Projects

Evaluation data for 25 Ms projects completed during 1976 is shown on the following page.

Accident costs for 1979 have not been received from the National Safety Council. But based on increases in accident costs in prior years, we can anticipate approximate costs of $155,000 per fatal accident, $6,000 per injury accident, and $1,000 per property damage accident only. Applying these adjusted cost figures to the accident severity in both the before and after periods the savings per 3-year period would be $1,249,000 or $416,303 per year. This annual savings when divided into the total cost for all projects evaluated indicate a time of recovery (TOR) of 4.25 years.

It should be noted that this evaluation includes only projects that are justified on an anticipated reduction of various types of accidents. We have purposely eliminated those locations where a geometric improvement was made to assist in the development of large traffic generators such as a shopping center.

STATE Michigan | M | 1 | FIPS CODE (Alpha)

HIGHWAY SAFETY IMPROVEMENT PROGRAM
PAVEMENT MARKING DEMONSTRATION PROGRAM
ANNUAL REPORT 1980
EVALUATION DATA FOR COMPLETED IMPROVEMENTS

Line		Safety Improvement Program (1)	Safety Classification Code (2)	Total Cost of Evaluated Improvements ($1000) (3)	Quantity of Improvements (4)	Units (5)	NUMBER OF ACCIDENTS										Evaluation Status (16)	Exposure (Millions)			Rural or Urban (20)	Number of Lanes (21)	Divided or Undivided (22)
							Before					After						Before (17)	After (18)	Units (19)			
							Mos. (6)	Fat. (7)	Inj. (8)	PDO (9)	Tot. (10)	Mos. (11)	Fat. (12)	Inj. (13)	PDO (14)	Tot. (15)							
01		SL	19	289.8	8	X	36	3	18	63	84	36	1	21	61	83	F	48.29	54.07	V	R	2	U
02		SL	19	145.0	2	X	36	2	185	540	727	36	0	118	349	467	F	29.34	36.94	V	U	2	U
03		SL	19	140.2	1	X	36	0	7	9	16	36	1	1	5	7	F	3.17	5.08	V	R	4	U
04		SL	12	74.4	1	X	36	0	12	19	31	36	0	7	13	20	F	5.80	7.81	V	R	4	U
05		SL	12	193.6	1	X	36	0	26	84	110	36	0	25	72	97	F	13.35	16.16	V	R	2	U
06		SL	12	195.8	3	X	36	0	67	204	271	36	0	65	165	230	F	52.96	58.35	V	U	4	U
07																							
08		SL	10	56.2	1	X	36	2	5	10	17	36	0	2	11	13	F	6.23	6.89	V	R	2	U
09		SL	10	88.5	1	X	36	0	5	9	14	36	0	6	7	13	F	7.52	8.46	V	U	2	U
10		SL	10	40.2	1	X	36	0	12	7	19	36	0	16	14	30	F	59.69	65.66	V	U	6	D
11		SL	99	3.6	1	X	36	0	2	9	11	36	0	1	3	4	F	13.89	13.51	V	U	4	U
12		SL	26	41.2	1	X	36	0	64	96	160	36	1	57	126	184	F	38.05	38.66	V	U	4	U
13		SL	99	19.8	1	X	36	0	1	2	3	36	0	0	0	0	F	7.20	8.06	V	R	2	U
14		SL	26	24.7	1	X	36	0	3	3	6	36	0	5	12	17	F	8.60	8.50	V	R	2	U
15		SL	29	42.8	4.24	M	36	0	55	115	170	36	1	42	107	150	F	136.00	152.03	M	U	8	D

STATE Michigan | M | 1 | FIPS CODE (Alpha)

HIGHWAY SAFETY IMPROVEMENT PROGRAM AND PAVEMENT MARKING DEMONSTRATION PROGRAM
ANNUAL REPORT 1980
EVALUATION DATA FOR COMPLETED IMPROVEMENTS

Line	Safety Improvement Program (1)	Safety Classification Code (2)	Total Cost of Evaluated Improvements ($1000) (3)	Quantity of Improvements (4)	Units (5)	NUMBER OF ACCIDENTS Before Mos. (6)	Before Fat. (7)	Before Inj. (8)	Before PDO (9)	Before Tot. (10)	After Mos. (11)	After Fat. (12)	After Inj. (13)	After PDO (14)	After Tot. (15)	Evaluation Status (16)	Exposure (Millions) Before (17)	Exposure (Millions) After (18)	Exposure (Millions) Units (19)	Rural or Urban (20)	Number of Lanes (21)	Divided or Undivided (22)
01	SL	29	415.3	0.59	M	36	0	9	38	47	36	0	15	19	34	F	30.25	28.65	M	U	6	D
02																						
03	TOTAL		1,771.1				7	471	1208	1686		4	381	964	1349		460.34	508.83				
04																						
05												-42.8	-19.1%	-22.2%	-19.8%			+10.5%				
06																						
07	ACCIDENT COSTS						1,085,	2,826,	1,208,			620,000	2,286,	964,000								
08																						
09								5,119,					3,870									
10										1,249,												
11																						
12																						
13																						
14																						
15																						

SECTION 3

OTHER SAFETY-RELATED PROJECTS

FISCAL YEAR 1979-80

Introduction

Michigan implements several other types of projects that are safety related. Projects falling within this category include federal aid urban, federal aid primary, federal aid secondary, federal aid off-system projects, and 100 percent state and local funded projects.

Typical safety-related work items accomplished through these projects are: intersectional geometric improvements, signal modernizations, rail-highway crossing and signal improvements, roadside control, guardrail modernization, obstacle removal, resurfacing for skidproofing, median barrier construction, side slope improvement, and shoulder improvements.

Federal Aid Urban System Program

This program provides the impetus to improve roads that service the centers of urbanized areas. Any construction project that qualifies for funding on any federal aid system is considered an eligible activity. Project selection is based on a predetermined planning process outlined in Title 23 Section 134.

Most urban projects include widening of traffic lanes, improvement of turning movements, upgrading of traffic signals, replacement of signs, widening of intersections, removal of roadside obstacles, and restrictions on parking. Many projects also include the replacing and upgrading of rail-highway crossings. The very nature of the Urban System Program basically is the upgrading of the existing major street systems under the jurisdiction of local agencies.

In addition, an emphasis has been on spot improvements of the TOPICS and TSM type projects, including bus turnouts, transfer points, bike paths, and vanpool-carpool studies.

Projects such as intersection improvements, elimination of unnecessary guardrail through slope grading, modification of crossovers, elimination of sight restrictions, guardrail installations when obstacle could not be relocated, widening to improve capacity, and resurfacing can be considered as safety oriented in part or totally.

During the old fiscal 1980 year July 1 to June 30, a total of $36,350,822 was obligated with $21,810,493 being safety related.

Federal Aid Primary Program

Projects within this program are on state trunklines and rural arterial routes that extend into or through urban areas considered to be part of a system of main connecting roads important to statewide and regional travel that service the interstate system.

The types of projects funded by this program include, but are not limited to, the construction of bus passenger loading areas and facilities, exclusive bus lanes, traffic control devices, bridge railing and bridge deck replacement.

During fiscal 1980 $15,474,719 was obligated that is safety related out of a total obligation of $44,213,483.

Federal Aid Secondary Program

This program provides the state and local road agencies with monetary assistance for improvement of federal secondary routes. It is a federal requirement that fifty percent or more of Michigan's apportionment be made available to the local road agencies for projects on secondary routes. Projects under local agency jurisdiction are selected by the local officials and the department on a cooperative basis.

For fiscal 1979 Michigan's secondary apportionment was $14,806,608 of which 66 percent or $9,772,361 was allotted to 83 county road commissions. The remainder was available for use by the state on the state trunkline system.

During old fiscal 1980, $10,467,867 was obligated for projects on routes under local agency jurisdiction. $6,690,756 of this total was attributed towards safety.

Federal Aid Off System Program

This program provides federal funds for safety-oriented projects on local agency roads located off the federal-aid system. Projects may be constructed in cities, villages under 5,000 population, and rural areas.

Congress did not appropriate funds for fiscal 1979 so Michigan did not receive an apportionment. However, the Federal Highway Administration did permit all states to obligate unused funds appropriated in prior years on a first-come first-served basis. Michigan obligated federal funds of $32,559 for projects on local agency routes.

Michigan Funded Projects

In addition to the Safety (Ms) Program, there are several other state funded programs within which safety-related work is performed.

The determination of which project types are safety related is relatively time consuming. For instance, resurfacing projects are checked against skid test data within the project limits. Those areas, where the skid number was low, are considered as safety expenditures. The same criteria was used in determining which bridge decks would be credited as a safety item.

Projects which replaced bridge railings, improved traffic signals, eliminated guardrail through grading, extended culverts, upgraded guardrail type, installed flared guardrail endings, etc., were evaluated similar to projects submitted for federal aid funding. If the project would have qualified for federal funds, 100 percent of the cost was considered safety. The percentage of safety items on other projects varied considerably.

Pedestrian and bicycle construction projects were considered 100 percent safety related if total segregation from the automobile conflict was established. Shoulder improvements were also considered 100 percent safety related because of the large percentage of right side, ran-off-roadway accidents and published research confirming the value of stabilized shoulders.

Mb Bituminous Resurfacing - This program is primarily aimed at the driving surface of highways. Resurfacing of highways that exhibit low coefficients of wet sliding friction, a high percentage of wet surface accidents, or have uneven surfaces are of primary concern. Correction of superelevation has also been accomplished through this program as has the stabilization of shoulders. Projects considered being safety-related in part or completely totaled $7,404,000.

Mbr Bituminous Reconstruction - This program focuses on the surface and base of highways. Projects may include minor widening and roadside control with curb and gutter and enclosed drainage. During fiscal 1980 $5,872,000 was identified as safety related.

M Miscellaneous Construction - During fiscal 1980, there were 109 projects let to contract. A total of 28 projects were of the type that qualifies them as safety projects. Several projects were for resurfacing and shoulder upgrading. Two each were for guardrail upgradings and railroad crossing work. Intersections were widened to five lanes or had other intersection improvements completed. One project was for skidproofing a location with an identified slippery when wet pavement surface. The total dollars that could be attributed toward safety was $18,316,000.

Mbd - Bridge Deck - Projects in this program correct bridge decks that have exhibited spalling to the point where rebars are exposed, the bridge deck leaks, or the bridge deck is slippery when wet. In most cases the deck is waterproofed after completing any required minor deck repair and a latex modified mortar, concrete, or bituminous surface is applied. During fiscal 1980, $1,226,000 was considered as being safety related.

Mnm Nonmotorized Vehicle Facility - This program funds facilities for exclusive pedestrian and bicycle usage. The conflict between vehicles, bicycles, and pedestrians has been the subject of concern for several years. Projects let to contract during fiscal 1980 cost a total of $132,000. The projects provided paved shoulders or separate pathways for nonmotorized vehicles.

Msh Shoulder Edge Treatment - This program provides a minimum 3-foot bitminous edge strip along the right-hand side of state highways. It is aimed at preventing the formation of an edge drop between the pavement and adjacent shoulder material. An edgeline is provided to delineate the driving lanes and prevent regular usage of the added width. During fiscal 1980, $2,009,000 was expended in this program.

Mtb - Turnback - This program rehabilitates trunkline routes that are to be turned over to local jurisdictions. Projects considered as safety expenditures include widening from two to five lanes or other geometric revisions plus shoulder upgrading and resurfacing to improve wet sliding friction values. The total dollars attributed toward safety is $3,639,000.

High Accident Skid Test Program

Incorporated into the Spot Safety Improvement Program is the annual review of statewide accident locations (0.2 mile segments) exhibiting a disproportionate frequency of wet accidents. The district average wet percentage is used to determine the threshold level to isolate locations warranting further investigation. Skid test data is obtained at those locations which have a wet accident frequency above the district threshold level. Those locations or areas which display low wet sliding friction (WSF) coefficients and have accident patterns considered susceptible to correction (rear-end or sideswipe types) are recommended for a friction resistant treatment. The procedures used to determine anticipated safety benefits, project amortization and the utilization of National Safety Council (NSC) values are similar to those used for spot safety projects.

The use of the accident surface friction model, developed by the Testing and Research Division, is being continued to generate a priority listing of candidate projects. Nonintersection or freeway sections which are not suitable for analysis by the model are identified and analyzed through the annual surveillance review process. The coordination of the overall program which includes implementation of the skid accident model continues.

A before-and-after study of several projects was recently completed to evaluate and analyze the effects of pavement texturing (Roto-Mill) on friction coefficients and on accident experience. Four years of accident data at 12 locations in Michigan were studied; the "before" period includes three years of data (8/74-8/77) and the "after" period includes the data for one year following completion of the projects (11/77-11/78). Control sites were selected for comparative analysis and were geometrically, geographically, and functionally similar to the textured sites.

The results of "before" and "after" friction tests indicated that coefficients of friction were increased by approximately 40 percent. Total accident frequencies increased at both textured and control locations, but neither increase proved significant. While wet accidents increased at both textured and control locations, the increase at the control sites was greater. The number of icy surface accidents at the textured sites decreased while the number increased at the control sites. Statistical techniques were used for analyzing this data and can be found in MDOT Report TSD-439-80 prepared by the Traffic and Safety Division.

It was concluded that pavement texturing had a significant impact on icy accident reduction and on friction coefficient improvement at the 12 locations studied.

Yellow Book Safety Program

The Michigan Department of Transportation is engaged in a program of implementing safety improvements to reduce hazards in the roadside environment. This program consists of culvert extensions, modernization of guardrails, resloping to eliminate guardrails, replacing or retrofitting inadequate bridge rails, concrete median barriers and glare screen installations, impact attenuation, installing traffic signs on breakaway supports or bridge mounts, and freeway lighting alterations.

Construction plan preparation for yellow book upgrading have been based on the 1967 and 1974 editions of the AASHTO publications of Highway Design and Operational Practices Related to Highway Safety commonly referred to as the Yellow Book. More recently, AASHTO's 1977 Guide for Selecting, Locating and Designing Traffic Barriers has also been used as a guideline for designing roadside safety improvements.

