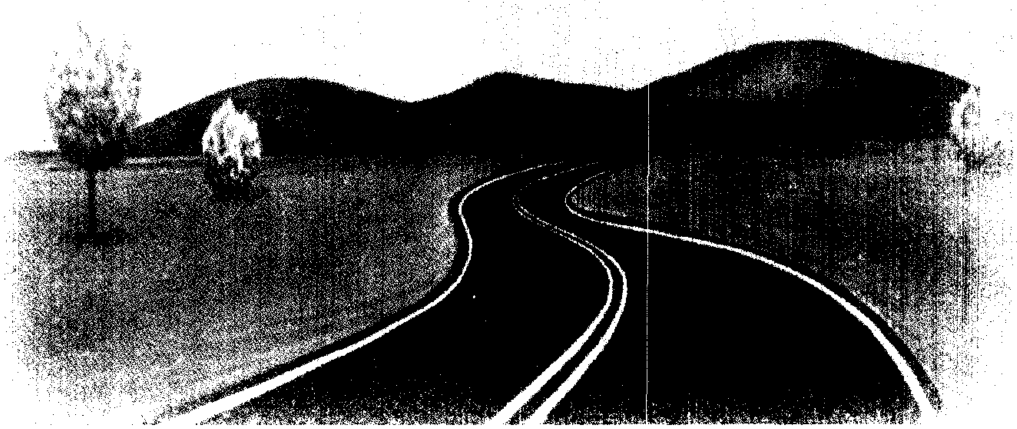
COST-EFFECTIVENESS AND SAFETY OF ALTERNATIVE ROADWAY DELINEATION TREATMENTS FOR RURAL TWO-LANE HIGHWAYS

VOL. IV. APPENDIX B, DEVELOPMENT AND DESCRIPTION OF COMPUTERIZED DATA BASE



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Federal Highway Administration

Offices of Research & Development

Washington, D.C. 20590

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FINAL REPORT

REPORT NO. FHWA-RD-78-53

FOREWORD

This six-volume report presents the findings of a research study to assess the effect of various delineation treatments on accident rates. Cost-benefit and cost models for evaluating specific delineation treatments were developed. Delineation guidelines were formulated by executing the cost-benefit models for selected delineation treatments.

The six volumes are:

Vol. I	Executive Summary
Vol. II	Final Report
Vol. III	Appendix A, Site Selection and Data Collection
Vol. IV	Appendix B, Development and Description of Computerized Data Base
Vol. V	Appendix C, Statistical Model Development
Vol. VI	Appendix D, Cost of Roadway Accidents and Appendix E, Cost and Service Life of Roadway Delineation Treatments.

Sufficient copies of the Executive Summary are being distributed to provide a minimum of two copies to each FHWA Regional Office, one copy to each Division Office, and five copies to each State highway agency. One copy of the Final Report is being provided to each FHWA Regional and Division Office and one to each State highway agency. Volumes III through VI are available only on request.

Charles F. Scheffey
Director, Office of Research
Federal Highway Administration

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16. Abstract

Under this research study, the effect of various delineation treatments on accident rates was assessed by analyzing accident data from more than 500 roadway sites in 10 States for tangent, winding and isolated horizontal curve sections on two-lane rural highways. Cost-benefit and cost models for evaluating specific delineation treatments were developed and guidelines formulated by executing the cost-benefit models for selected delineation treatments.

This Volume describes in detail the development of the computerized data base used in the study including the development of compatible data codes and resolution of coding discrepancies. Other volumes produced under this research study are:

Vol.	FHWA No.	Report Title
I	78-50	Executive Summary
II	78-51	Final Report
III	78-52	Appendix A, Site Selection and Data Collection
V	78-54	Appendix C, Statistical Model Development
IV	78-55	Appendix D, Cost of Roadway Accidents and Appendix E, Cost and Service Life of Roadway Delineation Treatments.

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PREFACE

This document and its appendices constitute the final report for the study "Cost-Effectiveness and Safety of Alternative Roadway Delineation Treatments." The study was conducted by Science Applications, Inc., with the assistance of Alan M. Voorhees and Associates, Inc., Dr. James Taylor, University of Notre Dame, and Mr. John Glennon, for the Federal Highway Administration under Contract DOT-FH-11-8587.

Science Applications, Inc., and FHWA wish to acknowledge the assistance of the many people who participated in this study, particularly Robert Felsburg of AMV, Sandra Morrow, SAI, and the key individuals in the ten states, listed below, where data collection took place. Without their cooperation this study would not have been possible.

States	Key Personnel
Arizona, Department of Transportation	Mr. Ross E. Kelley, Traffic Engineer, Safety Projects Services
California, Department of Transportation	Mr. Perry Lowden, Chief, Sign and Delineation Section
	Mr. James B. Dobbins, County Traffic Engineer for the County of Riverside
Connecticut, Department of Transportation	Dr. Charles E. Dougan, Chief of Research and Development
Georgia, Department of Transportation	Mr. Archie C. Burnham, Jr., State Traffic and Safety Engineer
	Mr. Arthur Durshimer, Jr., Traffic and Safety Engineer
Idaho, Department of Transportation	Mr. James L. Pline, Traffic Engineer

Louisiana, Department of Highways	Mr. Grady Carlisle, State Traffic and Planning Engineer
	Mr. John E. Evanco, Highway Planning and Needs Engineer
Maryland, Department of Transportation	Mr. Pierce E. Cody, III, Chief, Bureau of Highway Maintenance
	Mr. Paul S. Jaworski, Chief, Bureau of Accident Studies
Ohio, Department of Transportation	Mr. John LeGrand, Chief, Bureau of Transportation Safety
	Mr. John H. White, Assistant, System Facilities
Virginia, Department of Highways and Transportation	Mr. A. L. Thomas, Assistant, State Traffic and Safety Engineer
	Mr. P. J. Stenger, Associate Traffic Engineer
Washington, State Highway Commission	Mr. J. A. Gallagher, Traffic Engineer
	Mr. W. R. Curry, Traffic Operations Engineer

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METRIC CONVERSION TABLE

Several customary units appear in the text of this report. Generally, it is the policy of FHWA to express measurements in both customary and SI units. The purpose of this policy is to provide an orderly transition to the use of SI exclusively. It was decided that dualization of tables was not warranted because of the additional cost and delay in making this research available. Instead, the following conversion table is included.

To Convert	To	
in	mm	Multiply by 25.4*
ft	m	Multiply by 0.3048*
mi	km	Multiply by 1.609
mi/h	km/h	Multiply by 1.609
ft^2	m^2	Multiply by 0.0929
gal	L	Multiply by 3.785
^oF	^oC	Subtract 32 and multiply by 5/9
$\frac{\text{accidents}}{\text{MVM}}$	$\frac{\text{accidents}}{\text{MVkm}}$	Divide by 1.609
lb	kg	Multiply by 0.4536

*denotes exact conversion factor

The pound is a measure of force (weight) and the kilogram is a measure of mass. Mass and weight are not equivalent. For an object weighed under normal gravitational conditions, however, the above relationship may be used.

The Federal Highway Administration recognizes the "Standard for Metric Practice," E380 of the American Society for Testing and Materials, as the authority for SI usage.

APPENDIX B

DEVELOPMENT AND DESCRIPTION OF COMPUTERIZED DATA BASE

B.1 INTRODUCTION

In order to perform statistical analyses of site and accident data gathered in this study, it was necessary to computerize the data and put them on a tape file, to provide rapid access to data on more than 500 sites and 13,000 accidents. This appendix discusses the development of the computerized data base, describes in detail the data base itself, and indicates how the data base was and can be utilized.

From the outset, the information desired for each site (except for its accidents) was clearly defined and standardized. An information checklist form was developed, and a copy of this form was completed by hand for each site. One set of coded forms was then prepared for each state from the checklist forms. These coded forms contained the site data information deemed relevant to the analysis as extracted from the information checklist forms. With some modifications and additions, these forms were suitable for keypunching.

In contrast, accident data were not received in a standardized format. Each state had its own method for maintaining accident data, usually computerized. In view of the quantity of data requested (the sites averaged 30 accidents each), it was easiest for the states to provide accident data in the format used by their computer facilities. The task of reducing these data to a standardized format was accomplished by project personnel.

A summary of the various kinds of raw accident data received is given in Table 1. Figure 1 is an actual sample of raw accident data. Not only did formats vary from state-to-state, they also varied from year-to-year or region-to-region within a state. Further, not all

Table 1. Summary of raw accident data received.

STATE	YEARS COVERED	FORMAT OF ACCIDENT DATA
Arizona	1970-1972	Computer printout in an old format
Arizona [a)]	1973-1975	Computer printout in a new format
California [b)]	1970-1974 or 1975[c)]	Computer printout in the TASAS Selective Accident Retrieval format
California, Riverside Co.	1972-1975	Xeroxes of Riverside County's Computerized Traffic Accident Report Summary
Connecticut	1969-1973	Computer printout in an old format
Connecticut [d)]	1972-1974	Computer printout in a new format
Georgia [e)]	1970-1974	Xeroxes of handwritten, hand compiled lists
Idaho	1971-1974	Photocopies of their master computer printout
Louisiana	1970-1972	Photostats of individual police reports
Louisiana	1972-1974	Computer cards printer listing
Maryland	1969	Xeroxes of their master computer printout, 1969 format
Maryland	1970-1971	Xeroxes of their master computer printout, 1970-1971 format
Maryland	1972	Xeroxes of their master computer printout, 1972 format
Maryland	1973-1975	Xeroxes of their master computer printout, 1973 format
Ohio	1969-1972	Xeroxes of their old format style master computer printout
Ohio	1973-1974	Xeroxes of their new format style master computer printout
Virginia, Sites 2-24	1969-1973	Computer printout

Table 1. Summary of raw accident data received (continued).

STATE	YEARS COVERED	FORMAT OF ACCIDENT DATA
Virginia, Sites 2-24	1972 [f)]	Xeroxes of their master computer printout
Virginia, Sites 25-57 except as below	1970-1973 [g)]	Xeroxes of their master computer printout
Virginia, Sites 26, 42, 50	1970-1975	Xeroxes of individual police reports
Washington	1970-1974	Xeroxes of their master computer printout

[a)] The format of the Arizona computer printout changed in 1973. Many other states had one or more format changes, as noted in the table.

[b)] All data are currently accessed in one format; however, a data conversion between 1971 and 1972 may account for some of the incomplete data in earlier years.

[c)] Generally speaking, accident data for sites 1-29 were obtained through 1974; and for sites 30-57 through 1975.

[d)] The Connecticut computer printout was re-formatted prior to 1974 data becoming available. (It was easier to run a three year summary.) 1972 and 1973 accident data were then duplicated. This was an improvement as the old format did not provide such complete accident information.

[e)] At the time the data request was made, Georgia's computer file was being restructured; therefore, they could only compile hand lists.

[f)] The 1972 data had been in question for some of these sites, therefore, the data were reacquired. In addition, 1974 and 1975 data became available for some of these sites.

[g)] Some sites also have data for 1974 and 1975.

DIST	SR NO	ADD SR ID	SR MP SQ	SR MILE POST	EQU	PPRR EE 12	U/R	CO-CTY	DIAGRAM ANALYSIS DATA	RC AO MD PE	SEV	INJ	FAT	DATE MODAYR	TIME	INT. REL.	RDWY CHAR	ROAD WAY SURF	WTHR	LIGHT COND	TOTL ACID THIS LOC.	PROPTY DAMAGE DOLL''S	CCIDENT DESCRIPTION
5	127		00	5.00			R	12	1AG32000A1		1			081470	0530	NON-INT	STR	DRY	CLR	DAWN	1	1000	NON-DOM. ANIMAL (DEER, ETC)
5	128		00	1.31			R	12	1AA6000000		2	1		041770	1815	NON-INT	STR	DRY	CLR	DUSK	1	200	FENCE
5	128		00	1.40			R	12	1BA62000A0		2	2		051870	1725	NON-INT	CURV	DRY	CLR	DAYLT	1	1800	OVER EMBANKMENT-NO GRDRAIL
5	128		00	2.40			R	12	5AA32000A1		1			112870	1835	NON-INT	CURV	WET	FOG	DARK		900	DOM. ANIMAL (HORSE, COW, ETC)
5	128		00	7.40			R	12	1BA34000A0		1			122870	2000	NON-INT	STR	DRY	CLR	DARK	2	100	ROADWAY DITCH
5	128		00	7.40			R	12	1BA50000A0		3	5	1	102170	2250	NON-INT	CURV	WET	CLR	DARK	1	1500	OVER EMBANKMENT-NO GRDRAIL
5	128		00	15.40			R	12	7BA50000A0		1			082270	2340	NON-INT	CURV	DRY	CLR	DARK	1	669	VEHICLE OVERTURNED
5	128		00	36.40		V	R	02	1AA33000A0		2	2		012170	0545	NON-INT	CURV	WET	RAIN	DARK	1	1000	BEAM GRDRAIL-FACE-NOT THRU
5	128		00	36.63			R	02	7BA60000A0		1			120970	0010	NON-INT	STR	WET	CLR	DARK	1	800	ROADWAY DITCH
5	128		00	38.70			R	02	3AJ60000A0		1			012470	0530	NON-INT	CURV	WET	RAIN	DARK	1	1000	OBJECT STRUCK NOT STATED
5	128		00	39.15			R	02	2AA34000A0		1			100970	2205	AT INT.	STR	DRY	CLR	ST.LT	1	250	BUILDING
5	128		00	39.39			R	02	5B01650FD1		1			051970	1930	DRIVEWY	STR	DRY	CLR	DAYLT	1	250	ONE VEH ENTERING DRIVEWAY
5	128		00	39.53			R	02	5BA075BLD1		1			071870	1309	AT INT.	STR	DRY	CLR	DAYLT	1	300	ENTERIN AT ANGLE
5	128		00	39.70			R	02	5BB34000D0		2	1		100470	1500	DRIVEWY	STR	DRY	CLR	DAYLT	1	500	UTILITY POLE (POWER & ETC)
5	128		00	39.92			R	02	7BA167BAD1		2	1		111970	1930	AT INT.	STR	DRY	CLR	ST.LT	1	600	ENTERING AT ANGLE
5	128		00	40.20			R	02	7BA33000A7		1			030370	0645	NON-INT	CURV	ICE	SNOW	DAYLT	1	150	BEAM GRDRAIL-FACE-NOT THRU
5	128		00	40.50			R	02	7BG60000A0		1			051070	0015	NON-INT	CURV	WET	RAIN	DARK	1	200	S.DIR-BOTH STR-BOTH MOV-SS
5	128		00	40.71			R	02	3AA34000A0		1			030170	0220	NON-INT	CURV	WET	RAIN	DARK	1	350	ROCK BANK OR LEDGE
5	128		00	41.81			U	02	3DA131AAA1		2	1		060970	1926	AT INT.	STR	DRY	CLR	DAYLT	1	350	ENTERING AT ANGLE
5	128		00	41.94			U	02	1AA1230CA1		1			110270	1345	AT INT.	STR	DRY	CLR	DAYLT	1	1400	ENTERING AT ANGLE
5	129		00	15.80			R	02	1AA50000A0		1			101070	2103	NON-INT	CURV	DRY	CLR	DARK	1	1525	VEHICLE OVERTURNED
5	129		00	19.70			R	02	5BA50000A0		1			052470	0900	NON-INT	STR	DRY	CLR	DAYLT	1	500	VEHICLE OVERTURNED
5	129		00	22.70			R	02	1AA99000A0		1			071570	1344	NON-INT	CURV	DRY	CLR	DAYLT	1	250	ROADWAY DITCH
5	129		00	25.57			R	02	1AA125BAA1		1			021570	1750	NON-INT	STR	DRY	CLR	DUSK	1	101	O.DIR - BOTH STRAIGHT - SS
5	129		00	30.00			R	02	3AA34000A0		1			053070	0230	NON-INT	CURV	DRY	CLR	DARK	1	200	ROADWAY DITCH
5	129		00	30.86			R	02	5BA3200001		1			101870	1958	NON-INT	CURV	WET	RAIN	DARK	1	75	DOM. ANIMAL (HORSE, COW, ETC)
5	129		00	31.00			R	02	1AA32000A1		1			122570	1700	NON-INT	CURV	DRY	FOG	DARK	1	237	NON-DOM. ANIMAL (DEER, ETC)
5	129		00	36.50			R	02ASOT	1AC025BAD1		1			070970	2030	AT INT.	STR	DRY	OTHR	DUSK	1	850	O.DIR- ONE L.TURN- ONE STR
5	129		00	38.30			R	02	5BA6000000		2	1		011670	2335	NON-INT	STR	SNOW	SNOW	DARK	1	500	VEHICLE OVERTURNED
5	129		00	38.34			R	02	1AC161AAA1		1			090970	0955	AT INT.	STR	DRY	CLR	DAYLT	1	1500	S.DIR-ONE L.TURN - ONE STR
5	129		00	39.50			R	02	5AA6000000		1			101170	0310	NON-INT	STR	DRY	CLR	DARK		350	VEHICLE OVERTURNED
5	129		00	39.50			R	02	1AA061AUA1		2	1		111070	1230	DRIVEWY	STR	DRY	CLR	DAYLT	2	100	ONE VEH ENTERING DRIVEWAY
5	129		00	39.57			R	02	1AA015BAD1		2	3		010170	0220	NON-INT	STR	WET	OTHR	DARK	1	1200	O.DIR - BOTH MOVE- HEAD ON
5	129		00	39.92			U	02	1AA6000000		2	1		041870	1611	AT INT.	STR	DRY	CLR	DAYLT	1	400	ROADWAY DITCH
5	129		00	40.19			U	02	5BA1230A[illegible]		2	1		090670	2015	AT INT.	STR	DRY	CLR	DARK		450	ENTERING AT ANGLE
5	129		00	40.19			U	02	30C131AAA1		1			123170	1530	AT INT.	STR	DRY	CLR	DAYLT	2	350	ENTERING AT ANGLE
5	129		00	41.28			U	02CLAR	30B3400000		1			121770	1730	AT INT.	STR	DRY	CLR	ST.LT	1	227	UTILITY POLE (POWER & ETC)
5	129		00	41.52			U	02CLAR	5BA0459PD7		1			060270	2340	NON-INT	STR	DRY	CLR	ST.LT	1	600	ONE VEH PARKED- ONE MOVING
5	129		00	41.55			U	02CLAR	3DA021AAA1		1			032970	0832	AT INT.	STR	WET	RAIN	DAYLT		700	ENTERING AT ANGLE
5	129		00	41.55			U	02CLAR	5BA30000D1		2	1		100570	0800	AT INT.	STR	WET	OTHR	DAYLT	2		PEDESTRIAN- VEH GOING STR
5	129		00	41.68			U	02CLAR	5BA065BPD7		2	1		070370	1616	NON-INT	STR	DRY	CLR	DAYLT	1	800	ONE VEH PARKED- ONE MOVING
5	129		00	41.75			U	02CLAR	5BA111AAD1		2	2		032070	0144	NON-INT	STR	DRY	CLR	ST.LT	1	2100	O.DIR - BOTH MOVE- HEAD ON

Figure 1. Sample of accident data.

of the data were directly computer accessed. In some instances there was no computerization - only police reports or handwritten lists were available.

From the initiation of the study, a major task involved the standardization of the various forms of accident data received.

B.2 TAPE CREATION

This section describes the process by which all of the raw site and accident data was transformed from paper form into a data tape. Basically, this involved standardizing and coding the information onto computer cards, then reading the cards into the computer, and creating a permanent tape file.

B.2.1 Coding Formats

The first step in organizing the data was to define a standardized set of variables and subclassifications for the site and accident data. The selection of these variables and subclassifications was tempered by both information that was required for meaningful analysis, and information that was actually available. Important variables, with their subclassifications considered, are listed below.

Site Data

- Site Identification (State, Route Number, Mileposts)
- Site Geometry
  - general highway
    - tangent sections
    - winding sections
  - horizontal curves
- Site Type for Analysis
  - matching control site
  - before-after site

- Functional Classification
  - federal aid primary
  - federal aid secondary
  - non-federal aid
- Delineation
  - centerline (type and date)
  - edgeline (type and date)
  - post delineators (system and date)
  - guardrail (for horizontal curves only)
  - unintentional delineation
- Traffic Volume (AADT for Each Year)
- Posted Speed Limit
- Roadway Width and Pavement Surface Type
- Shoulder Width and Type
- For General Highway Sites Only
  - number of intersections
  - driveway frequency
  - general vertical alignment
    - flat
    - rolling
    - mountain
- For Horizontal Curves Only
  - degree of curvature
  - distance to adjacent curves
  - signing
- Average Number of Precipitation Days per Year
- Average Number of Snow Days per Year
- Average Number of Foggy Days per Year

- Time Period Covered in Accident Data
- Total Number of Accidents

<u>Individual Accident Data</u>

- Identification (Accident Report Number)
- Location (Milepost)
- Date
- Type of Accident
  - head-on
  - sideswipe (same direction)
  - sideswipe (opposite direction)
  - rear-end
  - run-off-road, overturned, hit fixed object off pavement
  - angle collision
  - foreign object in road
  - other
- Accident Severity
  - fatal
  - injury
  - property damage only
- Number of Vehicles
  - number of passenger cars
  - number of trucks and buses
  - number of other vehicles
- Time of Day
  - daylight
  - dark
  - dusk
  - dawn

- Roadway Lights (On/Off)
- Road Defects (Yes/No)
- Surface Condition
  - dry
  - wet
  - snow or ice
- Weather
  - clear or overcast
  - rain or snow
  - fog
- Intersection Related/Non-Related
- Delineation Related/Non-Related

Note that for purposes of analysis, sites were selected and classified as a matching-control site or a before-after site. Also, general highway situations have been defined as tangent or winding sections. Horizontal curves are treated independently in this study.

Once appropriate variables had been identified, data coding schemes and card formats were developed. Numerical codes were used predominantly with special provisions made for "missing values." (If a particular bit of information was "not unknown," and zero was a legitimate value for that variable, a code such as -9 was assigned to designate "not known.") The details of the variable names and numerical codes can be found in Section 3.0 of this appendix. The card formats developed are illustrated in their final form in Figures ·2 through ·6,

The card input scheme was as follows: For each site there was to be a site ID Card, Delineation Treatment Card, Traffic Volume Card, Road Site Geometry Card, and Accident Header Card, followed by Individual Accident Cards (a card for each accident that occurred at the site). In addition, some sites required a Milepost Continuation Card just after the Site ID Card.

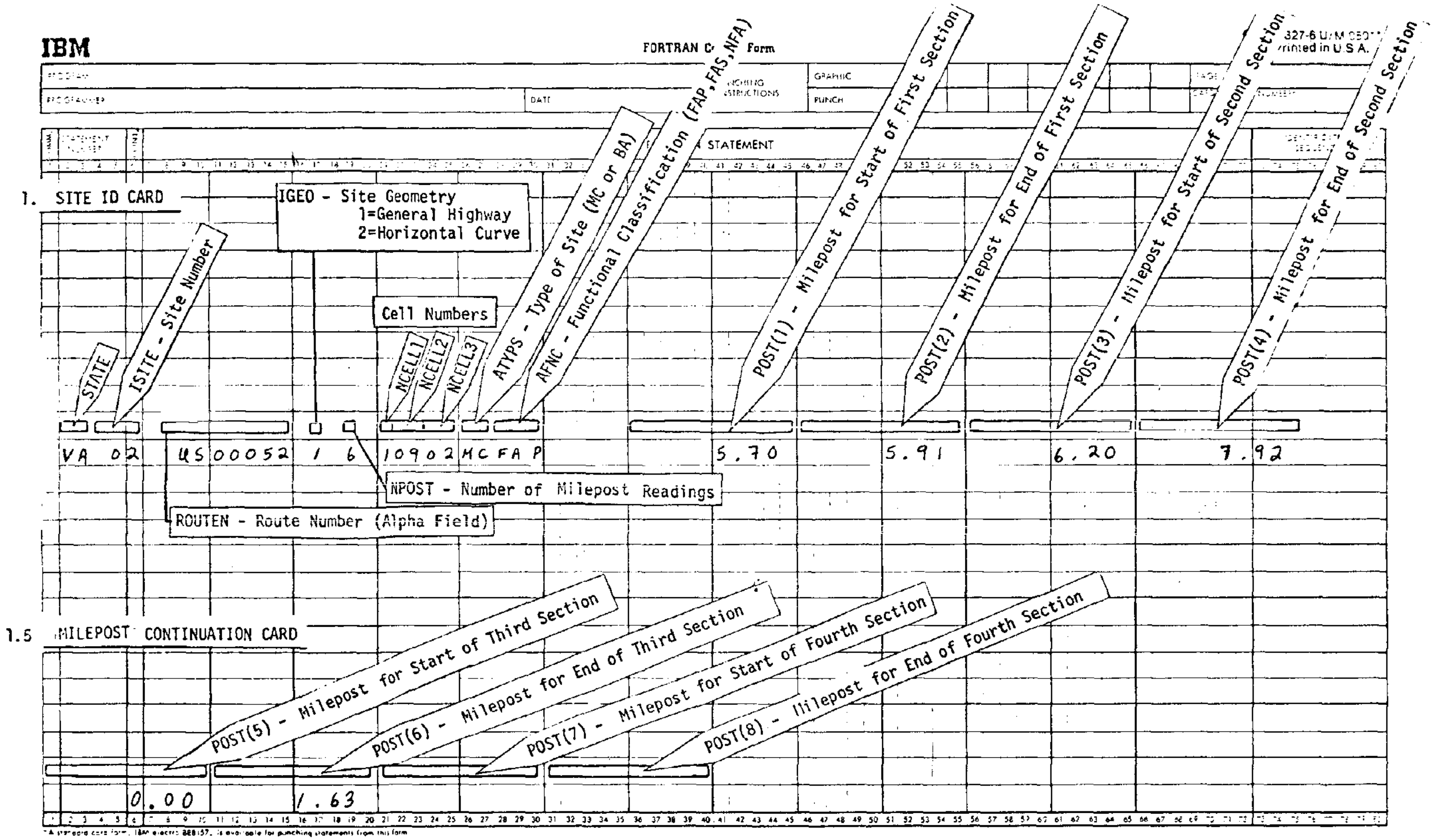


Figure 2. Data card formats for the Site ID and Milepost Cards.

