ASSESSMENT OF THE INTEGRATION OF
ADVERTISING AND VARIABLE MESSAGE SIGNS
FOR FUNDING PURPOSES

by

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With the recent increase in the number of transportation management centers (TMCs) in urban areas in the United States, the need for funding has also increased. TMCs are expensive to construct, operate and maintain. Typical TMCs relay information to motorists with variable message signs (VMSs). Government agencies are considering alternatives which would provide funds to operate or reduce the costs of TMCs. These methods involve the participation of the private sector in the use and costs of VMSs. One option is to advertise commercially on VMSs, using either dynamic messages or static signs. Another alternative is to create an Adopt-a-Sign program where agencies would financially adopt a VMS to maintain its operation. A third option is to use privately owned variable message signs, such as those which are owned by amusement parks, malls, and hotels, for traffic management purposes. This would reduce the costs of purchasing and installing variable message signs for the sole purpose of traffic management.

While these alternatives may be possible funding methods, there are sources of opposition. Federal and/or state laws may prohibit these methods. Other opposition deals with human factors issues. Sensory overload may occur because a driver would have to process too much information. This may create safety problems by distracting drivers from the driving task with unnecessary information. However, it is possible that advertising will make drivers more aware of the signs.

The objective of this paper is to make an assessment of advertising on VMSs, creating an Adopt-a-Sign program, or displaying emergency messages on privately owned VMSs. These alternative strategies and their benefits and disadvantages will be defined. State laws and federal regulations will be examined to determine the legalities regarding each method. Finally, a case study in Houston, Texas will assess the feasibility of the three previously mentioned alternatives.

The approach of this paper was to review available literature pertaining to federal and some state laws regarding outdoor advertising and signing in the United States. Existing applications were reviewed, and transportation officials were contacted to discuss safety and legal issues regarding VMS and advertising integration.

It is currently illegal to advertise on official signs in Texas, including VMSs. However, laws permit the erection of logo signs for directional advertising, as do many other states. Logo signs are typically found on rural interstates which follow Federal logo sign standards. By creating specifications for VMSs to provide directional advertisements, VMSs could essentially become logo signs for urban areas during non-incident periods. The Houston case study specified signs in the area which could be appropriate for directional advertising.

Other Houston signs were selected for an Adopt-a-Sign program. Such a program does not currently exist; however, by developing a program with guidelines which are similar to those of Adopt-a-Highway, transportation departments could receive additional funds for VMSs. Another part of the case study involved the selection of private VMSs which seem appropriate for displaying emergency traffic messages.
This paper is provided as a guide for transportation officials to realize the issues which are involved with the aforementioned alternatives. It can serve as a guide for selecting and implementing the most appropriate methods for a particular area. All state and local laws are not discussed within this paper. These regional laws should be reviewed for any region prior to implementation of these strategies.
# TABLE OF CONTENTS

## INTRODUCTION
- Objectives ............................................................ H-1
- Scope ................................................................. H-1
- Study Approach .................................................... H-2
- Organization of Report .............................................. H-2

## EXISTING VMS ADVERTISING APPLICATIONS
- New Jersey, Garden State Parkway .......................... H-3

## TYPES OF ADVERTISING WITH VMSs
- Dynamic Advertising ................................................ H-4
- Adopt-a-Sign ....................................................... H-5
- Traffic Messages on Private VMSs ............................. H-6

## LAWS AND REGULATIONS REGARDING OUTDOOR ADVERTISING
- Federal Regulations ................................................ H-7
  - Bonus Program ................................................... H-7
  - Highway Beautification Act of 1965 ........................ H-7
  - Federal-Aid Highway Act of 1974 ............................ H-8
  - Federal-Aid Highway Act of 1976 ............................ H-8
  - Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 .... H-9
  - Manual on Uniform Traffic Control Devices (MUTCD) ................. H-9
- State Laws ........................................................... H-10
  - Texas ............................................................ H-10
  - New Jersey ....................................................... H-10
  - Washington ...................................................... H-11
  - New York ........................................................ H-11

## HUMAN FACTORS AND SAFETY ISSUES RELATED TO ADVERTISING ON VMSs

## CASE STUDY
- Sign Placement ..................................................... H-13
- VMSs for High-Occupancy Vehicle Lanes ..................... H-15
- Park and Ride Signs .............................................. H-15
- VMSs for General Traffic ........................................ H-15
- Private Signs ..................................................... H-19

## CONCLUSIONS .................................................... H-21

## RECOMMENDATIONS ............................................... H-22

## ACKNOWLEDGMENTS ................................................ H-23

## REFERENCES ........................................................ H-24
INTRODUCTION

With an increasing number of transportation management centers (TMCs) in urban areas of the United States, tremendous costs are incurred to local, state, and federal governments. A standard TMC detects incidents on freeways and relays information to motorists with variable message signs (VMSs), also called changeable message signs (CMSs). TMCs typically operate VMSs for each traffic management system to display congestion and incident information. A VMS mounted as an overhead sign may have an initial cost of approximately $120,000, plus the cost of the computer system and connections to the TMC (1). Since these signs are expensive to purchase, erect, operate, and maintain, some governmental agencies are considering methods to defer the costs. One possible strategy is to commercially advertise on VMSs to receive funds. Another alternative is to start an Adopt-a-Sign program where profit and non-profit organizations could Adopt-a-Sign to financially maintain VMSs. A final option is to display emergency traffic condition messages on privately owned signs, such as those owned by amusement parks, malls, and hotels. This would reduce the cost of government agencies purchasing and operating VMSs for traffic management.