Progress in actual completion of yellow book interstate safety improvements has been slow. Initially, work authorizations were issued starting in 1971 to have the work performed by contract counties and state forces as their schedules permitted. The work at that time consisted mainly of guardrail improvements, culvert extensions, and minor grading.

As time went on, however, only a small amount of work was completed. The contract counties and state forces did not have enough time or required manpower (with a few exceptions) to complete the work as initially anticipated.

In 1975 we cancelled the work authorizations issued three to four years earlier and began to let yellow book interstate safety projects to private contract. The conversion to private contract allowed the scope of the work to be expanded to include bridge railing replacements, crash cushion installations, concrete median barrier and glare screens, and freeway lighting upgrading.

Yellow Book projects are blanket-type projects which include complete roadside safety improvements for longer segments of highway such as an entire control section. Yellow Book safety improvements are often classified as interstate safety projects but are separated for this report.

Interstate safety projects may also include superelevation corrections, modification of interchange ramp termini to avert wrong-way maneuvers, widening lanes or structures to separate turning movements, or provide for left-turns and freeway on- and off-ramp roadway alignment, signalization, and other types of spot improvements to improve safety.

Interstate Freeways - Yellow Book Status

Yellow book upgrading continues on the 1,100 miles of interstate routes open to traffic with 935 miles of upgrading approved by the FHWA. The remaining 165 miles are in accordance with present day standards with the exception of a limited number of buried end section guardrails and a few minor items which will ultimately be brought up to current standards.

Of the 935 miles:

1. 72 percent (676 miles) has been completed or are presently under contract.

2. 27 percent (251 miles) are programmed and in the design stage.

3. 1 percent (8 miles) are either unprogrammed or not in the design stage.

In 1978-79 Michigan obligated yellow book projects that total $14,952,000. Of this total 29 miles were let to contract at an estimated cost of $8,800,000.

Michigan has recognized that it will be necessary to review each yellow book project that has been completed since standards and guidelines for safety improvements have changed over the years. For instance, freeway mainline improvements were the main issue for some of the earlier projects. Some interchange and crossroad work, including guardrail modernizations and bridge railing replacements for structures over freeways was not accomplished. Also, it was quite common to retain Type A guardrail (12'6" post spacing and not blocked out) for some of the older projects if it was structurally sound, of appropriate height, and did not show evidence of being struck. Current practice includes complete roadside upgrading, including ramps and crossroads, replacement of all obsolete bridge rails for freeway mainline or crossroad structures over freeways.

Interstate safety projects are similar to those categorized as yellow book safety improvements and include installation and/or removal of traffic barriers and endings; installation of impact attenuators; lengthening culverts and modifying end sections; minor grading of slopes; installation, modification, and/or relocation of signs and markings; overpass screening; and glare screening. Generally, interstate safety projects are spot improvements.

Noninterstate Freeways - Yellow Book Status

Of the 560 miles of noninterstate freeways open to traffic, it will be necessary to perform yellow book safety upgrading on 500 miles. The remaining 60 miles is up to current safety standards.

Of the 500 miles:

1. 45 percent (225 miles) has been completed or is presently under contract.

2. Programmed or in design - 36 percent (180 miles).

3. The remaining 95 miles have been prioritized based upon accident rates over a five-year period but are currently not programmed.

A total of 32 miles was let to contract since last year's report. Also there were other spot roadside safety projects obligated in the category of ROS, HHO, and HES and the costs are included on page VII.

The estimated cost for completing the 180 miles of noninterstate freeways that are programmed or in design is $10,000,000. The remaining 95 miles is estimated to cost $6,000,000. The Michigan Department of Transportation is deeply concerned about funding to complete yellow book upgrading on the noninterstate freeway system since approximately $1,000,000 of the HES funds is used annually for financing these projects.

Free Access State Trunklines - Yellow Book Status

Realizing that complete yellow book upgrading on the free access state trunkline system will require several hundred million dollars to complete. Michigan has elected to complete this work in three stages defined as Task 1, Task 2, and Task 3.

Task 1 includes the installation of buffered end sections to eliminate straight guardrail endings and the potential hazard of penetration into passenger compartments. This work began on a limited basis and three counties were completed during the winter of 1974-75 and was financed with 100 percent state funds. In the fall of 1976 the remaining work was authorized in the amount of $1,455,000 and financed with Transitional Quarter funds as a Roadside Obstacle Safety (ROS) project with the FHWA participating in 90 percent of the total cost. Due to cost increases since authorization, the amount required to complete all Task 1 work has risen to $1,600,000.

The project is estimated 95 percent complete to date.

Task 2 includes upgrading guardrails proximate to bridges and replacing or retrofitting guardrails to the existing railing system. This type of work is currently being included with road and bridge reconstruction or resurfacing projects as available manpower and funding allows. Most of this work is being financed with 100 percent state funds.

The costs for this Task 2 work are included in the category of Other State Funded Projects on page 30.

Task 3 includes improvement of the roadside to current yellow book standards. Due to lack of funds, specific Task 3 programs have not been initiated. However, guardrail modernization work is currently being included with road and bridge reconstruction or resurfacing projects as resources allow. The costs for this Task 3 work are included in the category of Other State Funded Projects on page 31. A computer program to prioritize Task 3 improvements based on frequency, rate, and severity of fixed-object accidents is currently being developed by Michigan's Department of Transportation. As of this date, this program is not complete.

Network Simulation (NETSIM) Model

We have continued to make good use of the NETSIM model on both our local and state trunkline road systems. During the past year, the NETSIM modeling process was used to analyze several locations.

We used NETSIM to analyze a signal modernization proposal on River Street in Ottawa County. The study showed that the system, which includes three signalized intersections, could be improved by providing better progressive flow during both the morning and afternoon peak hours. NETSIM was used to compare the various traffic flow parameters of four different alternatives with the do-nothing alternative.

NETSIM was also used to analyze several alternatives at the Portage-Cork-Lovers Lane intersection in the city of Kalamazoo. The analysis showed the difference in total delays, fuel efficiencies, and travel times of the various alternatives.

On the state trunkline system, we also used NETSIM to evaluate the difference between a boulevard and a 5-lane section along M-11 (28th Street) in Grand Rapids. This study was made at the request of our district traffic and safety engineer.

At present, we are using NETSIM to evaluate local signal systems in both Escanaba and Berkley. The Escanaba system includes 17 signals while the Berkley system includes five signals.

We anticipate that NETSIM will continue to play a vital role, in conjunction with our MALI and MIDAS programs in the development of safety improvement projects.

Impact Attenuators

The Michigan Department of Transportation has 187 existing impact attenuators installed on the state highway system. One hundred and fifteen are Hi-Dro Cell attenuators, 35 are "GREAT" (Guardrail Energy Absorption Terminal) attenuators, 27 are sand barrel attenuators, one is a Hi-Dri Cell attenuator, and the remaining 10 are Cell Cluster attenuators. We installed 16 attenuators during fiscal 1979 at a cost of $331,269. We also have approximately 40 attenuators in the design stage. The total estimated installation cost for these attenuators is $1,137,350.

Traffic Engineering Services

Our department continues to provide traffic engineering services to local governmental agencies through the Community Assistance and Operational Inventories Programs. These services are intended primarily for those agencies that lack the resources or expertise to develop and carry out highway safety improvements.

These services came into being as a result of Highway Safety Program Standard 13 of the 1966 Highway Safety Act. The Act encouraged each state, in cooperation with local political subdivisions, to develop programs that would reduce the likelihood and severity of traffic accidents. To carry out these programs, our department requested and received, through the Michigan Office of Highway Safety Planning, a federal grant to fund the staff required to provide the needed services.

The Community Assistance Program provides a technical staff for identifying, analyzing, and correcting problem accident locations. Through this

program, recommendations are made for operational and geometric improvements that will reduce the number and severity of accidents.

The Operational Inventories Program provides assistance to local governmental agencies for the inventory of the traffic control devices on the local road system. As part of the inventory process, recommendations are made for the erection, replacement, relocation, and removal of traffic control devices to conform with the Michigan Manual of Uniform Traffic Control Devices. Department personnel conduct inventories for the smaller agencies and train local personnel to conduct their own inventories in larger agencies.

Participation in both services is initiated through a request by the local agency to the department's Local Government or Traffic and Safety Divisions. Both programs are federally funded through a grant from the Office of Highway Safety Planning using Section 402 funds. This enables these services to be provided at no cost to the local agencies.

Consultant Services - The services provided by our two programs have proven so successful that a considerable backlog of requests has developed. To help decrease this backlog, we contracted with a private consultant in 1979 to perform some of this work. This contract, which was a pilot project, was very successful in terms of quality and cost effectiveness. Therefore, we have engaged the consultant in a larger project which we are confident will assist us in addressing the traffic needs of local governmental agencies.

Community Assistance Program - In fiscal 1979-80, the Community Assistance Program provided traffic engineering services to 36 different local jurisdictions for the analysis of 76 spot locations. Recommendations included traffic signal installations and modernizations, intersection reconstructions, signing modifications, pavement resurfacing and marking, rural road realignments, and plans for urban parking. $1,406,100 in Federal Highway Safety funds was programmed to assist local agencies in implementing these recommendations.

The Community Assistance staff consists of four traffic engineers, one traffic technician, and one part-time student assistant. The staff uses a variety of traffic engineering tools in the analysis of high accident locations. Among these are the Michigan Accident Location Index (MALI), the Network Simulation (NETSIM) model, and Positive Guidance methodology.

In order to determine the effectiveness of safety projects that have been carried out on the local road system, we have conducted evaluation studies at several locations (see page 15). In general, the projects have been most beneficial in reducing the number and severity of accidents.

To help publicize the Community Assistance Program, we published a brochure describing our program (see brochure on pages 39 and 40). We distributed this brochure to officials of local agencies at MALI Coordinating Council meetings that were held around the state. Hopefully, this brochure will encourage local agencies to contact us if they are experiencing traffic problems.

Operational Inventories Program - As of June 30, 1980, traffic control device inventories have been finalized on:

17,683 miles of county primary roads in 53 counties
15,388 miles of county local roads in 19 counties
10,020 miles of major and local streets in 249 cities and villages

In addition, completed field inventories need to be reviewed on:

610 miles of roads and streets in 32 cities and villages
5,303 miles of county local roads in seven counties
1,350 miles of county primary roads in four counties need to be reviewed

An emphasis was placed on expediting the inventorying and finalizing of those inventories conducted or reviewed by the department. The department's computerized inventory program provides an agency with route by route inventory and quantity sheets and agencywide quantity sheets. The quantity sheets indicate the material needs by type of road system (local, FAS, FAU, etc.). To date, 78 local agencies have been inventoried using this system. Pilot traffic engineering consultant contracts were implemented and resulted in one consultant contract being retained. Thirty-five traffic control devices inventories were conducted between July 1, 1979, through June 30, 1980.

Six traffic control devices inventories were completed by trained agencies, 10 by contracted traffic engineering consultants, 17 by Michigan Department of Transportation personnel, and two by outside city consultant contracts.

From July 1, 1979, to June 30, 1980, department personnel prepared engineer estimates for 19 local agency sign upgrading projects. Contracts were awarded for 39 off-trunkline agency sign upgrading projects. Funds from the Safer Off-System, Safer Roads Demonstration, Federal Aid Secondary, and Federal Aid Urban Programs were utilized involving $614,263 in federal monies.

Michigan Accident Location Index (MALI)

The Michigan Department of Transportation and the Michigan Department of State Police, in cooperation with the Michigan Office of Highway Safety Planning, have developed a computerized crash location reference and analysis system referred to as the Michigan Accident Location Index (MALI). The MALI system is designed to generate a computerized description of traffic crash locations directly from the information reported by the police officer. The computer system generates and maintains the crash location information on the MALI street index for later retrieval and analysis. The MALI street index is a map of the street network stored in the computer. The street index is composed of distances between intersections, alternate street names, and accurate city and township boundaries.

The primary functions of the MALI system are to expand the state's crash locating capability to all roads and streets, eliminate the manual locating of crashes, and provide crash analysis information to state and local users.

What Can You Do?

If you've read this far you are now able to identify several types of possible roadside hazards. The next step is to report the condition to us. Your letter should be brief and factual, and should offer specifics as to the type of hazard. It should include the exact location, why you believe it to be a hazard, and any traffic accident information within the last three years for the suspected hazardous location.

Please send your letters regarding suspected hazards to:

Community Assistance Subunit
Safety Programs Unit
Traffic & Safety Division
Michigan Department of Transportation
P.O. Box 30050
Lansing, Michigan 48909
Telephone 517/373-2310

Follow Through.....

You have every right to expect a reply from your letter reporting a hazardous condition, and you'll probably get one as soon as an investigation has been conducted. If your inquiry deals with specifics and not emotional demands you stand a good chance of seeing some type of corrective action taken depending on urgency, availability of funds, and overall traffic priorities for the location under study. In short, if you identify and report one or more of the roadside hazards we've mentioned in this pamphlet, your traffic engineer will respond.

Remedial Action....

You'll notice we didn't suggest or recommend how the various roadway hazards we've reviewed could be corrected. That is because any remedial considerations are solely within the province of the traffic engineer who is responsible for making such decisions based on many technical factors. That's why the engineer needs correct initial information from you and your patience while a proper investigation is being conducted.

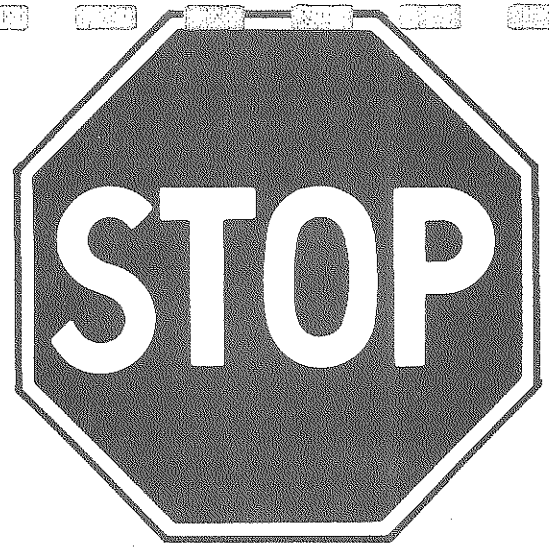
Program Benefits....