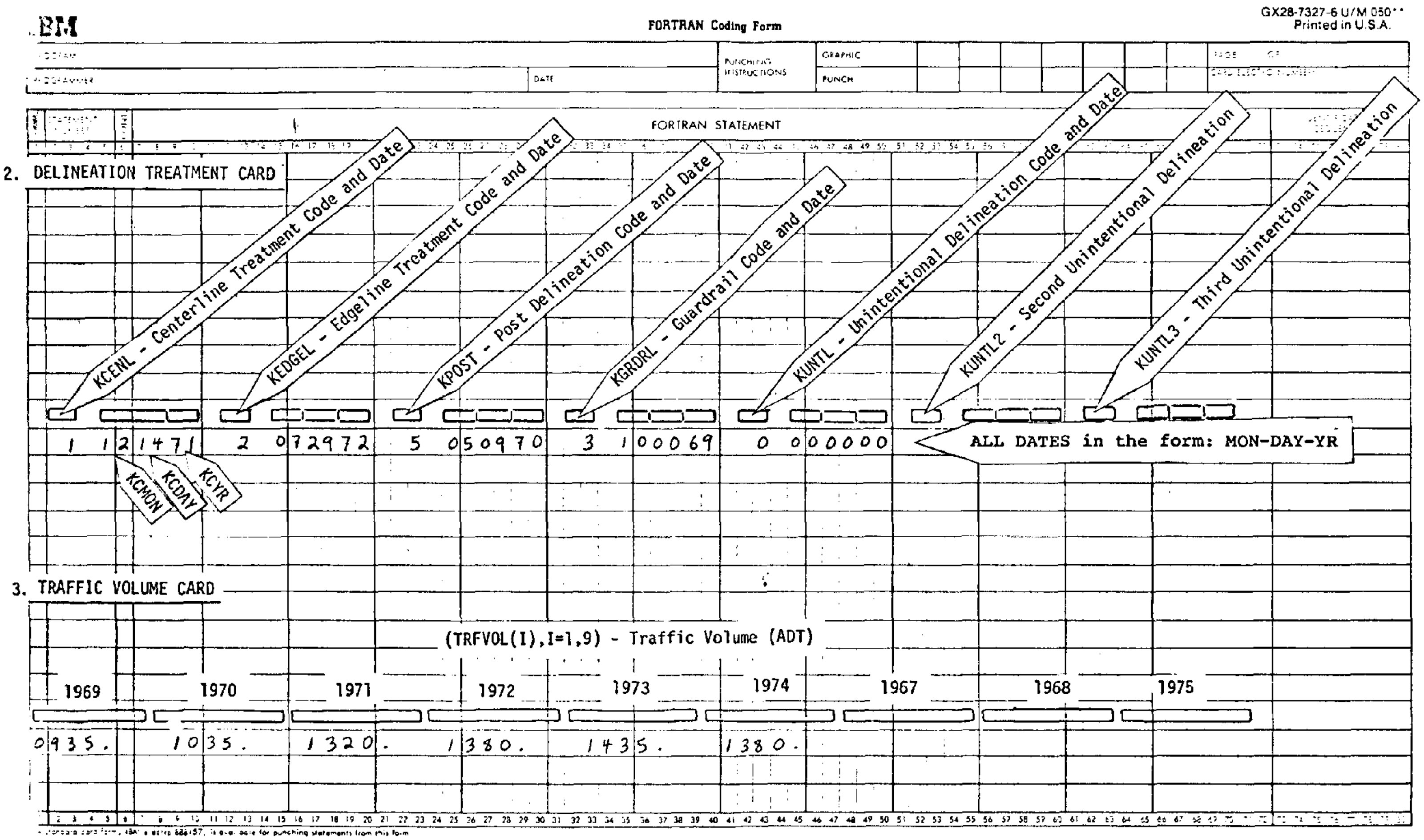


Figure 3. Data card formats for the Delineation and Traffic Volume Cards.

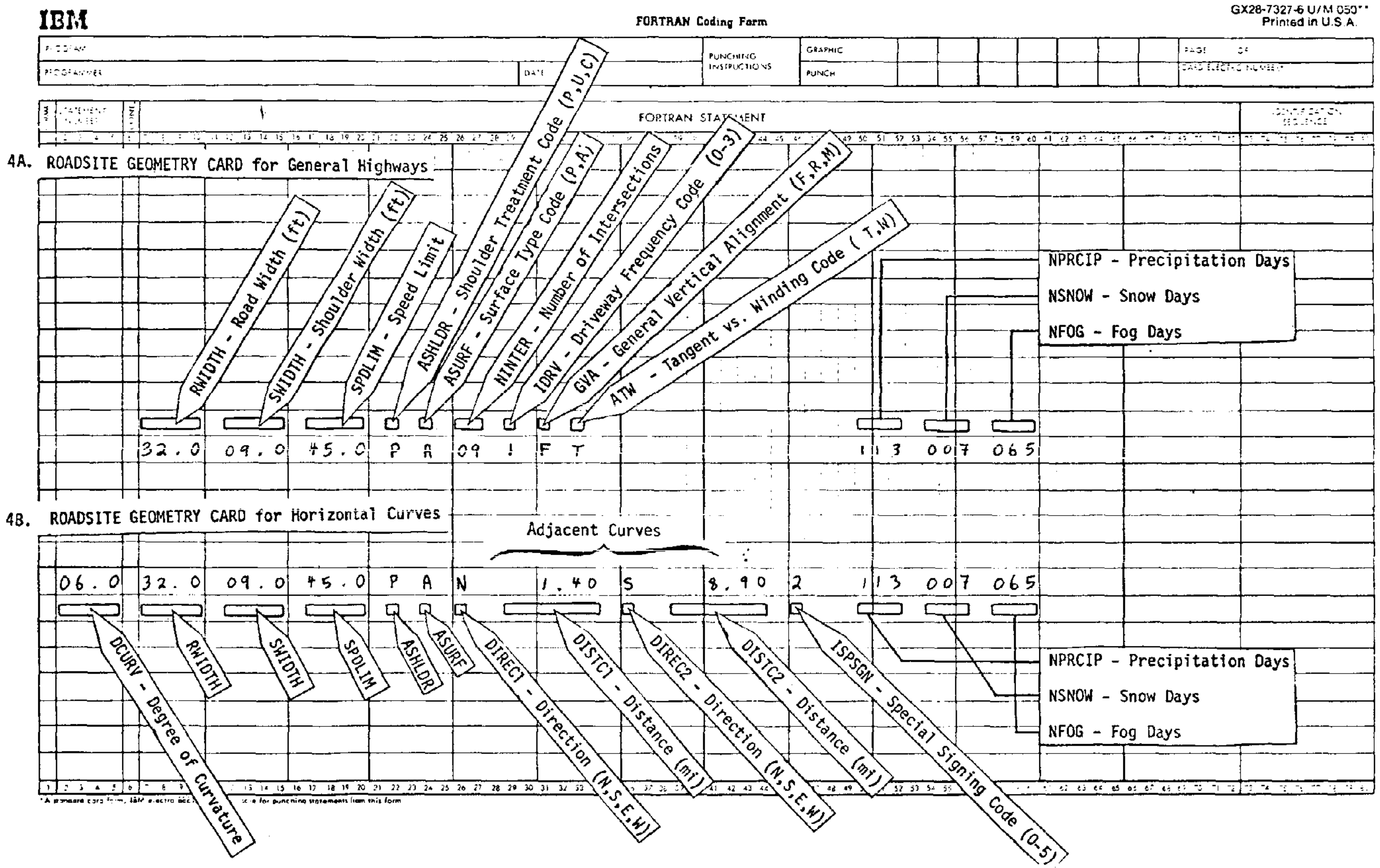


Figure 4. Data card formats for the Roadsite Geometry Cards.

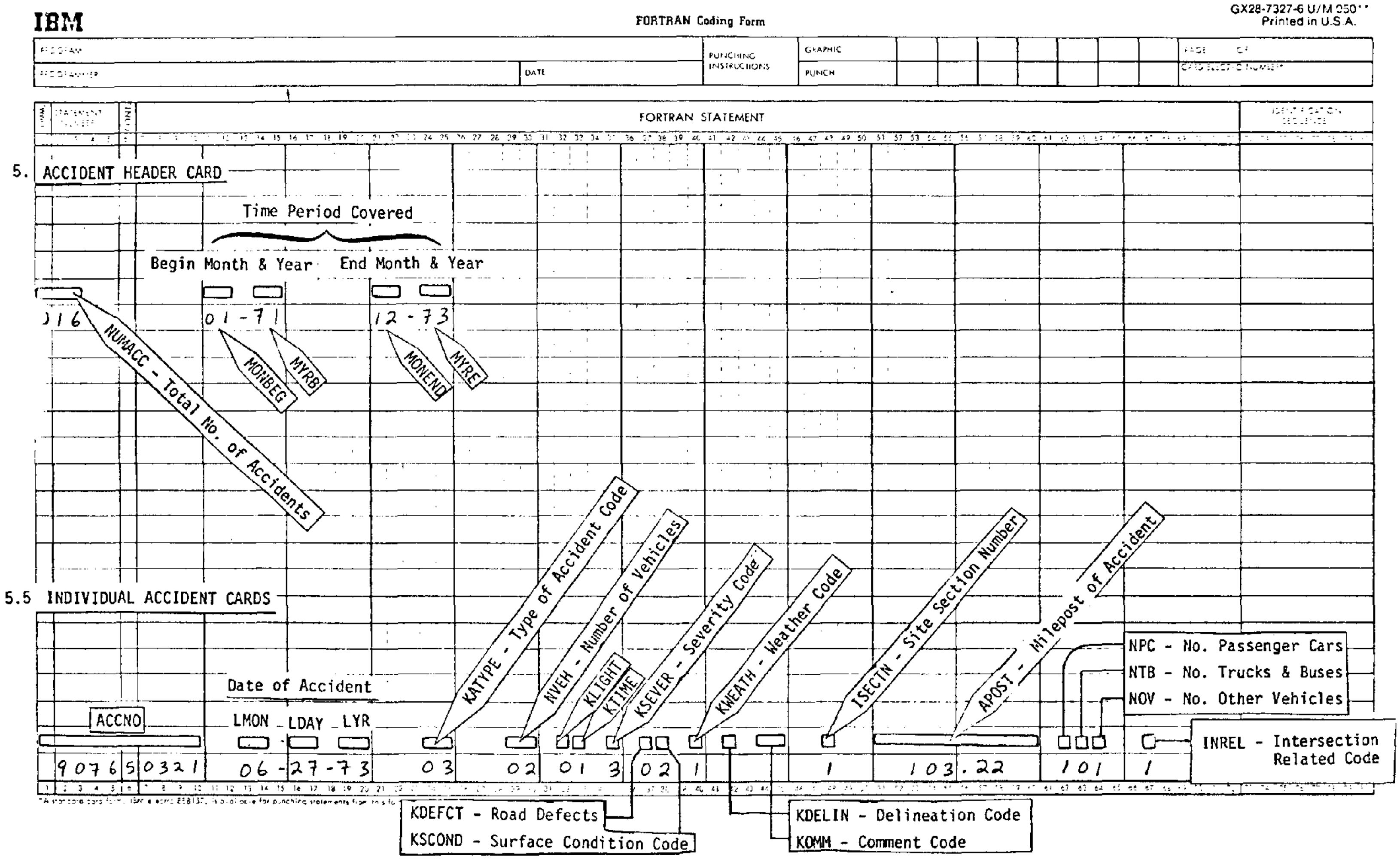


Figure 5. Data card formats for the Accident Cards.

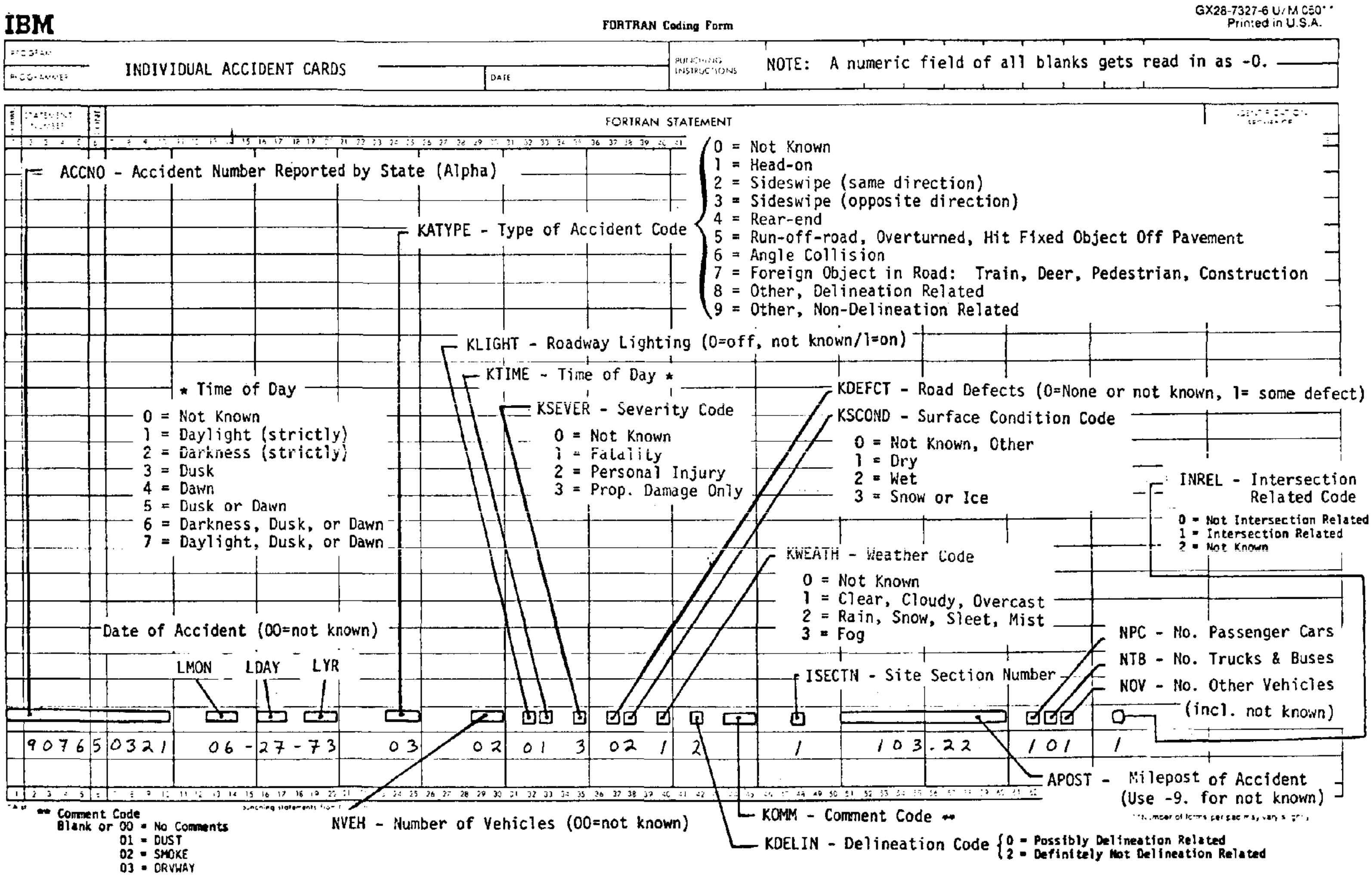


Figure 6. Data card format details for Individual Accident Cards.

B.2.2 Data Coding Activities and Difficulties

Once the data coding formats had been developed, the data were coded into IBM FORTRAN Coding Forms in preparation for keypunching. This was a relatively easy task for the site data because it had been collected and transferred in a standardized format. Accident data coding, however, required special efforts (as described below).

B.2.2.1 Accident Data Translation Guides

As mentioned previously, raw accident data varied in content and format from state-to-state and year-to-year or region-to-region within a state. Therefore, data translation guides were developed, one for each distinct set of raw data. Essentially, each data translation guide is a mini-report consisting of a set of rules, usually in the form of tables, for translating state data codes for use in this study. Table 2 is an example of one of the simpler data translation tables. Using the data translation guides, hand coding of accident data onto IBM FORTRAN Coding Forms commenced.

As the data coding progressed, two new variables, one for intersection relatedness and the other for delineation relatedness, were developed.

B.2.2.2 Coding Problems Encountered

Special cases, data anomalies, and information voids are always likely to come about in the amassing of a vast quantity of information from a variety of dissimilar sources; this study proved to be no exception. These, as well as other technical and operational problems, hampered not only the coding of accident data, but the site data as well. The numbered paragraphs below describe these problems.

SITE DATA PROBLEMS

1. Milepost Problems
    a. Most sites consisted of one continuous section of roadway. Some, however, were divided into as many as four sections due to intervening towns, major intersections, and county lines

Table 2. Example of a data translation table.

SAI	Louisiana (Cols. 34-35)
PC = Passenger Cars	A. Passenger Car G. Taxicab
TC = Trucks & Buses	C. Truck or Truck Tractor D. Truck Tractor, Semi-Trailer E. Other Truck Combination H. Bus I. School Bus
OV = Other Vehicles	B. Passenger Car and Trailer F. Farm Tractor and/or Farm Equipment J. Motorcycle K. Motor Scooter or Motor Bicycle M. Emergency (Including Private Owner) N. Military Vehicles O. Other Publicly Owned Vehicle P. Others and Not Stated
Non-Vehicles	L. Bicycle

at which the mileposting was reset to zero. These special cases were handled by allowing the bounding mileposts of each section of such a site to be coded on the input cards and to be accepted and properly utilized by the tape creation computer programs.

b. Some sites on county and secondary routes did not have mileposting. The lengths of these non-mileposted sites were measured in the field (e.g., by car odometer), and in coding, the starting milepost was arbitrarily set to zero and the terminal milepost was set to the site length.

c. Some sites experienced milepost changes. No general provision could be developed to handle these sites within the established coding formats, so a special computer subroutine was devised to adjust for these sites in the analysis. In at least one instance, the milepost change resulted from a major reconstruction such that the site length was not constant over the time period of interest. This site was eliminated.

2. Site Redefinition by Division

a. The usual reason for dividing a site into two new sites was that too many accidents occurred. The tape creation programs were written before the actual coding was started, and an arbitrary upper limit of 150 accidents per site existed in these programs (only 20 accidents per site had been expected). As a result, sites with more than this number were divided at some arbitrary interior milepost so that at the two new sites there would be a maximum of 150 accidents attributed to each site.

b. Several sites were divided because it was found that the delineation treatments were installed at different dates over different portions of the site.

c. Dividing a site created a problem with the "Number of Intersections" information. It was not always possible to determine how many intersections fell into each new division. In these cases, the original number of intersections was allocated roughly proportional to the length of each new division.

3. Traffic volumes were not known for every year of interest for some sites. Traffic volumes for these years were left blank in coding, and later an interpolation/extrapolation routine was devised to provide the missing data.

4. Some sites did not have a constant road width or shoulder width over their defined length; but in all cases, the variation was sufficiently small so that an average value sufficed. (Example: one road was 20 feet (6.09 m) wide, except in the middle of its expanse, where it was 22 feet (6.70 m) wide for some miles. An average value of 21 feet (6.40 m) was coded and used.)

5. Codes for unintentional delineation, such as utility poles, had to be devised as they were encountered, and a special provision for distinguishing intermittent unintentional delineation versus continuous unintentional delineation was devised.

ACCIDENT DATA PROBLEMS

1. The non-uniformity in content and format of the raw accident data from state-to-state, and year-to-year or region-to-region within a state was resolved by developing the data translation guides mentioned above. This, however, involved a number of difficult and arbitrary decisions.

    a. Most raw accident data provided a relatively simple Accident Type code. For some raw data formats, however, there was no such code. Thus, Accident Types had to be coded in a very complex way from various "Object Struck," "Manner of Collision," and "Directional Analysis" codes given in the raw data.

    b. In one set of raw accident data, it was impossible to distinguish head-on accidents from sideswipe, opposite direction accidents. Thus in coding, all such accidents were arbitrarily classified as the latter.

    c. The number and types of vehicles involved in an accident were not always known.

(1) Only a "single" vs. "multiple" vehicle accident code was given in one state. Thus, the multiple vehicle accidents in that state were arbitrarily coded as having two vehicles.

(2) Only the details of the first two vehicles in an accident were known for several sets of data, even though the total number was given. For such data, any vehicles beyond the first two were classified as "Other Vehicles."

(3) Vehicle types were unknown for some sets of data. One state had only a "Truck Involvement" code. The vehicles for such accidents were arbitrarily coded as though they were all trucks.

(4) One data set's TRUCK code actually included motorcycles, which did not fit the "Trucks and Buses" category. These data were, however, included in this code.

2. Due to the different record-keeping procedures of the accident data, it was often difficult to categorize accidents according to delineation/non-delineation related and intersection/non-intersection related as described below.

   a. *Intersection-Related Accidents* - One state identified intersection-related accidents by locating them at intersections regardless of whether or not the accident actually occurred at the intersection. Another state properly distinguished between accidents which occurred at intersections and were related to intersections. In contrast, most states merely classified all accidents occurring at intersections as intersection accidents and made no statement as to whether or not they actually were intersection related.

   b. *Delineation-Related Accidents* - As will be noted in the next section, individual characteristics were developed to identify accidents which could not possibly be related to the existing roadway delineation treatments. However, due to the variations in data from state to state, it was often difficult to obtain proper classification of accidents. For example, it was originally decided that any accident which involved a fixed object within the travel lane would be classified as one which could not possibly be related to the existing delineation treatment. However, some states were ambiguous regarding this situation and used such expressions as "fixed object within the roadway." This leaves doubt as to whether or not the fixed object was indeed within the travel lane or on the shoulder.

The criteria used by one state for recording accidents in their data bank changed several times over the period 1969-1974. Disclaimers were sent out warning against comparisons of accident data unless these comparisons were made within time periods in which the same criterion applied. After reviewing the disclaimers and criteria changes described therein, differences were reconciled so that the data would be usable for analysis purposes.

B.2.3 Delineation Relatedness

The identification of accidents which could have been related to the existing delineation treatment at the site, was viewed as a crucial task. If accidents, which are in fact related to the existing delineation treatments, are eliminated from the analysis due to erroneous decision criteria, they will only reduce the sample size and perhaps bias the results. On the other hand, if accidents which are unrelated to delineation treatments are included in the analysis, they will spread the distribution of data (that is, increase sample variance) and reduce the confidence associated with the derived results. It was, therefore, decided that a serious attempt be made to develop a rational procedure to eliminate those accidents which could not possibly have been related to the existing roadway delineation treatments.

