THE DWIGHT DAVID EISENHOWER TRANSPORTATION FELLOWSHIP PROGRAM

REFERENCE MARKERS PERFORMANCE SURVEY

FINAL REPORT

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LIST OF ACHRONISMS

AASHO	American Association of State Highway Officials
AASHTO	American Association of State Highway and Transportation Officials
ADA	Americans with Disabilities Act
ARTIMIS	Advance Regional Traffic Interactive Management and Information System
CTIA	Cellular Telecommunications and Internet Association
FHWA	Federal Highway Administration
ITS	Intelligent Transportation Systems
JC	Joint Committee
MDUCT	Manual de Dispositivos Uniformes para el Control del Tránsito
MUTCD	Manual on Uniform Traffic Control Devices
NCSHS	National Conference on Street and Highway Safety
NHTSA	National Highway Traffic Safety Administration
TCC	Traffic Control Centers
USA	United States of America

INTRODUCTION

Reported experience at several traffic control centers nationwide suggested that wireless phones callers provide an important source of incident detection information, sometimes resulting in much faster detection. Wireless phone users can report incidents that traditional incident detection methods cannot capture. Inaccurate information about the location of the incident is one of the major obstacles to reliable incident detection by wireless phones. It is usually difficult for a driver to report his/her location correctly and to provide meaningful information for the operator at the traffic control center to adequately characterize the incident in hand. As a result, valuable minutes are lost in providing medical care as the emergency service provider searches for the crash. This situation is even worse with unfamiliar motorists.

Location markers have been found to be very useful to avoid this problem. This signs help informers to know exactly where the incident is, and response teams will more easily know which route to take to get to the reported location in the minimum amount of time possible.

Reference markers have been in used in eleven states within the United States (Figure 1). Their performance in a real world scenario must be studied in order to understand their usefulness and possible flaws. An intense study is essential in surveying the states and local jurisdictions on local referencing sign systems they using.

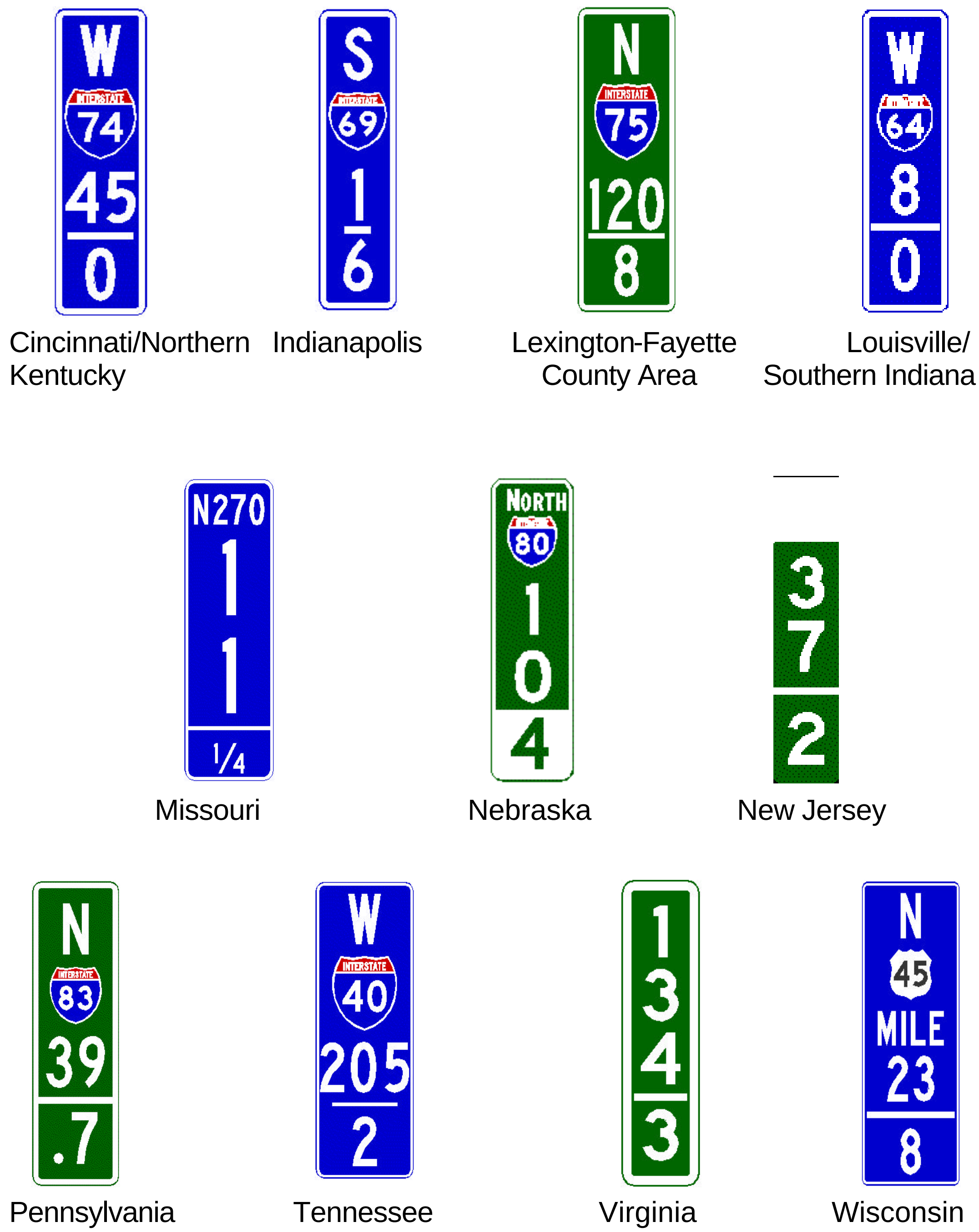

Figure 1. Reference Markers currently installed in U.S. Highways

BACKGROUND AND IMPORTANCE

It is estimated that over half of the traffic congestion in the United States is caused by incidents. Such incidents as accidents, adverse weather conditions, sporting events, parades, construction and maintenance activities, tourist attractions, or other events can cause congestions by temporarily increasing demand or reducing the capacity of the transportation network. Those not directly affected by the incident can lead to further congestion and delays. Even minor incidents, such as an abandoned vehicle on the shoulder, can reduce roadway capacity and create a potential safety hazard. Incident Management programs have been implemented in various locations throughout the country as a systematic approach to minimizing the traffic congestion and safety impacts of incidents. From these programs, Incident Management has proven to be one of the most successful ways to reduce traffic congestion, but the associate commitment of resources and institutional arrangements often appears frightening. Including of new Intelligent Transportation Systems (ITS) technologies and concepts promises to make Incident Management more effective, less resource-intensive, and more feasible for widespread application throughout the United States.

Incident Management services help to immediately and correctly identify a variety of incidents, and to implement a set of actions to minimize the effects of those incidents on the movement of goods and people. Furthermore, the service will help to distinguish or forecast hazardous weather, traffic, and facility conditions so that they can take action in advance to prevent incidents or minimize their impacts. A major concern and focal point of the Incident Management user service is improving the response to unpredicted incidents. These include unexpected events such as vehicle breakdowns, accidents, and loss of cargo situations. Because these situations give no advanced warnings, the time of detecting the situation and of implementation of proper response is critical. The longer it takes to correct this situation, the more congestion there will be.

The concept of developing a product, based on available research, for providing location referencing via signs has been a desirable target of incident management system. While the concept in not new, only recently have researchers determined the necessity of developing recommendations and guidance material in regards to location marker signs.