By identifying and reporting potential hazards, you will make a significant contribution to your community in the form of reduced injuries year after year. It's up to you. Together we can make it work.

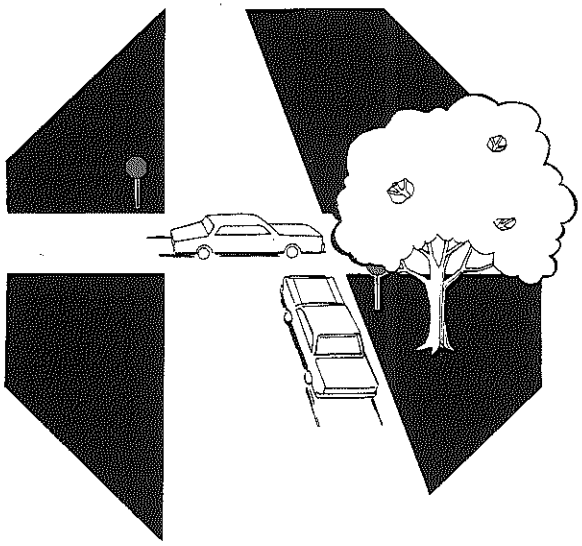
Funding Improvements....

In addition to recommending improvement measures for accident locations, we can also help in paying for the improvements by identifying potential sources of federal funding.

MICHIGAN DEPARTMENT OF TRANSPORTATION



HIDDEN HIGHWAY SIGNS ARE *DANGEROUS!*



A TRAFFIC SAFETY ACTION PROGRAM AIMED AT REDUCING HAZARDOUS LOCATIONS IN YOUR COMMUNITY

PROGRAM BACKGROUND:

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

> *Standard 4.4.13 of the Act, Traffic Engineering Services, has as its purpose "to assure the full and proper application of modern traffic engineering principles and uniform standards for traffic control to reduce the likelihood and severity of traffic accidents."*

One of the goals of this standard is the identification of locations on streets or highways which have experienced a disproportionately large number of accidents when compared with the volume of traffic.

Through a federal grant administered pursuant to the Act, the Michigan Department of Transportation is providing traffic engineering assistance to local governmental agencies that lack the necessary resources to conduct their own accident location analyses. The intent of this program is two-fold: to improve traffic safety on Michigan streets and highways; and to provide uniform standards for traffic control devices.

WE NEED YOUR HELP!

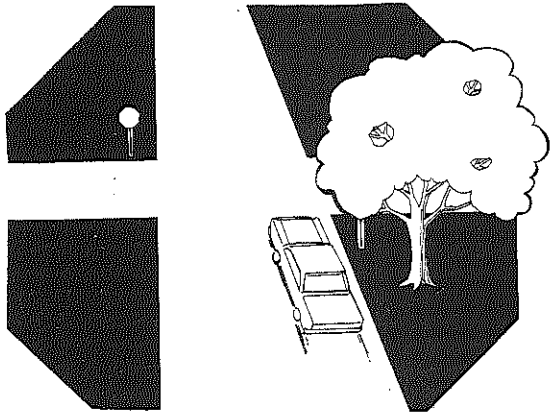
Quite frequently the residents or local officials of an area may be aware of a hazardous location which has not come to the attention of the proper authority. We need your help in finding these locations.

What is a Hazard?

A hazard can be any characteristic of a location that creates a danger to vehicles or pedestrians. The following are some common hazards you may be able to identify and bring to our attention:

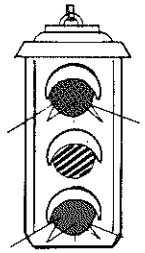
VISUAL OBSTRUCTION

Visual obstructions may be bushes, trees, parked cars, billboards or any of a variety of things that block the sight distance or traffic control devices at an intersection.



MALFUNCTIONING SIGNALS

Signals whose operation is erratic or improper because of defective or obsolete equipment can contribute to traffic accidents.

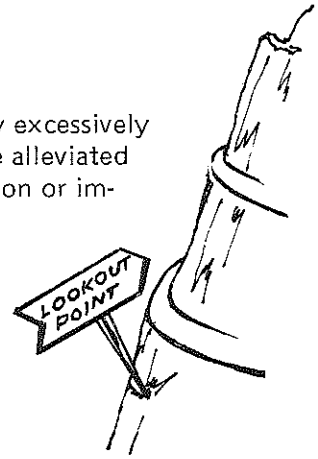


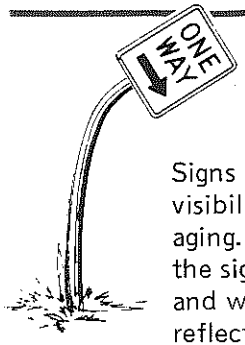
SLIPPERY PAVEMENTS

Pavement that becomes slippery after a rain may take the unwary traveler by surprise, particularly if there are no warning signs.

SHARP CURVES

Accidents caused by excessively sharp curves may be alleviated by roadway relocation or improved signing.





DAMAGED OR OLD SIGNS

Signs may lose much of their visibility through damage and aging. A bent post may turn the sign from its proper direction and weathering may destroy its reflective property.

If you are aware of any of the above situations or others which you believe may be dangerous, please tell us. We can help.

The MALI system will enable the user to identify hazardous locations on all roads and streets, forming the basis for establishing priorities for safety improvement projects, selected enforcement areas, and other activities that have an impact on the state's accident experience.

The MALI project is currently operational on the state trunkline system and the local road system in all 83 counties. Thus, the MALI system is locating current crash data (1980 data) on all roads and streets in the state.

The MALI system has currently been enhanced by the addition of all public railroad crossings to each county index. Railroad crossings were treated as intersections using the federal, railroad, identification number and railroad name. Currently, railroad crashes are being coded directly to specific railroad crossings.

A further enhancement of the MALI program involves the location of 1978 crash data on the local road system. Since location of crash data on the local system did not begin until 1979, the data for 1978 was stored in a large file. The resolution of this large file to specific crash locations will provide three years of crash data for analysis purposes. This project should be completed by December of 1980.

SECTION 4

NEW DEVELOPMENTS IN

HIGHWAY SAFETY

Interchange Priority Study

The interchange priority study was undertaken to comply with federal guidelines concerning justification for interstate and noninterstate safety improvement projects. Phase 1 of the study established a criticality ranking of those statewide interchanges exhibiting an abnormally high number of injury accidents. Phase 2 of the study examines the analyzation/prioritization procedure by addressing alternate solutions, estimated costs and benefits, and cost effectiveness.

Since the writing of last year's annual report, 16 critical interchanges have been placed into the department's construction program. These specific interchanges will go through the analyzation/prioritization process so that the most cost-effective projects can be selected. The various steps involved in this process can be outlined as follows:

1. Perform interchange data analysis
2. Determine alternate countermeasures or solutions
3. Obtain cost estimate and calculate benefits
4. Detemine cost effectiveness of each alternative
5. Implement and evaluate

The analyzation/prioritization process of these critical interchanges must be continually updated. The need is rather apparent since recent or impending construction, operational changes, ongoing studies, or lack of concentration of actual accident patterns can alter the uppermost ranking of the critical interchanges. Consequently, the department has requested and received FHWA approval to annually update the statewide interchange criticality ranking. Also, an updating process was approved that concentrates on those interchanges that continue to reappear in critical groupings. These reappearing critical interchanges are given the strongest consideration for project development.

MIDAS

The department is continuing to develop a crash surveillance and analysis system known as the Michigan Dimensional Accident Surveillance model (MIDAS). The system being designed will provide a statistical anlaysis of abnormal crash patterns and an analysis of all feasible corrective treatments.

The goal of the department is to develop further and implement the MIDAS model which, in conjunction with the MALI index, will provide Michigan with a coordinated traffic record and analytic system.

The model is composed of three stages. The first stage involves a computerized data bank containing information such as laneage, alignment, lane and shoulder widths, auxiliary lanes, traffic controls, and land usage. It is possible to classify the information into discreet units, with each unit containing accident data for sites with nearly identical characteristics. The numerous variables are explained by four basic dimensions; geometry, environment, cross section, and accident characteristics. At the present time this stage of the model is operational within the constraints of existing accident data and program limitations.

LEFT TURN

NUMBER OF LOCATIONS

```
          1         2         3         4         5         6
ACC*12345678901234567890123456789012345678901234567890123456789012345678901234
  0*XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX  155
  1*XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX   84
  2*XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
  3*XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
  4*XXXXXXXXXXXXXXXXXXXXX
  5*000000000000000000000
  6*0000000000
  7*00000000000
  8*0000
  9*000000
 10*000
 11*000
 12*0
 13*000000
 14*
 15*0
 16*00
 17*
 18*00
 19*
 20*
 21*
 22*
 23*0
 24*
 25*0
 26*
 27*0
```

ACCIDENT TYPE = 4
LOCATIONS = 424
AVE 24HR VOLUME= 24804
AVE ACCIDENTS = 2.446
UPPER LIMIT = 4.010

HIGH HAZZARD LOCATIONS-- 74

CSECT	MP	ACC	ROUTE	XROAD/MIDBLOCK	LOCAL GOV'T	COUNTY
9032	2.66	7	M-13,I-75BL	AT MIDLAND STREET	MONITOR TWP	BAY COUNT
11011	3.75	6	US-12	AT WHITTAKER STREET	NEW BUFFALO	BERRIEN C
12021	17.84	8	US-12	AT CHICAGO-MARSHALL	COLDWATER CI	BRANCH CO
13032	0.13	5	M-66	AT STATE STREET	BATTLE CREEK	CALHOUN C
18031	0.34	6	US27BR/US10B	AT JCT US10BR/FIFTH S	CLARE CITY	CLARE
23012	0.00	10	US-27,TP I69	AT M-50,TEMP I-69BL	CHARLOTTE	EATON
25051	1.21	5	US-23 BR	STRIP MIDBLOCK IN	FENTON CITY	GENESEE C
25051	2.26	9	M-54 BR	STRIP MIDBLOCK IN	FLINT CITY	GENESEE C
25051	5.09	5	M-54 BR	STRIP MIDBLOCK IN	FLINT CITY	GENESEE C
25072	3.95	18	M-54	AT LIPPINCOTT BLVD.	FLINT CITY	GENESEE C
25072	5.60	6	M-54	AT ROB. T. LONGWAY RD	FLINT CITY	GENESEE C
25072	6.62	5	M-54	AT LEITH AVENUE	FLINT CITY	GENESEE C
25072	9.37	11	M-54	AT CARPENTER ROAD	FLINT CITY	GENESEE C
25072	11.37	6	M-54	AT STANLEY ROAD	GENESEE T	GENESEE C
25073	2.06	16	M-54	AT M-57/VIENNA ROAD	VIENNA TWP.	GENESEE C
25081	5.91	7	M-56	AT ELMS ROAD	FLINT TWP.	GENESEE C
25081	7.91	13	M-56	AT LINDEN ROAD	FLINT TWP.	GENESEE C

25091	11.62	25	M-15	AT	M-21/DAVISON RD.	DAVISON CITY	GENESEE C
25101	9.92	5	M-57	AT	MILL STREET	CLIO CITY	GENESEE C
27021	1.74	6	US-2	AT	CO RD 505(LAKE ST)	IRONWOOD	GOGEBIC
32022	0.00	5	M-142	AT	M-53	BAD AXE CY	HURON CO.
33021	1.04	8	M-36	AT	COLUMBIA RD	MASON	INGHAM
33043	1.27	8	M-78	AT	ABBOTT RD	EAST LANSING	INGHAM
34032	7.21	13	M-66	AT	WASHINGTON	IONIA CITY	IONIA CO.
35032	1.03	7	US 23	AT	NEWMAN ST	E TAWAS CITY	IOSCO
37011	3.08	5	US-27BR	AT	PRESTON RD	UNION TWP	ISABELLA
37012	1.01	11	US-27BR	AT	PICKARD RD	MT PLEASANT	ISABELLA
38082	2.61	5	I-94BL	AT	N. WISNER ST.	JACKSON CTY	JACKSON C
38083	1.72	5	I-94BL	AT	EAST AVE	JACKSON CTY	JACKSON C
39041	0.45	23	I94BL,US-131	AT	12TH STREET	KLMZOO CITY	KLMZOO CO
39082	0.61	6	M43-M89	AT	GULL ROAD	KLMAZOO CITY	KALAMAZOO
50021	0.94	5	M-59	AT	CASS STREET	STLG.HTS. CY	MACOMB CO
50031	6.55	9	M-97	AT	MASONIC ROAD	FRAZER CITY	MACOMB CO
50052	2.73	18	US-25/M-59	AT	23 MILE ROAD	CHESTER.TWP.	MACOMB CO
51011	4.95	5	US 31	AT	FIRST ST	MANISTEE CTY	MANISTEE
52044	0.76	5	US-41BR	AT	LINCOLN AVE.	MARQUETTE CI	MARQUETTE
55011	0.73	7	US-41	AT	10TH STREET	MENOMINEE CI	MENOMINEE
56051	1.01	10	US-10BR	AT	SAGINAW RD.	MIDLAND CTY	MIDLAND
56051	2.16	5	US-10BR	AT	W. ST. ANDREWS	MIDLAND CTY	MIDLAND
58052	8.79	13	US-24	AT	FRONT RD. M-50	MONROE CTY	MONROE CO
58071	16.13	7	M-125	AT	STEWART&COLE RD.	MONROE CTY	MONROE CO
61022	0.78	9	M-46	AT	WOOD AVE	MUSKEGON CIT	MUSKEGON
63041	17.64	6	M-59	AT	CASS LAKE ROAD	WATERFORD T	OAKLAND C
63041	17.91	7	M-59	AT	ELIZABETH LAKE RD.	WATERFORD T	OAKLAND C
63041	18.62	5	M-59	AT	VOORHEIS ROAD	WATERFORD T	OAKLAND C
63053	0.20	8	US-10	AT	MAYBEE ROAD	INDEPEND. TWP	OAKLAND C
63053	5.64	7	US-10	AT	SILVER LAKE ROAD	WATERFORD T	OAKLAND C
63053	6.11	10	US-10	AT	US-10/TELEGRAPH RD	WATERFORD T.	OAKLAND C
63131	1.24	13	M-150	AT	WATTLES/17 MILE RD	PONTIAC CITY	OAKLAND C
63131	2.23	6	M-150	AT	E. LONG LK. RD.	PONTIAC CITY	OAKLAND C
63132	3.17	7	M-150	AT	5 TH/UNIVERSITY ST	ROCHESTER CY	OAKLAND C
70011	1.09	5	US-31BR	AT	16TH ST	HOLLAND CITY	OTTAWA CO
73062	3.95	5	M-46	AT	RIVER ROAD	SHIELDS VILL	SAGINAW C
73062	5.83	13	M-46	AT	CENTER ROAD	SAGINAW TWP	SAGINAW C
73062	7.44	9	M-46	AT	ELM STREET	SAGINAW CITY	SAGINAW C
76061	9.08	15	M-21	AT	CHIPMAN STREET	OWOSSO CITY	SHIAWASSE
77032	4.57	6	M-25	AT	GLENWOOD/HURON ST	PT. HURON CY	STCLAIR C
77091	0.84	7	US-25 BR	AT	HANCOCK STREET	PT.HURON CY.	STCLAIR C
78022	1.01	7	US-12,M-66	AT	KALAMAZOO STREET	WHITEPIGEON	STJOSEPH
78022	13.19	13	US-12,M-66	AT	LAKEVIEW AVENUE	STURGIS CITY	STJOSEPH
80072	0.77	11	M-40	AT	MICHIGAN AVENUE	PAW PAW CITY	VAN BUREN
81031	11.13	5	US-12	AT	ANN ARBOR ST.	SALINE CITY	WASHTENAW
81072	0.00	5	BL-94	AT	JCT. N. US-23 BR	ANN ARBOR CT	WASHTENAW
81072	0.12	5	BL-94	AT	FIFTH ST.	ANN ARBOR CT	WASHTENAW
81101	2.04	5	BL-94	AT	SEVENTH ST.	ANN ARBOR CT	WASHTENAW
82051	0.31	6	US-24&US-25	AT	W. HURON RIVER DR.	FLAT ROCK CY	WAYNE CO.
82052	2.00	27	US-24&US-25	AT	SIBLEY ROAD	BROWNSTOWN T	WAYNE CO.
82052	3.12	9	US-24&US-25	AT	PENNSYLVANIA ROAD	TAYLOR CITY	WAYNE CO.
82101	3.67	12	M-14	AT	SHELDON ROAD	PLYMOUTH C.	WAYNE CO.
82101	4.68	7	M-14	AT	MILL&LILLEY RDS.	PLYMOUTH C.	WAYNE CO.
82171	0.90	9	M-97	AT	MCNICHOLS/SIX MILE	DETROIT CITY	WAYNE CO.
82171	1.41	5	M-97	AT	GREINER AVENUE	DETROIT CITY	WAYNE CO.
82171	1.91	16	M-97	AT	SEVEN MILE ROAD	DETROIT CITY	WAYNE CO.