Several procedures were proposed. The earliest involved weighting and rating the various information components of each accident, summing up these weighted factors, and coming up with a numerical rating for delineation relatedness for each accident. The scheme was to create a relatively objective decision-making procedure. It was decided that despite all the efforts required to assign ratings and compute the numbers, this method would be as subjective as any other method, due to the inherent subjectivity associated with assignment of rates to each factor. Also, there is no allowance for interaction between different factors in the weighted sum. It was infeasible to follow such a time-consuming scheme for the vast amount of accident data to be analyzed. Consequently, alternative procedures were formulated along different directions.

The first alternative was that a researcher, well conversant with the associated problems, could probably make the decision regarding an accident's delineation relatedness by visually reviewing all available data. In fact, a decision made by reviewing all available information regarding an accident would also take into consideration the interaction between different causal factors in an integrated fashion. Therefore, this procedure may even be superior to any other. The major disadvantage was that the decision would be a function of the decision maker. Hence, if different decision makers were used, or even if one decision maker was used but the decision process stretched over a "long" period, a bias in the results might be introduced. Nonetheless, the idea appeared promising given the time and money constraints for the project.

Tentative guidelines were set up to provide a general framework for the decision maker's task. In these guidelines, lighting and weather conditions were adjudged to be most critical. The hypothesis was that nighttime or inclement weather conditions placed an added demand on the driver; in these conditions his performance was likely to be more sensitive to existing delineation.

These subjective decision guidelines eventually gave way to a definite list of characteristics for identifying accidents which were adjudged unrelated to delineation. It was decided that accidents would be classified into two categories: those which are obviously not delineation related, and those which are possibly delineation related. The specific category definitions are:

1. those accidents for which the presence or absence of the site delineation would have had no effect on the accident occurrence; and

2. those accidents where improved delineation may have reduced the likelihood of its occurrence.

A general set of accident characteristics was developed to identify those accidents falling into category 1. All other accidents were assumed to fall into category 2. Accidents with one or more of the following characteristics were identified to be in category 1:

- Collision Type
  - train
  - animal
  - fixed object within the travel lanes
- Maneuver
  - U-turn
  - starting
  - parking
  - backing
  - improper turning
- Traffic Control
  - police officer
  - railroad crossing
- Major Factor
  - driver-related
    - improper turn
    - backing into roadway
    - stopped in roadway
    - sudden incapacitation (heart attack, epilepsy, etc.)
    - avoid animal or object on travel lanes

- vehicle-related
  - defective equipment
  - struck by object
- roadway-related
  - construction, repair zone
  - flooded

- Vehicle Type
  - farm truck
  - emergency vehicle

It was hypothesized that an accident with one or more of the above general characteristcs could not possibly be related to the existing roadway delineation treatments. This was the basis for the final delineation relatedness/non-relatedness criteria.

The variation in format and information content of the state-supplied data did not allow for the use of the above noted general characteristics without developing characteristics specific to each state. Hence, these general characteritics were utilized to develop state-specific accident characteristics from the state-supplied data base. An accident which exhibited one or more of these specific characteristics was classified as unrelated to delineation.

B.3 DESCRIPTION OF THE BASIC DATA TAPE FILE

This section incorporates the complete computer documentation, all original data translation guides, their many revisions and additions, and the associated handwritten notes generated into a detailed, annotated description of the data base on a variable-by-variable basis. All variable names, variable codes, and coding anomalies will be found in this section except for a complete discussion of delineation relatedness which was featured in Section 2.3. This is not a presentation of the data - such a presentation would require 2000 pages of computer printout. Rather, this is a detailed description of the *form* and *quality* of the data.

B.3.1 Master List of Sites

The master list of sites, as they finally appeared on tape, is presented in Tables 4 through 13. This list is slightly different from that compiled by the Site Selection/Data Collection Team as several sites were split or redefined for reasons mentioned in the table footnotes. Route numbers given are state routes unless otherwise indicated. On the data tape, the sites within a state appear in the same ascending numerical order as in these tables. The states, however, were not grouped alphabetically on the tape. Their order, given in Table 3, merely reflects the order that the input data cards were readied for final tape creation.

Table 3. Order of sites on the accident data tape.

STATE	NUMBER OF SITES	LOGICAL RECORDS ON TAPE
Idaho	36	1-36
Georgia	32	37-68
California	68	69-136
Louisiana	33	137-169
Connecticut	32	170-201
Ohio	33	202-234
Washington	68	235-302
Virginia	56	303-358
Arizona	54	359-412
Maryland	102	413-514
Total	514	

Table 4. Arizona sites.

Site	Route No.	Section No.	County	Milepost
AZ 1[a)]	US 60	1	Yuma	31.61- 40.72
AZ 2[b)]	US 80	1	Maricopa	130.00-140.53
AZ 3	US 160	1	Coconino	331.00-343.45
AZ 4	US 160	1	Coconino	322.33-331.00
AZ 5	US 93	1	Yavapai	183.00-193.00
AZ 6[c)]	US 60	1	Maricopa	123.80-130.00
AZ 7	US 60	1	Maricopa	85.56- 98.26
AZ 8	84	1	Pinal	166.30-176.75
AZ 9	US 70	1	Graham	282.00-292.00
AZ 10[d)]	US 60	1	Yuma & Maricopa	62.37- 73.52
AZ 11	90	1	Cochise	291.00-308.26
AZ 12	85	1	Maricopa	4.00- 15.31
AZ 13	83	1	Pima	53.13- 58.15
AZ 14	87	1	Pinal	145.00-159.00
AZ 15[e)]	US 89	1	Pima & Pinal	81.00- 86.16
AZ 16	95	1	Mohave	167.07-176.46
AZ 17	87	1	Coconino	317.00-322.00
AZ 18	88	1	Gila	249.00-254.00
19-29 Not Used				
AZ 30*	US 80	1	Cochise	300.54-300.88
AZ 31*	87	1	Coconino	277.86-278.47
AZ 32*	87	1	Coconino	291.70-292.06
AZ 33*	87	1	Pinal	139.33-139.67
AZ 34*	US 89A	1	Coconino	394.58-394.92
AZ 35*	US 89	1	Coconino	426.38-426.62
AZ 36*	US 89	1	Coconino	431.00-431.31
AZ 37*	US 95	1	Yuma	4.60- 4.80
AZ 38*	US 95	1	Yuma	33.75- 34.13
AZ 39*	US 95	1	Yuma	40.20- 40.50
AZ 40*	US 180	1	Coconino	249.47-249.82

Table 4. Arizona sites (continued).

Site	Route No.	Section No.	County	Milepost
AZ 41*	US 180	1	Coconino	245.78-246.04
AZ 42*	US 180	1	Coconino	246.51-246.77
AZ 43*	US 180	1	Coconino	247.20-247.41
AZ 44*	181	1	Cochise	57.12- 57.35
AZ 45*	73	1	Navajo	341.41-341.61
AZ 46*	73	1	Navajo	348.06-348.31
AZ 47*	67	1	Coconino	581.34-581.61
AZ 48*	77	1	Gila	147.00-147.34
49-59 Not Used				
AZ 60	US 89A	1	Coconino	586.26-592.00
AZ 61	264	1	Coconino	322.01-325.00
AZ 62	260	1	Gila	273.43-281.89
AZ 63	US 666	1	Greenlee	146.42-150.58
AZ 64	67	1	Coconino	579.39-593.85
AZ 65	177	1	Pinal	152.96-163.00
AZ 66	US 89A	1	Coconino	566.07-577.02
AZ 67	US 666	1	Greenlee	154.80-160.00
AZ 68	87	1	Gila	226.37-230.50
AZ 69	87	1	Maricopa	219.00-222.00
AZ 70[f)]	US 89A	1	Coconino	376.05-381.20
(Following are newly created sites - see footnotes a) through f).)				
AZ 91	US 60	1	Yuma	40.73- 49.42
AZ 92	US 80	1	Maricopa	140.54-150.00
AZ 93	US 60	1	Maricopa	130.01-139.20
AZ 94	US 60	1	Yuma & Maricopa	73.53- 84.00
AZ 95	US 89	1	Pima & Pinal	86.17- 91.00
AZ 96	US 89A	1	Coconino	381.21-387.68

* Denotes Horizontal Curve.

[a)] Site 1 was split into Sites 1 and 91 because more than 150 accidents occurred.

Table 4. Arizona sites (continued).

[b] Site 2 was split into sites 2 and 92 because more than 150 accidents occurred.

[c] Site 6 was split into sites 6 and 93 because more than 150 accidents occurred.

[d] Site 10 was split into sites 10 and 94 because more than 150 accidents occurred.

[e] Site 15 was split into sites 15 and 95 because more than 150 accidents occurred.

[f] Site 70 was split into sites 70 and 96 because more than 150 accidents occurred.

Table 5. California sites.

Site	Route No.	Section No.	County	Milepost
CA 1	36	1 2	Humboldt Humboldt	7.74-10.15 14.00-16.04
CA 2	36	1	Humboldt	37.53-42.54
CA 3	78	1	San Diego	28.00-30.00
CA 4	78	1	Imperial	1.50-12.80
CA 5	395	1 2	San Bernadino San Bernadino	6.90-10.50 25.00-36.00
CA 6*	395	1	San Bernadino	51.26-51.75
CA 7	395	1	Kern	15.20-23.00
CA 8	395	1 2	Inyo Inyo	28.00-32.00 40.74-45.40
CA 9*	395	1	Inyo	74.14-74.45
CA 10[a)]		- eliminated -		
CA 11	70	1	Butte	42.20-47.00
CA 12	46	1	San Luis Obispo	34.64-40.60
CA 13	46	1	San Luis Obispo	40.60-47.00
CA 14	97	1	Siskiyou	42.30-49.00
CA 15	99	1	Tehama	0.70- 4.24
CA 16[b)]	89	1	Shasta	16.10-21.40
CA 17*	139	1	Modoc	16.63-17.09
CA 18	139	1	Modoc	12.02-16.50
CA 19	139	1	Modoc	20.59-30.28
CA 20	299	1	Shasta	41.00-50.00
CA 21	127	1	San Bernadino	3.50-26.00
CA 22[c)]	20	1	Mendocino	3.84-15.00
CA 23	45	1	Glenn	12.15-17.65
CA 24	45	1	Colusa	26.60-33.00
CA 25*	45	1	Colusa	28.76-29.03
CA 26*	20	1	Colusa	16.86-17.05
CA 27	229	1	San Luis Obispo	5.56- 8.45
CA 28	229	1	San Luis Obispo	0.05- 5.56
CA 29*	229	1	San Luis Obispo	8.48- 8.56

Table 5. California sites (continued).

Site	Route No.	Section No.	County	Milepost
CA 30	26	1	San Joaquin	12.91-17.21
CA 31	26	1	Calaveras	6.75-10.05
CA 32	26	1	Calaveras	10.70-18.05
CA 33	113	1	Solano	8.15-18.15
CA 34	12	1	San Joaquin	10.25-13.55
CA 35	88	1	Amador	26.10-31.70
CA 36	88	1	Amador	0.00- 3.05
CA 37	88	1	San Joaquin	21.70-25.40
CA 38	79	1	Riverside	8.60-16.20
CA 39	18	1	San Bernardino	101.00-113.00
CA 40	US 95	1	San Bernardino	18.30-38.75
CA 41	195	1	Riverside	0.00- 7.20
CA 42	198	1	Fresno	27.20-42.73
CA 43	20	1	Sutter	0.60- 4.00
CA 44[d)]	16	1 2	Colusa Colusa	1.25- 7.26 0.32- 0.63
CA 45	16	1	Yolo	22.45-25.85
CA 46	16	1	Yolo	26.32-34.32
CA 47	162	1	Butte	0.00- 8.40
CA 48	162	1 2	Glenn Glenn	67.33-69.60 71.10-75.95
CA 49	US 101	1 2	Del Norte Del Norte	32.20-35.90 36.60-39.00
CA 50	111	1 2	Imperial Imperial	23.50-26.20 27.50-31.50
CA 51	111	1	Imperial	13.10-20.00
CA 52	208	1	Mendocino	0.20-13.70
CA 53	104	1	Sacramento	4.00- 8.30
CA 54	193	1	Placer	1.40- 4.40
CA 55	128	1	Sonoma	0.40- 4.10
CA 56	128	1	Sonoma	18.95-22.30
CA 57	128	1	Sonoma	15.45-18.80

Table 5. California sites (continued).

Site	Route No.	Section No.	County	Milepost
(Following are newly created sites. See footnotes b) through d).)				
CA 90	89	1	Shasta	22.00-25.90
CA 91	20	1	Mendocino	15.00-26.58
CA 92	16	1 2	Yolo Yolo	0.00- 0.32 0.63- 6.13

(Riverside County Sites)

Site	Route Name	Route Boundaries	Route Length (miles)
CA 101	McAllister St.	Riverside City Limit El Sobrante Rd.	2.26
CA 102	Nason St.	Ironwood Ave. Alessandro Blvd.	2.00
CA 103	Bridge St.	Gilman Springs Rd. Ramona Expy.	2.79
CA 104	Juniper Flats -Contour Rd.	Juniper Springs Rd. Hansen Ave.	3.94
CA 105	Rancho California Rd.	Margarita Rd. Buck Rd.	6.49
CA 107	Whitewater Canyon Rd.	Cutoff to N. Ind.	4.95
CA 113	54th Avenue	Jackson/Jefferson	3.10
CA 116	70th Avenue	Windward Dr. Hayes St.	4.50
CA 118	Calhoun St.	52nd Ave. Airport Blvd.	2.00

*Denotes Horizontal Curve.

a) Site 10 was eliminated because it was 4 lanes.

b) Site 16 was split into sites 16 and 90 because of variances in delineation installation dates.

c) Site 22 was split into sites 22 and 91 because more than 150 accidents occurred.

d) Site 44 was split into sites 44 and 92 because of variances in delineation installation dates.

Table 6. Connecticut sites.

Site	Route No.	Section No.	Townships	Milepost
CT 1	622	1	Eastford & Pomfret	1.29- 4.81
CT 2*	622	1	Pomfret	3.47- 3.51
CT 3	187	1 2	Bloomfield & Windsor Bloomfield & Windsor	3.75- 5.10 5.25- 7.25
CT 4*	833	1	N. Canaan	0.41- 0.47
CT 5	109	1 2	New Milford Washington	0.19- 3.05 6.41- 8.15
CT 6	148	1	Killingworth	0.04- 6.35
CT 7	41	1	Sharon & Salisbury	6.25- 9.50
CT 8	184	1	Stonnington & N. Stonnington	6.14-11.51
CT 9*	184	1	N. Stonnington	11.68-11.90
CT 10*	9A	1	Haddam	9.04- 9.09
CT 11	616	1	Colchester & Lebanon	2.08- 6.51
CT 12*	616	1	Lebanon	5.40- 5.46
CT 13	201	1	N. Stonnington & Griswold	9.25-12.00
CT 14	482	1	Barkhamsted	0.30- 3.81
CT 15	US 7	1	Sharon & Salisbury	61.90-68.68
CT 16	80	1	Killingworth & Deep River	18.27-21.43
CT 17	183	1	Torrington & Winchester	1.75- 5.30
CT 18	US 7	1	New Milford	40.12-43.80
CT 19	169	1	Brooklyn & Pomfret	22.13-25.33
CT 20*	316	1	Hebron	0.97- 1.07
CT 21*	203	1	Windham	4.09- 4.19
CT 22*	63	1	Goshen	45.36-45.44
CT 23*	85	1	Hebron	31.57-31.76
CT 24	181	1	Barkhamsted	3.70- 6.80
CT 25	354	1	Colchester & Salem	1.20- 5.15
CT 26*	354	1	Colchester	2.38- 2.57
CT 27	434	1	East Haddam	6.00- 9.50

Table 6. Connecticut sites (continued).

Site	Route No.	Section No.	Townships	Milepost
CT 28	69	1	Burlington	30.83-35.00
CT 29*	31	1	Coventry	9.96-10.02
CT 30	US 44	1	Putnam	104.10-107.46
CT 31*	US 44	1	Putnam	105.48-105.60
CT 32	58	1	Farfield & Easton	3.58- 6.85

*Denotes Horizontal Curve.

Table 7. Georgia sites.

Site	Route No.[a)]	Section No.	County	Milepost
GA 1	13	1 2	Gwinnett Hall	19.92-22.91 0.00- 2.30
GA 2	82	1 2	Jackson Hall	19.94-21.64 0.00- 3.97
GA 3	323	1	Hall	2.70- 7.57
GA 4	323	1	Banks	0.00- 4.75
GA 5	98	1 2	Banks Banks	9.44-12.01 13.64-16.41
GA 6	98	1	Banks	1.00- 5.96
GA 7*	52	1	Hall	3.29- 3.44
GA 8		- eliminated -		
GA 9	13	1	Hall	21.92-25.39
GA 10	9	1	Lumpkin	13.93-20.19
GA 11	60	1	Lumpkin	17.35-22.70
GA 12	180	1	Union	0.00-10.57
GA 13	11	1	Union & Lumpkin[b)]	0.00- 9.63
GA 14	197	1	Habersham	9.63-12.53
GA 15	197	1	Habersham	12.53-19.32
GA 16	S2224	1	Habersham	0.00- 5.10
GA 17	17	1	Stephens	11.74-15.06
GA 18	328	1	Stephens	0.00- 3.60
GA 19	328	1	Franklin	1.50- 6.15
GA 20	CR167	1	Elbert	0.00- 7.51
GA 21	S2216	1	Elbert	6.97-12.54
GA 22*	12	1	Greene	15.06-15.15
GA 23	22	1	Hancock	15.40-20.43
GA 24	15	1 2	Washington Washington	20.19-22.76 25.75-28.37
GA 25*	24	1	Morgan	3.29- 3.44
GA 26	143	1 2	Dade Walker	11.13-14.09 0.00- 0.67

Table 7. Georgia sites (continued).

Site	Route No.	Section No.	County	Milepost
GA 27	143	1	Walker	0.70- 5.20
GA 28	205	1	Cherokee	3.22-10.30
GA 29	156	1	Cherokee	7.35-14.00
GA 30	120	1	Haralson	1.35- 2.95
		2	Haralson	3.80- 7.80
GA 31	120	1	Haralson	14.10-17.84
		2	Paulding	0.00- 6.40
GA 32	CR 71	1	Lumpkin	0.00- 8.35
GA 33	S2224	1	Habersham	5.10-10.40

*Denotes Horizontal Curve.

a) S denotes Secondary Road, CR denotes County Road.

b) County boundary occurs at milepost 2.01.

Table 8. Idaho sites.

Site	Route No.	Section No.	County	Milepost
ID 1	78	1	Owyhee	25.00- 28.62
ID 2*	78	1	Owyhee	18.56- 18.76
ID 3*	78	1	Owyhee	24.74- 24.93
ID 4	25	1	Jerome	11.00- 15.10
ID 5*	25	1	Jerome	28.60- 28.77
ID 6	US 93	1	Jerome	59.00- 65.80
ID 7	US 26	1	Gooding	145.70-149.50
ID 8*	US 95	1	Benewah	380.71-380.86
ID 9	71	1	Washington	0.00- 13.00
ID 10	US 95	1	Adams	161.70-168.20
ID 11	US 95	1	Adams	168.20-174.10
ID 12	US 95	1	Canyon	49.20- 53.50
ID 13	US 95	1	Lewis	265.00-272.00
ID 14*	US 26	1	Blaine	199.09-199.27
ID 15	US 12	1	Nez Perce	15.85- 26.50
ID 16	US 12	1	Clearwater	44.20- 51.50
ID 17	US 12	1	Lewis	51.90- 63.50
ID 18	41	1	Bonner	22.50- 37.50
ID 19	81	1	Cassia	4.90- 13.30
ID 20	81	1	Cassia	0.60- 4.30
ID 21	28	1	Lemhi	113.60-134.30
ID 22	28	1	Lemhi	103.20-113.60
ID 23	19	1	Canyon	14.60- 17.60
ID 24	19	1	Canyon	9.30- 13.30
ID 25	41	1	Kootenai	1.42- 6.60
ID 26	11	1	Clearwater	18.90- 24.70
ID 27	3	1	Kootenai	97.65-103.35
ID 28	99	1	Latah	2.95- 10.85
ID 29	US 30	1	Caribou	389.80-397.80

Table 8. Idaho sites (continued).

Site	Route No.	Section No.	County	Milepost
ID 30	52	1	Boise Gem	47.00- 54.00
ID 31	55	1	Boise	67.05- 75.05
ID 32*	27	1	Cassia	7.58- 7.75
ID 33	US 30	1	Bear Lake	436.00-441.60
ID 34	39	1	Bingham	29.90- 35.10
ID 35	39	1	Power	3.30- 7.60
ID 36	55	1	Boise	53.80- 60.00

*Denotes Horizontal Curve.

Table 9. Louisiana sites.

Site	Route No.	Section No.	Parish	Milepost
LA 1	14	1	Calcasieu	12.85- 19.55
LA 2	82	1	Cameron	62.30- 68.30
LA 3	101	1	Calcasieu & Jefferson Davis (3.06)	0.00- 8.22
LA 4	1	1	Pointe Coupee	213.00-217.00
LA 5	1	1 2	Avoyelles Avoyelles	241.30-243.30 245.50-249.90
LA 6	696	1	Vermillion	0.00- 9.00
LA 7	343	1 2	Vermillion Lafayette	0.00- 6.00 10.25- 17.25
LA 8	12	1	Calcasieu	6.00- 15.20
LA 9	27	1	Calcasieu	93.30-100.30
LA 10	401	1	Assumption	2.75- 8.20
LA 11	22	1	Livingston	18.50- 27.50
LA 12	77	1	Iberville	0.00- 6.40
LA 13	77	1	Iberville	10.00- 13.40
LA 14	77	1	Iberville	24.25- 28.90
LA 15	76	1	West Baton Rouge	14.85- 20.60
LA 16*	1148	1	Iberville	1.95- 2.03
LA 17	411	1	Iberville	5.95 11.45
LA 18*	US 71	1	Winn	118.88-119.12
LA 19*	389	1	Beauregard	5.32- 5.69
LA 20*	1207	1	Rapides	3.90- 4.09
LA 21*	US 90	1	Calcasieu	18.52- 18.66
LA 22	US 90	1	Calcasieu	9.42- 18.12
LA 23*	109	1	Calcasieu	6.91- 7.18
LA 24	10	1	St. Helena	181.90-189.00
LA 25*	8	1	Vernon	42.69- 43.00
LA 26	8	1	Vernon	38.20- 41.30
LA 27	8	1	Vernon	31.30- 35.80
LA 28	10	1	Allen	33.65- 39.65

Table 9. Louisiana sites (continued).

Site	Route No.	Section No.	Parish	Milepost
LA 29	13	1	Acadia	7.65- 15.15
LA 30	13	1	Acadia	20.90- 31.60
LA 31*	13	1	Acadia	33.10- 33.37
LA 32	67	1	East Feliciana	34.05- 37.70
LA 33*	67	1	East Feliciana	37.92- 38.25

*Denotes Horizontal Curve.

Table 10. Maryland sites.

Site	Route No.	Section No.	County	Mileposts
MD 1	42	1	Garrett	9.65-15.15
MD 2	42	1	Garrett	3.00- 6.80
MD 3[a]	130	1	Baltimore	0.04- 1.37
MD 4	137	1	Baltimore	2.00- 7.75
MD 5	125	1	Baltimore	0.10- 3.59
MD 6	235	1	St. Mary's	2.70- 9.55
MD 7		- eliminated -		
MD 8	544	1	Queen Anne's	0.50- 8.80
MD 9*	291	1	Kent	15.12-15.24
MD 10		- eliminated -		
MD 11	346	1	Wicomico	7.25-14.00
MD 12*	346	1	Wicomico	14.16-14.26
MD 13	65	1 2	Washington Washington	2.00- 5.00 5.40- 6.50
MD 14	153	1	Frederick	0.20- 6.40
MD 15	413	1	Somerset	6.00-13.00
MD 16		- eliminated-		
MD 17*	667	1	Somerset	5.08- 5.26
MD 18*	495	1	Garrett	5.55- 5.92
MD 19*	128	1	Baltimore	2.32- 2.44
MD 20*	77	1	Carroll	0.95- 1.04
MD 21*	232	1	Charles	5.98- 6.10
MD 22	313	1	Dorchester	6.20- 9.30
MD 23*	313	1	Dorchester	10.03-10.21
MD 24		- eliminated -		
MD 25	75	1	Frederick	0.75- 4.75
MD 26	US 40	1	Washington	27.00-33.00 18.33-24.78[b]
MD 27*	57	1	Washington	2.38- 2.50
MD 28	85	1 2 3	Frederick Frederick Frederick	1.15- 3.25 3.40- 4.36 4.46- 4.80

Table 10. Maryland sites (continued).

