

*Abridgment*

# Traffic Engineering Evaluation of State Driver Licensing Manuals

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The contents of state driver licensing manuals were reviewed from a traffic engineering standpoint. On the basis of a review of published materials and discussions with educators and engineers, a list of topics was identified against which each manual was evaluated. By identifying the extent to which the manuals covered current traffic operational features, specific conclusions were reached and recommendations were made. The results indicated that driver licensing manuals do not adequately cover traffic operational topics. Each manual had strong points, but none covered every area examined in the research. Many manuals depicted important traffic control devices, but few actually gave satisfactory explanations of a device's meaning or location. A model manual that contains suggested topics is recommended as a first step in improving the manuals from a traffic engineering viewpoint. Better interaction and cooperation between the motor vehicle administrators and public relations personnel who write the manuals and engineers who implement traffic control features will ensure that the manuals reflect current highway practice.

Because of new approaches, techniques, and features associated with highway design, operation, and maintenance, motorists are encountering new and perhaps more sophisticated driving situations and traffic control devices. The driving public may not understand completely the meaning, purpose, or safe operation of these design features and traffic control devices. Examples include use of freeway acceleration and deceleration lanes, use of two-way left-turn lanes, layouts and traffic control of work zones, and meanings of symbolic signs. Thus, problems may develop that will lead to traffic accidents and inefficiencies in traffic flow if drivers are not educated further. Educating the driving public about the operation and meaning of these changes and new situations is a major challenge for engineers, educators, motor vehicle administrators, and enforcement agencies.

One important educational tool that all states use to inform and teach at least prospective licensed drivers is the driver licensing manuals published by state departments of motor vehicles. A driver licensing manual is typically a printed, pocket-size document that contains information about rules, laws, and regulations for driving in a particular state. The manual also explains highway terminology, defines the legal meaning of certain traffic control devices, and illustrates a variety of driving situations that may be encountered in rural and urban settings. State driver licensing manuals are the principal media for transferring the latest highway advances to the driving population of the future, so it appears appropriate to examine

them to see how well the latest traffic control technology is incorporated and to identify deficient areas so that corrective action can be taken. The end result should be improved highway safety.

The overall goal of this work was to evaluate, from a traffic engineering standpoint, the contents of state driver licensing manuals. To meet this overall goal, several specific objectives were developed, which were

1. To conduct a comprehensive review of traffic operations standards and guidelines;
2. To identify, on the basis of the literature review and discussion with educators and practitioners, recently developed traffic control devices that may be causing problems for drivers because of lack of knowledge or experience with them;
3. To obtain and review carefully each state's driver licensing manual relative to its coverage of the topics identified in the previous objective; and
4. To make recommendations to improve the manuals from a traffic engineering standpoint.

## METHODOLOGY

A key task in the research was to identify recently developed or implemented traffic control devices and techniques that may be causing problems for drivers because they lack knowledge about or experience with a particular feature. This was accomplished through a review of pertinent literature and discussions with engineering educators and practitioners. Major references (textbooks, standards, and manuals) dealing with traffic engineering and highway safety were reviewed with an eye toward identifying recently developed features and devices and preparing a list of potentially misunderstood highway features.

The list was also based on formal and informal discussions with practicing engineers at professional society meetings and training courses. Another source of input was Eck's experience in accident reconstruction. Such in-depth analysis of accidents generates information, especially in the area of human factors, that is not typically available from accident records. The literature review did not locate any data relative to driving difficulties or accidents experienced by drivers that could be traced to lack of knowledge or to the fact that specific information was missing in the manuals. Because of the large number of interrelated factors present in most motor vehicle accidents, it is not possible to determine from accident statistics that lack of understanding of traffic control elements contributed to an accident. However, the list generated was thought

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to be reasonable because it was based on information from different sources.