The continued application of advanced communication and information technologies to traffic systems operations will perform a range of possibilities in this regard. The implementation of this system will efficiently diminish response times needed to help alleviate the problem of inaccurate location reporting. Feasibility of providing freeway location signs at frequent intervals to assist in accurately locating the scene and the need for rapid verification of the nature, location, magnitude, and appropriate response mechanisms for reported incidents.

OBJECTIVES

The main objective of this research is to access the actual performance of some of the existing reference markers to understand the importance of the markers for incident management and to identify flaws to be corrected.

LITERATURE REVIEW

Previous Works

The Kentucky Transportation Center at the University of Kentucky (1) has being investigating the reference markers in Cincinnati-Northern Kentucky, Lexington-Fayette County Area, Louisville Southern Indiana, and Indianapolis. The Interim Report, published in December 1998, was prepared in a cooperative with the Kentucky Transportation Cabinet, the Ohio Department of Transportation, and Federal Highway Administration.

The first phase of the report document the installation characteristics for the four markers studied. Information about the system under the markers were installed, the quantity of markers used, the exact installation location, the markers size, and the installation cost is summarized in this part.

The report summarizes the conditions and procedures followed by the second phase of the project. The second phase consist of a condition and an opinion survey of reference markers. Results of the condition surveys present the physical conditions of the installed markers. The missing, and damage markers were counted and reported. The opinion survey was conducted by passing questionnaires to staff members related to the markers. Three different questionnaire versions were distributed to

ARTIMIS (Advance Regional Traffic Interactive Management and In formation System) staff in Cincinnati-Northern Kentucky. The results of the survey are summarized and analyzed by the reporters

Wireless Communications

Transportation systems are developing constantly and the need to improve highways capacity have created a new approach that integrates technology with roadways systems. Technology has permitted communications to become wireless and these have created a great advantage in highway safety. Reported experience at several traffic control centers nationwide suggested that wireless phones callers provide an important source of incident detection information, sometimes resulting in much faster detection. Wireless phone users can report incidents that traditional incident detection methods cannot capture. (8)

The use of cellular phones has become popular among the population. Cellular phone subscribers in the United States have increased from about 55 millions at the end of 1997 to approximately 120,880,698 in August 2001(5). In an estimate done by the Cellular Telecommunications and Internet Association (CTIA) it is expected that about 33 percent of drivers nationwide are expected to be subscribers (5)

This means a great advantage for the implementation of drivers with cellular phones in the incident report stage.

Reporting of freeway incidents by drivers by personal mobile phones has become common in the United States (5). A 10 % prevalence of mobile phones would assure detection of an incident in less than a minute even under low volume conditions (7).

There is a safety issue related to the use of cellular phone in the car. Concern with this issue, CTIA developed an educational campaign to avoid the incorrect use of cellular phones on automobiles. (4)

The National Highway Traffic Safety Administration (NHTSA) recently released a new survey that confirms that education is a priority on the driver distraction. The survey also found that 54 percent of drivers usually have a wireless phone in their vehicle with them, recognizing the inherent safety benefits. It should be recognized that drivers also carry cellular phones on their cars for safety reasons, and that sometimes this could represent the only means to save somebody's life. All drivers should be encouraged to use their wireless phones safely and responsibly, but their safety benefits cannot be overlooked. (4)

Highway Sign Standards

When studying markers, it is essential to understand the standards for highway signs in the United States. It is important to know the standards that exist and the requirements that these standards have.

Traffic signs are the most extensively used form of traffic control in the United States. More than 55 million traffic signs line the nation's roadsides (2). They provide information about speed limits and road conditions. They direct traffic along certain routes and to specific destinations. By using signs, traffic control planners tell drivers what to do, what to watch for, and where to drive (2).

In the United States the Manual on Uniform Traffic Control Devices (MUTCD) standardizes traffic control devices such as signs. This manual contains standards, guidance, and options for signing within the right-of-way of all types of highways open to public travel (9). MUTCD classifies signs in three major categories: Regulatory, Warning, and Guidance.

Regulatory signs, as defined by the MUTCD, should be used to inform the road user of traffic laws and regulations, and indicate the applicability of the legal requirement. The colors used in most of these signs are red, white, and black (9). These markers usually have distinctive shapes to avoid confusion. Figure 2 presents an example of a regulatory sign (the Stop sign).

Figure 2. Example of a Regulatory Stop Sign
(Source: MUTCD Millennium Edition)

Warning signs are designed to inform unexpected conditions on or adjacent to the road and situations that are not apparent to the road user. All these signs are diamond shaped with a yellow background and a black legend (9). Figure 3 presents various examples of typical warning signs.

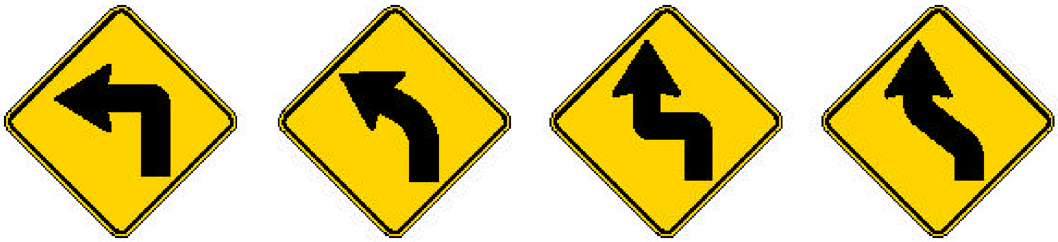

Figure 3. Examples of Warning Signs
(Source: MUTCD Millennium Edition)

Guidance signs are essential to direct road users, and to inform them of intersecting routes to help them along their way in the most simple and direct manner. These signs should be, unless otherwise specified, green in the background with white lettering. Guidance signs may have different shapes, but the majority has a rectangular form (9). An example of a guidance sign is shown in Figure 4.

Figure 4. Example of a Guide Sign
(Source: MUTCD Millennium Edition)

The standard for the alphabet used in highway signs is contained in the 1977 Standard Alphabets for Highway Signs and Pavement Markings. For signs in the United States the alphabet is divided in 6 series. These series are B, C, D, and E (M). This standard indicates the exact widths and heights for each series. (10)

Manual on Uniform Traffic Control Devices

The MUTCD defines the standards of traffic control devices used in all the streets and highways in the USA. Traffic control devices are signs, signals and pavement markings. These devices are very important because they improve traffic performance, promote uniformity, and help improve safety by reducing the number and severity of traffic incidents.

History of Traffic Control Devices

Motor vehicles appeared in the United States at the beginning of the 20^{th} century (3). In the beginning the use of cars was complicated because drivers tended to get lost due to the lack of signalization (6). In 1899 owners of the new vehicles in New York City formed the automobile club responsible for maintaining signs in the principal local highways and assuring these devices were able to guide drivers to common destinations (6).

Additional clubs formed around the country, and they started to signalize their roads. (6) Unfortunately, competition for signing certain popular routes grew and became increasingly aggressive as to which club would sign which routes. A study showed that about 40 to 50 percent of the most frequently traveled roads, had as many as 11 different signs for one single route.(6)

Other traffic control devices, besides the signs, were developed at the beginning of this century. In 1911 the first centerline was painted in

Michigan, in 1914 the first electric traffic signal was placed in Cleveland, and in 1920, 3 color traffic signal was installed in Detroit (6).

Standardization of Traffic Control Devices

In the early 1920s, representatives from Indiana, Minnesota, and Wisconsin gathered to develop a basis for uniform signs and road markings. The group reported its findings in 1932. The results were standards for sign shapes, some of which are still in use as we enter the 21st century. In 1924, the First National Conference on Street and Highway Safety (NCSHS) improved earlier efforts and proposed the standardization of colors for traffic control devices. Again, many of the approved signs remain in use today. In 1924, the American Association of State Highway Officials (AASHO, the forerunner of AASHTO) took earlier efforts one step further by issuing a report that combined the previous efforts to standardize sign shapes and colors (6).