Site	Route No.	Section No.	County	Milepost
MD 29*	85	1	Frederick	4.36- 4.46
MD 30*	85	1	Frederick	3.25- 3.40
MD 31*	26	1	Frederick	3.25- 3.40
MD 32*	165	1	Harford	1.22- 1.46
MD 33*	165	1	Harford	12.86-13.08
MD 34*	136	1	Harford	5.26- 5.40
MD 35*	51	1	Allegheny	17.36-17.59
MD 36*	261	1	Calvert	4.25- 4.34
MD 37*	521	1	Calvert	1.21- 1.39[c)]
MD 38*	760	1	Calvert	0.99- 1.20
MD 39*	312	1	Caroline	5.14- 5.24 4.24- 4.34[d)]
MD 40*	312	1	Caroline	10.71-10.80 9.83- 9.92[e)]
MD 41*	313	1	Caroline	32.49-32.77 27.61-27.89[f)] 32.18-32.46
MD 42*	314	1	Caroline	2.42- 2.52 2.36- 2.46[g)]
MD 43*	213	1	Cecil	5.53- 5.66
MD 44*	282	1	Cecil	7.62- 7.68
MD 45*	803	1	Cecil	0.75- 0.82
MD 46*	227	1	Charles	12.41-12.49
MD 47*	231	1	Charles	2.99- 3.06
MD 48*	231	1	Charles	9.50- 9.69
MD 49*	146	1	Harford	1.87- 1.93
MD 50*	425	1	Charles	7.25- 7.38
MD 51	488	1 2	Charles Charles	1.10- 2.30 3.40- 4.40
MD 52*	488	1	Charles	2.39- 2.51
MD 53*	16	1	Dorchester	10.84-10.90 10.95-11.01[h)]

Table 10. Maryland sites (continued).

Site	Route No.	Section No.	County	Milepost
MD 54*	313	1	Dorchester	1.76- 1.83
MD 55*	313	1	Dorchester	3.72- 3.77
MD 56*	313	1	Dorchester	4.46- 4.53
MD 57*	335	1	Dorchester	7.01- 7.09
MD 58*	335	1	Dorchester	13.39-13.52
MD 59*	462	1	Harford	1.99- 2.10
MD 60	336	1 2 3	Dorchester Dorchester Dorchester	0.40- 1.25[i] 2.00- 3.60[i] 3.85- 4.94[i]
MD 61*	336	1	Dorchester	0.27- 0.36
MD 62*	336	1	Dorchester	1.37- 1.41
MD 63*	31	1	Frederick	4.31- 4.43
MD 64*	75	1	Frederick	6.13- 6.23
MD 65*	77	1	Frederick	13.31-13.39
MD 66	550 81[j]	1	Frederick	0.70- 4.60
MD 67*	180	1	Frederick	15.19-15.24
MD 68*	495	1	Garrett	12.75-12.83
MD 69	495	1	Garrett	13.70-16.70
MD 70*	US 50	1	Garrett	0.44- 0.50
MD 71*	US 50	1	Garrett	1.23- 1.32
MD 72*	7	1	Harford	8.07- 8.18
MD 73*	23	1	Harford	11.17-11.27
MD 74*	543	1	Harford	6.92- 7.14
MD 75*	144A	1	Howard	13.52-13.61
MD 76*	20	1	Kent	3.77- 3.81
MD 77*	21	1	Kent	2.16- 2.28 1.24- 1.12[k]
MD 78*	213	1	Kent	10.91-11.00
MD 79*	213	1	Kent	11.48-11.64
MD 80*	297	1	Kent	5.05- 5.10 4.97- 5.03[l]

Table 10. Maryland sites (continued).

Site	Route No.	Section No.	County	Milepost
MD 81*	298	1	Kent	6.23- 6.33
MD 82*	80	1	Frederick	3.78- 3.81
MD 83*	300	1	Queen Anne's	11.32-11.48 m) 11.16-11.32
MD 84*	514	1	Kent	2.10- 2.16
MD 85*	28	1	Montgomery	8.72- 8.83
MD 86*	18C	1	Queen Anne's	8.06- 8.10 15.13-15.17 n)
MD 87*	213	1	Queen Anne's	11.13-11.20
MD 88*	213	1	Queen Anne's	9.87-10.19
MD 89*	313	1	Queen Anne's	11.14-11.21
MD 90*	242	1	St. Mary's	4.92- 4.98
MD 91*	299	1	Kent	2.04- 2.21
MD 92*	363	1	Somerset	15.98-16.19
MD 93		- eliminated -		
MD 94*	667	1	Somerset	1.41- 1.46
MD 95*	667	1	Somerset	4.17- 4.27
MD 96*	667	1	Somerset	7.76- 7.83
MD 97*	667	1	Somerset	15.61-15.79
MD 98*	333	1	Talbot	6.31- 6.46
MD 99*	12	1	Wicomico	2.25- 2.39
MD 100*	12	1	Wicomico	4.37- 4.46
MD 101*	349	1	Wicomico	16.99-17.11
MD 102*	352	1	Wicomico	8.59- 8.70
MD 103*	354	1	Worchester	2.60- 2.78
MD 104*	365	1	Worchester	3.33- 3.42
MD 105*	335	1	Dorchester	12.97-13.08
MD 106	108	1	Montgomery	4.50- 7.10 o) 14.57-11.97
MD 190 p)	130	1	Baltimore	1.84- 4.33

*Denotes Horizontal Curve.

Table 10. Maryland sites (continued).

[a] Site 3 was split into sites 3 and 190 because more than 150 accidents occurred.

[b] Mileposts 27.00-33.00 apply to site 26 for the year 1972-1975; and mileposts 18.33-24.78 apply for the years 1969-1971. Apparently, there was reconstruction sometime between 1971 and 1972. Only accidents after June 1972 (apparent date of reconstruction completion) were used in analysis.

[c] These mileposts apply only to the years 1970 and 1972-1975. Apparently the 1971 mileposts were different.

[d] Mileposts 5.14-5.24 apply for 1972-1975; and 4.24-4.34 for 1970-1971.

[e] Mileposts 10.71-10.80 apply for 1972-1975; and 9.83-9.92 for 1970-1971.

[f] Mileposts 32.49-32.77 apply for 1972-1975; mileposts 27.61-27.89 for 1971; and 32.18-32.46 for 1970.

[g] Mileposts 2.42-2.52 apply for 1973-1975; and 2.36-2.46 for 1970-1972.

[h] Mileposts 10.84-10.90 apply for 1972-1975; and 10.95-11.01 for 1970-1971.

[i] Mileposts given in the table apply for 1971-1975. For 1970 the mileposts are 4.54-3.69 for section 1, 2.94-1.34 for section 2, and 1.09-0.00 for section 3 (note also change in mileposting direction).

[j] Route 81 applies for 1970-1974, for 1975 the route number was changed to 550.

[k] Mileposts 2.16-2.28 apply for 1972-1975; and 1.24-1.12 for 1970-1971 (note also change in mileposting direction).

[l] Mileposts 5.04-5.10 apply for 1973-1975; and 4.97-5.03 for 1970-1972.

[m] Mileposts 11.32-11.48 apply for 1972-1975; and 11.16-11.32 for 1970-1971.

[n] Mileposts 8.06-8.10 apply for 1971-1975; and 15.13-15.17 for 1970.

[o] Mileposts 4.50-7.10 apply for 1971-1975; and 14.57-11.97 for 1970 (note also direction change).

[p] Newly created site - previously was section 2 of site 3.

Table 11. Ohio sites.

Site	Route No.	Section No.	County	Milepost
OH 1	204	1	Fairfield	2.54- 5.56
OH 2*	204	1	Fairfield	6.63- 6.67
OH 3	204	1	Fairfield	7.66-10.91
		2	Fairfield	11.41-13.31
OH 4	37	1	Fairfield	2.50- 6.35
OH 5	37	1	Fairfield	6.35- 9.60
OH 6	158	1	Fairfield	11.10-13.55
		2	Fairfield	13.95-15.63
OH 7	US 40	1	Licking	17.05-19.36
		2	Licking	19.90-24.70
OH 8	310	1	Licking	5.33- 9.98
OH 9*	US 62	1	Licking	0.34- 0.36
OH 10	US 62	1	Licking	5.40-10.46
OH 11	657	1	Licking	9.94-14.55
OH 12	79	1	Licking	17.00-23.00
OH 13	313	1	Muskingum	5.60- 7.32
		2	Guernsey	0.00- 1.16
OH 14	284	1	Muskingum	0.00- 5.70
OH 15	284	1	Morgan	0.00- 4.10
OH 16	564	1	Noble	9.00-13.70
OH 17	260	1	Noble	3.73-12.11
OH 18	536	1	Monroe	1.00- 5.00
		2	Monroe	6.00- 8.00
		3	Monroe	9.00-12.10
OH 19	255	1	Monroe	0.00- 9.00
OH 20	26	1	Monroe	7.76-14.64
OH 21	537	1	Monroe	0.00- 4.97
OH 22	260	1	Washington	10.15-11.13
		2	Monroe	0.00- 5.52
OH 23	691	1	Athens	4.90- 8.99
OH 24	555	1	Morgan	0.00- 3.00
OH 25	555	1	Morgan	4.40-11.50

Table 11. Ohio sites (continued).

Site	Route No.	Section No.	County	Milepost
OH 26	555	1	Morgan	18.00-21.00
OH 27	669	1	Morgan	3.00- 8.00
OH 28	668	1	Perry	12.50-16.50
OH 29*	188	1	Fairfield	4.81- 4.88
OH 30*	188	1	Fairfield	3.88- 3.92
OH 31*	188	1	Pickaway	4.64- 4.68
OH 32*	104	1	Pickaway	12.40-12.47
OH 33	104	1	Pickaway	16.40-21.51

*Denotes Horizontal Curve.

Table 12. Virginia sites.

Site	Route No.	Section No.	County	Milepost
VA 1		- eliminated -[a]		
VA 2	31	1	Surry	15.98-16.45
		2	Sussex	0.00- 3.23
VA 3	45	1	Cumberland	2.95-14.40
VA 4	US 522	1	Louisa	16.91-19.82
		2	Louisa	21.19-28.25
VA 5	US 522	1	Louisa	14.38-16.91
		2	Louisa	19.82-21.19
VA 6	20	1	Albemarle	0.00- 1.45
		2	Albemarle	4.86-12.12
VA 7	53	1	Albemarle (18')[b]	6.75- 9.50
		2	Fluvanna (16')	0.00- 5.65
		3	Fluvanna (18')	5.65- 7.92
VA 8	53	1	Albemarle	3.17- 6.75
		2	Fluvanna	7.92- 8.70
VA 9	6	1	Goochland (20'&22')[c]	18.20-26.48
VA 10	US 250	1	Henrico	13.50-15.91
		2	Goochland	0.00- 8.26
VA 11	35	1	Prince George	1.18- 4.77
VA 12	40	1	Sussex	17.54-18.80
		2	Sussex	19.30-22.56
VA 13	40	1	Sussex	11.01-17.54
VA 14	31	1	Surry	5.50- 9.50
		2	Surry	14.40-15.98
VA 15	10	1	Surry	20.50-24.27
		2	Prince George	0.00- 1.50
VA 16	10	1	Surry	11.00-20.50
VA 17	5	1	Charles City	22.65-27.00
		2	Henrico	0.00- 1.72
VA 18	156	1	Henrico	8.00-12.40
		2	Henrico	13.59-17.70
		3	Hanover	0.40-10.13
VA 19*	10	1	Prince George	11.90[d]
VA 20*	22	1	Louisa	13.97[d]

Table 12. Virginia sites (continued).

Site	Route No.	Section No.	County	Milepost
VA 21*	22	1	Louisa	18.64[d)]
VA 22*	31	1	Surry	8.30[d)]
VA 23*	31	1	Surry	15.26[d)]
VA 24*	US 15	1	Fluvanna	12.55[d)]
VA 25	US 15	1	Louisa	4.06-10.48
VA 26	618	1	Louisa	e)
VA 27	6	1	Albemarle	10.10-13.73
VA 28	56	1	Nelson	0.00-10.59
VA 29*	56	1	Buckingham	2.20- 2.30
VA 30	US 15	1	Fluvanna	0.00- 5.00
VA 31	US 522	1	Orange	2.61-13.62
VA 32*	22	1	Louisa	3.30- 3.40
VA 33*	US 522	1	Culpepper	14.05-14.25
VA 34	45	1	Goochland	0.00- 4.80
VA 35	45	1	Cumberland	2.95-14.40
VA 36	13	1	Cumberland	0.00- 6.02
VA 37	45	1 2	Cumberland Cumberland	19.18-22.02 24.48-29.50
VA 38	40	1	Lunenburg	23.47-27.57
VA 39*	40	1	Lunenberg	20.31-20.41
VA 40	40	1	Lunenberg	14.88-18.63
VA 41	137	1	Brunswick	0.00- 3.20
VA 42	712	1	Brunswick	f)
VA 43	271	1 2	Goochland[g)] Hanover	0.06- 0.48 0.00- 3.16
VA 44	3	1 2	Richmond[g)] Westmoreland	18.45-18.60 0.00- 5.60
VA 45*	205	1	Westmoreland	3.08- 3.23
VA 46*	201	1	Lancaster	6.86- 6.96
VA 47*	US 17	1	Essex	2.04- 2.19
VA 48	218	1	King George	8.49-16.35

Table 12. Virginia sites (continued).

Site	Route No.	Section No.	County	Milepost
VA 49	218	1	King George	16.35-20.49
VA 50	738	1	Fairfax	h)
VA 51	215	1	Prince William	0.70- 3.04
		2	Prince William	3.23- 6.58
VA 52*	215	1	Faugier	0.90- 1.00
VA 53	57	1	Pittsylvania	7.73- 8.63
		2	Pittsylvania	9.03-11.13
VA 54	40	1	Pittsylvania	0.00-10.61
VA 55	40	1	Halifax	0.97- 8.91
VA 56	56	1	Nelson	19.90-21.50
		2	Nelson	22.35-23.95
VA 57	24	1	Campbell	15.01-19.00

*Denotes Horizontal Curve.

a) Site 1 was eliminated because it had 4 lanes.

b) Numbers in parenthesis are roadwidths. An average value of 17 ft was put on the data tape.

c) Roadwidth is 20 ft to milepost 21.98, it is 22 ft thereafter. An average value of 21 ft was put on the data tape.

d) Only the centerpoint of the horizontal curve was obtained for sites 19 through 24.

e) This secondary road is 9.50 miles long, extending from Route 701 to Route 700.

f) This secondary road is 4.20 miles long, extending from Route 721 to Route 608.

g) Section numbers of these sites (43 and 44) have been reversed from those originally assigned by the Site Selection/Data Collection Team so as to conform with the convention that the end milepost of section 1 and the beginning milepost of section 2 form a common boundary when such exist.

h) This secondary road is 3.82 miles long, extending from Route 193 to Route 684.

Table 13. Washington sites.

Site	Route No.	Section No.	County	Milepost
WA 1	395	1	Ferry	258.19-263.89
WA 2	129	1	Asotin	0.00- 4.39
WA 3	129	1	Asotin	5.60- 13.25
WA 4*	125	1	Walla Walla	17.04- 17.58
WA 5	104	1	Jefferson	2.20- 8.90
WA 6	97	1	Kittatas	142.40-146.00
WA 7	21	1	Lincoln	63.90- 66.90
WA 8	220	1	Yakima	11.40- 21.22
WA 9	220	1	Yakima	21.23- 26.45
WA 10[a)]	7	1	Pierce	36.38- 41.08
WA 11	21	1	Adams	5.00- 12.00
WA 12	26	1	Adams	62.08- 70.58
WA 13	26	1	Adams	70.58- 77.58
WA 14	20[b)] 30[b)]	1	Ferry	310.04-320.04 48.19- 58.19
WA 15	20[c)] 30[c)]	1	Ferry	306.44-310.04 44.58- 48.18
WA 16	172	1	Douglas	22.87- 34.87
WA 17	108	1	Mason	4.18- 10.68
WA 18	142	1	Klickitat	13.50- 18.80
WA 19	142	1	Klickitat	4.00- 10.00
WA 20	7	1	Pierce	22.62- 25.90
WA 21	7	1	Pierce	27.42- 31.92
WA 22*	261	1	Adams	21.54- 21.82
WA 23	702	1	Pierce	2.00- 8.00
WA 24	27	1	Whitman	15.78- 23.58
WA 25*	243	1	Grant	19.41- 19.55
WA 26*	243	1	Grant	15.30- 15.52
WA 27*	243	1	Grant	14.37- 14.55
WA 28*	243	1	Grant	10.85- 10.98

Table 13. Washington sites (continued).

Site	Route No.	Section No.	County	Milepost
WA 29*	231	1	Stevens	56.44- 56.52
WA 30	221	1	Benton	2.70- 17.00
WA 31	241	1	Yakima	1.40- 5.70
WA 32*	241	1	Yakima	15.39- 15.51
WA 33*	241	1	Yakima	8.86- 8.96
WA 34*	504	1	Cowlitz	40.37- 40.53
WA 35*	504	1	Cowlitz	29.54- 29.64
WA 36*	101	1	Clallam	201.14-201.30
WA 37*	101	1	Grays Harbor	119.21-119.32
WA 38	101	1	Clallam	221.06-231.06
WA 39*	224	1	Benton	2.74- 2.81
WA 40*	4	1	Wahkiakum	27.66- 27.80
WA 41	4	1	Wahkiakum	21.71- 24.76
WA 42*	12	1	Walla Walla	333.28-333.42
WA 43*	20[d)] 30[d)]	1	Okanogan	267.21-267.32 5.26- 5.37
WA 44*	20[e)] 30[e)]	1	Okanogan	292.09-292.20 30.14- 30.25
WA 45*	508	1	Lewis	10.77- 10.86
WA 46*	508	1	Lewis	11.82- 11.88
WA 47*	507	1	Thurston	10.48- 10.63
WA 48*	510	1	Thurston	11.47- 11.55
WA 49*	542	1	Whatcom	25.40- 25.46
WA 50*	14	1	Klickitat	96.93- 97.05
WA 51*	2	1	Lincoln	233.42-233.66
WA 52	2	1	Lincoln	233.73-237.98
WA 53*	24	1	Yakima	15.30- 15.38
WA 54*	24	1	Yakima	17.83- 17.95
WA 55*	24	1	Yakima	23.93- 24.02
WA 56*	24	1	Yakima	25.99- 26.06
WA 57*	23	1	Whitman	8.81- 8.99

Table 13. Washington sites (continued).

Site	Route No.	Section No.	County	Milepost
WA 58*	395	1	Stevens	189.09-189.30
WA 59*	21	1	Ferry	146.69-146.83
WA 60	97	1	Kittitas	149.86-157.26
WA 61*	97	1	Chelan	178.69-179.02
WA 62*	97	1	Okanogan	312.27-312.43
WA 63*	24	1	Grant	52.17- 52.28
WA 64	24	1	Grant	53.58- 65.18
WA 65*	25	1	Stevens	39.31- 39.39
WA 66*	202	1	King	11.47- 11.67
WA 67*	231	1	Lincoln	41.36- 41.53
WA 90[f)]	7	1	Pierce	42.08- 45.68

*Denotes Horizontal Curve.

[a)] Site 10 was split into sites 10 and 90 because more than 150 accidents occurred.

[b)] Designation "Route 20 mileposts 310.04-320.04" applies for 1973 to present; designations "Route 30 mileposts 48.19-58.19" applies for 1970-1972.

[c)] Designations "Route 20 mileposts 306.44-310.04" applies for 1973 to present; designations "Route 30 mileposts 44.58-48.18" applies for 1970-1972.

[d)] Designations "Route 20 mileposts 267.21-267.32" applies for 1973 to present; designations "Route 30 mileposts 5.26-5.37" applies for 1970-1972.

[e)] Designations "Route 20 mileposts 292.09-292.20" applies for 1973 to present; designations "Route 30 mileposts 30.14-30.25" applies for 1970-1972.

[f)] Newly created site (formerly second section of site 10).

B.3.2 Detailed Variable List and Data Description

A list of the variables associated with the basic data tape is presented in Table 14. Most of these variables are present on the input data cards, and are organized as follows:

Card Number 1.0 - SITE ID CARD

Card Number 1.5 - MILEPOST CONTINUATION CARD
(Note: the program will not look for this card unless NPOST .GT. 4.)

Card Number 2.0 - DELINEATION TREATMENT CARD

Card Number 3.0 - TRAFFIC VOLUME CARD

Card Number 4.0 - ROAD SITE GEOMETRY CARD

4A. - For General Highway Situations (IGEO = 1)

4B. - For Horizontal Curves (IGEO = 2)

Card Number 5.0 - ACCIDENT HEADER CARD

Card Number 5.5 - INDIVIDUAL ACCIDENT CARD

It should be mentioned that the cards had to be punched according to the 026 keypunch character set. It was not necessary to type 0 into those numeric fields for which data were missing and 0 was the designated "not known" code. With FORTRAN, blank numeric fields are read into the computer as -0.

The grouping and order of the variables in Table B-14 are based primarily on their order on the input cards, with some modification made for logical grouping. This order will be precisely adhered to in the discussion that follows.

STATE, ISITE, ROUTEN

These variables identify the site. The standard two-letter postal abbreviation is punched onto the Site ID Card, it is then read into memory by an A2 format and the bit configuration is transferred to tape. The abbreviations used are as follows:

AZ = Arizona
CA = California
CT = Connecticut
GA = Georgia
ID = Idaho
LA = Louisiana
MD = Maryland
OH = Ohio
VA = Virginia
WA = Washington

Table 14. Variables associated with the basic data tape.

(Unless otherwise indicated, all variables can be assumed to be on basic tape.)

VARIABLE	CARD NUMBER	CARD COLUMN	FORMAT	MEANING
STATE	1.0	2-3	A2	State; two letter postal abbreviation
ISITE	1.0	4-6	I3	Site number
ROUTEN	1.0	8-15	A8	Route number or name
NPOST	1.0	19	I1	Number of milepost readings
POST(1)	1.0	36-45	F10.3	Milepost of start of Section 1
POST(2)	1.0	46-55	F10.3	Milepost of end of Section 1
POST(3)	1.0	56-65	F10.3	Milepost of start of Section 2
POST(4)	1.0	66-75	F10.3	Milepost of end of Section 2
POST(5)	1.5	1-10	F10.3	Milepost of start of Section 3
POST(6)	1.5	11-20	F10.3	Milepost of end of Section 3
POST(7)	1.5	21-30	F10.3	Milepost of start of Section 4
POST(8)	1.5	31-40	F10.3	Milepost of end of Section 4
SLENG	-	-	-	Site length (mi)
NSECTN	-	-	-	Number of site sections
IGEO	1.0	17	I1	Site geometry
ATW*	4A.	33	A1	Tangent vs. winding
ITW	-	-	-	Tangent, winding, horizontal curve
ATYPS*	1.0	26-27	A2	Type of site
ITYPS	-	-	-	Type of site
AFNC*	1.0	28-30	A3	Functional classification
IFNC	-	-	-	Functional classification
NCELL1	1.0	21	I1	First cell number
NCELL2	1.0	22-23	I2	Second cell number
NCELL3	1.0	24-25	I2	Third cell number
KCENL	2.0	2-3	I2	Centerline treatment
KCMON	2.0	5-6	I2	Month
KCDAY	2.0	7-8	I2	Day
KCYR	2.0	9-10	I2	Year

Table 14. Variables associated with the basic data tape (continued).

