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April 21, 1975

H.3.64

MEMO TO: J. R. Harbison  
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SUBJECT: Research Report No. 426;  
"Coding Urban Traffic Accident Locations;"  
KYP-74-64; HPR-PL-1(10), Part III.

Report 378 ("Traffic Accident Reporting in Kentucky") was supportive to statewide uniform-accident-reporting legislation. Report 392 ("Identification of Hazardous Locations . . .") related criteria for recognizing hazardous situations from accident statistics. The route-mileage method of referencing rural, accident sites was already in operation. A compatible method for referencing urban accident sites and encoding them for storage and retrieval was requested by the Traffic Division in order to prepare for orderly processing of these additional reports from the Bureau of State Police, beginning July 1. Criteria for recognizing and flagging hazardous, urban sites are currently under study.

Although this report does not directly address the matter of referencing accidents which occur on un-numbered state roads or county roads, it is assumed that the name of the road and the distance from a named intersection or mile marker would suffice. Parking lot accidents, etc., could be referenced by address.

Respectfully submitted,

A handwritten signature in cursive script, appearing to read "Jas. H. Havens".

Jas. H. Havens  
Director of Research

sh  
Attachment  
cc's: Research Committee

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15. Supplementary Notes Prepared in cooperation with the US Department of Transportation, Federal Highway Administration  Study Title: Data Management					
16. Abstract  <p style="text-align: center;">This study reviews urban traffic accident location reference methods. Consideration is given to techniques used in other states and various cities. The needs for the Commonwealth of Kentucky were examined and a recommended location reference method and coding scheme are presented.</p>					
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Research Report  
426

**CODING URBAN TRAFFIC  
ACCIDENT LOCATIONS**

KYP-74-64; HPR-PL-1(10), Part III

by

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DEPARTMENT OF TRANSPORTATION  
Commonwealth of Kentucky

The contents of this report reflect the views of the author who is responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the Bureau of Highways. This report does not constitute a standard, specification, or regulation.

April 1975

## INTRODUCTION

The Highway Safety Act of 1966 committed each state to a program to reduce traffic accident frequency and severity. Each state's program is subject to approval by the U.S. Secretary of Transportation and must conform to standards issued. Federal highway funding has been linked to these standards by POLICY AND PROCEDURE MEMORANDUM 21-16. The U.S. Department of Transportation has issued eighteen uniform safety standards (1), relating to

1. motor vehicle inspection,
2. motor vehicle registration,
3. motorcycle safety,
4. driver education,
5. driver licensing,
6. traffic codes and laws,
7. traffic courts,
8. alcohol in relation to highway safety,
9. identification and surveillance of accident locations,
10. traffic records,
11. emergency medical services,
12. highway design, construction, and maintenance,
13. traffic control devices,
14. pedestrian safety,
15. police traffic services,
16. accident cleanup,
17. pupil transportation safety, and
18. accident investigation and reporting.

The Bureau of Highways and Bureau of State Police are jointly responsible for programs relating to Standards 9 and 10. The Bureau of Highways conducts a high-accident location identification and surveillance program, which attempts to flag dangerous locations and correct them. State Police keeps the accident records and uses them for identifying dangerous locations and improving enforcement. Complete and accurate accident reporting is essential to both agencies. Accident reports by State Police and reports of all fatal accidents submitted by other investigating police agencies are in the file. However, The 1974 Kentucky General Assembly (2) extended uniform reporting requirements to all police agencies, as follows:

"(1) Every law enforcement agency whose officers investigate a vehicle accident of which a report must be made as required in this chapter shall file a written report of the accident with his law enforcement agency within ten (10) days after his investigation of the accident upon duplicate forms supplied by the department of justice.

(2) Every law enforcement agency receiving vehicle accident reports required by subsection (1)

shall forward one (1) copy thereof to the department of justice from time to time as prescribed by regulations of the department."

Accident reports will be coded and stored on magnetic tape. The milepost system has been implemented; the signing cost \$460,000 (3). The system, which is common throughout the United States, uses a county code number, route, and milepoint. Mileposting streets in urban areas, except freeways, may be inappropriate. The purpose of this study, therefore, was to examine urban reference methods and their adaptability to impending implementation of the law. Letters of inquiry were sent to other state traffic engineering agencies, and replies were analyzed. Inasmuch as the uniform accident reporting law becomes effective on July 1, 1975, the system must be one that can be implemented in a minimum of time. It should also be a method that can be easily understood and used by the investigating officer and the encoder.