The importance of the AASHO report is that it became the basis for the first guidebook, *Manual and Specifications for the Manufacture, Display, and Erection of U.S. Standard Road Markers and Signs*, published in 1927. However, that manual exclusively addressed the use and design for signs, and did not address signals or markings. Following a national survey of existing traffic control devices, the *Manual on Street*

Traffic Signs, Signals, and Markings was published (6). The Manual included signs, signals, pavement markings, and devices for safety zones.

Evolution of the MUTCD

In 1932, AASHO and NCSHS formed the first Joint Committee on Uniform Traffic Control Devices (JC). In 1935, the first MUTCD was published. It was approved as an American Standard by November 1935. The content of this first manual was separated into four parts that addressed signs, markings, signals, and islands (6).

This edition started to grow and various supplements were written afterward. In 1939, the JC issued the first supplement that recommended changes in signs illumination, speed signs, no-passing zones paving markings, signal warrants, and pedestrian signals. A new supplement was published in 1942. It described the types of traffic control devices to be used in blackout conditions (as a result from the war) (6).

In 1948, a new edition of the MUTCD was published. The new format used has every control device divided to avoid repetition or confusion. It also addresses the need to simplify word signs by adopting a rounded-letter alphabet. Other editions of the MUTCD were written in 1961 and 1971. The 1961 edition adopted two new parts; one addressed construction and maintenance operations, and the other included civil defense signing. The 1971 edition had definitions for the use of the words “should”, “shall”, and “may”. In this edition school signs were also adopted (6).

In 1978 the fifth edition of the MUTCD was published. This edition contained two new parts that addressed highway-rail crossings and traffic control for bicycle facilities. The next edition was published ten years later, in 1988. The 1988 edition suffered a change in 1993 with the inclusion of part VI concerning temporary traffic signals. The 1988 MUTCD edition was the last edition ever written before the current Millennium Edition (9).

MUTCD Millennium Edition

The last edition of the MUTCD currently available was published in December 2000. This new edition will make it easier for users to keep up with updates and revisions (9). The edition was made in a book mode divided in modules, in CD-ROM and on the Internet (http://mutcd.fhwa.dot.gov), which permits greater access to new information (9).

The millennium edition was formatted to improve overall organization and discussion, and facilitate availability and understanding.

The edition contains changes of various sections including: new signs and pavement markings, changes in standards and guidance, two new sections (rural roads and light rails), major changes in work zones section, and the addition of the Americans with Disabilities Act (ADA) and pedestrian guidance. (9).

There are two chapters of the MUTCD that are directly related to this research project: chapter 2 and chapter 5. Chapter 2 contains the regulations for traffic signs. Chapter 5 is related to traffic control devices for low-volume flows. Both chapters are related to the research because they have regulations concerning traffic signs, which are the devices this work is based on.

EXPERIMENT DESCRIPTION

In order to understand the performance level of reference markers that are currently operational. In order to obtain information on how these markers are working in real world situations, a questionnaire was developed (Appendix 1).

Six markers were randomly chosen for this survey. The selected markers are the ones located in Lexington, New Jersey, Missouri, Pennsylvania, Tennessee, and Virginia. Questionnaires were distributed to state highway officials and response center operators in this locations.

The questionnaire was developed to assess the performance of these devices based on the opinion of the personnel that is working with them on a daily basis. It intended to find out if any instructions were given to operators about the use of the markers. The questionnaires inquire about the configuration of any educational campaign to educate the public about the usage of these new markers.

RESULTS

The performance survey was distributed to six offices in the USA that manages reference markers as explained previously. The participant areas were: Lexington/Fayette County Area, Missouri, New Jersey, Pennsylvania, Tennessee, and Virginia. Results were studied independently for each area and altogether.

Lexington/Fayette County Area

In this area the performance survey questionnaire was distributed to 17 state highway officials and response center operators. These markers have been in use on two main interstates (I-64, and I-75) in this area for approximately 3 years. Results showed that according to the majority of the participants an educational campaign for the drivers has not been conducted in this particular area.

Results based on the opinion of the majority of the participants showed that:

1. Only some of the drivers reporting incidents use the reference markers (Figure 5) – 79%
2. When drivers use markers for location, they are at least accurate on their report (Figure 6) – 86%

3. Incident detection time moderately reduced with the implementation of the reference markers (Figure 7) – 69%

4. Emergency response operators ask callers to use the reference markers to indicate location

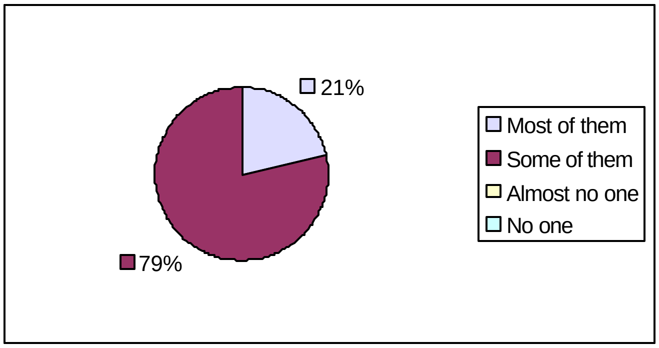

Figure 5. Drivers reporting incidents using reference markers in Lexington

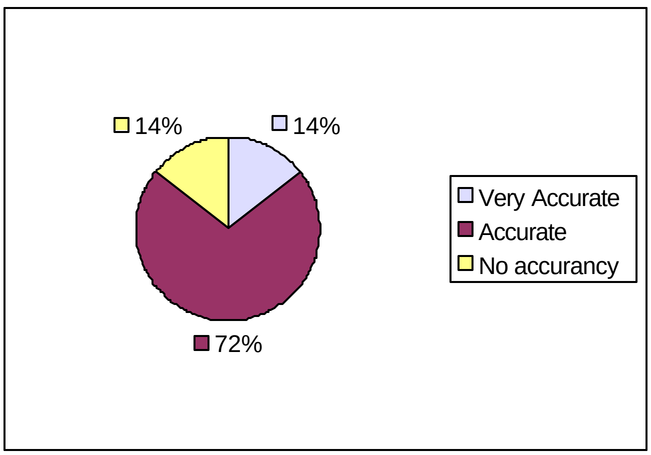

Figure 6. Accuracy from drivers as perceived by questionnaire participants in Lexington

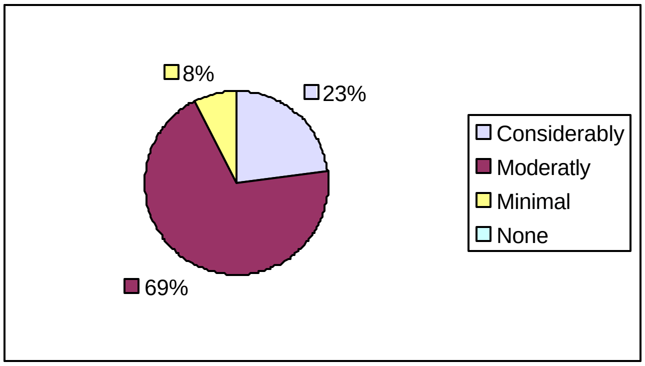

Figure 7. Improvement in response time perceived by the questionnaire participants in Lexington

Missouri

Only one performance survey questionnaire was distributed in the Missouri area due to personnel availability constraints. The markers have been operational in the Saint Louis area for approximately 4 to 5 years. The participant stated that an educational campaign for the drivers has been conducted in this area.