VARIABLE	CARD NUMBER	CARD COLUMN	FORMAT	MEANING
KEDGEL	2.0	12-13	I2	Edgeline treatment
KEMON	2.0	15-16	I2	Month
KEDAY	2.0	17-18	I2	Day
KEYR	2.0	19-20	I2	Year
KPOST	2.0	22-23	I2	Post delineation
KPMON	2.0	25-26	I2	Month
KPDAY	2.0	27-28	I2	Day
KPYR	2.0	29-30	I2	Year
KGRDRL	2.0	32-33	I2	Guardrail
KGMON	2.0	35-36	I2	Month
KGDAY	2.0	37-38	I2	Day
KGYR	2.0	39-40	I2	Year
KUNTL	2.0	42-43	I2	First unintentional delineation
KUMON	2.0	45-46	I2	Month
KUDAY	2.0	47-48	I2	Day
KUYR	2.0	49-50	I2	Year
KUNTL2	2.0	52-53	I2	Second unintentional delineation
KUMON2	2.0	55-56	I2	Month
KUDAY2	2.0	57-58	I2	Day
KUYR2	2.0	59-60	I2	Year
KUNTL3	2.0	62-63	I2	Third unintentional delineation
KUMON3	2.0	65-66	I2	Month
KUDAY3	2.0	67-68	I2	Day
KUYR3	2.0	69-70	I2	Year
TRFVOL(1)	3.0	1-7	F7.2	1969 traffic volume
TRFVOL(2)	3.0	8-15	F8.2	1970 traffic volume
TRFVOL(3)	3.0	16-23	F8.2	1971 traffic volume
TRFVOL(4)	3.0	24-31	F8.2	1972 traffic volume
TRFVOL(5)	3.0	32-39	F8.2	1973 traffic volume
TRFVOL(6)	3.0	40-47	F8.2	1974 traffic volume

Table 14. Variables associated with the basic data tape (continued).

VARIABLE	CARD NUMBER	CARD COLUMN	FORMAT	MEANING
TRFVOL(7)	3.0	48-55	F8.2	1967 traffic volume
TRFVOL(8)	3.0	56-63	F8.2	1968 traffic volume
TRFVOL(9)	3.0	64-71	F8.2	1975 traffic volume
NPRCIP	4A.or4B.	50-52	I3	Precipitation days
NSNOW	4A.or4B.	54-56	I3	Snow days
NFOG	4A.or4B.	58-60	I3	Fog days
RWIDTH	4A.or4B.	7-10	F4.1	Roadwidth (ft)
SWIDTH	4A.or4B.	12-15	F4.1	Shoulder width (ft)
SPDLIM	4A.or4B.	17-20	F4.1	Posted speed limit
ASHLDR*	4A.or4B.	22	A1	Shoulder type
ISHLDR	-	-	-	Shoulder type
ASURF*	4A.or4B.	24	A1	Surface type
ISURF	-	-	-	Surface type
NINTER	4A.	26-27	I2	Number of intersections
IDRV	4A.	29	I1	Driveway frequency
GVA*	4A.	31	A1	General vertical alignment
IGVA	-	-	-	General vertical alignment
DCURV	4B.	2-5	F4.1	Degree of curvature
DIREC1	4B.	26	A1	Direction to adjacent curve
DISTC1	4B.	29-34	F6.2	Distance to adjacent curve
DIREC2	4B.	36	A1	Direction to adjacent curve
DISTC2	4B.	39-44	F6.2	Distance to adjacent curve
ISPSGN	4B.	46	I1	Special signing
NUMACC	5.0	1-3	I3	Number of accidents
MONBEG	5.0	11-12	I2	Begin month
MYRB	5.0	14-15	I2	Begin year
MONEND	5.0	21-22	I2	End month
MYRE	5.0	24-25	I2	End year
NUMDO	-	-	-	DO loop range

Table 14. Variables associated with the basic data tape (continued).

VARIABLE	CARD NUMBER	CARD COLUMN	FORMAT	MEANING
NEXTRA	-	-	-	Number of extra values
EXTRA(1)	-	-	-	Extra value
- The following variables are defined for I=1, ..., NUMACC -				
ACCNO(I)	5.5	1-10	A10	Reported accident number
LMON(I)	5.5	13-14	I2	Month
LDAY(I)	5.5	16-17	I2	Day
LYR(I)	5.5	19-20	I2	Year
ISECTN(I)	5.5	48	I1	Section number
APOST(I)	5.5	51-60	F10.4	Accident milepost location
KATYPE(I)	5.5	24-25	I2	Accident type
NVEH(I)	5.5	29-30	I2	Number of vehicles
NPC(I)	5.5	62	I1	Number of passenger cars
NTB(I)	5.5	63	I1	Number of trucks/buses
NOV(I)	5.5	64	I1	Number of other vehicles
KLIGHT(I)	5.5	32	I1	Road lights
KTIME(I)	5.5	33	I1	Time of day lighting
KSEVER(I)	5.5	35	I1	Accident severity
KDEFCT(I)	5.5	37	I1	Road defects
KSCOND(I)	5.5	38	I1	Surface condition
KWEATH(I)	5.5	40	I1	Weather
KDELIN(I)	5.5	42	I1	Delineation relatedness
KOMM(I)	5.5	44-45	I2	Comments
INREL(I)	5.5	67	I1	Intersection relatedness

*Denotes that the variable does not reside on the basic data tape.

The route number or name information is read into memory using an A8 format and the bit configuration is transferred to tape. State route numbers have been entered merely as numbers, sometimes with leading zeroes to partially fill out the A-field, while U.S. routes have the prefix US, e.g., US Route 95 is "US00095". Some sites had no route numbers, just names such as "NASON" for Nason St., Riverside, California. Other sites had route number changes. Washington site 14, for example, was handled "20 (30)".

NPOST, POST (1)-(8), SLENG, NSECTN

These variables identify the boundaries of the site by milepost and give its total length (SLENG) in miles, usually to the nearest .01 mile. Most sites consisted of one continuous section of roadway. Some, however, were divided into as many as four sections due to conditions such as intervening towns, major intersections, or county lines where the mileposting was reset to zero. The mileposts for each of the section boundaries are to be specified in array POST; NPOST is the number of these readings. All this is best illustrated by the example in Figure 7. The number of sections NSECTN is not an input - the computer calculates it from NPOST. Likewise, SLENG is a computation rather than an input.

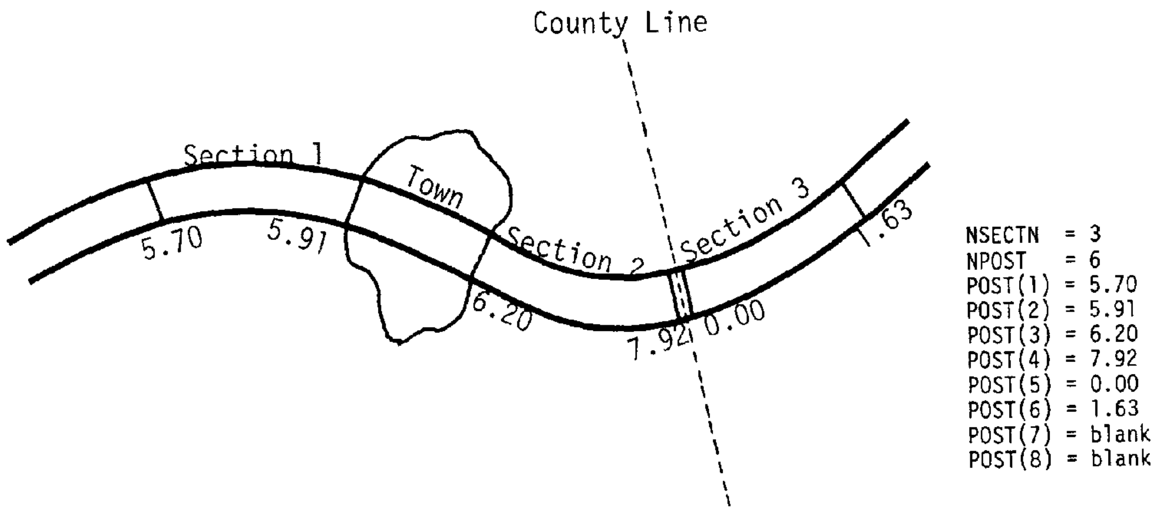


Figure 7. Example of site sections and milepost readings.

A few sites had unique mileposting problems.

1. Only the milepost of the centerpoint of Virginia sites 19 through 24 was obtained by the Site Selection/Data Collection Team. These sites are horizontal curves. In the analysis it was arbitrarily decided that the boundaries of these sites would be set .2 mile in either direction from the centerpoint; special analysis programs were devised to accomplish this, for on the tape there is POST(1) = POST(2) = centerpoint and SLENG = 0.

2. Mileposts did not exist for Virginia sites 26, 42, 50; Georgia sites 16, 20, 21, 32, 33; and California Riverside County sites 101 through 118. These are all secondary or county routes. The lengths of these sites were known, consequently, the start milepost was set to zero and the end milepost set to the length.

3. Washington sites 14, 15, 43 and 44 underwent milepost and route number changes. These sites were all unisectional. The following example illustrates the method used to handle these types of sites:

   Washington Site 14

   ```
   NPOST   = 6
   POST(1) = 310.04 = start of site, 1973 mileposting
   POST(2) = 320.04 = end of site, 1973 mileposting
   POST(3) = 48.19 }
   POST(4) = 48.19 }  start of site, pre-1973 mileposting
   POST(5) = 58.19 }
   POST(6) = 58.19 }  end of site, pre-1973 mileposting
   ```

   Note that the most recent mileposting is primary on the tape, and that the above method permitted a proper SLENG to be computed.

4. Maryland sites 26, 37, 39, 40, 41, 42, 53, 60, 66, 77, 80, 83, 86, and 106 also underwent milepost or route number changes. Since site 60 had more than one section, the method used above for Washington would not work. The most recent mileposting was therefore used on tape for these sites, and the next pair of entries in the POST array were set to -9, so as to flag these problem sites on tape. A special routine was later devised in the computer analysis, cataloging all milepost changes and their dates.

IGEO, ATW, ITW

These variables specify the site geometry via codes given in Table 15. IGEO and ATW are used to define ITW. Another important purpose of IGEO is to tell the card-reading program whether to expect Road Site Geometry Card type 4A. or 4B.

Table 15. Site geometry codes.

IGEO	ATW (Input Only)	ITW (Tape Only)
1 = General Highway 2 = Horizontal Curve	T = Tangent W = Winding	0 = Horizontal Curve 1 = Tangent Site 2 = Winding Site

ATYPS, ITYPS, AFNC, IFNC

These codes are for Type of Site and Functional Classification as defined in Tables 16 and 17. In both cases an alphabetic code was used for input and a numeric code was defined for tape.

Table 16. Type of site codes.

ATYPS (Input Only)	ITYPS (Tape Only)	MEANING
MC	1	Matching-Control Site
BA	2	Before-After Site
blank	0 or -0	No Unique Site Type

Table 17. Functional classification codes.

AFNC (Input Only)	IFNC (Tape Only)	MEANING
FAP	1	Federal Aid Primary
FAS	2	Federal Aid Secondary
NFA	3	Non-Federal Aid
blank	0 or -0	Missing Information

The ITYPS flag on the basic data tape is a foolproof indication that the site is an MC site or a BA site. The original MC/BA criteria were deemed unsatisfactory for the actual analysis performed. Several sites had been unclassifiable because in most cases a unique classification (MC or BA) did not apply. Such sites could be utilized for both the MC and BA analysis by applying suitable restrictions to their accident analysis time period dates. In addition, many sites classified as MC or BA did not strictly adhere to their classification over the entire time period of their available data. Consequently, a new set of criteria were developed and used in the analysis. The new criteria considered not only the ITYPS flag but also the site's delineations, delineation installation dates, and accident data availability dates. (For details see subsequent sections of this Appendix and Appendix C.)

NCELL1, NCELL2, NCELL3

A set of six tables in matrix form was developed to serve as criteria, a design plan for the selection of sites, and the subsequent statistical analysis (e.g., Analysis of Variance). The tables, their rows and columns, were numbered. NCELL1 is the table number, NCELL2 is the column number, and NCELL3 is the row number. If a particular cell number could not be uniquely assigned to a particular site, it was set to zero.

The six original tables were later revised as data for certain cells could not be filled. Two tables for four-lane rural roads were deleted. The revised tables are presented in Figures 8 through 11 for reference. With reference to these tables, the cell numbers were defined as above.

Several sites could not be assigned a complete set of cell numbers. In some cases this was due to the fact that the site did not fall into any of the revised tables. In other cases, the site's delineation was so frequently updated and improved that no one unique

CENTERLINE ON 2-LANE ROADS

Controls: Sections Ten Miles in Length
No Edgelines or Post Delineators

Table 1

Delineation Treatment	Roadway Characteristic																	
	Type of Section*	Tangent								Winding								Row Number
	Roadway Width (ft.)	16-18				>18				16-18				>18				
	Volume (ADT)	0-2000		2000-5000		0-2000		2000-5000		0-2000		2000-5000		0-2000		2000-5000		
	Shoulder Width (ft.)	<4	≥4	<4	≥4	<4	≥4	<4	≥4	<4	≥4	<4	≥4	<4	≥4	<4	≥4	
No Centerline																		1
Painted Centerline																		2
RPM's on Painted Centerline																		3
	Column Number →	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	

*Tangent - Predominantly tangent sections with no curves greater than three degrees

Winding - Predominantly curved sections with degrees of curvature greater than three degrees with tangent sections of less than 1500 feet between curves.

Shaded areas denote cells which were deleted from the study.

Figure 8. Site criteria matrix for NCELL1 = 1.

EDGELINES ON 2-LANE ROADS

Controls: Sections Ten Miles in Length
Roadway Width > 20 Feet
Painted Centerlines
No Continuous Post Delineators

Table 2

Delineation Treatment	Roadway Characteristic									Row Number
	Type of Section*	Tangent				Winding				
	Volume (ADT)	0-2000		2000-5000		0-2000		2000-5000		
	Shoulder Width (ft.)	<4	≥4	<4	≥4	<4	≥4	<4	≥4	
No Edgelines		←			Selected sites from Table 1.**					1
Painted Edgelines										2
	Column Number →	1	2	3	4	5	6	7	8	

*Tangent - Predominantly tangent sections with no curves greater than three degrees.

Winding - Predominantly curved sections with degrees of curvature greater than three degrees with tangent sections of less than 1500 feet between curves.

**Selected sites designated in Table 1 with a painted centerline may have characteristics which satisfy these requirements. Therefore, the same sites may be used in both analyses, reducing the total number of sites necessary.

Shaded areas denote cells deleted from the study.

Figure 9. Site criteria matrix for NCELL1 = 2.

POST DELINEATORS ON 2-LANE ROADS

Controls: Sections Ten Miles in Length
Roadway Width 20 Feet
Shoulder Width 4 Feet
Painted Centerline

Table 3

Delineation Treatment	Roadway Characteristic									Row Number
	Type of Section*	Tangent (Post Delineators on Right Side Only)				Winding (Post Delineators on Outside of Curve Only)				
	Volume (ADT)	0-2000		2000-5000		0-2000		2000-5000		
	Presence of Edgelines (Painted)	Without Edgelines	With Edgelines	Without Edgelines	With Edgelines	Without Edgelines	With Edgelines	Without Edgelines	With Edgelines	
Without Post Delineators		← Selected sites from Tables 1 and 2 ** →								1
With Post Delineators										2
	Column Number →	1	2	3	4	5	6	7	8	

*Tangent - Predominantly tangent sections with no curves greater than three degrees.

Winding - Predominantly curved sections with degrees of curvature greater than three degrees with tangent sections of less than 1500 feet between curves.

** Selected sites designated in Table 1 with a painted centerline or those sites designated in Table 2 with painted edgelines may have characteristics which meet these requirements. Therefore, the same sites may be used in both analyses, reducing the total number of sites necessary

Figure 10. Site criteria matrix for NCELL1 = 4.

HORIZONTAL CURVE ON 2-LANE ROAD

Controls: Should be an Isolated Curve
Must have superelevation

Table 4

Delineation Treatment	Roadway Characteristic																	Row Number
	Roadway Width (ft.)	< 20								≥ 20								
	Degree of Curvature	3-6				> 6				3-6				> 6				
	Volume (ADT)	0-2000		2000-5000		0-2000		2000-5000		0-2000		2000-5000		0-2000		2000-5000		
	Shoulder Width (ft).	<4	≥4	<4	≥4	<4	≥4	<4	≥4	<4	≥4	<4	≥4	<4	≥4	<4	≥4	
None																		1
Painted Centerline																		2
RPM's on Painted Centerline																		3
Painted Edgelines w/ Painted Centerline																		4
Post Delineators w/ Painted Centerline																		5
Post Delineators w/ Painted Centerline & Painted Edgelines																		6
Painted Centerline w/ Continuous GUARDRAIL*																		7
	Column Number ⟶	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	

*Steel guadrail (painted or corrugated but excluding CORTEN STEEL) with no retroreflective system.
Shaded areas denote cells which were deleted from the study.

Figure 11. Site criteria matrix for NCELL1 = 5.

cell number could apply during its analysis time period. In addition, some sites were selected as part of the AMV Field Evaluation Study and therefore did not necessarily fit the SAI criteria.

Ultimately, it was determined that the cell numbers and their design tables were unsuitable for the statistical analysis of the sites actually obtained and put on tape. Cell frequencies were generally unequal, some being zero (i.e., no site fell into the cell). A more balanced design was required in the statistical analysis, necessitating the construction of new statistical designs (see Appendix C), additional programming to implement these designs, and the total disregard of the actual cell numbers on the data tape.

KCENL through KUYR3

The codes for the primary delineation treatment variables KCENL, KEDGEL, KPOST, AND KGRDRL are given in Tables 18 through 21. For each of these delineation type variables there is a set of date variables of the form K_MON, K_DAY, K_YR. For example, KCMON-KCDAY-KCYR is the date that centerline treatment type KCENL was installed. The date convention is highlighted in Table 22.

Table 18. Centerline treatment code.

KCENL
0 = No Information
1 = None
2 = Paint - dashed
3 = Paint - solid one side, dashed on other side
4 = Paint - double solid
5 = Paint - unknown pattern
6 = RPM's - reflective markers only between paint gaps
7 = RPM's - reflective markers between paint gaps with ceramic markers on paint
8 = RPM's - continuous reflective markers
9 = RPM's - only ceramic markers

Table 19. Edgeline treatment code.

KEDGEL
0 = No Information
1 = No Treatment
2 = Solid White Paint

Table 20. Post delineation treatment code.

KPOST
0 = No Information
1 = None (i.e., no treatment)
2 = Continuous - crystal reflectors on one side
3 = Continuous - crystal reflectors on both sides
4 = Continuous - reflectorized paddles on one side
5 = Continuous - reflectorized paddles on both sides
6 = Continuous - crystal reflectors on paddles, one side
7 = Continuous - crystal reflectors on paddles, both sides
8 = Noncontinuous - delineators at culverts, bridges, hazards, etc.
9 = Noncontinuous - reflectors on sharp curves
10 = Noncontinuous - reflectorized paddles on sharp curves
11 = Noncontinuous - reflectors on paddles on sharp curves

Table 21. Guardrail treatment code.

KGRDRL (applies only to Horizontal Curves)
0 = No Information, or does not apply
1 = None (no treatment)
2 = Galvanized Steel Rail
3 = Painted Steel Rail
4 = Cable Type
5 = Expandable Mesh Type

Table 22. Delineation installation date convention.

K_MON	Number of the month, e.g., 12 for December
K_DAY	Number of the day
K_YR	Number of the year, e.g., 72 for 1972

Note: A value of 00 for any of the above variables singly denotes "Not Known". If all three are 00, this denotes the date is "Not Known" *or* it was prior to the first year of available accident data.

The dates of delineation installation were very important in the analysis because often it would happen that a delineation was installed (e.g., on 3-14-75) after the time period covered by the accident data on tape (e.g., 1-70 through 12-74). Thus, it was *not* sufficient to merely check the delineation codes — one must have checked the associated dates as well.

In those cases where a delineation date followed the accident analysis time period, one could not determine actual delineation present during the time period. The following convention was therefore assumed. If the installation date of a painted centerline, edgeline, post system or guardrail treatment occurred after the accident analysis time period, such a treatment was assumed not to exist during the analysis time period. If the treatment was an RPM centerline, the site was assumed to have a painted centerline of unknown pattern during the analysis time period.

Up to three unintentional delineations were allowed on the tape, KUNTL, KUNTL2, KUNTL3. Their codes are given in Table 23. Date variables were set up for these unintentional delineations, but in practice, all were 00-00-00, and so the initial presence of all unintentional delineations was assumed prior to the first year of available accident data. Note that "unintentional" is perhaps a misnomer since code 04 is guardrails. This code (04) was used for curves which had guardrails on the approaches but not in the curve itself. Finally, Table 24 is a catalogue of all "other unintentional delineation" actually encountered.

TRFVOL (1)-(9)

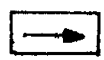
Traffic volume is given in ADT, which means average daily traffic (number of vehicles per day). Traffic volume is known for each year of available accident data for most sites. However, most of the Ohio sites, as a rule, had traffic volumes available only every other year. In addition, a few sites in Georgia, Washington, and Connecticut did not have traffic volumes available for every year. An interpolation/ extrapolation routine was therefore developed to fill in these missing data during the analysis.

For many sites traffic volume fluctuated more than had been expected. There was one extreme case, CA site 53, where ADT values during 1970-1975 were 470, 500, 1650, 1650, 800, 900. Upon request, these values were specifically reconfirmed by the state agency, and it was also determined that no unusual occurrences (e.g., road detour) had affected the ADT values.

Table 23. Unintentional delineation codes.

Blank, -0, or 0	= None or Not Known
01	= Fence or "Fence Line"
11	= Intermittent Fence Line
02	= Trees or "Tree Line"
12	= Intermittent Tree Line
03	= Poles or "Pole Line," including telephone poles, power lines, and mail boxes
13	= Intermittent Poles
04	= Guardrails or Rock/Stone walls
14	= Intermittent Guardrails, including sporadic guardrails, guardrails on curves of winding roads, intermittent stone walls, and mountain roads with rock walls on one side and shear drops on the other side
05	= Ditch or "Ditch Lines," including cuts and fills, bank cuts, road follows stream or bayou, road follows railroad tracks
15	= Intermittent Ditch
06	= Shoulder, including asphaltic curb, shoulder color
16	= Intermittent Shoulder
07	= Other Unintentional Delineation
17	= Intermittent Other Unintentional Delineation

Table 24. Master list of "other" unintentional delineations.

SITE	CODED	ACTUAL
MD 25	17	"Short sections of all of these (fence line, tree line, pole line, guardrails, other) scattered throughout the route."
MD 59*	07	"Speed limit sign is at mid-point on outside of curve."
MD 82*	07	"Big tree stump painted on outside of curve."
MD 90*	07	"Arrow signs  on curve at midpoint."
MD 102*	07	"Buildings on outside."
WA 27*	07	"Advertising sign on curve."

*Denotes horizontal curve.

NPRCIP, NSNOW, FNOG

These are the average number of precipitation, snow, and fog days per year (one value for each per site).

RWIDTH, SWIDTH

These are specified in feet. SWIDTH = 00.0 and denotes "no shoulder".

SPDLIM

This is the Posted Speed Limit (mph), with 0.00 denoting "not known" *or* "no posted speed limit."

On the data tape a provision was made for only one posted speed limit per site. Unfortunately, many sites underwent changes in posted speed limits during the period of time accident data were made available. This was particularly noticable in Washington sites where over half had speed limits lowered from 60 mph or 70 mph to 55 mph. Many California sites were also reduced from 65 mph to 55 mph. As a rule, the most recent posted speed limit was put on the data tape. For most sites, detailed histories of posted speed limits were unavailable, and if changes did occur they were unknown.

Another problem was that some sites had speed limits that differed for cars and trucks (e.g., Virginia site 25, as well as fifteen other Virginia sites). Yet another problem was that there could be several differing posted speed limits within one site (e.g., Arizona sites 61, 62, and 65).

Overall, there were many sites for which a speed limit was not posted, or, if posted, the speed limit was not known. The final consensus was that the SPDLIM variable was unreliable for use in any analysis.

ASHLDR, ISHLDR, ASURF, ISURF

The codes for these variables are presented in Tables 25 and 26.

Table 25. Shoulder treatment codes.

ASHLDR (Input Only)	ISHLDR (Tape Only)	MEANING
P	1	Paved
U	2	Unpaved
C	3	Combination of paved and unpaved
blank	0 or -0	Not known or no shoulder

Table 26. Road pavement surface type codes.