## ACCIDENT LOCATION REFERENCE METHODS

Highway location reference systems may be categorized as field oriented and office oriented (4). Field systems are those involving markers along the roadway and measuring or estimating the distance from the nearest marker or reference point to the site. Office systems are those based on maps, printed logs, or indexes. The location is referenced to the nearest permanent physical feature (by the investigating officer in the field), and the specific description is written and coded later in the office. Field-oriented systems are more reliable than office-oriented systems because the accident location is determined on the spot. Office systems require some remote interpretation and coding of site descriptions.

Location reference methods used in the United States have three common elements:

1. they identify a known point,
2. they measure a distance from that known point, and
3. they identify a direction from that known point (5).

Note: Distance and direction from a known point define a position vector.

Further, these methods are variations of three basic concepts:

1. route number-accumulated mileage,
2. nodal systems, or
3. coordinates (6).

The route-mileage method is about as simple as reading an ordinary highway map. Nodal systems assign intersections a node number and locate an accident site at a distance from a node along a link of road. Coordinate systems, in general, describe the point along the roadway in terms of X and Y rectangular coordinates. The most widely used is the route-mileage method; the others are used on a limited basis but, as yet, have not proven to be as effective (4).

The route-mileage methods are predicated on either milepoints or reference points. They are field oriented if milepoint or reference point markers are erected in the field. They can be more office oriented if milepoints or reference points are fully indexed or mapped. Field systems are preferred, although location with respect to permanent landmarks does allow the principles of these systems to be accomplished in the office.

Mileposting begins and ends at a boundary, usually a county or state line, or at route termini. The mileage is accumulated from the southern or western boundary or from the terminus of the route if it does not cross such boundaries. In earlier times, many distances were reckoned from county courthouses or from zero-mile markers erected in county seat towns. Roads interconnecting or radiating from county seats were numbered clockwise, from north, for project identification; now, additional numbering obscures the original system. Surveys and plans show distances by feet or 100-foot stations. Mileposting, however, is usually determined by odometer measurements. Mileposts are placed at regular intervals, which are usually one mile, and mileages can be read directly from them. Reference points were developed because relocation, reconstruction, or re-routing changes the distances or lengths of segments and causes discrepancies in milepoints. Reference points never change; they can be abandoned if they are bypassed; and new ones can be established and cross-referenced. Mileages are difficult to associate with street systems (7, 8) inasmuch as street intersections provide a type of reference point system already familiar to all and documented by maps.

#### URBAN ACCIDENT LOCATION REFERENCE METHODS

There are two basic types of routes in urban areas: state and federal routes traversing the urban area and city streets. Accident locations on the state or federal routes using streets through cities could be referenced by the same methods used for the rural sections, but this could lead to two different systems inside the cities and suburbs. Emphasis in urban areas is placed on identifying the intersections where high concentrations

of accidents occur. Consequently, some methods reference urban accidents to the nearest intersection or merely as being between two intersections. Others place more importance on the exact point of impact.

Once the nearest intersection is identified, the distance and direction from the intersection fix the site. This distance can be estimated or measured in feet rather than in hundredths of a mile; 0.01 mile is no closer than 50 feet. The house number along the street can also be used to describe a location and may be mentioned on the accident report, but the distance in feet from a named intersection is preferred.

The link-node method appears to be the most applicable in states which originally adopted the township or section plan for public land surveys. Columns and tiers of squares are numbered; node numbers are assigned to road intersections, ramps, bridges, etc., in each square. Distances are referenced to the node. Grid scales and transparent overlays for maps are necessary for coding and de-coding. Iowa has adopted a grid coordinate system, and the adaptation to accident location is summarized in a report by Wilbur Smith and Associates (9). Arruda, Crevo, and Manning (11) developed a method for Rhode Island which matches the accident location, identified by street address, to locations on the Bureau of the Census' DIME/GBF Dual Independent Map Encoding/Geographic Base File (10). This is a computerized representation of map features. All accidents occurring on both rural and urban routes in Massachusetts are referenced by coordinates (11).