It was also stated on the questionnaire that some of the drivers calling to inform incidents use the markers for reference. When callers refer to reference markers for location, they tend to be accurate on their location report. A moderate reduction on incident response time has been gained in this area since the markers were located.

New Jersey

In this location three participants responded to the performance survey questionnaires. Markers on two main interstate in this area have been operational for about 4 to 7 years as stated by participants. In this area, no public educational campaign related to these devices has been performed.

Results based on the opinion of the majority of the participants showed that:

1. Only some of the drivers reporting incidents used the reference markers (Figure 8) – 67%
2. When drivers use markers for location, they are accurate on their report (Figure 9) – 67%
3. Incident detection time moderately reduced with the implementation of the reference markers (Figure 10) – 67%
4. Emergency response operators always ask callers to use the reference markers to indicate location

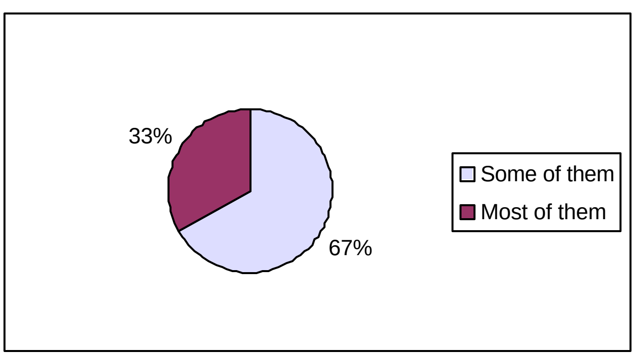

Figure 8. Drivers reporting incidents using reference markers in New Jersey

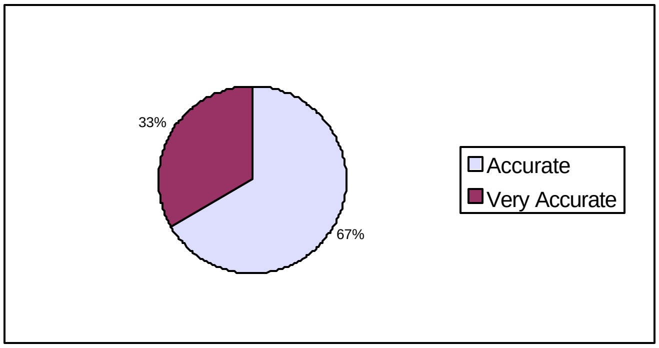

Figure 9. Accuracy from drivers as perceived by questionnaire participants in New Jersey

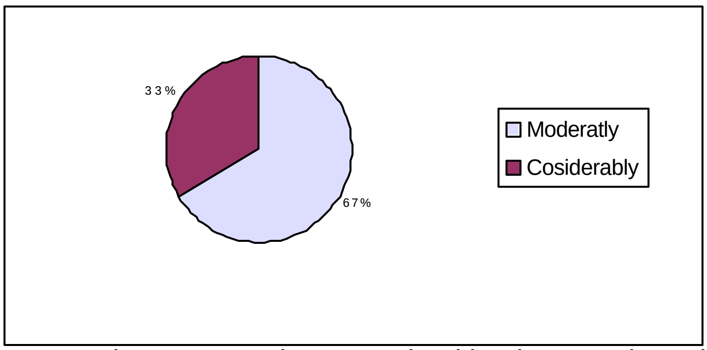

Figure 10. Improvement in response time perceived by the questionnaire participants in New Jersey

Pennsylvania

The questionnaires for this area were distributed to 12 state highway officials and response centers. The markers in three main highways in this area have been working from 4 to 5 years. Based on the answers, an educational campaign for drivers has not been done yet.

Results based on the opinion of the majority of the participants showed that:

1. At least some of the drivers reporting incidents used the reference markers (Figure 11) – 92%
2. When drivers use markers for location, they are accurate in their report (Figure 12) – 100%
3. Incident detection time was reduced at least moderately with the implementation of the reference markers (Figure 13) – 83%
4. Emergency response operators ask callers to use the reference markers to indicate location

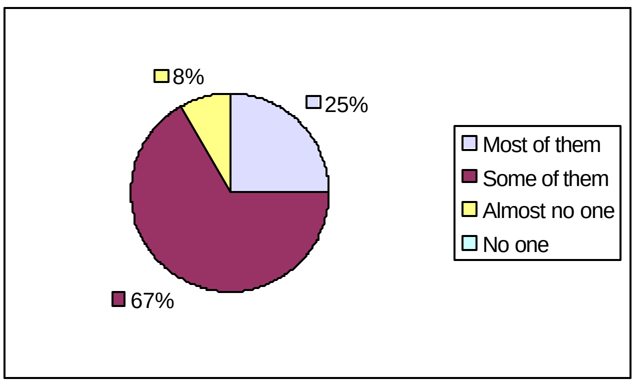

Figure 11. Drivers reporting incidents using reference markers in Pennsylvania

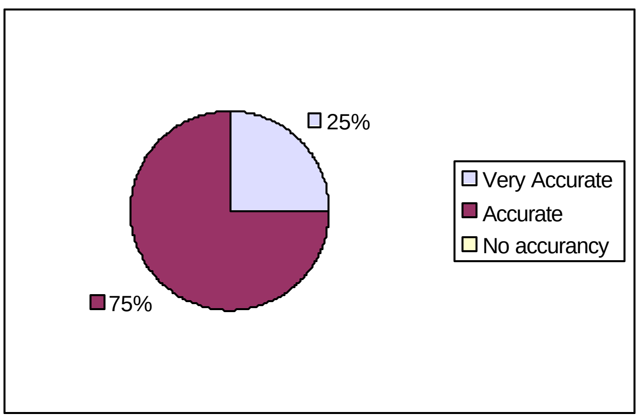

Figure 12. Accuracy from drivers as perceived by questionnaire participants in Pennsylvania

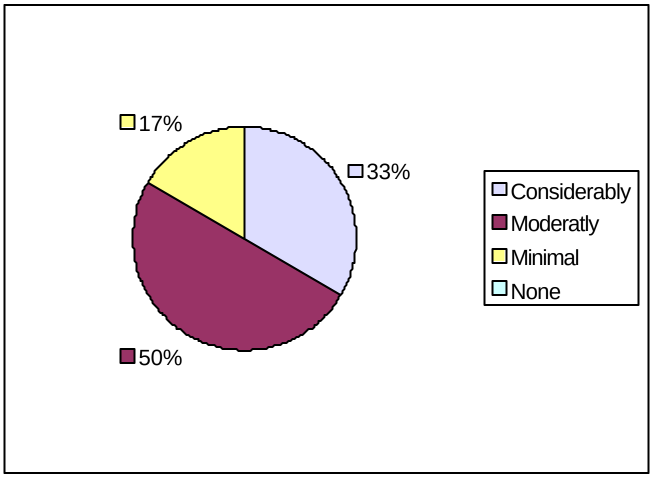

Figure 13. Improvement in response time perceived by the questionnaire participants in Pennsylvania

Tennessee

Twenty-seven state highway officials and response center operators in Tennessee participated in the performance survey. The reference markers have been operational in the Nashville and Knoxville areas for about 2 years. According to 54% of the participants, an educational campaign related to the use of the markers was conducted. However, the remaining 46% stated that no educational campaign was developed in this area. These results showed contradiction among responses perhaps caused by lack of communication within the agency.