ASURF (Input Only)	ISURF (Tape Only)	MEANING
P	1	Portland cement concrete
A	2	Asphaltic or bituminous concrete
blank	0 or -0	Not known

NINTER, IDRV, GVA, IGVA

These variables are set to 0 for Horizontal Curves since they apply only for General Sites. Tables 27 and 28 present the codes. It should be mentioned that in Arizona "turn-off areas to rest stops" were counted as driveways.

Table 27. Driveway frequency code.

IDRV
0 = Not known, or does not apply (Horizontal Curves)
1 = Few or None
2 = Moderate
3 = Many

Table 28. General vertical alignment codes.

GVA (Input Only)	IGVA (Tape Only)	MEANING
F	1	Flat
R	2	Rolling
M	3	Mountainous
blank	0 or -0	Not known or does not apply (Horizontal Curve)

The "number of intersections within the site" variable, NINTER, should *not* be considered uniformly reliable. A careful review of sites revealed some significant discrepancies between the mileposts of intersections given in the site data and the mileposts of accidents that occurred at intersections. A casual review of the other sites generally revealed similar inconsistencies, although some states seemed to be free of this problem. In one state a master list of intersection mileposts was provided so that the data were made consistent.

DCURV, DIREC1, DISTC1, DIREC2, DISTC2, ISPSGN

These variables apply only to Horizontal Curves; they take on values of either zero or a Holerith blank (1H), whichever is appropriate for general sites. The degree of curvature, DCURV, is the turning angle in degrees per 100 ft. traveled (the usual highway engineer's definition). A value of -9. was to be used for those curves for which DCURV was not known, but this provision was never required.

The distances and directions to adjacent curves were put on tape. The distances, DISTC1 and DISTC2, are in miles, and the directions, DIREC1 and DIREC2 are N, S, E, or W, read into memory by an A1 format with the bit configuration being transferred to tape.

Table 29 presents the special signing code.

Table 29. Special signing code.

ISPSGN
0 = Not Known, or does not apply (General Sites)
1 = None
2 = Advance Warning
3 = Advance Warning w/Advisory Speed
4 = Advance Warning w/Arrow on Curve
5 = Advance Warning w/Advisory Speed and w/Arrow on Curve

NUMACC, MONBEG, MYRB, MONEND, MYRE, NUMDO

NUMACC is the number of accidents listed for the given site. This defines the size of all the individual accident information arrays, and thus tells the card reading program how many Accident Cards it should expect for the site. If NUMACC is not zero, then NUMDO = NUMACC; but if NUMACC = 0, then NUMDO is set to 1, and the first entry in each accident information is zeroed out.

The time period covered by the accident data in the given site is specified by MONBEG through MYRE, which has the usual date conventions.

NEXTRA, EXTRA(1)

The EXTRA array was to be used as a variable length storage if any unanticipated variables occurred. None occurred in this study.

ACCNO(I)

This is the Accident Number as reported by the state. It is read into memory by an A10 format and the bit configuration is transferred to tape.

Generally speaking, a report number had been assigned to each accident by whichever state agency maintained the accident data, be the number a "Case Number" (Connecticut, Maryland 1969-72, Ohio), "Report Number" (California Riverside, Virginia), "Accident Computer Number" (Louisiana 1972-74), "Accident Number" (Arizona 1969-72), "Common Accident Number" (California), "Serial No." (Idaho), "Accident Report

Number" (Maryland 1973-75), or "Police Report Number" (Louisiana 1970-72). However, in some instances (Arizona 1973-75, Georgia, Washington), no such numbers were provided. Also, some of the report numbers were hard to read from the raw data provided; therefore, some incomplete, partial numbers exist on tape. Report numbers were put on tape only for reference purposes.

LMON(I) through APOST(I)

These variables identify the accident by date and location. ISECTN(I) is the number of the section of the site in which the ith accident occurred, consistent with the milepost order on the Site ID Card.

A code of -9. was used to designate missing values of APOST(I), for 0.00 is a legitimate milepost log.

Generally speaking, accident milepost locations were known within 0.01 mile. However, in some instances, accidents were located only to the nearest 0.1 mile. In addition, accident mileposts were not known for most small secondary or county routes.

Five of these sites were handled in a special manner because for them at least some degree of location information had been known — those roads had been sectioned. The following example illustrates how these sites were handled. One site consisted of four "sections", numbered 2-01 through 2-04 by the state. It was determined that the site was 7.51 miles long. Therefore, milepost readings for the beginning and endpoint were arbitrarily designated as 0.00 and 7.51 for the site specification on the computer tape. Accidents occurring in 2-01 were given a milepost reading of 0.00; accidents in 2-02 were given 2.50; those in 2-03 were given 5.00; and those in 2-04, 7.51.

KATYPE(I)

This is the Accident Type variable for which codes are given in Table 30. The original intent was to base delineation relatedness on accident type alone; hence, the two "other" codes, (8) and (9). Later, a special delineation relatedness variable was devised, so the distinction between (8) and (9) could not be ignored.

Table 30. Type of accident codes.

KATYPE(I)
0 = Not Known or not sufficient information
1 = Head-on
2 = Sideswipe (same direction)
3 = Sideswipe (opposite direction)
4 = Rear-end
5 = Run-Off-Road or Overturned or Hit Object Off Pavement
6 = Angle Collision
7 = Foreign Object in Road: Train, Deer, Pedestrian, Other Animal, Fixed Objects in Roadway, Construction, etc.
8 = Other, delineation related
9 = Other, non-delineation related

The translation of the state raw data codes into accident type codes was quite complex and is fully documented in Tables 31 through 40. Note that Maryland, Louisiana, and Ohio (old format) raw data had no simple accident type code, so the translation was quite complex. Also, head-on and sideswipe opposite direction accidents were not distinguished in the Ohio (old format) raw data, so they were arbitrarily all coded as the latter.

NVEH(I), NPC(I), NTB(I), NOV(I)

These variables are, respectively, the total number of vehicles involved in the ith accident, the number of which were passenger cars, the number of which were trucks or buses, and finally, all other vehicles. Table 41 specifically shows the coding rules by which these numbers were obtained.

Note that the number of vehicles is not known at all for Georgia, and that Washington has only a "single" vs. "multiple" code, the latter of which was arbitrarily coded as two vehicles. However, NVEH was properly known for the sites in all the other states.

There were two common problems with the individual vehicle-type data. First, some raw accident formats (i.e., Arizona, Louisiana, and Maryland 1969) provided individual data on only the first two vehicles

Tabel 31. Arizona and California "accident type" translation.

SAI	ARIZONA	CALIFORNIA b)	CALIFORNIA, RIVERSIDE CO. SITES 101-118 f)
0 = Not Known, Other	Non-Collision a) Miscellaneous a)	< or any other case not covered below	H if other data is insufficient
1 = Head On	Head On	A	A
2 - SS/SD	Sideswipe (same)	B, and vehicle directions DIR column are same	B (check "Direction of Travel" column)
3 = SS/OD	Sideswipe (opposite)	B, and vehicle directions in DIR column are opposite	B (check "Direction of Travel" column)
4 = Rear End	Rear End	C	C
5 = ROR/OT	Ran-Off-Road Hit Fixed Object Overturned	F or; E and OSP column d) is 01 through 29, 43 or 44	F E and "Vehicle Involved With" H, I, J, or K if "Preceeding Movement" is C
6 = Angle	Angle Turning Left Turning Right	D	D
7 = OBJ in Road	Hit Object in Road Hit Animal Hit Ped or Cycle Hit Train	G or; E and OSP column d) is 40, 41, or 42	G E and "Vehicle Involved With" B, E, F, or G and H, I, J, or K if "Preceeding Movement" is not C
8 = Other, DR	Non-Collision a) Miscellaneous a)	H and LOC column e) is A, B, C, G, H, or I	H, but must check other data for support
9 = Other, NDR	Parking Non-Collision a) Miscellaneous a)	H and not a case covered immediately above	H, but must check other data for support

(Footnotes to Table 31 found on next page.)

Table 31. Arizona and California "accident type" translation (continued).

ARIZONA

[a] One should review the Directional Analysis data in order to properly categorize "Non-Collision/Miscellaneous" accidents for 1970-1972. For 1973-Present, these accidents may be categorized by reviewing the "Collision Manner" and "Vehicle Action" data.

CALIFORNIA

[b] Can be found in T O C column of printout (Type of Collision), which corresponds to variable 21 of Template.

[c] D I R column of printout is Direction of Travel, variable 24 of Template.

[d] O S P column of printout is Object Struck Primary, variable 29 of Template.

[e] L O C column of printout is Location of Collision-Primary, variable 30 of Template.

[21] TYPE OF COLLISION

A - Head-on
B - Sideswipe
C - Rear End
D - Broadside
E - Hit Object
F - Overturn
G - Auto-Pedestrian
H - Other -
< - Not Stated

[24] [6][ ][ ] DIRECTION TRAVEL (1)

N - Northbound
S - Southbound
E - Eastbound
W - Westbound
< - Not Stated
- - Does Not Apply

CALIFORNIA, RIVERSIDE COUNTY, SITES 101-118

[f] "Type of Collision" Column

TYPE OF COLLISION

A HEAD-ON
B SIDESWIPE
C REAR END
D BROADSIDE
E HIT OBJECT
F OVERTURNED
G AUTO/PEDESTRIAN
H OTHER (EXPLAIN IN NARRATIVE)

[29] [6][6][ ] PRIMARY OBJ STRUCK (2)

[31] [6][8][ ] OTHER

01 - Side of Bridge Railing
02 - End of Bridge Railing
03 - Pier Column Abutment
04 - Bottom of Structure
05 - Bridge End Post
10 - Light or Signal Pole
11 - Utility Pole
12 - Pole (Type Not Stated)
13 - Traffic Sign/Sign Post
14 - Other Signs Not Traffic
15 - Guardrail
16 - Barrel
17 - Wall: Concrete/Wood
18 - Dike or Curb
19 - Traffic Island
20 - Raised Bars
21 - Concrete Object(HOWL., D.I.)
22 - Guidepost Culvert PM
23 - Cut Stone or Embankment
24 - Over Embankment
25 - In Water
26 - Drainage Ditch
27 - Fence
28 - Trees
29 - Plants
40 - Natural Material on Road
41 - Temp Barricades, Cones, etc.
42 - Other Object off Road
43 - Other Object off Road
44 - Overturned
98 - Unknown Object Struck
1 - Thru V9 - Vehicle 1 to 9
< - Not Stated
- - Does Not Apply

[30] [6][7][ ] PRIMARY LOC OF COLL (1)

[32] [6][9][ ] OTHER

A - Beyond Median or Stripe - Left
B - Beyond Shlder Drivers Left
C - Left Shoulder Area
D - Left Lane
E - Interior Lanes
F - Right Lane
G - Right Shoulder Area
H - Beyond Shlder Drivers Right
I - Gore Area
J - Other
  - Not Stated
- - Does Not Apply
. - Prior to Conversion

Table 32. Connecticut, Georgia, and Idaho "accident type" translations.

SAI	CONNECTICUT OLD FORMAT (1969-1973)	CONNECTICUT NEW FORMAT (1972-1974)	GEORGIA	IDAHO
0 = Not Known, Other	UNKNOWN	MISC.	blank	OTHER 1-VEHICLE NON-COLLISION ACC. OTHER 1-VEHICLE ACCIDENT CLASS ALL OTHER 2 OR MORE VEH. ACCIDENTS OTHER ACCIDENT CLASS - SAME WAY OTHER ACCIDENT CLASS - GOING OPPOSITE WAY
1 = Head On	HEAD ON	HD-ON TRN HEAD-ON	Head on Opp.	HEAD ON ACCIDENT
2 = SS/SD	SIDESWIPE a)	SIDESWP-SM	Sideswipe-same	OVERTAKING AND PASSING g) SIDESWIPE ACC., GOING SAME WAY
3 = SS/OD	SIDESWIPE a)	SIDESWP-OP	Sideswipe-opposite	SIDESWIPE ACC., GOING OPPOSITE WAY OVERTAKING AND PASSING g)
4 = Rear End	REAR END	REAR END	Rear End	REAR END ACCIDENT STOPPED IN TRAFFIC, GOING SAME WAY
5 = ROR/OT	OVERTURN F OBJ OT b) F OBJECT c)	OVERTURN FXD OBJ OT FIXED OBJ e)	Off Road Overturn Off Rd Overturn Off RD Fxd Obj Fixed Object f)	1-VEHICLE RAN INTO DITCH 1-VEHICLE OVERTURNED OFF OF RAOD VEHICLE OVERTURNED IN ROAD 1-VEHICLE STRUCK { FENCE / TREE / EMBANKMENT / GUARDRAIL / BRIDGE ABUTMENT / BRIDGE RAILING / CULVERT OR SIPHON } 1-VEHICLE HIT { NON-BREADAWAY SIGN POST / NON-BREAKAWAY LIGHT POLE / BREAKAWAY SIGN POST / TRAFFIC SIGNAL POLE / DELINEATOR OR GUARD POST / OTHER UTILITY POLE }
6 = Angle	ANGLE TURNING	ANGLE TURN-INTS TURN-SAME	Angle Intersect Turning Movement	RIGHT ANGLE ACCIDENT TURNING ACCIDENT GOING SAME WAY LEFT TURN ACC., GOING OPPOSITE WAY
7 = OBJ in Road	PED M OBJECT d) F OBJECT c)	PEDESTRIAN MOVING OBJ FIXED OBJ e)	Ped. on Road Animal Bicycle Parked Car Object at Rest f)	VEHICLE AND TRAIN ACCIDENT 1-VEHICLE STRUCK { HORSE / CATTLE / SHEEP / WILD ANIMAL / OTHER ANIMAL } STRUCK PARKED CAR ACCIDENT STOPPED IN TRAFFIC, GOING OPPOSITE WAY
8 = Other, DR	(none)	(none)	(none)	(none)
9 = Other, NDR	(none)	BACKING	(none)	1-VEH. DEBRIS FALLEN FROM { VEHICLE / ROADSIDE } LEAVING ALLEY OR DRIVEWAY ACCIDENT ENTERING ALLEY OR DRIVEWAY ACCIDENT

a) For sideswipes, can determine Same or Opposite Direction from 2nd and subsequent lines of printout where vehicle direction is indicated (e.g., EB or E BND = East Bound, etc.).

b) Stands for "Fixed Object Overturned".

c) Look in OBJECT INVOLVED column of printout to determine whether KATYPE should be 5 or 7.

d) Stands for "Moveable Object".

e) The third line of printout for a given FIXED OBJECT accident should indicate both the Object Struck and location (e.g., IN ROADWAY or OFF RD LEFT, etc.) from which the necessary distinction (SAI code 5 or 7) can be made.

f) If information about the object struck is provided, must make decision as to whether it is on or off the road. If no such information, adhere to convention in the table.

g) Look at Vehicle Directions to tell whether accident is same direction or opposite direction.

Table 33. Louisiana "accident type" translation.

SAI	LOUISIANA (COMPUTERIZED 1972-1974) [a]
0 = Not Known, Other	Any not below
1 = Head On	Col. 52 = A (and Col. 51 = D)
2 = SS/SD	Col. 52 = D (and Col. 51 = D)
3 = SS/OD	Col. 52 = E (and Col. 51 = D)
4 = Rear End	Col. 52 = B (and Col. 51 = D)
5 = ROR/OT	Col. 51 = A (Col. 52 will probably be F or G); or Col. 51 = B (Col. 52 will probably be F or G); or Col. 51 = I or J <u>and</u> Col. 50 is one of (*); or Col. 52 = F or G <u>and</u> Col. 50 is one of (*) (*) = (B,C,D,E,F,G,L,M,N)
6 = Angle	Col. 52 = C (and Col. 51 = D)
7 = OBJ in Road	Col. 51 = C or E or F or G or H; or Col. 51 = I or J <u>and</u> Col. 50 is one of: A,H,I,J,K,O,P,Q,R,S,T,U,V,W,X
8 = Other, DR	(none)
9 = Other, NDR	Col. 51 = K; or Col. 52 = F or G <u>and</u> Col. 50 is <u>not</u> one of (*) above

[a] See next table for definitions of columns 50, 51, 52. For Louisiana data in the form of police reports (1970-1972), the type of accident information is available from the narrative report and the accident diagram. The "Point of Location and Point of Impact" column on the second page of each police report also has some useful information.

Table 34. Louisiana computer codes relating to "accident type".

LOUISIANA (COMPUTERIZED 1972-1974)

Col. 50 Point of Impact # 1

Initial con-tact	2nd object struck	LOCATION OF ACCIDENT-POINT OF IMPACT
A ☐	☐	Main travel lane
B ☐	☐	Improved shoulder left (including parking strip)
C ☐	☐	Improved shoulder right (including parking strip)
D ☐	☐	Off roadway left (beyond shoulder, including sidewalk)
E ☐	☐	Off roadway right (beyond shoulder, including sidewalk)
F ☐	☐	Off roadway straight ahead (T intersection)
G ☐	☐	Off roadway, direction unknown
H ☐	☐	Marked pedestrian crosswalk
I ☐	☐	Left turn lane, non freeways
J ☐	☐	Right turn lane, non freeways
K ☐	☐	Median opening
L ☐	☐	Ramp nose
M ☐	☐	Curb return
N ☐	☐	Traffic island
O ☐	☐	Off ramp taper or declaration lane
P ☐	☐	Off ramp roadway
Q ☐	☐	Off ramp terminal
R ☐	☐	On ramp lanes or acceleration lane
S ☐	☐	On ramp roadway
T ☐	☐	Auxiliary lane or collector road
U ☐	☐	Freeway to freeway connection
V ☐	☐	Service road
W ☐	☐	Within construction zone
X ☐	☐	Other

Col. 51 Type Accident

A. RUNNING OFF ROADWAY
B. OVERTURNING ON ROADWAY
C. COLLISION WITH PEDESTRIAN
D. COLLISION WITH OTHER MOTOR VEHICLE IN TRAFFIC
E. COLLISION WITH PARKED CAR
F. COLLISION WITH TRAIN
G. COLLISION WITH BICYLIST
H. COLLISION WITH ANIMAL
I. COLLISION WITH FIXED OBJECT
J. COLLISION WITH OTHER OBJECT
K. OTHER NON-COLLISION ON ROAD

Col. 52 Type Collision

A. HEAD-ON
B. REAR END
C. RIGHT ANGLE
D. SIDESWIPE (SAME DIRECTION)
E. SIDESWIPE (OPPOSITE DIRECTION)
F. OTHER
G. NON-COLLISION

Table 35. Maryland "accident type" translation.

SAI	MARYLAND (1973-1975) a)	1972 a)	1970-1971 b)	1969 c)
0 = Not known, Other	O and MOC are not one of those below:	(Same as 73-75)	TO and MOC are not listed below	T and M/C are not listed below
1 = Head On	O is 2 and MOC is 201	(Same as 73-75)	TO is 2 and MOC is 201	T is 2 and M/C is 201
2 = SS/SD	O is 2 and MOC is 113, 114, or 233	(Same as 73-75)	TO is 2 and MOC is 113, 114, 233	T is 2 and M/C is 212
3 = SS/OD	O is 2 and MOC is 202	(Same as 73-75)	TO is 2 and MOC is 202	T is 2 and M/C is 121, 202
4 = Rear End	O is 2 and MOC is 112, 115, 121, 241, or 242	(Same as 73-75)	TO is 2 and MOC is 112, 115, 121, 241, or 242	T is 2 and M/C is 111, 114, 211
5 = ROR/DT	O is 9 and MOC any; O is X and MOC any; O is 8 and MOC is one of A thru K; or O is J and MOC is one of 331, 332, 333, 341, 342, 343, 391	O is 9 and MOC any; O is X and MOC any; O is 8 and MOC is one of 305 307-317, or 375; or O is J and MOC is one of 331, 332, 333, 341, 342, 343, 352	TO is 9 and MOC any; TO is X and MOC any; TO is 8 and MOC is one of 305 307-317, or 375; or TO is J and MOC is one of 331, 332, 333, 341, 342, or 352	T is 9 and M/C any; T is X and M/C any; T is 8 and M/C is one of 303-320; T is J and M/C of 321, 322, 331, 332, 333, 341, 342, 343, 344, 351, 352, 353, 354, 361; T is K d)
6 = Angle	O is 2 and MOC is one of: 101-106, 111, 211, 212, 221, 222, 223, 231, 232	O is 2 and MOC is one of 101-105, 111, 211, 212, 221, 222, 223, 231, 232	TO is 2 and MOC is one of 101-105, 111, 211, 212, 221, 222, 223, 231, 232	T is 2 and M/C is one of 101-105, 112, 113, 122, 123
7 - OBJ in Road	O is 1, 3, 4, 6, 7, or A; or O is 2 and MOC is 122 or 123;or O is 8 and MOC is L or M	O is 1, 3, 4, 5, 6, 7 or A; or O is 2 and MOC is 122 or 123; or O is 8 and MOC is 319,321,or 392	TO is 1, 3, 4, 5, 6, 7; or TO is 2 and MOC is 122 or 123;or TO is 8 and MOC is 319 or 321	T is 1, 3, 4, 5, 6, or 7; T is 2 and M/C is 221 or 222; T is 8 and M/C is 305, 306; T is K d)
8 = Other, DR	(none)	(none)	(none)	(none)
9 = Other, NDR	O is 2 and MOC is 124 or 131	(Same as 73-75)	TO is 2 and MOC is 124 or 131	T is 2 and M/C is 223, 231, 232, 233, 241, 242, 251, 252, 253, 254; T is J and M/C is 373, 374, 375, 381,391

a) Accident Type Categories must be determined from Columns O (Type Object Involved) and MOC (Manner of Collision) of the computer printout. (Refer to the next tables following this.)

b) Accident Type Categories must be determined from Columns TO (Type Object Involved) and MOC (Manner of Collision) of the computer printout. (Refer to the next tables following this.)

c) Accident Type Categories must be determined from columns T (Type Object Involved) and M/C (Manner of Collision) of the computer printout. (Refer to the next tables following this.)

d) "K" in the T column refers to "Hit and Run" and will be coded according to object struck.

Table 36. Maryland type of object codes.

MARYLAND 1973-1975	MARYLAND 1970-1972	MARYLAND 1969
Print out Column O Type Object Involved 1 - Pedestrian 2 - Other Motor vehicle 3 - RR train 4 - Mini-bike, go-cart, lawnmower 6 - Bicycle 7 - Animal 8 - Fixed object 9 - Overturned in roadway X - Ran off road J - Other non-collision A - Construction barrier	Print out Column O (1972) Print out Column TD (1970-1971) Card Col. 42 Type Object Involved Code first object hit as type object involved Ex. Vehicle #1 hit pole then pinned a pedestrian between vehicle #2 and vehicle #2 hit vehicle #3. Code this as a fixed object "8", but include the pedestrian and the other vehicles under vehicle types and condition of pedestrian. If vehicle #1 hit another vehicle and then hit a pedestrian, code it as other motor vehicle. 1 - Pedestrian 2 - Other motor vehicle 3 - RR train 4 - Mini bike, go cart, lawnmower 5 - Animal drawn vehicle 6 - Bicycle 7 - Animal 8 - Fixed object 9 - Overturned in roadway X - Ran off road J - Other non-collision	Print out Column T Card Col. 52 Type Object Involved 1 - Pedestrian 2 - Other motor vehicle 3 - RR train 4 - Motorcycle 5 - Animal drawn vehicle 6 - Bicycle 7 - Animal 8 - Fixed Object 9 - Overturned in roadway X - Ran off road J - Other non-collision K - Hit and run

Table 37. Maryland manner of collision codes.

MARYLAND 1973-1975

Cols. 51-53 MANNER OF COLLISION — Alpha and Numerical Code

(Fixed object struck, all codes A-M are valid - all combinations of Alpha codes are valid)

Example: If codes L, H and G were coded in cols. 51, 52 and 53, the vehicle would first have struck a construction barrier, then a light support pole, and then a fence.