The other methods are not drastically different from the link-node method. Many of them identify the nearest intersection and the direction and distance from it. The intersections are identified by varying means. Delaware assigns a unique number (similar to node numbers) to each intersection in each city (12). Alternatively, many methods reference the intersection by identifying the two intersecting streets. Georgia, for example, uses a universal street index, which uses the same code number for all streets with the same name in all Georgia cities (13). Others use numerical codes for the streets in each urban area. Some spell the street name; some use the first few letters or only the consonants. The City of Louisville uses a method of referencing intersection accidents by identifying the two intersecting streets, and non-intersection accidents are identified by the street and house number (14). The streets are identified by name but are also numerically coded.

**RECOMMENDATIONS FOR KENTUCKY**

Inasmuch as rural Kentucky is not mapped by planar coordinate grids (14, 15), X-Y coordinate referencing of accidents would not be readily implementable on a statewide basis. Although the coordinate method might be adapted to some cities and towns, the problem of defining urban boundaries could lead to considerable confusion for the encoder. Although an X-Y system provides the potential capabilities for computerized graphics, the need for such displays of accident occurrences has not been established. The most readily implementable system for Kentucky appears to be merely an extension of the rural route-mileage system into cities and suburbs. The street or road is named, and distance is referenced to the nearest intersection. The proposed method of reporting and encoding is given in the following outline. A schematic diagram of the proposed format follows thereafter.

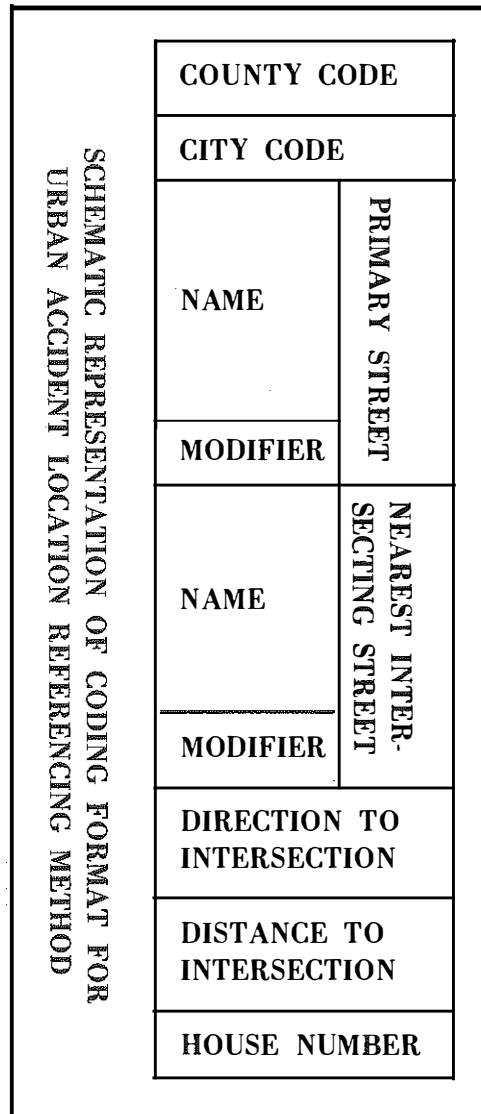
**URBAN ACCIDENT LOCATION REFERENCE  
METHOD CODING INSTRUCTIONS**

- I. COUNTY CODE
- II. CITY CODE  
Use of four-digit code taken from IBM MANUAL OF NUMERICAL CODES FOR STATES, COUNTIES, AND CITIES.
- III. PRIMARY STREET  
This is the street on which the accident occurred or the principal street at an intersection accident. It is coded with the first eight letters of the street name.
- IV. STREET NAME MODIFIER  
This is coded as below:  

Avenue	A
Boulevard	B
Road	R
Highway	H
Pike	P
Street	S
Drive	D
Lane	L
Way	W
Circle	O
Court	C
Trail	T
- V. NEAREST INTERSECTING STREET  
This is the nearest intersecting street. Codes same as in III.
- VI. STREET NAME MODIFIER: Codes same as in IV.

- VII. DISTANCE AND DIRECTION TO NEAREST INTERSECTING STREET
  - A. Distance in feet, estimated from the center of the intersection
  - B. Direction from intersection:
 

North	N
East	E
South	S
West	W
- VIII. HOUSE NUMBER  
Record if available and applicable.



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