Results based on the opinion of the majority of the participants showed that:

1. At least some of the drivers reporting incidents used the reference markers (Figure 14) – 89%

2. When drivers use markers for location, they are accurate in their report (Figure 15) – 78%
3. Incident detection time reduced at least moderately with the implementation of the reference markers (Figure 16) – 85%
4. Emergency response operators always ask callers to use the reference markers to indicate location

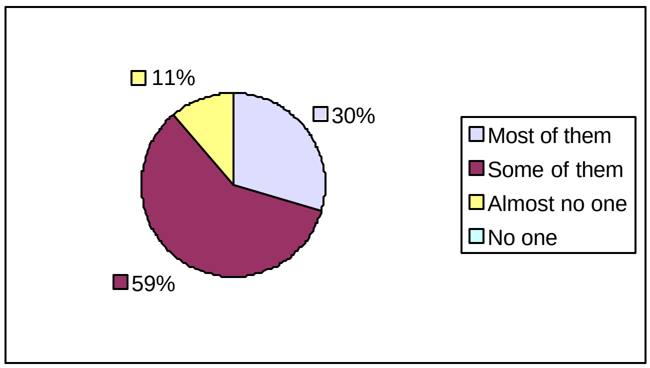

Figure 14. Drivers reporting incidents using reference markers in Tennessee

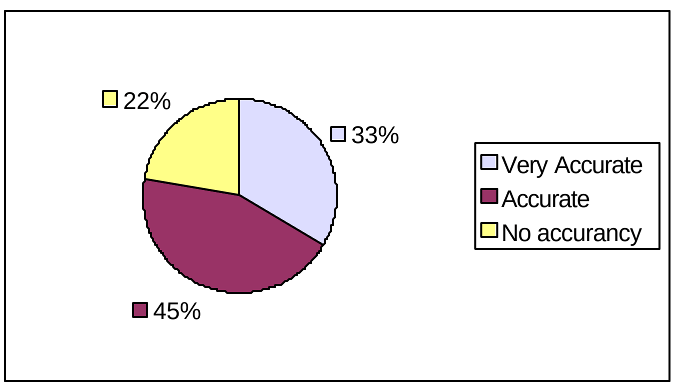

Figure 15. Accuracy from drivers as perceived by questionnaire participants in Tennessee

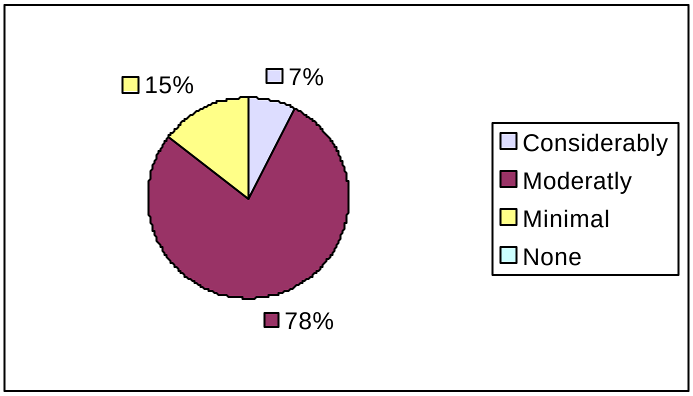

Figure 16. Improvement in response time perceived by the questionnaire participants in Tennessee

Virginia

In the Virginia area 13 state highway officials and response center operators participated in the performance survey. Markers have been working in a major interstate in this area for 3-5 years. An educational campaign for highway users about the marker has not been performed in the area based on the participant's responses.

Results based on the opinion of the majority of the participants showed that:

1. Most of the drivers reporting incidents used the reference markers (Figure 17) – 62%
2. When drivers use markers for location, they are accurate in their report (Figure 18) – 62%
3. Incident detection time was considerably reduced with the implementation of the reference markers (Figure 19) – 77%

4. Emergency response operators always ask callers to use the reference markers to indicate location

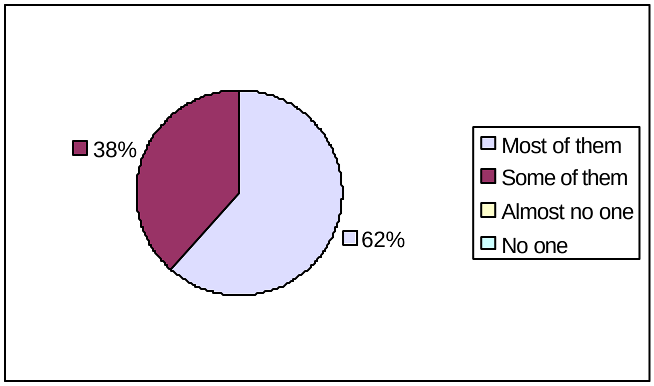

Figure 17. Drivers reporting incidents using reference markers in Virginia

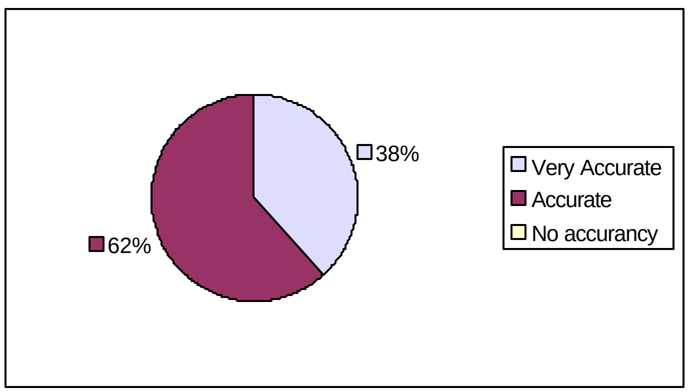

Figure 18. Accuracy from drivers as perceived by questionnaire participants in Virginia

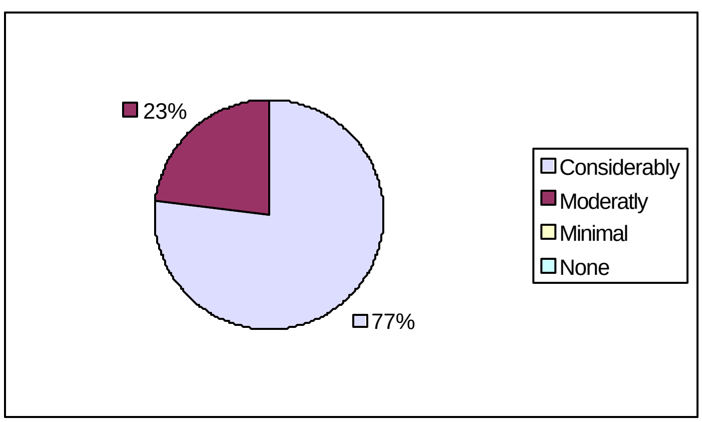

Figure 19. Improvement in response time perceived by the questionnaire participants in Virginia

Integrated Data Analysis

All the data from the six areas was grouped for the analysis (Appendix 2). The 73 questionnaires were studied to obtained results that will explain how in general these markers are working in the highways and roads where they are displayed in experimental stage granted by the FHWA.

Responses obtained for the different questions asked are presented here:

1. Do drivers use these signs to report incidents location?

The results presented on Figure 20 show that the majority of the participants (66%) indicate that some of the callers use the reference markers for incidents location. A 23% indicated that most drivers use the marker, and only a 7% believed that almost none of the callers used these signs. The remaining 4% indicated that none of the drivers used the markers for this purpose.