SEGMENT PROFILE

DIST 6 CS 73091 MP 0.00 (MALI), 0.00 (PHOTOLOG) AT SAGINAW COUNTY

SEGMENT GEOMETRICS

APPROACH DIRECTION	SPEED (MPH)	DAILY VOLUME (1978)	LANEAGE BASIC	LANEAGE LEFT	LANEAGE RIGHT	LEFT TURNS PROHIBITED	LEFT TURNS PHASE	DIST	CS	INFLUENCE ZONE MALI MP	INFLUENCE ZONE LENGTH
NORTH BOUND	35	8826	2			NO	NONE	6	73091	0.00- 0.00	0.00MI 0FT
SOUTH BOUND	35	8826	2			NO	NONE	6	73091	0.00- 0.00	0.00MI 0FT

SEGMENT ACCIDENTS : 1-1-74 THRU 12-31-78 (5.00 YEARS)

APPROACH DIRECTION	INJ ACC	FAT. ACC	TOTL ACC	NUMBER OF ACCIDENTS BY TYPE: OVER TURN	TRN OBJT	FIX	ANML	PED/ BIKE	HEAD ON	SS PASS	SS MEET	SS S-VH	OTHER MT-V	OTHER	PERCENT WET	PERCENT ICY	PERCENT DARK	ACC PER MILLION VEHICLES
NORTH BOUND	0	0	4	0	1	0	0	0	0	2	0	1	0		25.0	0.0	0.0	90.68
SOUTH BOUND	0	0	2	0	0	0	0	0	0	2	0	0	0		0.0	0.0	0.0	45.32
5.00 YEAR TOTAL	0	0	6	0	1	0	0	0	0	4	0	1	0		16.7	0.0	0.0	
AVERAGE PER YEAR	0.0	0.0	1.2	0.0	0.2	0.0	0.0	0.0	0.0	0.8	0.0	0.2	0.0					
PERCENT OF TOTAL	0.0	0.0	100.0	0.0	16.7	0.0	0.0	0.0	0.0	66.7	0.0	16.7	0.0					
STATEWIDE AVE.																		
NO. OF STD DEV.																		

INTERSECTION HISTORY :

SEGMENT PROFILE

COUNTY: SAGINAW COUNTY

AVERAGE DAILY TRAFFIC (ADT): 17653

DISTRICT	CONTROL SECTION	MALI MILEPOINT BEGINNING	MALI MILEPOINT ENDING	PHOTOLOG MILEPOINT BEGINNING	PHOTOLOG MILEPOINT ENDING
6	73091	0.00	0.09	0.00	0.09

DATA REQUESTED: ALL ACCIDENTS JANUARY 1, 1974 THRU DECEMBER 31, 1978 (5 YEARS, 0 MONTHS, 0 DAYS)

REPORT RUN BY: GREG HOCH

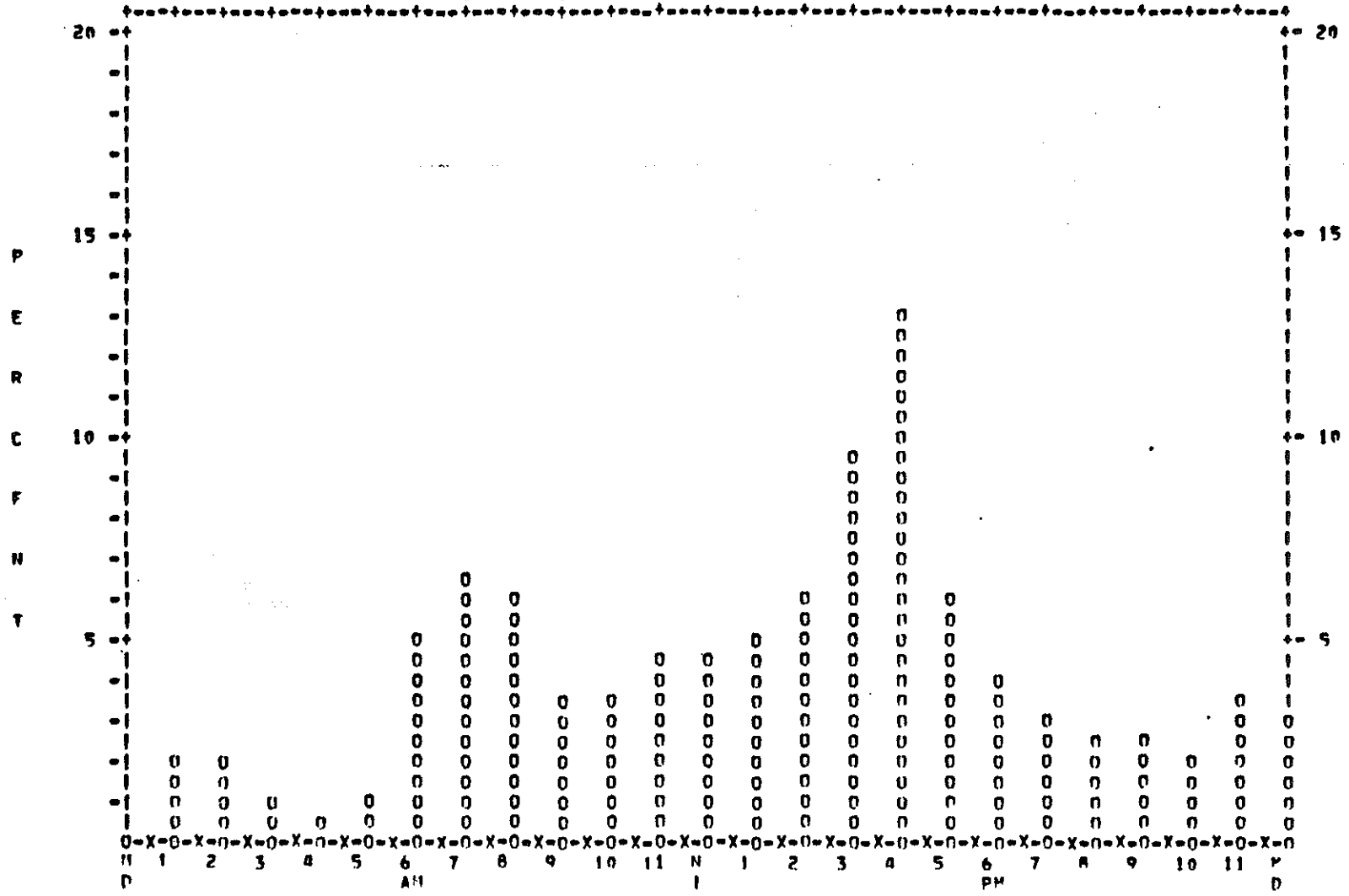
REASON FOR RUN: TEST RUN AT 1:20 ON AUGUST 6, 1980

AUGUST 06, 1980

SEGMENT PROFILE-HISTOGRAM

DIST 6 CS 73091 MP 0.00 (MALI) 0.00 (PHOTOLOG) AT SAGINAW COUNTY

DISTRIBUTION BY HOUR OF DAY



X = ACCIDENT DISTRIBUTION (JANUARY 01, 1974 THRU DECEMBER 31, 1978)
0 = VOLUME DISTRIBUTION (CALCULATED FOR A WEDNESDAY IN OCTOBER 1974)

SEGMENT ACCIDENT PROFILE

SEGMENT TYPE : 8 LANE 2-WAY NON-SIGNALIZED

LOCATION : AT , SAGINAW COUNTY

DISTRICT 6 CONTROL SECTION 73091 MILEPOINT 0.00

DIST FROM ISCN	ACCIDENT TYPE	VIOLATOR (OR VEH 1) DR	INTENT	IMPACT	HAZRD ACT'N	SECOND VEHICLE DR	INTENT	IMPACT	HAZRD ACT'N	SRF WEATH	CND	LIGHT	VEH 1 CIRCUM	NUMBER OF INJURIES INJURY CLASS F	A	B	C	O	PRP DMG	DATE OF		ACCDNT REPORT NUMBER
NORTHBOUND APPROACH																						
300	2-VEH R-END	N	GO STR	FRONT	WR LN	N	GO STR	REAR	WR LN	CLEAR	DRY	DAY		0	0	0	0	3	X	FRI	5/20/77	4PM 128493
200	2-VEH SSW-M	N	LV PRK L	SIDE F YLD		N	GO STR	R SIDE	NONE	CLEAR	DRY	DAY		0	0	0	0	3	X	TUE	8/31/76	NOON 194936
0	1-VEH PARKD	N	BACKNG	R SIDE BCKNG						CLEAR	DRY	DAY		0	0	0	0	0	X	MON	12/30/74	10AM 249656
150	2-VEH R-END	N	GO STR	REAR F YLD		N	GO STR	FRONT	NONE	CLEAR	WET	DAY	NONE	0	0	0	1	5	X	SAT	1/21/78	3PM 11492
SOUTHBOUND APPROACH																						
0	2-VEH R-END	S	CHNG L	L SIDE WR LN		S	L-TURN	FRONT	NONE	CLEAR	DRY	DAY		0	0	0	0	0	X	WED	10/16/74	3PM 198974
400	2-VEH R-END	S	GO STR	R SIDE WR LN		S	STOPPD	REAR	NONE	CLEAR	DRY	DAY		0	0	0	2	2	X	FRI	4/14/78	11AM 105316

OBJECT-HIT TABLE

	GUARD RAIL	HWY SIGN	POWER POLE	CULV	DITCH	ABUT/ PIER	BRDG RAIL	TREE	HY/RR SGNL	BLDG	MAIL BOX	FENCE	ISLND /CURB	CONC BARR	ON RD OBJCT	OFFRD OBJCT	OVRHD OBJCT	UNKWN
PD ACC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
INJ ACC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
INJURED	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FATAL ACC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
KILLED	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL ACC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1

INTERSECTION PROFILE

LOCATION: M-13 AT TUSCOLA STREET

CITY/VILLAGE/TOWNSHIP: SAGINAW CITY

COUNTY: SAGINAW COUNTY

INTERSECTION TYPE: 3 LEGS = TEE = SIGNAL

DISTRICT	CONTROL SECTION	MILEPOINT MALI	MILEPOINT PHOTOLOG
6	73091	0.08	0.08

DATA REQUESTED: ALL ACCIDENTS JANUARY 1, 1978 THRU DECEMBER 31, 1978 (5 YEARS, 0 MONTHS, 0 DAYS)

REPORT RUN BY: GREG MOCH

REASON FOR RUN: TEST RUN AT 1:20 ON AUGUST 6, 1980

AUGUST 06, 1980

I N T E R S E C T I O N P R O F I L E

DIST 6 CS 73091 MP 0.08 (MALI), 0.08 (PHOTOLOG) M-13 AT TUSCOLA STREET SAGINAW CITY SAGINAW COUNTY

I N T E R S E C T I O N G E O M E T R I C S

APPROACH DIRECTION	SPEED (MPH)	DAILY VOLUME (1978)	LANEAGE BASIC	LANEAGE LEFT	LANEAGE RIGHT	LEFT TURNS PROHIBITED	LEFT TURNS PHASE	DIST	CS	INFLUENCE ZONE MALI MP	INFLUENCE ZONE LENGTH
NORTH BOUND	35	8826	2			NO	NONE	6	73091	0.00- 0.12	0.12MI 633FT
SOUTH BOUND	35	8826	2			NO	NONE	6	73091	0.00- 0.12	0.12MI 633FT
EAST BOUND						NO	NONE	6	73091		

I N T E R S E C T I O N A C C I D E N T S : 1-1-74 THRU 12-31-78 (5.00 YEARS)

APPROACH DIRECTION	INJ ACC	FAT. ACC	TOTL ACC	NUMBER OF ACCIDENTS BY TYPE HEAD ON	SS MEET	SS PASS	ANGL	LEFT TURN	RIGHT TURN	REAR END	BACK UP	PARK	OTHER	PERCENT WET	PERCENT ICY	PERCENT DARK	ACC PER MILLION VEHICLES
NORTH BOUND	1	0	5	0	0	0	0	1	0	4	0	0	0	60.0	20.0	20.0	113.30
SOUTH BOUND	1	0	8	0	1	1	0	0	1	2	0	3	0	25.0	25.0	12.5	181.28
EAST BOUND	0	0	2	0	0	0	0	0	0	0	0	2	0	0.0	50.0	0.0	0.00
OTHER	0	0	2	0	0	0	0	0	0	1	0	1	0	0.0	0.0	50.0	0.00
5.00 YEAR TOTAL	2	0	17	0	1	1	0	1	1	7	0	6	0	29.4	23.5	17.6	
AVERAGE PER YEAR	0.4	0.0	3.4	0.0	0.2	0.2	0.0	0.2	0.2	1.4	0.0	1.2	0.0				
PERCENT OF TOTAL	11.8	0.0	100.0	0.0	5.9	5.9	0.0	5.9	5.9	41.2	0.0	35.3	0.0				
STATEWIDE AVE.																	
NO. OF STD DEV.																	