For each of the traffic control elements identified, a set of questions was developed to be used for evaluating that element. To produce an objective, reproducible technique, each question required a "yes" or "no" response. The questions were developed so as to show how well each traffic engineering topic was addressed in the manuals. Although the specific criteria are too numerous to present here, an example is included for illustrative purposes.

### Example

#### Topic

A two-way left-turn lane is a continuous center lane in which left turns are permitted in both directions. Such lanes are typically found in places where an arterial passes through a developed area with many street and driveway intersections and where it is impractical to limit left turns. Geometrically, a two-way left-turn lane is located between opposite lines of traffic and provides a bay that harbors left-turning vehicles. This lane is sometimes misused as a passing or acceleration and deceleration lane. Drivers must be aware of the purpose of two-way left-turn lanes and be familiar with the signing and pavement markings associated with such lanes; they must understand how to use them.

#### Questions

Questions to be considered for this criterion ask if the manual discusses

- What a two-way left-turn lane is,
- Where such lanes can be found,
- A desirable procedure for negotiating such lanes, and
- Signing and pavement markings associated with such lanes.

### Evaluation

The first step in acquiring the licensing manuals for evaluation was to send a letter describing the nature of the research and requesting a copy of the current (early 1989) edition of the driver licensing manual to the department of motor vehicles for each of the 50 states, the District of Columbia, and Puerto Rico. Manuals were received from 49 states and Puerto Rico. It was subsequently learned that the District of Columbia does not use a traditional driver licensing manual.

Each of the manuals was carefully reviewed with an eye toward answering the questions just outlined. The researchers often had to use judgment in determining if the question was answered in the context of this research. A data collection form was developed to make tabulating the results more convenient.

### RESULTS

A summary of the percentage of manuals with affirmative responses to each of the traffic control device questions is presented in Table 1. This section highlights some of the specific findings.

As expected, assignment of specific colors and shapes to particular classes of signs was well covered in the manuals. Except for those of a few states, the manuals contained full-color representations of the different classes of signs. Use of color is thought to be critical in conveying the meaning of different classes of signs.

Most of the signs identified in this study were shown in the manuals. Several signs—for example, limited sight distance, added lane, divided highway, and chevrons—did not receive adequate coverage in the opinion of the researchers.

Although pictorial representations of the signs were shown and labeled, very few manuals discussed the meanings of the signs or the places they could be expected to be located. The researchers believe that the functions of the signs should be explained and that plan views should be included to show typical locations at which the signs are installed.

TABLE 1 Summary of Affirmative Responses to Traffic Control Device Questions

Traffic Control Device	Number of Affirmative Responses (Total Responses = 50)	% of Manuals with Affirmative Responses
1. Sign Color/Shape		
Color	46	92
Shape	47	94
Full-color Graphics	47	94
2. STOP/YIELD Ahead Sign		
Graphic of Sign	17	34
Meaning and Purpose	9	18
3. Turn/Curve Sign		
Graphic of Signs	34	68
Difference Explained	20	40
4. Signal Ahead Sign		
Graphic of Sign	43	86
Meaning and Purpose	19	38

(continued on next page)