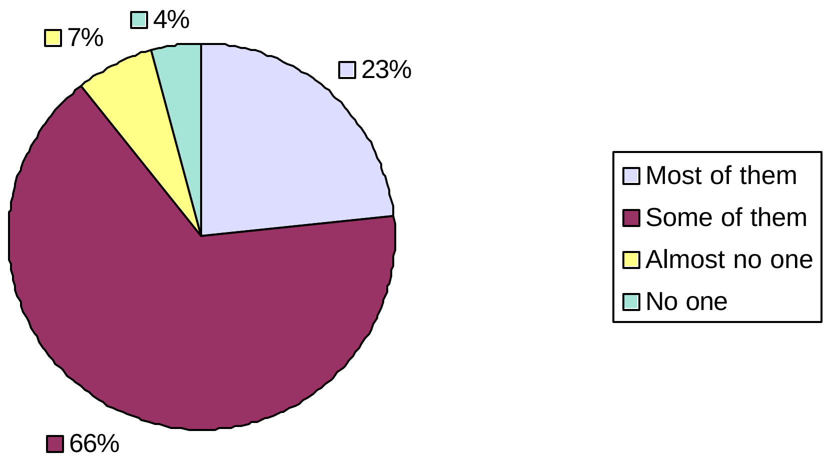

Figure 20. Drivers reporting incidents using reference markers for the integrated data analysis

2. How accurate are the drivers when reporting incidents location using these markers?

Results on Figure 21 show that the majority (63%) of the responders indicated that drivers using reference marker for location were accurate in their reports. Twenty six percent (26%) indicated that drivers were very accurate. Adding these two results lead to an 89% of the responders indicating some accuracy when using the markers. Seven percent (7%) responded that drivers presented no accuracy; the remaining 4% did not answer this question.

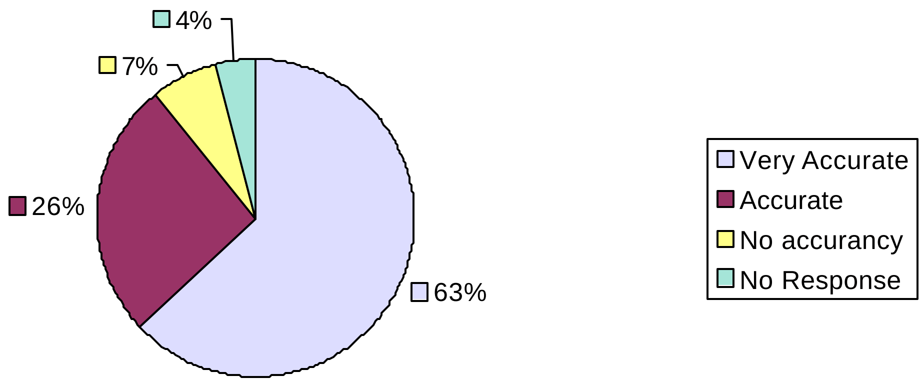

Figure 21. Accuracy from drivers as perceived by all the questionnaire participants

3. According to your experience, the incident detection time has improved with the implementation of these signs.

The responses obtained are shown in Figure 22. Forty four percent of the participants answered that incident detection was moderately reduced when the markers were implemented. Thirty eight percent (38%) indicated that the response time was considerably reduced. Adding these two results showed that the majority (82%) of the participants indicated that the markers reduced response time to some extent. Twelve percent believed that it was only minimally reduced, while only a 5% indicated that no reduction on response time took place after the implementation of the markers.

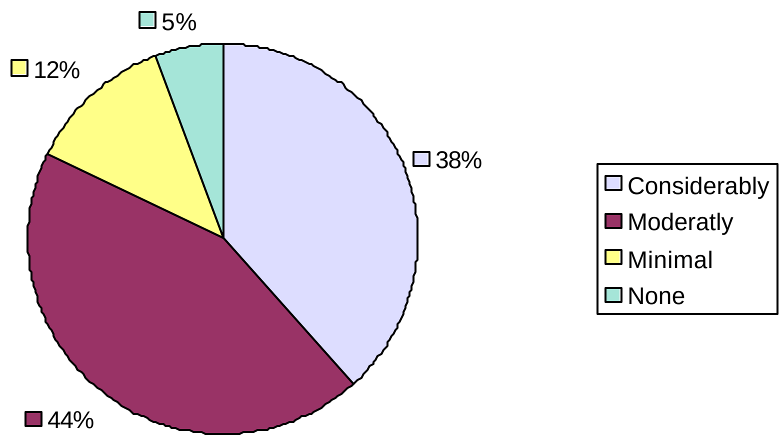

Figure 22. Improvement in response time perceived by all the questionnaire participants

It was also found in this analysis that 88% of the interviewed operators indicated that when they receive a call to inform of an incident situation they ask drivers to use the markers for location. This percentage was divided in 43% of responders that always use this procedure, and 45% that only apply the procedure sometimes.

CONCLUSIONS AND RECOMMENDATIONS

The results obtained showed that the markers have proven to be advantageous in incident management system reducing incident detection times. It was found that some drivers are using the reference markers when reporting incidents in the real world. Drivers using the markers were usually accurate in their reports, showing a good level of marker understanding. This situation is improved because the vast majority of the response center operators interviewed asked callers to use the markers to identify the precise location of the incident they were reporting.

The results of this performance survey also showed a lack of public awareness and the need for an educational campaign directed to teaching general public about the new reference markers. The results lead to the recommendation of the usage of these markers as part of the incident management programs around the USA, but complemented by a public awareness and educational campaign, and a good training to TCC operators about the usage and importance of these markers. An effective public awareness educational campaign can be performed in various manners such as:

1. Creation of an educational brochure
2. Press releases
3. Driving license examination

4. Driving license renewals
5. Advertisements on TV or on the road

Reference mile markers are important safety devices. Their main purpose is to provide fast and precise information mostly in high-speed highways. For incident detection every minute is important not only for congestion, but to save lives. Therefore, having a system to inform drivers their exact location under incident situations should be a major task to avoid liability issues related to lack of information along the highway. This is particularly important in cases where multiple jurisdictions are involved. In such cases it is crucial to identify the exact incidents location in order to send the corresponding emergency team through the shortest path.

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10. US Department of Transportation, Federal Highway Administration; ”Standard Alphabets for Highway Signs and Pavement Markings”; 1977 Edition

APPENDIX 1. REFERENCE MARKERS PERFORMANCE SURVEY QUESTIONNAIRE

Reference Signs Performance Survey

Please answer the following questions as accurate and clear as possible

The University of Puerto Rico at Mayagüez is performing a project for FHWA about reference signs. This questionnaire has been developed to find out how the existing signs have been working around the country. Your help will be very significant for the success of this research.

Demographic Information:

1. Where do you work?

   ____

2. What is your position in this work?

   ____

3. How is your job related to reference markers signs?

   ____

   ____

Select the best answer, and if you have any comment, please write them in the provided space:

Reference Signs Markers:

1. How long have these signs being in use in your area?
   - ❑ 6-7 years (6)
   - ❑ 4-5 years (5)
   - ❑ 3 years (4)
   - ❑ 2 years (3)
   - ❑ 1 year (2)
   - ❑ Less than a year (1)
   - ❑ Don't know (7)

   Comments:

2. Do the drivers use these signs to report incidents location?

- ❑ Most of them (1)
- ❑ Some of them (2)
- ❑ Almost no one (3)
- ❑ No one (4)

Comments:

3. How accurate are the drivers when reporting incidents location using these markers?

- ❑ Very accurate (1)
- ❑ Accurate (2)
- ❑ No accuracy (3)

Comments:

4. According to your experience, the incident detection time has improved with the implementation of these signs:

- ❑ Considerably (1)
- ❑ Moderately (2)
- ❑ Minimally (3)
- ❑ None (4)

Comments:

Public Awareness:

1. Have any campaign been conducted in your area to educate drivers about the function of these signs?

- ❑ Yes (1)
- ❑ No (2)

Comments:

2. **If you are a response center operator:** When you receive a call, do you ask the caller to report his/her position using these signs?