INTERSECTION HISTORY :

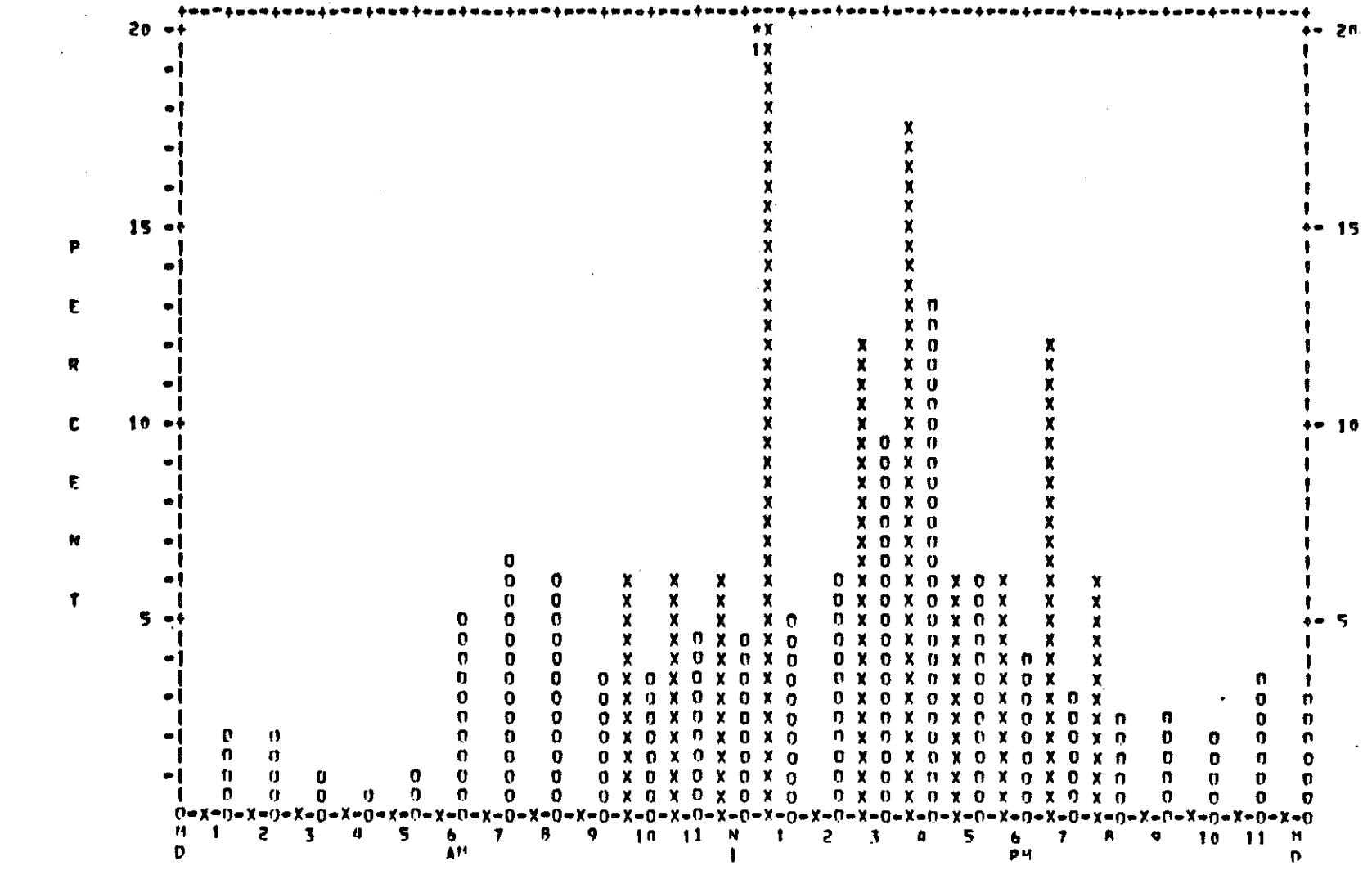
??????

MICHIGAN DEPARTMENT OF TRANSPORTATION
TRAFFIC AND SAFETY DIVISION

I N T E R S E C T I O N P R O F I L E - H I S T O G R A M

DIST 6 CS 73091 MP 0.08 (MALI) 0.08 (PHOTOLOG) M-13 AT TUSCOLA STREET SAGINAW CITY SAGINAW COUNTY

DISTRIBUTION BY HOUR OF DAY



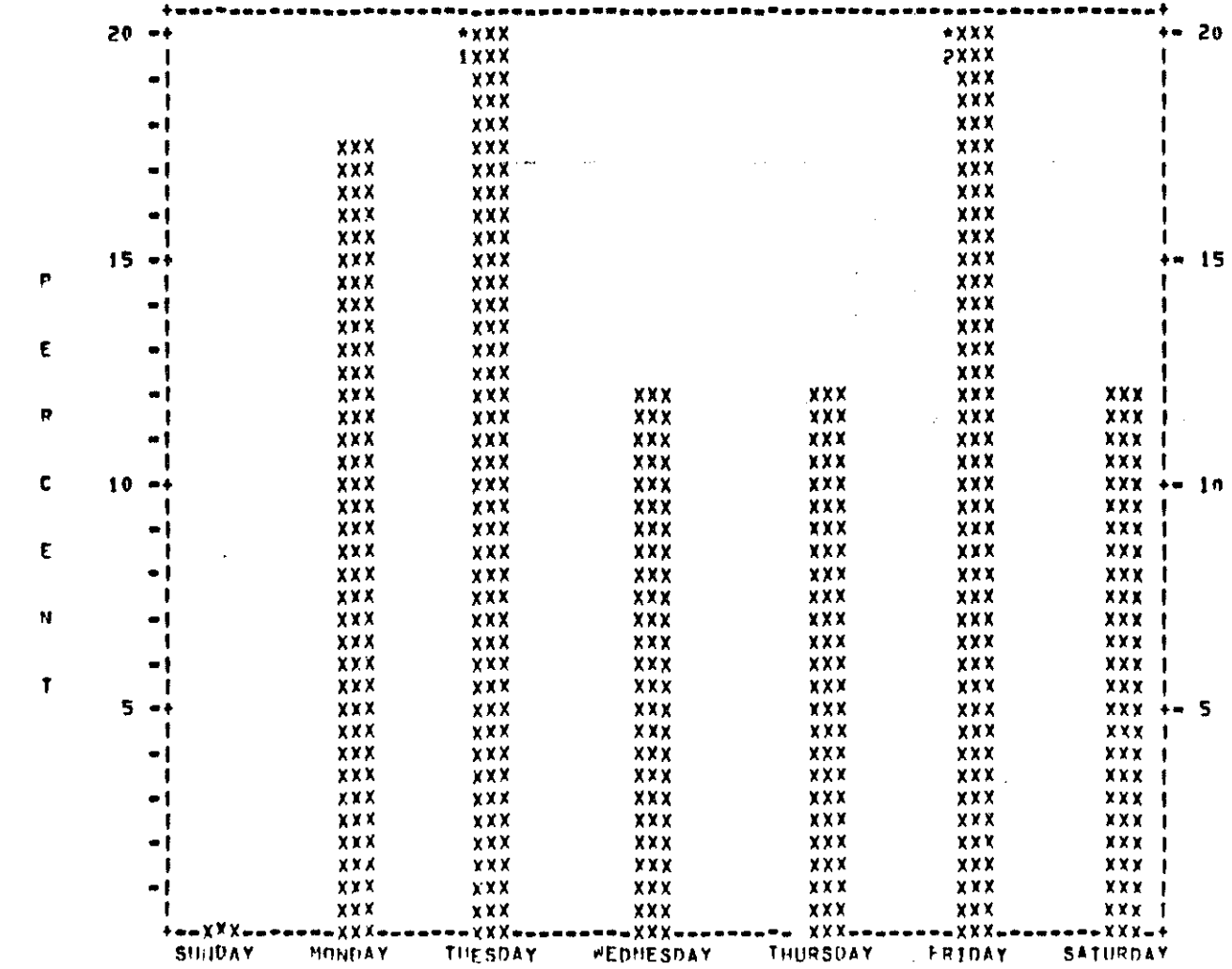
X = ACCIDENT DISTRIBUTION (JANUARY 01, 1978 THRU DECEMBER 31, 1978)
0 = VOLUME DISTRIBUTION (CALCULATED FOR A WEDNESDAY IN NOVEMBER 1975)

*1 : ACTUAL PERCENT IS 23

I N T E R S E C T I O N P R O F I L E - H I S T O G R A M

DIST 6 CS 73091 MP 0.08 (MALI) 0.08 (PHOTOLOG) M-13 AT TUSCOLA STREET SAGINAW CITY SAGINAW COUNTY

DISTRIBUTION BY DAY OF WEEK

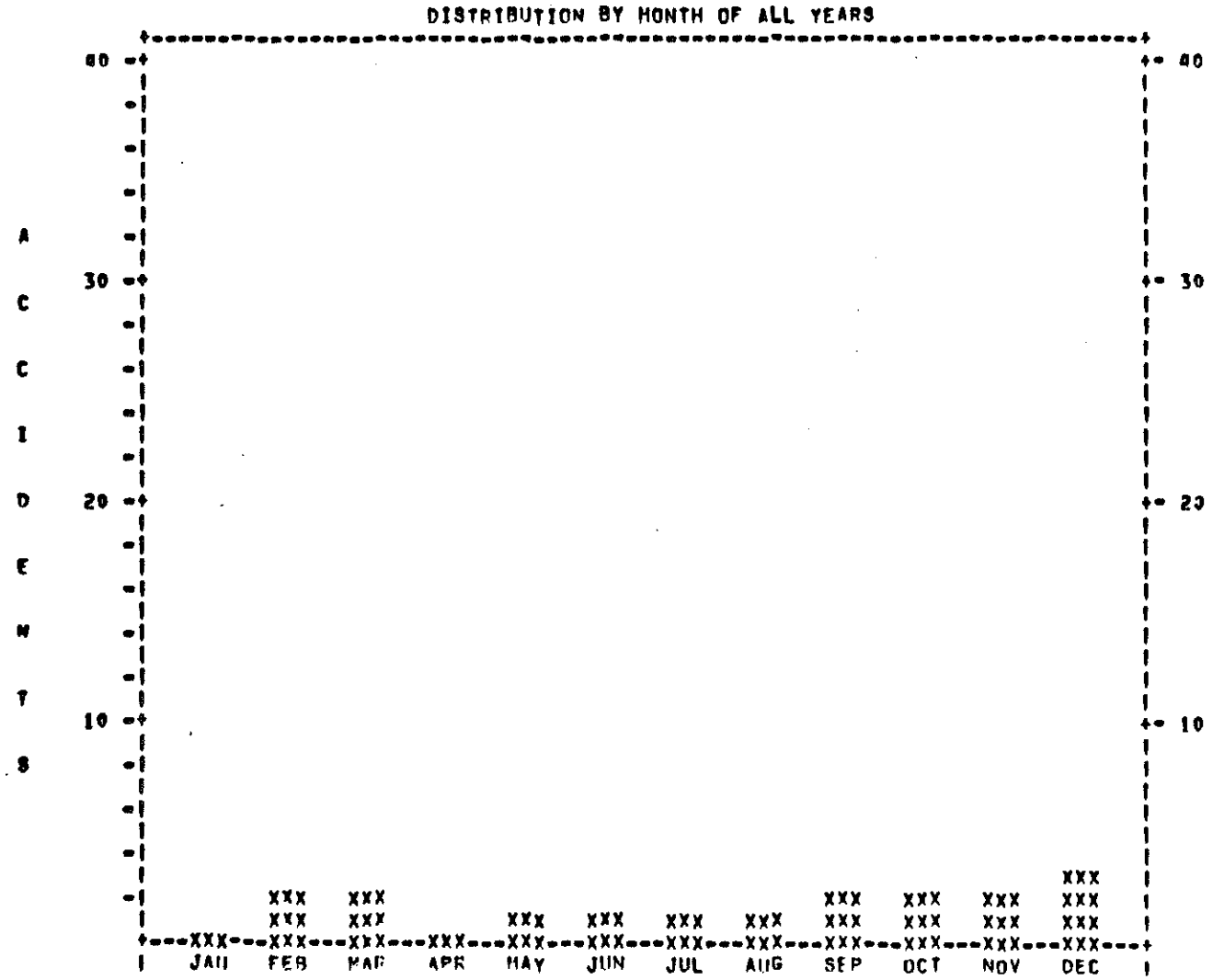


X = ACCIDENT DISTRIBUTION (JANUARY 01, 1974 THRU DECEMBER 31, 1978)