TABLE 1 *continued*

Traffic Control Device	Number of Affirmative Responses (Total Responses = 50)	% of Manuals with Affirmative Responses
5. Added Lane Sign		
Graphic of Sign	2	4
Meaning and Purpose	1	2
6. Work Zones		
Signs and Markings	44	88
Importance of Speed Limits	0	0
7. Lane Drops		
Drop Defined	10	20
Safe Procedure	11	22
Graphic of Sign	39	78
8. Divided Highway Sign		
Graphic of Sign	5	10
Meaning and Purpose	4	8
9. Limited Sight Distance Sign		
Sight Distance Concept	0	0
Problems	1	2
Graphic of Sign	0	0
10. Chevron Alignment Sign		
Graphic of Sign	6	12
Purpose and Intent	5	10
11. Narrow Bridge Sign		
Graphic of Sign	18	36
Purpose and Intent	7	14
12. Hill Sign		
Graphic of Sign	41	82
Meaning and Purpose	20	40
13. Truck Escape Ramp Signing		
Types of Signs	0	0
Symbols and Colors	0	0
14. HOV Lane Signing	7	14
15. Traffic Signals		
Meaning of Colors	49	98
Solid vs. Flashing	48	96
Change Interval	30	60
16. Actuated Signals		
Definition	1	2
Recognition	0	0
17. Left-turn Signals		
Graphics of Displays	45	90
Meanings of Displays	47	94
Associated Signing	11	22
18. Pavement Markings		
Meanings of Colors	45	90
Solid vs. Broken	49	98
19. Two-Way Left-Turn Lanes		
Definition/Description	28	56
Geometry of	28	56
Procedure for Use	16	32
Associated Signing	18	36
Associated Pavement Markings	27	54

In general, the manuals did a good job of discussing the meaning of the different color indications found on a traffic signal head. The difference between solid and flashing signals was also well covered. Laws and signing pertaining to right turns on red were usually explained in the section on traffic signals. However, traffic-actuated signals were not directly defined or described in any of the manuals.

Discussion of the different colors and the meanings of solid versus broken longitudinal pavement markings were judged adequate in most manuals. Full-color representations of the pavement markings were shown in most manuals.

## CONCLUSIONS AND RECOMMENDATIONS

Overall, the manuals appeared to do a fair job in showing traffic control devices but a poor job in explaining the meanings of the devices. Most manuals did not sufficiently describe the meanings and locations of traffic control devices. Many manuals showed a traffic control device included in the criteria but merely labeled it without detailing its function. Without a description of the meaning and location of a particular traffic control device, motorists may not know how to interpret and react to it.

Overall, it appeared that no set format was followed for the organization and layout of the manuals. No two manuals appeared to be alike. Although standardization is probably undesirable, there should be at least some minimum set of topics that all manuals should cover. Some uniformity and consistency would be helpful.

Similarly, there must be an arrangement of material that would be optimum from the viewpoint of information transfer. The manuals lacked a consistent approach in terms of the organization of individual sections dealing with particular topics. Many manuals related information on one subject over several, unconnected pages. It would be desirable to show all available information about one subject in one section as opposed to throughout the manual. In this way, the reader can better appreciate interrelationships.

There appears to be only limited coordination between traffic engineers and those who prepare driver licensing manuals. With highway technology changing almost daily, engineers

should have a defined procedure for transferring new advances directly to motor vehicle administrators. Problems that arise because of the lack of coordination include manuals that show signs that are no longer in use and manuals that do not show newly developed signs.

If a state does not use a particular traffic control device on its highway system, discussion of that device typically will not be incorporated into its licensing manual, even though surrounding states may use that device. In a society that is as mobile as ours, drivers travel readily between states and it is important that they be able to recognize and interpret common traffic control devices that may not be used in their own states.

As stated, driver licensing manuals should not be standardized. Each state has unique areas that only it can address properly. However, all manuals probably should include a predetermined minimum amount of information about engineering-related subjects relative to highway safety. The following recommendations are intended to improve the manuals' coverage of traffic engineering topics:

- Engineers should play a bigger role in manual development. This includes engineers' working directly with the manual developers to determine jointly the best combination of engineering and educational topics that would enhance highway safety.
- Full-color representations of signs and pavement markings are a necessity to ensure that the correct expectancies can be developed about a sign or marking.
- Signs shown in the manuals should not be merely labeled but also discussed briefly as to their purpose and meaning. If possible, the signs should be shown in conjunction with plan views of highway situations (e.g., an intersection) so that the driver will know where to look for a particular sign.
- States should have a system or procedure for publicizing revisions to the manuals so that currently licensed drivers can keep up to date with changes.
- A model manual that contains the minimum amount of information necessary in a manual should be developed.

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