- ❑ Always
- ❑ Sometim
- ❑ Never

Comments:

APPENDIX 2. RESULTS OF THE INTEGRATED DATA ANALYSIS

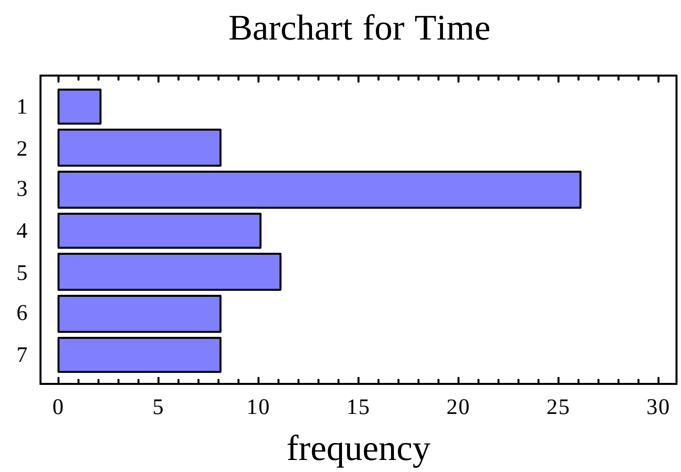
Analysis Summary

Data variable: Time

Number of observations: 73
Number of unique values: 7

The StatAdvisor

This procedure counts the number of times each of the 7 unique values of Time occurs. It then displays tables and graphs of the tabulation.

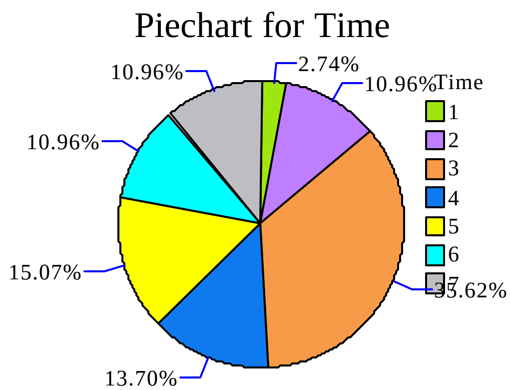


Frequency Table for Time

Class	Value	Frequency	Relative Frequency	Cumulative Frequency	Cum. Rel. Frequency
1	1	2	0.0274	2	0.0274
2	2	8	0.1096	10	0.1370
3	3	26	0.3562	36	0.4932
4	4	10	0.1370	46	0.6301
5	5	11	0.1507	57	0.7808
6	6	8	0.1096	65	0.8904
7	7	8	0.1096	73	1.0000

The StatAdvisor

This table shows the number of times each value of Time occurred, as well as percentages and cumulative statistics. For example, in 2 rows of the data file Time equaled 1. This represents 2.73973% of the 73 values in the file. The rightmost two columns give cumulative counts and percentages from the top of the table down.



Tabulation - Drivers

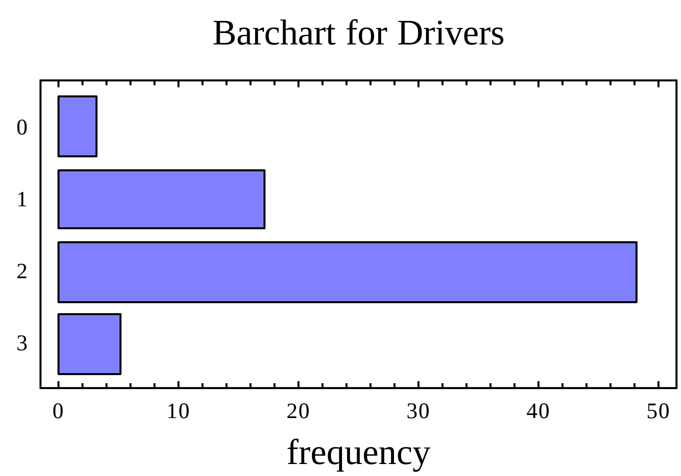
Analysis Summary

Data variable: Drivers

Number of observations: 73
Number of unique values: 4

The StatAdvisor

This procedure counts the number of times each of the 4 unique values of Drivers occurs. It then displays tables and graphs of the tabulation.



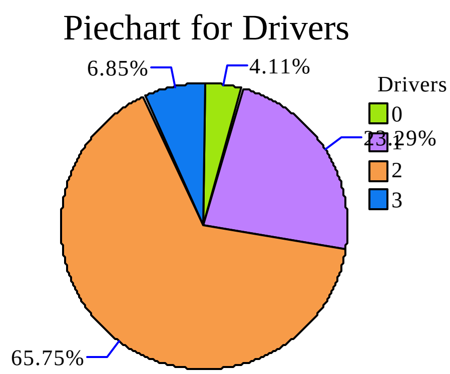
Frequency Table for Drivers

Class	Value	Frequency	Relative Frequency	Cumulative Frequency	Cum. Rel. Frequency
1	0	3	0.0411	3	0.0411

2	1	17	0.2329	20	0.2740
3	2	48	0.6575	68	0.9315
4	3	5	0.0685	73	1.0000

The StatAdvisor

This table shows the number of times each value of Drivers occurred, as well as percentages and cumulative statistics. For example, in 3 rows of the data file Drivers equaled 0. This represents 4.10959% of the 73 values in the file. The rightmost two columns give cumulative counts and percentages from the top of the table down.



Tabulation - Accurate

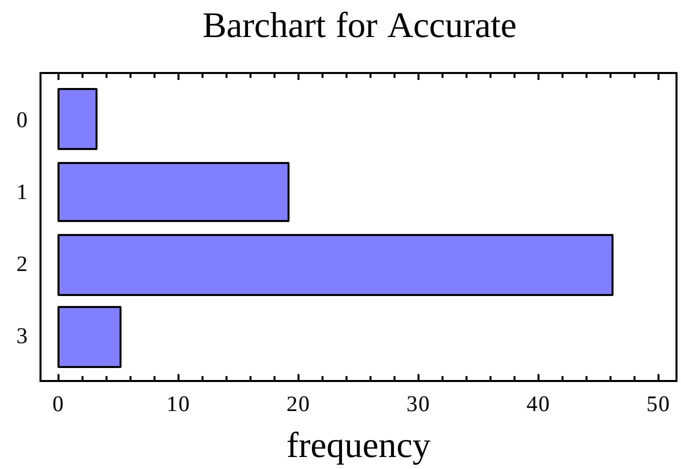
Analysis Summary

Data variable: Accurate

Number of observations: 73
Number of unique values: 4

The StatAdvisor

This procedure counts the number of times each of the 4 unique values of Accurate occurs. It then displays tables and graphs of the tabulation.

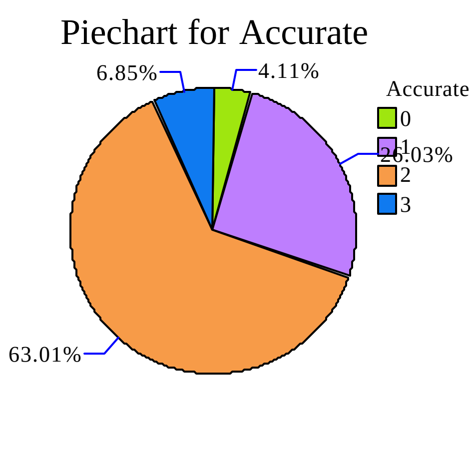


Frequency Table for Accurate

Class	Value	Frequency	Relative Frequency	Cumulative Frequency	Cum. Rel. Frequency
1	0	3	0.0411	3	0.0411
2	1	19	0.2603	22	0.3014
3	2	46	0.6301	68	0.9315
4	3	5	0.0685	73	1.0000

The StatAdvisor

This table shows the number of times each value of Accurate occurred, as well as percentages and cumulative statistics. For example, in 3 rows of the data file Accurate equaled 0. This represents 4.10959% of the 73 values in the file. The rightmost two columns give cumulative counts and percentages from the top of the table down.