*1 : ACTUAL PERCENT IS 23 *2 : ACTUAL PERCENT IS 23

INTERSECTION PROFILE - HISTOGRAM

DIST 4 CS 73091 MP 0.08 (MALI) 0.08 (PHOTOLOG) M=13 AT TUSCOLA STREET SAGINAW CITY SAGINAW COUNTY



X = ACCIDENT DISTRIBUTION (JANUARY 01, 1978 THRU DECEMBER 31, 1978)

INTERSECTION ACCIDENT PROFILE

INTERSECTION TYPE : 4 LANE 2-WAY SIGNALIZED

LOCATION : M-13 AT TUSCOLA STREET SAGINAW CITY , SAGINAW COUNTY

DISTRICT 6 CONTROL SECTION 73091 MILEPOINT 0.08

DIST FROM ISCN	ACCIDENT TYPE	VIOLATOR (OR VEH 1) DR	INTENT	IMPACT	HAZRD ACT'N	SECOND VEHICLE DR	INTENT	IMPACT	HAZRD ACT'N	WEATH	SRF CND	LIGHT	VEH 1 CIRCUM	NUMBER OF INJURIES INJURY CLASS F	A	B	C	O	PRP DMG	DATE OF	ACCDNT REPORT NUMBER
NORTHBOUND APPROACH																					
0	3-VEH R-END	N	CHNG L	FRONT	WR LN			REAR	NONE	CLEAR	DRY	DK-SL		0	0	0	0	0	X	WED 11/19/75 6PM	279368
0	2-VEH R-END	N	GO STR	NONE	CLOSE	N	SLOWNG	REAR	NONE	RAIN	WET	DAY		0	0	0	0	0	X	WED 6/11/75 2PM	125763
20	2-VEH R-END	N	GO STR	NONE	FAST	N	STOPPD	REAR	NONE	CLEAR	ICY	DK-SL		0	0	0	0	4	X	FRI 12/ 9/77 6PM	284708
60	3-VEH R-END	N	GO STR	NONE	CLOSE	N	STOPPD	REAR	NONE	RAIN	WET	DAY		0	0	1	3	0		THU 9/18/78 2PM	230899
30	2-VEH R-END	N	CHNG L	L SIDE	WR LN	N	GO STR	R SIDE	NONE	CLEAR	DRY	DAY		0	0	0	0	2	X	THU 11/18/76 NOON	257605
315	2-VEH L-TRN	N	L-TURN	L SIDE	NONE	S	GO STR	L SIDE	NONE	RAIN	WET	DAY	NONE	0	0	0	1	2	X	TUE 3/21/78 3PM	84567
SOUTHBOUND APPROACH																					
0	1-VEH PARKD	S	GO STR	R SIDE	NONE					CLEAR	DRY	DAY	NONE	0	0	0	0	0	X	MON 12/ 2/74 NOON	286911
50	2-VEH SSW-P	S	GO STR	REAR	WR LN	N	GO STR	REAR	NONE	CLEAR	DRY	DAY		0	0	0	0	2	X	TUE 8/17/76 11AM	179889
30	2-VEH SSW-M	S	CHNG L	FRONT	WR LN	S	GO STR	REAR	NONE	SNOW	ICY	DAY		0	0	0	0	3	X	FRI 3/18/77 3PM	85956
20	2-VEH R-END	S	LV PRK	L SIDE	BCKNG	S	GO STR	FRONT	NONE	RAIN	WET	DAY		0	0	0	1	5	X	MON 9/18/78 NOON	230930
80	1-VEH PARKD	S	GO STR	FRONT	NONE					CLEAR	WET	DAY		0	0	0	0	2	X	FRI 2/ 6/76 NOON	56431
0	2-VEH R-TRN	S	R-TURN	FRONT	R YLD	S	PASSNG	L SIDE	NONE	CLEAR	ICY	DK-SL		0	0	0	0	2	X	SAT 2/ 7/76 7PM	56418
20	2-VEH R-END	S	GO STR	NONE	CLOSE	S	STOPPD	REAR	NONE	CLEAR	DRY	DAY		0	0	1	1	1		SAT 7/23/77 4PM	165196
0	2-VEH PRKNG	S	GO STR	FRONT	WR LN			REAR	NONE	CLEAR	DRY	DAY		0	0	0	0	0	X	MON 10/ 6/75 3PM	253527
EASTBOUND APPROACH																					
60	1-VEH PARKD	E	LV PRK	REAR	BCKNG					CLEAR	ICY	DAY		0	0	0	0	2	X	TUE 12/28/76 5PM	295081
0	2-VEH PRKNG	W	LV PRK	L SIDE	BCKNG	W	GO STR	FRONT	NONE	CLEAR	DRY	DAY	NONE	0	0	0	0	0	X	TUE 10/14/75 9AM	255009
100	1-VEH PARKD	E	GO STR	NONE	CLOSE					CLEAR	DRY	DAY		0	0	0	0	1	X	FRI 5/ 7/76 10AM	120609

SEGMENT GEOMETRICS TABLE

DIST	CNTRL SECTN	MILEPOINT POB	MILEPOINT POE	LENGTH (MILE)	GEOMTC TYPE	WIDTH LN	WIDTH SH	DELTA DEG:MN	CURVE DEG:MN	BEARING DEG:MN	ACTVTY	PASSNG ZONE	TRUCK LANE	SPD LMT	DIRECTION APP	DIRECTION DEP	ADT
6	73091	0.00=	0.09	0.09	4L.2W	11	0	01 0	01 0	N161 0E	URBAN			35	CSH	S	17653
6	73091 *	0.08	<<<<<<<<<<<<<	INTERSECTION OF	M-13			AT TUSCOLA STREET		SAGINAW CITY,	SAGINAW CO	>>>>>>>>>>>>>>					17653

The second stage of the computer model will calculate the cost effectiveness of each potential accident countermeasure.

The third stage will involve objective optimization using mathematical optimizing processes.

During the development of the model, deficiencies have been discovered, for the most part involving a lack of needed data, insufficient precision of existing data, and/or file incompatibilities. Thus we requested and have received two Highway Safety Grants ($900,000 each over three years) for model improvements and advancement. A major component of the proposed projects consists of the integration of parallel data sources, such as the Secretary of State driver and vehicle records, weather bureau information, and environmental data with the existing data base for the MIDAS model. These types of data will allow the MIDAS model to relate the driver, the vehicle, and the roadway to available crash characteristics.

Because the modeling techniques are continuously being improved as we gain greater insight, MIDAS will be developed in a series of generations. MIDAS-I is the present state of the art. MIDAS-II will be completed in 1980 and consist of a variable length analysis, improved rationale for merging data files, and improved data on horizontal alignment. MIDAS-III is anticipated for completion in 1981 and will be our first attempts for integrating and modeling data on the driver and vehicle. MIDAS-IV is scheduled for completion in 1982 and will have more precise data on highway geometry and more advanced mathematical algorithms for alternative analysis and optimization of objectives.

A sample output of the MIDAS-I is a histogram model which is a graphical representation of the accident frequency distribution. The accident codes used in this sample include total accidents, right angle, rear end, left turn, and wet surface accident rankings at 139 2-lane two-way signalized trunkline intersections. These histograms determine families based on like geometrics, traffic control, and ADT. Those intersections that are within a family norm are indicated by X's to the right of the number of accidents that occurred. Intersections having more accidents than what has been determined as the upper confidence limit are indicated by zeros to the right of the number of accidents that occurred. These intersections are called outliers which are identified in English and reviewed for possible corrective treatment.

A preliminary output from MIDAS-II is also included and follows the histograms. The intent of the outputs is to serve as stand-alone reports which include traffic and accident data on segments of a given roadway as well as intersections included within those segments. These reports are rather self-explanatory and are subject to change as the model is further developed.

Positive Guidance Demonstration Project

In last year's annual report, we reported on a Positive Guidance Demonstration Project we were conducting at the eastbound I-96 freeway split at M-37 and US-131 near the city of Grand Rapids. The project is part of a FHWA contract to evaluate the principles of Positive Guidance. As of a

year ago, we had developed a Positive Guidance plan but had not yet carried it out. As of this writing, the Positive Guidance plan, through the implementation of a signing contract, has been implemented. We are now in the process of evaluating this project.

Briefly reviewing, Positive Guidance is a method that is used to improve the safety and operational features of a problem location. It integrates the traffic engineering and human factor technologies to produce an information system matched to driver performance capabilities under varying traffic conditions. It is designed to provide high payoff, short-range solutions to safety and operational problems at relatively low cost. Positive Guidance is based on the premise that a driver can be given sufficient information to avoid accidents.

The Positive Guidance methodology consists of the following six steps:

1. Data Collection at Problem Locations
2. Specification of Problems
3. Definition of Driver Performance Factors
4. Definition of Information Requirements
5. Determination of Positive Guidance Information
6. Evaluation

The Positive Guidance signing plan developed for the project features the use of overhead diagrammatic signs. The final evaluation report (Step 6) for the project should be complete by the end of November.

Project BEAR Update

The state's CB motorist aid system officially became operational on October 1, 1978. This joint effort by the MDOT and the MSP provides motorists on I-96 between Grand Rapids and Detroit a means of communication with the State Police to obtain assistance in emergencies.

The system has been operational for over one year. The data below compares the incidents reported during the 6-month period prior to beginning operation with the same 6-month period after the system began operation.

Type of Call	Before (April-Sept. '78)	After (April-Sept. '79)	% Increase
Abandoned Vehicle	18	19	.06
Motorist Assist	195	745	282
Accident	39	278	613
Fire	9	81	800
Medical Emergency	3	19	533
Highway Hazard	16	165	931
Traffic Violation	42	264	529
Other	35	204	483
Total	357	1775	397

In the first operational year the BEAR operators handled 4115 calls for an average of 11.3 per day. Of the 4115 calls received 73 percent were from motorists traveling I-96. The remaining 27 percent of the calls came from motorists who were not on I-96. These calls accounted for 1092 motorists receiving assistance that were not expected in the original project. During the first operational year of the system, volunteer groups along I-96 handled 1290 calls within the influence area of one of the 10 CB relay towers.

The following chart shows the breakdown of the calls received:

Action/Service	BEAR		Volunteer		Total	
	Calls	%	Calls	%	Calls	%
Abandoned Vehicle	60	1.5	16	1.3	76	1.4
Motorist Assist	1927	46.8	748	58.0	2675	49.5
Accident	701	17.0	160	12.4	861	15.9
Fire	124	3.0	35	2.7	159	2.9
Medical Emergency	32	.8	10	.8	42	.8
Highway Hazard	387	9.4	118	9.2	505	9.4
Traffic Violation	512	12.5	157	12.2	669	12.4
Other	372	9.0	46	3.4	418	7.7
Total	4115	100	1290	100	5405	100

The following is an explanation of the action/service categories:

Abandoned Vehicle - Most of these calls were about vehicles that had some type of mechanical problem and the driver had left his vehicle to obtain assistance. One of the vehicles checked on turned out to be a stolen vehicle.

Motorist Assist - These calls consist of flat tires, need gas, dead battery, vehicle in a ditch, and mechanical problems. A small percentage of these calls were for directions or information. It is significant that the data showed 70 percent of the motorist assist calls received were calls being made for other motorists.

Accident - Calls on accidents were split 51 percent on I-96 and 49 percent off of I-96. There were 188 property damage accidents and 107 injury accidents two of which were fatal accidents. There were 38 logs that were marked as no contact made by the investigating officer. An unusual statistic shows that there were 94 accidents involving deer and another 11 involving other animals. A total of 387 calls were made by motorists not involved in the accidents.

Fire - The breakdown on the calls for fire assistance show that 47 percent were for vehicle fires and 25 percent for structure or grass fires with 34 percent of the calls originating off I-96. Most of the calls, 66 percent,

were called in by another motorist. There were 10 calls that resulted in no contact or contact but no fire.

Medical Emergency - The BEAR operators handled 32 calls for medical assistance. There were seven calls for heart attack victims, five for illness, one for a seizure, three for women in labor, and one for an escort for a red cross blood run. The police also responded to two attempted suicides. Motorists called for assistance for some other person in 50 percent of the cases. No contact was made in eight cases while one heart attack call turned out not to be an attack.

Highway Hazard - This category is not common to most motorist-aid systems. The type of calls received include objects being thrown at or dropped on vehicles, animals, or objects in the road, vehicles traveling at night without lights on, and trucks losing there loads. Calls off I-96 included 22 reports of traffic signals out, traffic signs down, broken water main and power lines down.

Traffic Violation - Drunk driving accounted for 57 percent of the calls received. Speeding accounted for 18 percent, reckless driving 14 percent, vehicles traveling on the wrong side of the road 5 percent. Contact was made on 25 of the BEAR Logs resulting in 10 arrests for drunk driving and one arrest for driving a vehicle with stolen license plates.

Other - Only 61 percent of the calls in this category were on I-96. Most of these calls - 27 percent - were about hitchhikers, pedestrians, or bicyclists on the expressway. The calls off I-96 dealt with domestic problems, burglaries, breaking and entering, auto theft, or suspicious people or situations.

Recognition Study

After the system had been in operation for approximately one year, a study of how many people were aware of Project BEAR and used it was taken at one of the rest areas. This study was conducted by one of the CB volunteer groups. A total of 513 people were interviewed, with 401 indicating that they had heard of Project BEAR. There were 48 people questioned who had attempted to use Project BEAR with 36 indicating that they found the system satisfactory. This study was conducted in September 1979 during the Labor Day weekend when many vehicles from other areas were on I-96. And still 80 percent of the people interviewed were aware of the system.

COST PER CALL

The cost breakdown for the project was:

Capitol Cost	$158,326
Maintenance	1,800/year
Leased Telephone Lines	4,000/year
Dispatchers	91,000/year

Based on an expected 10-year system life the cost per call would be (15,833 + 1,800 + 4,000 + 91,000 4,115), $27.37. If the 1920 calls handled by the volunteer groups along I-96 were added in the cost per call would drop to

$20.84. The cost per call could be further reduced if all calls were counted, however, many calls for the same incident are not always recorded. The State Police could handle two more systems of equal size, with the existing dispatchers, which would drop the cost per call drastically.