A - Bridge or overpass
B - Building
C - Culvert, ditch
D - Curb, wall
E - Guard rail/barrier
F - Embankment
G - Fence
H - Light Support (Pole)
I - Sign Support (Pole)
J - Other poles
K - Tree, shrubbery
L - Construction barrier (s)
M - Other

Cols. 51-53 MANNER OF COLLISION — Alpha and Numerical Codes

I. Vehicles with Pedestrian

001 - Crossing or Entering Roadway at Intersection
002 - Crossing or Entering Roadway Not at Intersection
003 - Walking on Road with Traffic
004 - Walking on Road Against Traffic
011 - Playing
012 - Standing
013 - Getting on or off Vehicle
014 - Pushing or Working on Vehicle
015 - Other Working
021 - Hitch-Hiking
022 - Approaching or Leaving School Bus Zone
023 - Unknown
024 - Other
025 - Pedalcycle

II. Two Vehicle Collision

A. Both Traveling at Angle

101 - Both going straight
102 - One right turn, other straight - from left
103 - One left turn, other straight - from right
104 - One left turn, other straight - from left
105 - One right turn, other straight - from right
111 - One left turn, other stopped - from left
222 - One backing, other straight
223 - Both turning left
*106 - One right turn, other stopped - from right

B. Both traveling same direction

112 - Both going straight - rear end
113 - Both going straight - sideswipe
114 - Both going straight - sideswipe, trying to pass
241 - Both turning right - rear end
242 - Both turning left - rear end
115 - One right turn, struck in rear - from other straight
121 - One left turn, struck in rear - from other straight
231 - One right turn - from wrong lane - other straight (Dual lane highways) sideswipe
232 - One left turn - from wrong lane - other straight (Dual lane highways) sideswipe
233 - Sideswipe - both turning same direction

Note: For U-turn use code as if vehicle is turning left.

ONE VEHICLE

122 - Parked - Proper location
123 - Parked - Improper location
124 - Pulling from parked position
131 - Backing into parked position

C. Both traveling at opposite directions

201 - Both going straight - head on
202 - Both going straight - sideswipe
211 - One left turn - other straight
212 - Both turning left
221 - One right turn - other left turn

III. All Other Accidents

Left roadway

331 - Then overturned
332 - Then struck other vehicle (s)
333 - Then struck debris
341 - Then struck animal
342 - Then re-entered and struck other vehicle
343 - Then re-entered and overturned
391 - All other events

Table 37. Maryland manner of collision codes (continued).

MARYLAND 1970-1972

Cols. 51-53 Manner of Collision

I. Vehicle with Pedestrian

A. Vehicle going straight

001 Pedestrian crossing with signal
002 Pedestrian crossing against signal
003 Pedestrian crossing without signal present
004 Pedestrian Lying in Roadway
011 Pedestrian coming from behind parked cars
012 Pedestrian walking in or crossing road
013 Pedestrian getting on or off other vehicle
014 Left roadway - struck pedestrian
015 Pedestrian walking on shoulder of road

B. Vehicle turning

021 Right turn - Pedestrian at fault
022 Right turn - Pedestrian had right of way

023 Left turn - Pedestrian at fault
024 Left turn - Pedestrian had right of way
025 Not stated

II. Two Vehicle Collision

A. Both traveling at angle

101 Both going straight
102 One right turn, other straight - from left
103 One left turn, other straight - from right
104 One left turn, other straight - from left
105 One right turn, other stopped - from right
111 One left turn, other stopped - from left
222 One backing, other straight
223 Both turning left

B. Both traveling same direction

112 Both going straight - rear end
113 Both going straight - sideswipe
114 Both going straight - sideswipe, trying to pass
241 Both turning right - rear end
242 Both turning left - rear end
115 One right turn, struck in rear - from other straight
121 One left turn, struck in rear - from other straight
231 One right turn - from wrong lane - other straight (Dual lane highways) sideswipe
232 One left turn - from wrong lane - other straight (Dual lane highways) sideswipe
233 Side swipe both turning same direction

Note: For U-turn use code as if vehicle is turning left

One Vehicle

122 Parked - Proper location
123 Parked - Improper location
124 Pulling from parked position
131 Backing into parked position

C. Both traveling at opposite directions

201 Both going straight - head on
202 Both going straight - sideswipe
211 One left turn - other straight
212 Both turning left
221 One right turn - other left turn

Note: For U-turn use code as if vehicle is turning left

III. All Other Accidents

A. Left roadway

331 Then overturned
332 Then struck other vehicle(s)
333 Then struck debris
341 Then struck animal
342 Then re-entered and struck other vehicle

Collision with fixed object on type control 1 or 2

Use this code system only when code 1 or 2 is in Col. 17 (Type Control)
Code 4 in Col. 51
Code 1 thru 9 in Col 52, if only one object involved code "0" in Col. 53
If two (2) objects involved, code 1 thru 9 in Col. 53 only code the first two objects

1 - Guard rails (on right side of road)
2 - Median drainage inlet or wall
3 - Median barrier or median guard rail
4 - Other vehicle(s)
5 - Light poles
6 - Sign supports
7 - Bridge supports or bridge headwalls
8 - All others i.e. trees, fence, embankment, etc.
9 - Pedestrian

Collision with fixed object on type control 3 to 9

Use these codes when 3 thru 9 is in Col. 7 (Type Control)

305 All other fixed objects
307 Poles (G&E, Telephone, etc.)
308 Light Poles
309 Bridge supports or bridge headwalls
310 Sign Post
311 Guard Rails
312 Drainage inlet or wall
313 Trees
314 House or store
315 Fire hydrant or fence
316 Parking meter or curbing
317 Embankment

B. Other Events

351 Collision with non-motor vehicle (train, horse-cart, etc.)
352 Overturned in roadway
353 Fire
319 Struck debris in roadway
320 Struck animal in roadway
321 Hit and run
375 Crossed center median parkway or center line into opposite lane and overturned or hit fixed object (single vehicle)
391 All other events

Table 37. Maryland manner of collision codes (continued).

MARYLAND 1969

Cols. 61-63

Manner of Collision

I. Vehicle with Pedestrian

Vehicle Going Straight

001 - Entering Intersection
002 - Within Intersection
003 - Leaving Intersection
004 - Non-Intersection
005 - Not Stated

Vehicle Turning Right

011 - Entering Intersection
012 - Within Intersection
013 - Leaving Intersection
014 - Non-Intersection
015 - Not Stated

Vehicle Turning Left

021 - Entering Intersection
022 - Within Intersection
023 - Leaving Intersection
024 - Non-Intersection
025 - Not Stated

Vehicle Backing

031 - Entering Intersection
032 - Within Intersection
033 - Leaving Intersection
034 - Non-Intersection
035 - Not Stated

All Others

041 - Entering Intersection
042 - Within Intersection
043 - Leaving Intersection
044 - Non-Intersection
045 - Not Stated

Not Stated

051 - Entering Intersection
052 - Within Intersection
053 - Leaving Intersection
054 - Non-Intersection
055 - Not Stated

II. Two Vehicle Collision at Intersection

Both Entering at Angle

101 - Both Going Straight
102 - One Right Turn, Other Straight
103 - One Left Turn, Other Straight - From Right
104 - One Left Turn, Other Straight - From Left
105 - All Others

Both Entering From Same Direction

111 - Both Going Straight
112 - One Right Turn, Other Straight
113 - One Left Turn, Other Straight
114 - One Stopped
115 - All Others

Both Entering From Opposite Directions

121 - Both Going Straight
122 - One Left Turn, Other Straight
123 - Both Turning Left
124 - All Others
131 - Not Stated

III. Two Vehicle Collision (Non-Intersection)

Going Opposite Directions

201 - Rear End Collision
202 - Sideswipe

Going Same Direction

211 - Rear End Collision
212 - Sideswipe

One Vehicle Parked

221 - Proper Location
222 - Improper Location

One Vehicle

223 - Stopped in Traffic
231 - Forward from Parked Position
232 - Backward from Parked Position
233 - Backward into Parked Position
241 - Entering Alley
242 - Leaving Alley
251 - Entering Driveway
252 - Leaving Driveway

Stopped at Driveway

253 - Signal Controlled Only
254 - Not Signal Controlled (253 & 254 cover such situations as open-air theatres, shopping centers, tent shows, industrial parks, etc.)

Two Vehicle Collision (Non-Intersection)

261 - All Others
271 - Not Stated

IV. All Other Accidents

Collision with Non-Motor Vehicle (Train, Bicycle, etc.)

301 - At Intersection
302 - Not At Intersection

Table 37. Maryland manner of collision codes (continued).

MARYLAND 1969 continued
Collision With Fixed Object 305 - At Intersection 306 - Not At Intersection Overturned in Roadway 321 - At Intersection 322 - Not At Intersection Left Roadway - At Intersection 331 - Then Overturned 332 - Then Struck Fixed Object 333 - Then Struck Other Vehicle Left Roadway at Curve 341 - Then Overturned 342 - Then Struck Fixed Object 343 - Then Struck Other Vehicle 344 - Then Struck Pedestrian Left Roadway on Straight Road 351 - Then Overturned 352 - Then Struck Fixed Object 353 - Then Struck Other Vehicle 354 - Then Struck Pedestrian 361 - Driverless Moving Vehicle Occupant Fell from Vehicle 371 - Boarding or Allighting in Traffic 372 - Not Boarding or Allighting in Traffic No Other Event 373 - Injured Within Vehicle 374 - Mechanical Failure 375 - Fire 381 - All Others 391 - Not Stated Collision with Fixed Object 303 - Poles (G&E, Telephone, etc.) at intersection 308 - Poles (G&E, Telephone, etc.) not at intersection 309 - Light poles at intersection 310 - Light poles not at intersection 311 - Bridge abutment at intersection 312 - Bridge abutment not at intersection 313 - Sign post (roadside or overhead) at intersection 314 - Sign post (roadside or overhead) not at intersection 315 - Guard rails at intersection 316 - Guard rails not at intersection 317 - Culvert headwalls at intersection 318 - Culvert headwalls not at intersection 319 - Trees at intersection 320 - Trees not at intersection

Table 38. Ohio "accident type" translation.

SAI KATYPE	OHIO 1973-1974 ACC TYPE	OHIO [a] 1969-1972 DIR ANA	OBJ STRK	SIDE	DIST
0 = Not Known	00 = Not Stated	29 49 69	or 99	or 9	or 9
1 = Head On	01 = Head-on	-none- [b]			
2 = Sideswipe (same direction)	03 = Sideswipe and see DIR [c]	21 31			
3 = Sideswipe (opposite direction)	03 = Sideswipe and see DIR [c]	25[a] 27 30[a]			
4 = Rear End	02 = Rear-end/ Backing	23 34			
5 = Run-Off-Road/ Overturned/Hit Object Off Road	12 = Fixed Object 13 = Other Object and SIDE = 2,4,5 or 15 - Overturning	61 62	or 00 thru 26 28 29	or 1 2 3 5	or 1 thru 8
6 = Angle	04 = Angle 05 = Turning	20 22 26			
7 = Object in Road	06 thru 11, 14 or 12 } and SIDE=0,1,3 13 }	11 thru 14 18 19 32 33 50 thru 53 55 60	or 27	or 4	or 0
8 = Other, Delin. Related	-none-	-none-			
9 = Other, Nondelin. Related	16 = Other noncollision 18 = Other	24 28 35 36 40 41 42 48 54 63 67 68			

[a] Definitions of Ohio variables ACC TYPE, DIR ANA, OBJ STRK, SIDE, and DIST are in following pages.

[b] DIR ANA Codes 25 and 30 denote collisions by cars traveling in opposite directions. It is impossible to separate out the Head-on from the Side-swipe (OD) collisions, so all such collisions have been arbitrarily classified as Sideswipe-Opposite Direction.

[c] To determine whether Sideswipe is Same Direction or Opposite, look in DIR (Direction) Column of Printout: Example:

$\frac{15}{15}$ is Same Direction, $\frac{15}{51}$ is Opposite Direction

Table 39. Ohio computer codes relating to "accident type."

OHIO (1973-1974)

ACC TYPE - Type of Accident

Collision between two or more moving vehicles:

00 - Not Stated
01 - Head-on
02 - Rear-end/Backing
03 - Sideswipe
04 - Angle
05 - Turning

Collision between one moving vehicle and:
06 - Parked motor vehicle
07 - Pedestrian
08 - Animal
09 - Train
10 - Pedalcycles
11 - Other non-motor vehicle
12 - Fixed object
13 - Other object
14 - Motorcycle

Non-collision involving one motor vehicle only:
15 - Overturning
16 - Other non-collision
(Poisoning, explosion, etc.)
18 - Other

SIDE - Side of Road

0 - Not Stated
1 - On Roadway
2 - Off Roadway
3 - On Other Roadway (divided highway)
4 - Off Left Side
5 - Off Right Side

DIR - Direction of Travel for the vehicles involved. The directions are coded on a "From" and "To" basis according to the following diagram:

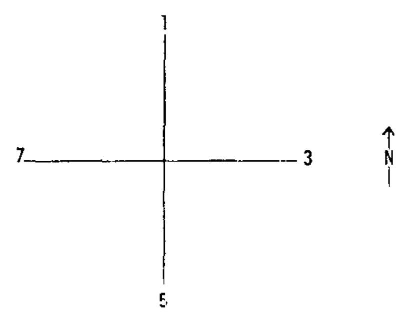


Table 39. Ohio computer codes relating to "accident type" (continued).

OHIO (1969-1972)

DIR ANA - Directional analysis of movement

Pedestrian

11 - Car going straight
12 - Car turning right
13 - Car turning left
14 - Car backing
18 - All others
19 - Not Stated

Intersection

20 - Entering at angle (includes one car turning from an intersecting street)
21 - From same direction - both going straight
22 - From same direction - one turning, one straight
23 - From same direction - one car stopped
24 - From same direction - all others
25 - From opposite directions - both going straight
26 - From opposite directions - one left, other straight
27 - From opposite directions - one car stopped
28 - All others
29 - Not stated

Non-Intersection

30 - Going in opposite directions
31 - Going in same direction
32 - One car parked-proper location
33 - One car parked-improper location
34 - One car stopped
35 - One car entering parked position
36 - One car leaving parked position
40 - One car entering alley or driveway
41 - One car leaving alley or driveway
42 - Backing from alley or drive
48 - All others
49 - Not stated

All Other

50 - Collision with train
51 - Collision with farm tractor, any tractor type vehicle
52 - Collision with animal drawn vehicle
53 - Collision with all others (bicycle, etc.)
54 - Backing other than from alley or drive
55 - Collision with animal
60 - Collision with fixed object in road
61 - Overturned in roadway
62 - Car left roadway
63 - Fell from moving vehicle
67 - U turn
68 - All others
69 - Not stated

Table 39. Ohio computer codes relating to "accident type" (continued).

OHIO (1969-1972)

OBJ STRK - For single vehicle accidents this indicates the object that was struck.

Overpass or river crossing

- 00 - End of overpass structure not protected by guardrail
- 01 - Guardrail protecting end of overpass
- 02 - End of overpass structure although protected by guardrail
- 03 - Overpass railing or side of overpass structure

Underpass

- 04 - Underpass pier or abutment not protected by guardrail
- 05 - Guardrail protecting underpass pier or abutment
- 06 - Underpass pier or abutment althrough protected by guardrail

Light pole or utility pole

- 07 - Highway lighting pole or utility pole not protected by guardrail
- 08 - Guardrail protecting highway lighting pole or utility pole
- 09 - Highway light pole or utility pole although protected by guardrail

Sign

- 10 - Highway sign post or street sign not protected by guard-rail
- 11 - Guardrail protecting highway sign post
- 12 - Highway sign post although protected by guardrail
- 16 - Sign post in gore although protected by guardrail

Overhead Sign

- 13 - Overheard sign support not protected by guardrail (not in gore)
- 14 - Guardrail protecting overhead sign support (not in gore)
- 15 - Overhead sign support although protected by guardrail (not in gore)

Guardrail

- 17 - Hit guardrail used as median separator
- 18 - Hit guardrail along fill
- 19 - Other guardrail

Miscellaneous

- 20 - Vehicle ran off road, into ditch and struck nothing
- 21 - Vehicle ran off road, struck embankment
- 22 - Struck vehicle (s) parked off the road or street
- 24 - Vehicle struck tree or tree stump
- 25 - Struck building off road or street
- 26 - Other object off the road
- 27 - Other object on road
- 28 - Vehicle struck fence
- 29 - Vehicle ran off road, overturned in ditch
- 99 - Unknown or not stated

Table 39. Ohio computer codes relating to "accident type" (continued).

OHIO (1969-1972)
DIST - Distance from road to object struck from single vehicle accidents 0 - On roadway 1 - 1 to 5 feet from road 2 - 6 to 12 feet from road 3 - 13 to 20 feet from road 4 - 21 to 29 feet from road 5 - 30 to 39 feet from road 6 - 40 to 50 feet from road 7 - 51 to 65 feet from road 8 - Over 65 feet from road 9 - Not stated SIDE - Side of road for single vehicle accidents 1 - Ran off right side of road 2 - Ran off left side of road 3 - Ran onto median area 4 - Remained on road 5 - Ran off end of 'T' road 9 - Not stated

Table 40. Virginia and Washington "accident type" translation.

SAI	VIRGINIA [a] [c]	WASHINGTON ACCIDENT DESCRIPTION [d]
0 = Not known, Other	9 = Not Stated [b] 12 = Miscellaneous [b]	O. Dir - All Others (Diagram Data says both moving straight, but struck on side at angle.)
1 = Head On	3 = Head On	O. Dir. - Both Move - Head On O. Dir. - One Stop - Head On
2 = SS/SD	4 = Sideswipe - same direction	S. Dir. - Both Str. - Both Mov. - SS
3 = SS/OD	5 = Sideswipe - opposite direction	O. Dir. - Both straight - SS
4 = Rear End	1 = Rear End	S. Dir. - Both Str. - One stop - RE S. Dir. - Both Str. - Both Mov. - RE S. Dir. - One L. Turn - One Str. (RE)
5 = ROR/OT	11 = Overturned or Ran-Off-Road 13 = Fixed Object Off Roadway (from outside of ditch)	Rock Bank or Ledge Vehicle Overturned Over Embankment - No Guardrail Bridge Rail Earth Bank or Ledge Roadway Ditch Beam Grdrail Culvert End - Other in Ditch Guide Post Guardrail, Face of Wood Sign Post Bridge Abutment Utility Pole (Power, etc.) Building Metal Sign Post Tree or Stump (stationary) Into River, Lake, Swamp, Etc. Fence Mail Box Snow Bank Retaining Wall
6 = Angle	2 = Angle	Entering at Angle O. Dir. - One L. Turn - One Str. S. Dir. - One L. Turn - One Str. (Angle)
7 = OBJ in Road	6 = Fixed Object within Roadway (from ditch to ditch) 7 = Train 8 = Pedestrian or Cyclist 14 = Deer 15 = Animals Other than Deer	Non-Dom. Animal (Deer, etc.) Dom. Animal (Horse, Cow, etc.) Fallen Rock or Tree Road or Construction Machinery Collision with Bicycle One Vheicle Parked Misc. Obj. or Debris on Road
8 = Other, DR	9 = Not Stated [b] 12 = Miscellaneous [b]	(none)
9 = Other, NDR	9 = Not Stated [b] 12 = Miscellaneous [b]	One Veh. Parked - One Moving Fell, Jump, Pushed from Veh.

[a] There is no Virginia Accident Code 10.

[b] Sometimes one can figure out what category a Not Stated/Miscellaneous accident belongs to by looking on continuation page details of the accident.

[c] Accident types for Virginia Sites 26, 42, and 50 can be obtained from the narrative descriptions on the police reports.

[d] The SAI type of accident code can best be determined through the brief written Accident Description in the last column. It is possible to reconstruct the accident through the information included in the Diagram Analysis Data column, but such a review would require the translation of eight different codes. Therefore, it is best to determine the Accident Type from the Accident Description and if there is any question to then review the Diagram Analysis Data.

Table 41. Individual vehicle coding guides.

SAI	ARIZONA [a]	CALIFORNIA [b]	CALIFORNIA, RIVERSIDE COUNTY SITES 101-118
PC = Passenger Cars	Passenger Car - Regular Passenger Car - Medium Passenger Car - Small Pick-up Truck Taxicab Pick-up with Camper	A - Passenger Car/Station Wagon D - Pickup/Panel Truck	A - Passenger Car D - Pickup or Panel Truck
TB = Trucks or Buses	Truck or Truck Tractor Truck Tractor and Semi-Trailer Truck Combination Commercial Bus Non-Commercial Bus School Bus - Type 1 School Bus - Type 2	F - Truck, Truck Tractor G - Truck/Tractor with Trailer H - School Bus I - Other Bus	F - Truck or Truck Tractor G - Truck or Truck Tractor w/Trailer H - School Bus I - Other Bus
OV = Other Vehicles	Passenger Car and Trailer Farm Vehicle Motorcycle Motorscooter or Motor Bicycle Emergency Vehicle Military Vehicle Publicly-owned Vehicle Recreational Vehicle Motor Home or House Car Vehicle with Special Controls Unknown	B - Passenger Car with Trailer C - Motorcycle E - Pickup/Panel with Trailer J - Emergency Vehicle K - Highway Construction Equipment M [c] - Other/Not Stated S - Runaway Vehicle	B - Passenger Car w/Trailer C - Motorcycle/Scooter E - Pickup or Panel Truck w/Trailer J - Emergency Vehicle K - Highway Construction Equipment M - Other
Non-Vehicles	(none)	L - Bicycle M [c] - Other/Not Stated Q - Uninvolved Vehicle T - Train U - Pedestrian V - Dismounted Pedestrian W - Animal, Livestock X - Animal, Deer Z - Animal, Other	L - Pedalcycle

[a] Both Arizona formats provide individual data on only the first two vehicles involved in an accident.

[b] Printout of Column $\frac{P}{T}$ (Party Type), Variable 23 of Template. Each Vehicle contained in one line of print.

[c] PT's of M should be classified as Other Vehicles unless this leads to an inconcsistency with the Total No. of Vehicles in which case PT's of M should be designated as Non-Vehicles.

Table 41. Individual vehicle coding guides (continued).

SAI	CONNECTICUT a)		GEORGIA d)	IDAHO	LOUISIANA e)
	OLD FORMAT (1969-1973)	NEW FORMAT (1972-1974)			
PC= Passenger Cars	VEH	AUTO	d)	PASSENGER CAR PICKUP PANEL TRUCK	A. Passenger Car G. Taxicab
TC = Trucks & Buses	TRUCK b)	TRUCK TR TRUCK	d)	TRUCK OR TK. TRACTOR TRUCK & SEMI-TRAILER OTHER TRUCK COMBO BUS	C. Truck or Truck Tractor D. Truck Tractor, Semi-Trailer E. Other Truck Combination H. Bus I. School Bus
OV = Other Vehicles	(none)	EMERGENCY VEHICLE MTRCYCLE	d)	MOTORCYCLE FARM-TRACTOR-EQUIPMENT VEH. TYPE NOT STATED	B. Passenger Car and Trailer F. Farm Tractor and/or Farm Equipment J. Motorcycle K. Motor Scooter or Motor Bicycle M. Emergency (Including Private Owner) N. Military Vehicles O. Other Publicly Owned Vehicle P. Others and Not Stated
Non-Vehicles	PDSTRN	BICYCLE NON CONT. c)	d)	(none)	L. Bicycle

a) A separate line of print is given for each vehicle following the first printout line of each individual accident.

b) Some motorcycles were coded as TRUCK in the old format.

c) Denotes Non-Contact

d) No information available, either as to total number of vehicles or vehicle types.

e) For the police reports (1970-1972 data) this information can be obtained from the description of the individual vehicles involved in the accident. For the computerized data (1972-1974) this information can be found in their cols. 34-35. Since it is restricted to two columns, individual data on only the first two vehicles are available, although the total number of vehicles is accurately reported in their cols. 36-37.

Table 41. Individual vehicle coding guides (continued).

SAI	MARYLAND 1973-1975	MARYLAND 1970-1971 and 1972	MARYLAND 1969	
			SINGLE-VEHICLE ACCIDENT (Double letter code for one vehicle)	MULTI-VEHICLE ACCIDENT (Single letter code for each vehicle) [a]
PC = Passenger Cars	P - Passenger Car J - Camper on Pickup Truck U - Pickup Truck	P - Passenger Car J - Camper or Pickup Truck U - Pickup Truck	PV - Passenger Vehicle	P - Passenger Car
TB = Trucks and Buses	S - Single Unit Truck T - Tractor-Trailer B - School Bus C - Commercial Bus	S - Single Unit Truck T - Tractor-Trailer B - School Bus C - Commercial Bus	US - Single Unit Truck TS - Tractor Trailer Truck CB - Commercial Bus BS - School Bus	U - Single Unit Truck T - Tractor Trailer Truck C - Commercial Bus B - School Bus
OV = Other Vehicles	E - Emergency Vehicle F - Farm Vehicle M - Motorcycle Q - Construction Equipment O - Unknown	E - Emergency Vehicle F - Farm Vehicle M - Motorcycle O - Unknown G - House Trailer H - Boat Trailer I - Utility Trailer & Folding Camper K - Travelall Q - Construction Vehicle	MC - Motorcycle LL - Train FU - Farm Vehicle	M - Motorcycle L - Train F - Farm Vehicle
Non-Vehicles	X - Pedestrian	L - Train X - Pedestrian	(none)	X - Pedestrian

[a] In the 1969 Format the total number of vehicles is accurately reported and can be more than two. However it appears that the details of the vehicles types are reported only for the first two vehicles.