Tabulation - Detection

Analysis Summary

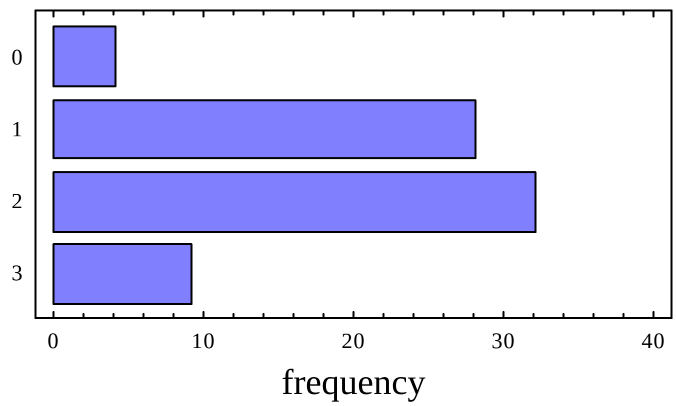
Data variable: Detection

Number of observations: 73
Number of unique values: 4

The StatAdvisor

This procedure counts the number of times each of the 4 unique values of Detection occurs. It then displays tables and graphs of the tabulation.

Barchart for Detection

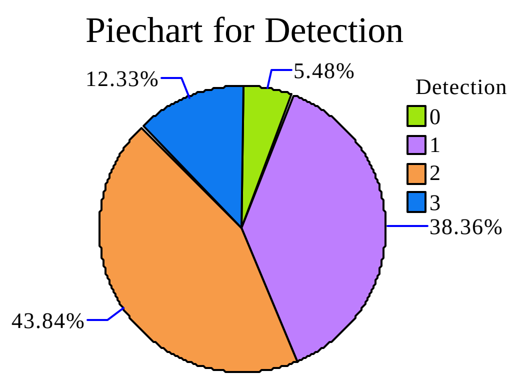


Frequency Table for Detection

Class	Value	Frequency	Relative Frequency	Cumulative Frequency	Cum. Rel. Frequency
1	0	4	0.0548	4	0.0548
2	1	28	0.3836	32	0.4384
3	2	32	0.4384	64	0.8767
4	3	9	0.1233	73	1.0000

The StatAdvisor

This table shows the number of times each value of Detection occurred, as well as percentages and cumulative statistics. For example, in 4 rows of the data file Detection equaled 0. This represents 5.47945% of the 73 values in the file. The rightmost two columns give cumulative counts and percentages from the top of the table down.




```
Tabulation - Campaign

Analysis Summary

Data variable: Campaign

Number of observations: 73
Number of unique values: 3


The StatAdvisor
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   This procedure counts the number of times each of the 3 unique
values of Campaign occurs.  It then displays tables and graphs of the
tabulation.
```
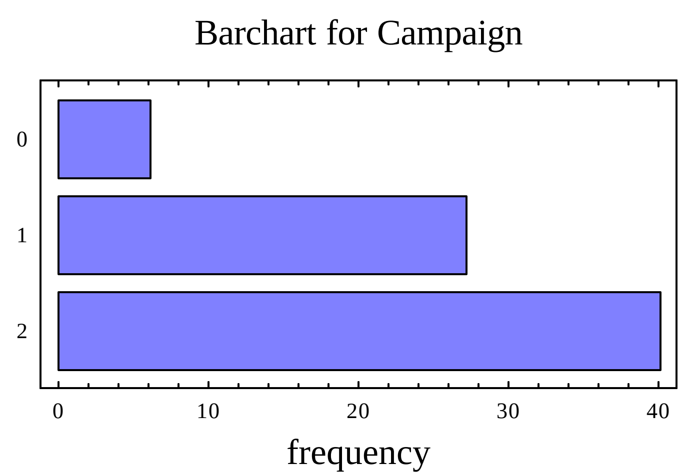



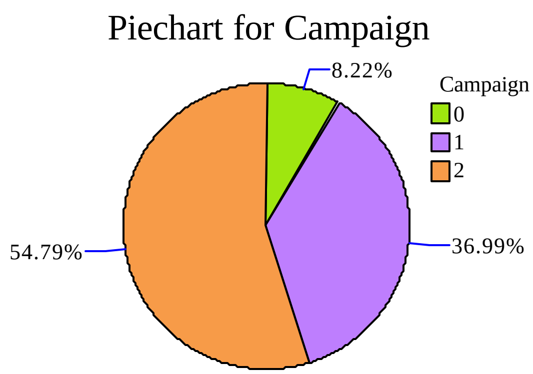
Frequency Table for Campaign

Class	Value	Frequency	Relative Frequency	Cumulative Frequency	Cum. Rel. Frequency
1	0	6	0.0822	6	0.0822

2	1	27	0.3699	33	0.4521
3	2	40	0.5479	73	1.0000

The StatAdvisor

This table shows the number of times each value of Campaign occurred, as well as percentages and cumulative statistics. For example, in 6 rows of the data file Campaign equaled 0. This represents 8.21918% of the 73 values in the file. The rightmost two columns give cumulative counts and percentages from the top of the table down.



Tabulation - Operator

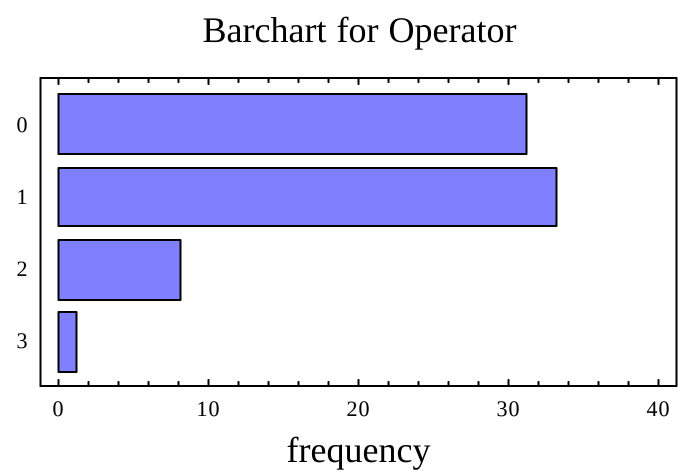
Analysis Summary

Data variable: Operator

Number of observations: 73
Number of unique values: 4

The StatAdvisor

This procedure counts the number of times each of the 4 unique values of Operator occurs. It then displays tables and graphs of the tabulation.



Frequency Table for Operator

Class	Value	Frequency	Relative Frequency	Cumulative Frequency	Cum. Rel. Frequency
1	0	31	0.4247	31	0.4247
2	1	33	0.4521	64	0.8767
3	2	8	0.1096	72	0.9863
4	3	1	0.0137	73	1.0000

The StatAdvisor

This table shows the number of times each value of Operator occurred, as well as percentages and cumulative statistics. For example, in 31 rows of the data file Operator equaled 0. This represents 42.4658% of the 73 values in the file. The rightmost two columns give cumulative counts and percentages from the top of the table down.