SECTION 5

SPECIAL STUDIES

Operation Lifesaver Public Information Program

Operation Lifesaver is a public information program developed to reduce both the number and severity of railroad grade crossing accidents in Michigan (see statistics on pages 69 and 70). It is sponsored by our department in cooperation with the Michigan Traffic Safety Information Council and the Michigan Railroads Association. The program utilizes principles long recognized as effective in improving highway safety - Education, Engineering, and Enforcement. We anticipate reductions in train-vehicle fatalities comparable with those of other states where Operation Lifesaver has been used.

Although the law requires motorists to yield the right-of-way to trains at railroad crossings, impatience or carelessness causes some drivers to speed across in front of passing trains. By revealing the consequences that can occur, it is hoped that motorists will heed the warning devices that exist at grade crossings. By instilling into motorists the inherent dangers that exist, motorists are likely to use more caution when negotiating railroad grade crossings.

Operation Lifesaver was kicked off in Michigan on April 21 of this year. To date, we have distributed posters and brochures that explain the program's main theme - "Trains Can't Stop...You Can" (see brochure on following page). In addition, radio and television public service announcements explaining the Operation Lifesaver message have been sent to all radio and television stations in Michigan.

In addition to educating the driving public, we are also focusing on elementary school children. As part of a pilot project, a railroad safety filmstrip was sent to all of the elementary schools in District 7. The feedback from teachers indicates that the filmstrip has been favorably received. As funds become available, we may expand this portion of Operation Lifesaver to other districts.

An evaluation of train-vehicle accident experience will be made after a 1-year period to determine the impact of Operation Lifesaver. A decision will be made at that time to determine if the project should be continued.

Operation Lifesaver Feedback for the Filmstrip "No Place to Play"

We asked a number of lower elementary school teachers to show "No Place to Play" in their classrooms (see Evaluation Sheet on page 72). Here are some of their comments.

"All of our students were attentive during the showing. Afterwards they said they liked the show and began to talk about why children should stay away from trains." K.R., Homer, Michigan

"I learned about train safety myself." K.R., Calhoun County

"It was fast moving and to the point. It wasn't too pedantic, yet it got the message across." H.S., Berrien County

"Students were interested from start to finish and afterwards made several comments on their own experiences of near misses at RR crossings." Mrs. H.T., St. Paul's Lutheran School

"Good reception--repeated principals afterwards. Excellent." W.G., Kalamazoo County

"Children were very interested. Had a good discussion afterwards. Much of the information was new to them." P.H., Franklin School

"The filmstrip is good and its message important." Rev. J.M., Albion

"The children seemed to be very enthusiastic. Many of them had railroad stories to tell." O.W., Berrien County

"Teachers felt it was very worthwhile. Easily presented to the children." Eau Clair Public Schools

"We'd like booklets for all of our students in the 1st, 2nd, and 3rd grades." Vicksburg Schools

"We are using it now only in 1st, 2nd, and 3rd grades. We are going to the 4th, 5th, and 6th with it too. We feel it is that well done and that important." J.S., Calhoun County

9-2-80
AHD(41A-88)-3

Pedestrian, School Crossing, and Bicycle Safety

The pedestrian accident problem, which affects all age groups of our society, is of serious proportions. This is particularly true as it relates to children and to certain older persons. While the problem is both urban and rural in scope, it is more serious in urban areas where 60 percent of the nationwide pedestrian fatalities take place.

During the past five years, a total of 1,682 pedestrians have been killed in Michigan for an average of 336 per year. A little over 15 percent of all traffic fatalities in the state involved a pedestrian. In addition, for each pedestrian killed, about 16 pedestrians are injured.

Closely related to the pedestrian safety problem is the problem involving bicycle safety. In 1977 there were 43 bicyclists killed and 3,567 injured in 4,073 total reported crashes involving bicycles and motor vehicles. It is expected, due to the energy shortage and the growing popularity of recreational riding, that bicycle usage will increase in the next five to ten years resulting in a proportional increase in fatalities and injuries.

There is a need for a coordinated effort to develop and implement a program designed to improve pedestrian and nonmotorized vehicular safety. The major emphasis on this program will focus on the need to recognize pedestrian safety as an integral element of highway safety and community planning and to ensure a continuing program to improve pedestrian safety on all roads in the state. Safe pedestrian environments are not chance occurrences. Safety is created by design through the constant attention and effort of responsible agencies and individuals. Unfortunately, pedestrian safety efforts have been haphazard or uncoordinated. There is a need for a rational program development and solution implementation.

The initial phase of the program is designed to define the extent of the safety problem relating to pedestrians, school crossings, and bicycles. Based on the results of this initial phase, a program can be developed to address specific problems. The program will include the identification of pedestrian and bicycle crash problem locations and the subsequent recommendations for improvements that will result from an in-depth analysis of these locations. Special emphasis will be directed at school crossings, which will be inventoried, where uniform criteria for traffic controls will be developed and applied consistently statewide. In addition, laws relating to pedestrians, school crossings, and bicycles will be reviewed and proposals developed to achieve greater compliance with the uniform vehicle code.

Critical Accident Program

The necessary staff required to implement this program during fiscal 1980 was not hired due to budgetary cutbacks. A new request to staff this program has been formulated with the hope that the program can begin during fiscal 1981.

Right Turn on Red (RTOR)

The Traffic and Safety Division recently coordinated the preparation of a report for the American Association of State Highway and Transportation

Officials (AASHTO) to determine the safety and delay impacts of right turns on red. Although the study has not as yet been approved by the Executive Committee of AASHTO and the report itself cannot be released, the results of this nationwide study are pertinent to those individuals who are responsible for safety program planning and implementation.

CAN YOU MAKE THE GRADE?

Train your mind to mind the TRAIN! The following quiz is designed to help you do just that.

1. The warning lights are flashing; the gates are coming down; you have a minimum of ____ seconds before a train reaches the grade crossing.
a. 20 b. 30 c. 45 d. 60

2. A 100-car train traveling 60 miles per hour requires a distance of ____ to stop.
a. 1½-Miles b. 1-Mile c. ½-Mile d. ¼-Mile

3. A train whistle sounding two longs, one short, and one long means ____.
a. All clear, proceed. b. The engineer is saying hello to a passing train. c. Stop, a train is approaching the crossing. d. The train is about to stop.

4. Engineers begin to sound their locomotive warning whistle at a distance of ____ from the crossing.
a. 1-Mile b. ¼-Mile c. 500 feet d. 20 feet

5. At night, be sure you can stop in time. ____
a. True b. False

6. Railroad warning devices include: _____.
a. Crossbucks b. Flashing lights c. Bells d. Gates e. Any/or a combination of the above.

7. A train should be expected on any track at any time. ____
a. True b. False

8. The advance railroad warning sign is _____ in color with _____ lettering and _____ in shape.
a. Red; white; hexagonal b. White; black; rectangular c. Yellow; black; circular d. Red; white; triangular

9. The principal contributing cause in vehicle-train accidents is: _____
a. The inability of the train to stop quickly b. Weather conditions c. Intoxication d. Driver error

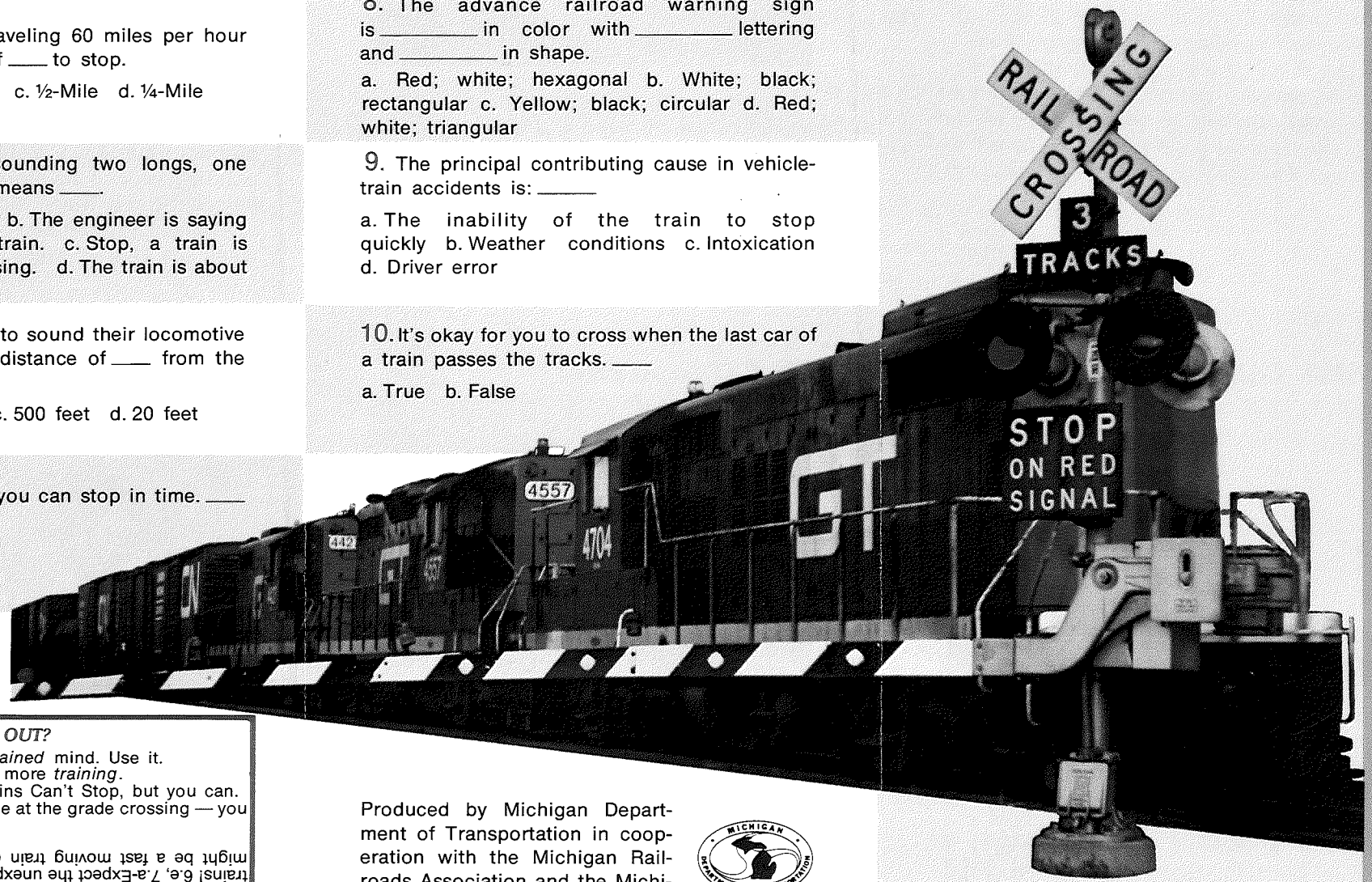
10. It's okay for you to cross when the last car of a train passes the tracks. ____
a. True b. False

HOW DID YOU GRADE OUT?

10 — You have a *well-trained* mind. Use it.
8-9 — You need a little more *training*.
6-7 — Remember — Trains Can't Stop, but you can.
5 or less — When it is a tie at the grade crossing — you lose.

Answers to Quiz 1.a, 2.b, 3.c, 4.b, 5a.-In about half of all night grade crossing accidents, motor vehicles run into trains! 6.e, 7.a-Expect the unexpected. 8.c, 9.d, 10.b-There might be a fast moving train on another track.

TRAINS CAN'T STOP...



YOU CAN

OPERATION LIFESAVER

Produced by Michigan Department of Transportation in cooperation with the Michigan Railroads Association and the Michigan Traffic Safety Information Council

WHAT IS OPERATION LIFESAVER?

Operation lifesaver is a program designed to help save your life at the most dangerous spot on any highway or road — the highway/rail grade crossing. Nationally, the chance for death or serious injury in a train-motor vehicle collision is 40 times greater than for other types of highway accidents. The sad part is these accidents could be avoided. They would be, if more people understood the dangers at crossings. That is the purpose of this brochure.

ANYTIME IS TRAIN TIME

Always exercise caution when approaching a grade crossing, even at a familiar crossing that you drive past regularly. An extra train or special one may be making a run when you least expect it.

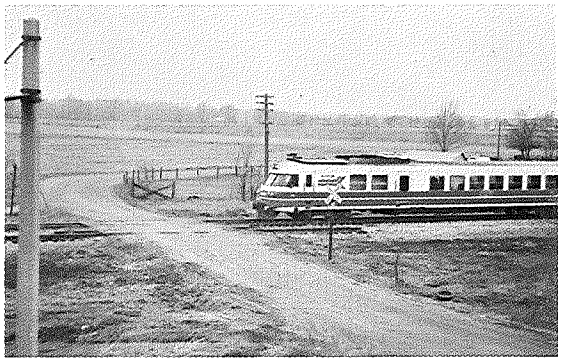
LOOK BEFORE YOU LEAP

Be cautious when crossing tracks after a train has passed. Too often impatient drivers dart across as soon as the last car clears the crossing only to be struck by a train on an adjacent track. Never move while the flashing lights are operating. They stop flashing when it's safe to cross.

TRAINS CAN'T STOP

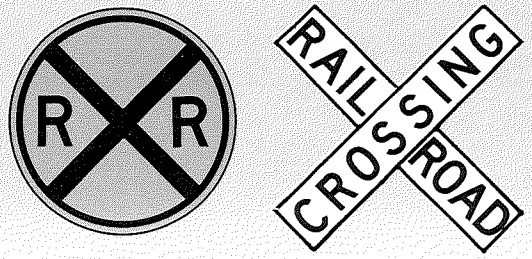
A train cannot stop quickly, nor can it veer from its path. A 100-car train moving at 60 miles per hour takes 100 seconds and nearly a mile to stop. After the brakeman applies the brakes, it takes 15 seconds before the train begins to slow down. Therefore, it *must* be given the right-of-way at the grade crossing.