Table 41. Individual vehicle coding guides (continued).

SAI	OHIO 1973-1974 [a]	OHIO 1969-1972 [b]	VIRGINIA [d]	WASHINGTON [e]
PC = Passenger Cars	01 - Passenger Car 14 - Taxi 16 - Recreation Vehicle	Place all vehicles in this classification if TRKS = 0 or 9	PC - Passenger Car (1)	e)
TB = Trucks & Buses	02 - Truck 03 - Bus 07 - Tractor & Semi-Trailer 08 - School Bus 18 - Truck w/Trailer	Place all vehicles in this classification if TRKS = 1 [c]	TRUCK - Truck (3) TR-TR - Tractor Trailer or Truck Combination (4) BUS - Bus (5) SCHBUS - School Bus (0)	e)
OV = Other Vehicles	00 - Not Stated 04 - Motorcycle 05 - Passenger Car w/Trailer 06 - House Vehicle 09 - Motor Scooter/Bike 15 - Public Safety Vehicle 17 - Other	(none)	PCTOV - Passenger Car Towing Other Vehicle (2) CYCLE - Motorcycle, etc. (6) FARM EQP - Farm Equipment (7) EMVEH - Emergency Vehicle (8) N/S - Not Stated (9)	e)
Non-Vehicles	10 - Bicycle 11 - Unlicensed Farm Vehicle 12 - Rail 14 - Animal PD - Pedestrian	(none)	(none)	e)

[a] There is a line of printout in raw data for each vehicle.

[b] A Vehicle Type breakdown is unavailable for 1969-1972. Only a truck involvement code, TRKS, is available. Therefore, the arbitrary grouping reflected in this table was made.

[c] There are also some typos "TRKS = 2," which should be coded as TB.

[d] The vehicle types are not generally noted on the police reports for Virginia sites 26, 42, and 50, and thus they can only be identified if the diagram is explicit in this matter.

[e] Information on individual vehicle types is not available for Washington. Furthermore the total number of vehicles is not known other than the designation "single" or "multiple". The Washington code, obtained from the fourth and fifth digits in the Diagram Analysis Data column, is 30-34, 40-41, 50, 60-62, 99 for Single Vehicle accidents, and 01-07, 11-17, 29 for Multi-Vehicle accidents.

involved; therefore, the rest of the vehicles had to be coded as OV, other vehicles. Second, some data (Connecticut old format and Ohio old format) provide only a vehicle vs. truck or a "truck involvement" code. Note in the table the arbitrary decisions that had to be made.

Individual vehicle-type data were not known for Georgia and Washington sites. In addition, vehicle types were not made available for Virginia sites 26, 42, and 50 for reasons of privacy (individual driver names were directly adjacent to vehicle information on the police reports). The diagram and narrative report, however, sometimes revealed some of the vehicle types. Unfortunately, the coding of these accidents for the SAI tape was inconsistent. Vehicle types were left blank for site 26, but for sites 42 and 50, all vehicles were assumed to be passenger cars unless specifically stated otherwise in the police report. An attempt was made to catch any inconsistencies or errors. Finally, in some of the hit fixed object off-road accidents in Virginia site 26, two cars were present causing the accident, while only one car was involved in the collision. These were coded as two vehicle accidents to distinguish them from "ROR/Hit Object" accidents in which a single car lost control and left the road.

KLIGHT(I) and KTIME(I)

The codes for these variables are given in Tables 42 and 43.

Table 42. Road lights code.

KLIGHT(I)
0 = No Road Lights, or Road Lights Off, or Not Known
1 = Road Lights On

Table 43. Time of day lighting code.

KTIME(I)
0 = Not Known
1 = Daylight (strictly)
2 = Darkness (strictly)
3 = Dusk
4 = Dawn
5 = Dusk or Dawn
6 = Darkness, Dusk or Dawn
7 = Daylight, Dusk or Dawn

The purpose of the KLIGHT flag was to indicate if roadway lights were on during a nighttime accident. Usually, such information went hand in hand with the KTIME coding. Roadway light information was unavailable for all Georgia accidents, Connecticut accidents in their old format (1969-1973), and Ohio accidents in their old format (1969-1972).

Table 44 summarizes the availability of the KTIME information. The primary SAI codes were 0-4, but codes 5 and 6 were set up to accommodate accident data in which "dusk or dawn" was specifically not distinguished in their Lighting Code, or in which "dusk or dawn" was specifically combined with "darkness." SAI codes 2 through 6 were lumped together in the actual analysis performed. SAI code 7 was supposedly a logical extension of 6, but, in fact, was never used.

KSEVER(I)

Accident severity information was generally provided by all states. Table 45 presents the coding.

Table 45. Accident severity code.

KSEVER(I)
0 = Not Known
1 = Fatality
2 = Personal Injury but no Fatalities
3 = Property Damage Only

Table 44. Time of day lighting condition availability in the raw accident data.

SAI CODES[a]	ARIZONA	CALIFORNIA	CALIFORNIA, RIVERISDE (101-118)	CONNECTICUT, OLD FORMAT (1969-1973)	CONNECTICUT, NEW FORMAT (1972-1974)	GEORGIA	IDAHO	LOUISIANA, COMPUTERIZED	LOUISIANA, POLICE REPORTS	MARYLAND, ALL FORMATS	OHIO, OLD FORMAT (1969-1972)	OHIO, NEW FORMAT (1973-1974)	VIRGINIA	WASHINGTON
1 - Day	X	X	X	X	X	X	X	X	X	X	X	X	X	X
2 - Dark (Night)	X	X	X	X[c]	X	X[d]	X	X	X	X		X	X	X
3 - Dusk	X[b]		X[b]		X					X			X	X
4 - Dawn	X[b]		X[b]		X					X			X	X
5 - Dusk or Dawn		X					X	X	X			X		
6 - Dark, Dusk, or Dawn											X[e]			

a) SAI Code 7 (Daylight, Dusk, or Dawn) was never used, and SAI Code 0 (Not Known) can, of course, be applied to any set of raw data so it not listed.

b) Although the data printout did not distinguish between "Dawn or Dusk," the proper response was ascertained by reviewing the "Hour" data.

c) Connecticut OLD FORMAT just distinguishes "LT" vs "DK," and the latter was coded as 2 on tape.

d) Georgia provides merely day (D) vs night (N), and the latter was coded as 2 on tape.

e) Ohio old format specifically distinguished between "Daylight" vs "Darkness, Dusk, Dawn."

KDEFCT(I), KSCOND(I), KWEATH(I)

The coding for road defects, pavement surface conditions, and weather are presented in Tables 46, 47, and 48.

Table 46. Road defects code.

KDEFCT(I)	
0	= No Road Defects, or Not Known
1	= There was some road defect

Table 47. Surface condition code.

KSCOND(I)	
0	= Not Known, Other
1	= Dry
2	= Wet
3	= Snow or Ice

Table 48. Weather code.

KWEATH(I)	
0	= Not Known, Other
1	= Clear, Cloudy, Overcast
2	= Rain, Snow, Sleet, Mist
3	= Fog

"Road Defects" include holes, ruts, debris on road, construction zone, etc. Road defects information is not known for Connecticut, Georgia, pre-1974 Ohio, and Washington data.

Surface condition information was available for all states. Examples of "other" surface conditions encountered are "fresh oil," "loose sand or gravel," "slippery (muddy oil)."

Weather information was generally available for all the data. "Other" weather included "dust," "smoke," "high wind," and the like. There are some anomalies in the coding. Idaho data did not have separate distinctions for Fog and Mist, so their "FOGGY OR MISTY" code was coded as Fog(3) on the SAI data tape. Washington's "OTHR" code included overcast weather, but this had to be coded as Other (0) on the SAI data tape.

KDELIN(I)

This is the delineation relatedness variable, whose development was fully described in Section 2.3. Table 49 presents the codes used on the data tape.

Table 49. Delineation relatedness code.

KDELIN(I)	
0, -0, or blank =	Noneliminated accidents, i.e., those which are possibly delineation related
1 =	(not used)
2 =	Definitely not delineation related

KOMM(I)

A comment code was originally set up with the idea that it might be useful later to append comments to some of the accidents. The idea was to keep a running list of comments as the situation was encountered, referring to the comments on tape via a numerical code. In practice, the code was little used; those comments actually coded are in Table 50. The first two comments (01 and 02) were used only with Idaho data, and the last (03) only with Washington data.

Table 50. Comment code.

KOMM(I)	
Blank, -0, Or 00 =	No Comments
01 =	DUST (i.e., Dust weather conditions)
02 =	SMOKE (i.e., Smoke conditions)
03 =	DRVWAY (indicates accident occurred at a driveway)

INREL(I)

The last variable to be discussed is the intersection relatedness variable, whose codes are given in Table 51.

Table 51. Intersection relatedness code.

INREL(I)	
Blank, 0, or -0	= Not Intersection Related
1	= Intersection Related
2	= Not Known

The SAI source guide for intersection relatedness is presented in Table 52. Some states carefully distinguished "intersection relatedness" from "intersection locatedness" while others did not. Maryland data was the most specific, stating "500 feet from intersection can be related due to backup of traffic causing *rear end* collision," on the one hand; "20 feet from intersection is not related if dog runs out in front of car, the motorist tried to avoid dog, ran off road, hit pole." Many sets of raw data, however, provided only an intersection code making no statements as to whether this includes (or is exclusively) intersection relatedness or not. This being the case, it was decided to code whatever was available (as given in Table 52) as being applicable to the INREL variable. Thus, Louisiana's Yes/No "Intersection" code, for example, was coded as though Yes meant intersection related and No meant not intersection related.

B.4 UTILIZATION OF BASIC DATA

The basic data tape was not suitable for direct use by statistical analysis programs. A number of intermediate processor programs and disk files had to be generated. This section briefly describes such steps taken to utilize the basic data tape.

B.4.1 Basic Reading and Processing

It will be useful in later discussion to have some understanding of the structure of the basic data tape. The basic tape was created by a FORTRAN program, and the reading of it was usually done with FORTRAN. The FORTRAN READ statement required is presented in Figure 12. The variable names and meanings are exactly as in the previous section.

Table 52. Intersection relatedness guide.

RAW DATA	INFORMATION USED FOR SAI INTERSECTION RELATEDNESS CODING
Arizona, old format (pre-1973)	"At Intersection" or "Non-Intersection" specified in the DIRECTIONAL ANALYSIS field of computer printout.
Arizona, new format (1973 on)	RELATIONSHIP TO INTERSECTION field of computer printout with possible responses "NO RELATIONSHIP," "INTERSECTION RELATED," "DRIVEWAY ACCESS," "ALLEY INTERSECTION," and "UNKNOWN."
California	File Type ($^{F}_{T}$) column of printout with possible responses H-Highway, R-Ramp, and I-Intersection.
California, Riverside	Yes/No code in a column titled "Intersectional."
Connecticut	All accidents physically at <u>or</u> related to an intersection have been located by milepost at the intersection in the State's data bank. A list of all the intersection mile-post locations in the Connecticut sites was provided to SAI.
Georgia	Specified on the handwritten list of accident data as either "Between Int." or "At Road Inter."
Idaho	Computer printout states "IN LANE NO. X NOT AT AN INTER-SECTION," "IN LANE NO. X AT AN INTERSECTION," "NOT STATED," or blank.
Louisiana, Police Reports	Judgement must be made from narrative description.
Louisiana, Computerized	Yes/No numeric code in a column titled "Intersection."
Maryland, all formats	Computer printout column in which R stands for "Inter-section Related" and N for "Intersection Non-related."
Ohio	Codes 1 and 8 of Location of Accident variable, LOC, specify at intersection or interchange, while other values of LOC are for not at intersection. For the old format data (1969-1972) the same LOC variable exists but the directional analysis variable, DIR ANA, was the primary indicator since DIR ANA codes 20-29 reserved for "Intersection" accidents are distinguished from the other DIR ANA codes.
Virginia	For police reports, must judge from narrative description. On the computer printouts, there is an Accident location code in column I specifying "Between Intersections" (0) vs intersections of various kinds (1-8). The latter codes 1-8 are used for accidents related to an intersection as well as those physically at an intersection.
Washington	INT. REL. column of computer printout with possible responses "Non-intersection," "At Intersection," "Drive-way Intersection," and "Intersection related but not at intersection."

```
READ  (2) STATE,ISITE,ROUTEN,IGEO,NCELL1,NCELL2,NCELL3,SLENG
1,NSECTN,NPOST,(POST(I),I=1,NPOST),ITYPS,IFNC,KCENL,KCMON,KCDAY
2,KCYR,KEDGEL,KEMON,KEDAY,KEYR,KPOST,KPMON,KPDAY,KPYR,KGRDRL,KGMON
3,KGDAY,KGYR,KUNTL,KUMON,KUDAY,KUYR,(TRFVOL(I),I=1,9),DCURV,RWIDTH
*,KUNTL2,KUMON2,KUDAY2,KUYR2,KUNTL3,KUMON3,KUDAY3,KUYR3
4,SWIDTH,SPDLIM,ISHLDR,ISURF,NINTER,IDRV,IGVA,DIREC1,DISTC1,DIREC2
5,DISTC2,ISPSGN,NPRCIP,NSNOW,NFOG,NUMACC,MONBEG,MYRB,MONEND,MYRE
*,NUMDO
6,(ACCNO(I),LMON(I),LDAY(I),LYR(I),KATYPE(I),NVEH(I),KLIGHT(I)
7,KTIME(I),KSEVER(I),KDEFCT(I),KSCOND(I),KWEATH(I),KDELIN(I)
8,KOMM(I),ISECTN(I),APOST(I),NPC(I),NTB(I),NOV(I)
*,INREL(I),I=1,NUMDO),ITW
9,NEXTRA,(EXTRA(I),I=1,NEXTRA)
```

Figure 12. READ statement required for the basic data tape.

The basic data tape is an unformatted, binary, sequential file with one site per logical record. Thus, each time the READ statement is encountered (e.g., in a loop), one site will be read off the tape and into the computer's central memory for processing. The length of each logical record varies with the number of accidents associated with the site. Variables STATE, ROUTEN, DIREC1, DIREC2, and each ACCNO(I) are Holerith constants, each a string of 10 central memory characters. Variables beginning with letters I through N are integers, and the rest are all floating point numbers. (These variable types will be an important consideration later.)

A FORTRAN program called AXSITES was developed to serve as the most basic reading routine of the data tape and a starting point for all other routines. Using the READ statement above, it read the tape site-by-site and computed and printed out the exposure and accident rate for each site. It had two important subroutines, FILLTV and MATCH. The latter routine matched yearly traffic volume data with analysis time period boundaries to come up with the correct "exposure," e.g., million-vehicle-miles for each site.

FILLTV was a very important subroutine which "filled in" missing traffic volume data by using linear interpolation and constant extrapolation of known data. Thus, if a given site was to be analyzed over 1970 to 1975, and traffic volumes (in ADT) were known only for 1970, 1972, and 1974, then linear interpolation was used between 1970 and 1972 to arrive at a 1971 value; between 1972 and 1974 for a 1973 value; and the 1975 value was set equal to the 1974 value (constant extrapolation).

Another subroutine, SUB750, was soon added to AXSITES. Its purpose will be explained in the next section.

B.4.2 Accident Inclusion on Horizontal Curves

A special problem exists for the Horizontal Curves because they are such short sites. Accidents which physically occurred within the curve's point of curvature (PC) to point of tangency (PT) region may or may not be curve related, but more importantly, many accidents occurring beyond these limits may, in fact, be curve related. The reasons are as follows.

1. Accidents are located by an investigating officer based on his assessment of the location of the accident by milepost. Therefore, an accident which actually occurs on a curve may appear to have occurred off-curve when plotted on the road log due to an error in locating it by milepost. (This has been validated from the police reports which were reviewed.)

2. Drivers scan the road curvature in an approach zone between two to six seconds before the curve depending upon the environmental, geometric, and traffic conditions. Due to this "preview distance," an accident that occurs as far ahead as 500 feet (152.4 m) from the curve could possibly be curve related.

3. An accident occurring after the curve has been negotiated could also be curve related due to driver's avoidance maneuvers which shift the location of the accident downstream. The accident nonetheless has occurred due to the existence of the curve.

A mini-study was conducted to examine this problem. Initially, it was hypothesized that an accident on or in the vicinity of a curve may or may not be curve related depending upon the individual circumstances under which the accident occurred. Hence, whenever an accident occurs, there is a probability, $p(x)$, that the accident is a curve-related accident. It is assumed that this probability is a function of x, the distance at which the accident occurs from the curve. Conceptually, the probability function p(x) would be expected to have forms similar to those given in Figure 13.

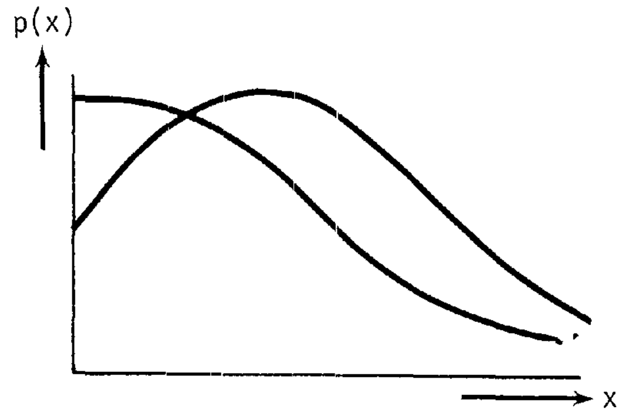
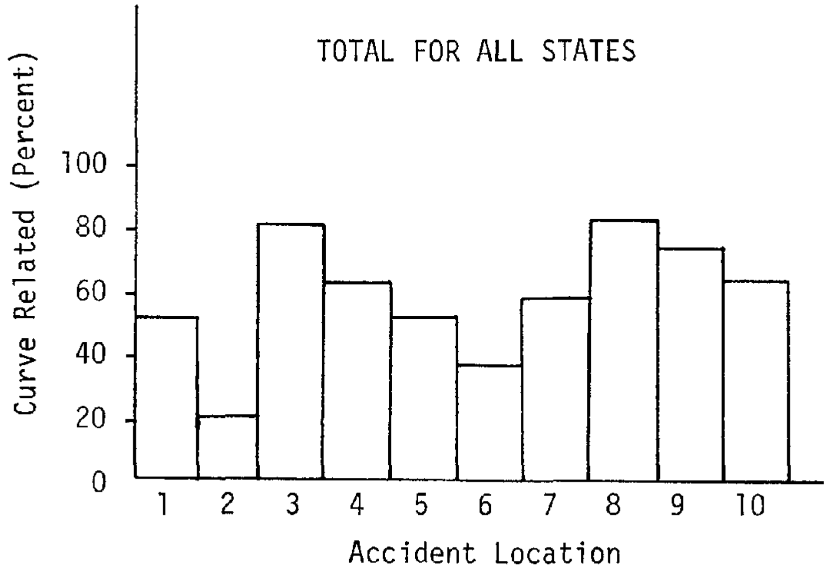


Figure 13. Alternative forms of p(x).

If appropriate functional relationships between the probability p(x) and x could be developed, then the length of the horizontal curve test section could be determined for a specified probability level $\hat{p}$, from $\hat{p} = p(\hat{x})$. This procedure would ensure that for accidents that occur outside the curve test section, the associated probability of their being curve related is some specified small value.

Police reports for all the accidents in the vicinity of the Horizontal Curve sites in Connecticut, Louisiana, Ohio, and Virginia were reviewed in hopes of developing such a p(x) above. "Curve relatedness" was generally easy to determine from the police reports. A tabulation was made of the percentage of curve related accidents as a function of their distance from the curve. Figure 14 presents a plot of the tabulation for all four states. As is evident from the figure, there is hardly any noticeable trend. Because of this random nature of the accident data, it was not possible to develop any functional relationship between p(x) and x. The mini-study failed to yield a usable result.

Fortunately, a fallback position had been previously agreed upon in a delineation coordination meeting in Washington D.C. It was decided



LEGEND

1 - Accidents on the curve
2 - Accidents within .01 mi of PC & PT
3 - Accidents within .01-.03 of PC & PT
4 - Accidents within .03-.05 of PC & PT
5 - Accidents within .05-.10 of PC & PT
6 - Accidents within .10-.15 of PC & PT
7 - Accidents within .15-.20 of PC & PT
8 - Accidents within .20-.25 of PC & PT
9 - Accidents within .25-.30 of PC & PT
10 - Accidents beyond .30 of PC & PT

1 mile = 1.609 km

Figure 14. Curve-related accidents as a function of distance from the curve.

that in the absence of any other information, all accidents that occur on the curve or within 750 feet (228.60 m) from the point of tangency and point of curvature would be treated as affected by the presence of the curve.

This 750-foot (228.60 m) criterion was easily implemented because all accidents occurring in a one mile interval on either side of every horizontal curve site had been coded and put on the basic data tape. So, it was merely a matter of selecting a proper subset of these accidents for use in the analysis based upon the known milepost location for each accident and the mileposts of each curve's PT and PC. Subroutine SUB750 precisely accomplished this task.

In practice, SUB750 was rather long and complex because it had to handle a number of exceptions. First, several Washington and Maryland sites had experienced milepost redefinitions over their analysis time periods. This required programming a detailed catalogue of the changes so that accident mileposts would be compared to the proper boundary definitions. Second, only the milepost of the centerpoint of Virginia curves 19 through 24 was known. An arbitrary decision was made (and subsequently programmed into SUB750) that these sites would have a total length of 0.4 miles (0.64 km).

B.4.3 Matching-Control Analysis Files (SPSS)

Once the basic reading and processing routines had been established, the sites had to be properly classified before the actual analysis could begin. The type of site (matching-control or before-after) flag, as previously mentioned, was found to be invalid for the final analysis to be done. After some searches by hand and on the computer, a final set of criteria for selecting sites for the matching-control analysis and the before-after analysis were established. The actual criteria established will be found in Appendix C. The matching-control criteria were programmed into a subroutine SUBMC; the before-after criteria were not readily programmable, as will be discussed in the next section.

Subroutine SUBMC did several things. In classifying a site as whether it was suitable or not for matching-control analysis, SUBMC might redefine the site's analysis time period dates. Then accidents falling outside of the revised analysis time period would have to be eliminated from consideration. Likewise, delineation dates would have to be checked for applicability in the new time period. The conventions mentioned in Section 3.2 were applied for cases where delineation dates indicated a later time than the accident analysis time periods. Finally, site classification flags suitable for SPSS were set.

The actual matching-control analysis was done using the Statistical Package for Social Scientists (SPSS). The FORTRAN routines AXSITES through SUBMC were used to generate a master file of matching-control sites from the basic data tape. This new file had to be strictly floating point, as required by SPSS. An SPSS system file of matching-control sites, MCFILE, was thereby created, and with it, the actual matching-control computer analysis went very smoothly.

B.4.4 Before-After Routines

The criteria for selecting before-after sites was not readily programmable. There were so many exceptions and special cases that it was easier to simply generate a hand list of "BA" sites, punch this list onto cards, and feed it into the computer.

Such a list was compiled from the printout of computer searches mentioned previously. The list involved approximately 150 sites, giving the site identification (state and number), the before-after treatment, the before and after period dates, and the associated matching-control site, if any. Card formats were developed and the information was punched.

In the meantime, a random access file copy of the basic data tape was made (the basic tape was sequential access). The punched before-after cards and the random access file version of the data tape were used together to create a master file of before-after sites, BAFILE. Random access was absolutely needed to facilitate the association of matching-control sites to before-after sites. Without random access, the tape would have to be repeatedly rewound and sequentially re-read to effect the association, an extremely costly process.

With the BAFILE, the before-after analysis went very smoothly. The analysis routines were devised by SAI as SPSS did not have the special chi-square analysis we desired. The actual analysis is fully discussed in Appendix C.