BE EXTRA ALERT



Not all grade crossings in Michigan are equipped with automatic flashing lights, especially those in rural areas. Always look both ways and listen carefully before crossing a railroad track. Be extra careful when there are no gates or flashing lights.

STOP, LOOK, LISTEN, & LIVE



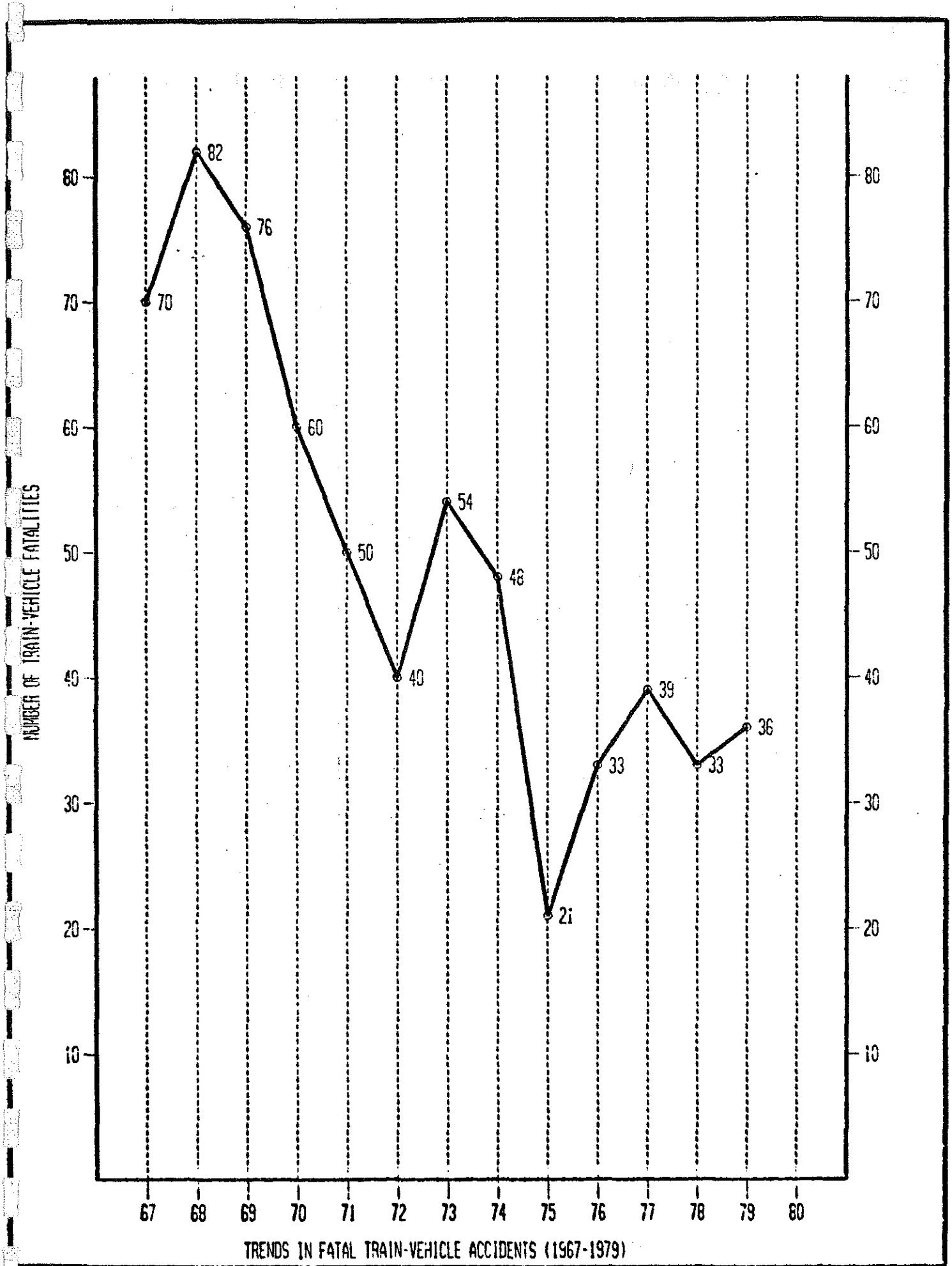
When you see the familiar round yellow sign with the black and yellow "RR" symbol, slow down. You are approaching a railroad grade crossing. When you see the crossbucks, you are at the crossing. If the lights are flashing -STOP- a train is coming and it cannot stop. It's your life, don't gamble with it. Be absolutely positive nothing is approaching before driving across.

TRAIN - VEHICLE FATALS IN MICHIGAN

1975 THROUGH OCTOBER, 1979

COUNTIES WHERE FATAL ACCIDENTS OCCURRED

TOTAL NUMBER STATEWIDE
128 FATAL ACCIDENTS
150 PEOPLE KILLED



TRENDS IN FATAL TRAIN-VEHICLE ACCIDENTS (1967-1979)

OPLAND. ISD 072580614

Michigan Traffic Safety Information Council

AFFILIATE OF MICHIGAN STATE SAFETY COMMISSION

7150 HARRIS DRIVE, GENERAL OFFICE BLDG., LANSING, MICHIGAN 48913
TELEPHONE (517) 322-1942

Evaluation Form for the Filmstrip "No Place to Play"

Evaluator's Name _____

Elementary School _____

County _____

Grades Shown to _____

Did you show the filmstrip?	Yes	No
Did you have audio-visual equipment available?	Yes	No
Did you use A-V equipment from your REMC Center?	Yes	No
Do you feel the filmstrip was worthwhile?	Yes	No

Please describe briefly:

A. The children's reactions to the filmstrip.

B. Your own reaction to the filmstrip.

C. Feedback, if any, from other teachers or members of the community.

Please add any further comments and suggestions you may wish to make.

Return form to:

William Opland
Michigan Department of Transportation
Traffic and Safety Division
P.O. Box 30050
Lansing, Michigan 48909

APPENDIX I

Table 1 Instructions and Codes

Procedural and Status Information
HIGHWAY SAFETY IMPROVEMENT PROGRAM
ANNUAL REPORT 1980

Highway Location Reference System

Column (1) - Percent of miles covered by location reference system.

Column (2) - If column (1) is less than 100 percent, show date it is expected 100 percent of highway mileage will be covered by reference method. (Yea

Traffic Records System

Column (3) - Percent of reported accidents for which accident data is correlated with traffic volume data.

Column (4) - Is it currently possible to correlate accident data with highway inventory data through automated data processing? (Y-Yes, N-No, U-Under development)

For columns (5), (6), (7), (8), (9) and (11) use the specified codes to list the major factors taken into account in developing projects for the various types of improvements. Describe "Y" codes on a separate sheet and attach to Table 1. Note that some changes have been made in the codes for columns 9, 10, and 11 since last year.

Hazardous Locations

Column (5) - Criteria used to identify high hazard locations for further study.

CODES (more than one may apply)

A Number of accidents

E Economic loss/accident cost

L A specfic number of locations (e.g. top 100)

R Accident rate, including rate-quality control

S Accident severity

Y Other (Describe on separate sheet)

Z Under development

Column (6) - Factors taken into account in establishing hazardous location project priorities.

CODES (more than one may apply)

- C Criteria indicated in column (5)
- E Cost-benefit analysis
- I Onsite inspection
- P Project cost
- R Accident number and/or severity reduction expected from project
- Y Other (describe on separate sheet)
- Z Under development

Elimination of Roadside Obstacles

Column (7) - Factors analyzed in establishing project priorities for correction of roadside obstacle hazards.

CODES (more than one may apply)

- A Accident data
- E Cost-benefit analysis
- H Highway system or type
- I Type of obstacle/type of improvement
- O Obstacle survey data
- R Accident number and/or severity reduction expected from project
- S Traffic speed or speed limit
- V ADT
- Y Other (describe on separate sheet)
- Z Under development

Skid Improvement Projects

Column (8) - Factors analyzed in determining priorities for correcting hazardous skid prone location.

CODES (more than one may apply)

A	Total accidents
E	Cost-benefit analysis
G	Roadway geometrics
I	Onsite inspection other than skid testing
P	Pavement texture or other pavement characteristics besides skid number
R	Accident number and/or severity reduction expected from project
S	Skid number
V	ADT
W	Wet pavement accidents
Y	Other (describe on separate sheet)
Z	Under development

Hazardous Bridges

Column (9) - Factors analyzed to determine priorities for correcting operationally hazardous conditions associated with bridges.

CODES (more than one may apply)

A	Accident history
B	Bridge width
D	Approach geometry
E	Cost-benefit analysis
G	Condition of approach guardrail and transition
R	Accident number and/or severity reduction expected from project
S	Posted speed limit
V	ADT
W	Bridge width in relation to approach width
Y	Other (describe on separate sheet)
Z	Under development

Railroad-Highway Grade Crossings

Column (10) - Method used to update crossing inventory

CODES

B	State inventory separate but National Railroad-Highway Crossing Inventory also being effectively maintained
N	National Railroad-Highway Crossing Inventory Update Manual (used as State inventory)
S	State inventory - National Railroad-Highway Crossing Inventory not being maintained
Y	Other (describe on separate sheet)

Column (11) - Factors taken into account in establishing project priorities

CODES

A	Potential for reducing the number and/or severity of accidents
E	Cost-benefit analysis
H	Hazard index formula (show formula on separate sheet and define all terms)
I	Onsite inspection
M	Hazardous materials factor
P	People factor (buses, passenger trains, pedestrians, bicyclists)
T	Characteristics of train traffic (volume, speed, etc.)
V	Characteristics of highway traffic (volume, speed, etc.)
W	Existing warning devices
Y	Other (describe on separate sheet)

Column (12) - Number of crossings upgraded to full MUTCD standards thru installation of crossbucks, advance warning signs, and/or pavement markings during the period July 1, 1973 to June 30, 1980 without regard to funding source. If this information was reported last year for the period July 1, 1973 to June 30, 1979, report only for the period July 1, 1979 to June 30, 1980.

Column (13) - Number of public crossings that do not comply with minimum MUTCD standards as of June 30, 1980.

Column (14) - Percentage of Public crossings that do not comply with minimum MUTCD standards as of June 30, 1980.

Column (15) - Target date for full compliance with MUTCD (Year).

APPENDIX II

Table 2 Instructions

EVALUATION DATA FOR COMPLETED IMPROVEMENTS HIGHWAY SAFETY IMPROVEMENT PROGRAM AND PAVEMENT MARKING DEMONSTRATION PROGRAM ANNUAL REPORT 1980

General

- Provide information only for improvements with at least 1 year "before" and 1 year "after" accident data.
- Data on more than one project may be combined as long as the source of funds (column 1), safety classification code (column 2), before and after periods (columns 6 and 11), and evaluation status (column 16) are the same. Otherwise, data for each project should be shown separately.
- Information for columns (1) through (16) is required.
- Information for columns (17) through (22) is optional.

Column (1) - Indicate source of funds for the safety improvement.

Code:

HH - High Hazard Location Projects

RO - Elimination of Roadside Obstacles

HR - High Hazard/Roadside Obstacle

HE - Hazard Elimination Program

SR - Safer Roads Demonstration

PM - Pavement Marking Demonstration Program

RR - Rail-Highway Crossings

SO - Safer Off-System Roads Program

IS - Interstate Safety Improvements

FA - Other safety improvements made with Federal-aid funds

SL - Safety improvements funded with State and local funds only

Column (2) - Indicate the type of safety improvement as classified by Safety Classification Codes in FHWA Administrative Manual, Volume 22, Chapter V, Paragraph 23.

Column (3) - For the improvement(s) included on each line enter the total cost(s) in thousands of dollars to one decimal place.

Column (4) - Based on classification code used in column (2), enter the total quantity of improvements included on each line according to the codes below:

Safety Codes	Quantity of Improvements	Unit Codes
10-19	Number of Intersections	X
20-24, 27, 29, 67	Number of miles (0.1)	M
25, 26	Either of the above as appropriate	X or M
30-39, 66	Number of structures	S
50-59	Number of crossings	R
64	Highway miles of centerline marked	C
	Highway miles of edgeline marked	E
	Highway miles of both center and edgelines marked	B
	Number of intersections marked (crosswalks, stop bars, etc.)	X
	Number of railroad grade crossings marked	R
	Other markings	As appropriate
68	Number of locations	L
All others	Any of the above as appropriate	As appropriate
Any	Unknown	N

Column (5) - Indicate the appropriate units code for quantity shown in Column (4). If quantity of improvements is not available, use "N" in column (5).

Columns (6) and (11) - Indicate the number of months included in the "before" and "after" periods, respectively.

Columns (7) and (12) - Enter the number of fatal accidents that occurred in the "before" and "after" periods, respectively.

Columns (8) and (13) - Nonfatal injury accidents.

Columns (9) and (14) - Property damage only accidents.

Columns (10) and (15) - Total accidents.

Column (16) - For each line of data in the table:

- o Enter "P" if this is preliminary data and more evaluation data will be submitted on the project(s).
- o Enter "F" if this is the final evaluation data that will be submitted on the project(s).

Columns (17) and (18) - For each line entry, based on the classification codes used in column (2), enter the appropriate exposure data for the "before" and "after" periods in million vehicles or million vehicle-miles to two decimal places.

$$\text{Million vehicles} = \frac{(\text{ADT} \times 30 \times \text{number of months} \times \text{quantity of improvements})}{(10)^6}$$

$$\text{Million vehicle miles} = \frac{(\text{ADT} \times 30 \times \text{number of months} \times \text{number of miles})}{(10)^6}$$

Safety Codes	Exposure	Units Code
10-19 30-39 50-59 66, 68	Million vehicles	V
20-24, 27, 29, 67	Million vehicle miles	M
All Others	Either of the above as appropriate	V or M

Column (19) - Indicate the appropriate units code for the exposure data shown in columns (17) and (18).

Column (20) - Enter "R" if projects are in a rural area. Enter "U" if projects are in an urban area.

Column (21) - Enter number of lanes. For divided highways indicate the total number of lanes in both directions. For intersection projects enter the number of lanes on the major street.

Column (22) - Enter "U" if roadway is undivided. Enter "D" if roadway is divided. For intersection projects indicate if the major street is divided or undivided.