Although advertising on VMSs may be a possible funding source, there is opposition to this idea. Federal and/or state laws may not allow transportation agencies to commercially advertise in any form when signs are within the highway right-of-way. Other opposition deals with human factors and safety issues. Sensory overload may occur because a driver would have to process too much information with advertising on highways. This may create safety problems by distracting drivers from the driving task with unnecessary information. On the other hand, some officials believe that continuous displays, typically public service messages, show the public that the VMSs are operable. The display of emergency messages on private signs and Adopt-a-Sign alternatives appear to be acceptable in terms of safety issues; however, laws and regulations may prohibit their implementation.

Objectives

The objective of this research was to make an assessment of advertising on VMSs, implementing an Adopt-a-Sign program, or displaying emergency messages on VMSs owned by private agencies. After documenting existing applications, alternative strategies were defined, and state laws and federal regulations were examined to determine which alternatives are legally feasible. A discussion of human factors issues defined how VMS and advertising integration may cause safety problems. Finally, a case study assessed implementation for the Houston, Texas area.

Scope

Although other applications are possible, the scope of this paper is limited to dynamic advertising, Adopt-a-Sign, and traffic messages on private VMSs. The dynamic signing discussed within this paper applies to VMSs which are owned by local or state agencies and are erected within the highway right-of-way. This paper is intended to provide a case study which can be evaluated by government agencies to assess the applicability of the three alternatives for other regions. The content of this paper is based on a review of literature, existing applications, professional contacts, and a case study in Houston.
Study Approach

A determination of existing advertising applications was revealed by contacting officials from various transportation agencies. Those officials having knowledge of existing applications were asked questions regarding opposition to advertising, laws in that region, and implementation methods. Next, a literature review was conducted to examine significant laws that were passed regarding outdoor advertising, specifically billboards and other advertisements which are outside of highway right-of-way, but are visible from highways. The literature review also revealed associated laws and regulations which permit and restrict advertising on official signs owned by government agencies; information on these topics were also provided through professional contacts. Realization of human factors and safety issues were also determined through a literature review and contacts with professionals; other statements are original ideas of the author.

An assessment of the integration of private sector advertising with emergency traffic signs and messages for Houston VMSs was conducted. The first step involved contacting officials from the Houston TMC to locate VMSs in Houston and to learn of their message applications and policies. The next step in conducting this study was to examine the locations of some of Houston’s VMSs to determine which application would be appropriate for each sign. Other officials were contacted to determine the possible cost benefit of implementing the three strategies to Houston’s VMSs.

Organization of Report

Following the introduction, there are six primary sections of the report. The first section of the report summarizes existing variable message sign advertising applications. In this section, the manner of advertising is described such that it defines how advertising is permitted. The second section of the report defines possible means of integrating advertising with variable message signs. The third section summarizes state laws and federal regulations which prohibit certain applications, but legally permit others. Section four outlines human factors and safety issues regarding advertising on variable message signs. Certain advertising types may be more distracting than others, and this section describes these issues. The fifth section assesses the integration of advertising with variable message signs for a case study in Houston. The final section contains recommendations for appropriate VMS advertising methods.
New Jersey, Garden State Parkway (2)

The only application of advertising on VMSs in the United States exists on New Jersey’s Garden State Parkway. Their advertising methods are considered to be traffic management tools; advertising was not implemented for the purpose of general commercial advertising. The New Jersey Highway Authority operates the Garden State Parkway Art Center, and advertisements for the Art Center are typically displayed about a week before the event. A message for the Art Center may be similar to that of Figure 1.

![Figure 1. Example display for Garden State Parkway Art Center events.](image)

Since the Garden State Parkway owns the Art Center, advertising for its events is considered legal because it is on-premise advertising. With this advertising, the general public becomes aware of potential traffic problems on the Garden State Parkway. The Highway Authority assumes that this information discourages drivers from making unnecessary trips on the facility during such special events. At a particular Art Center event, surveys were distributed to determine where the attendants learned about the event; only about 2% heard about the event from VMSs. Therefore, advertising for Art Center events does not create a significant amount of additional traffic.

VMSs on the Garden State Parkway also advertise transit information to increase ridership and decrease single occupant vehicle commuter traffic. By providing commuter busing information into New York City for a private bus line, drivers can easily exit the parkway and use the park-and-ride facility. A typical message for the bus line advertises the transit cost and the exit number to access the bus terminal. The New Jersey Highway Authority receives a small payment for this service. The bus line pays $0.67 for all riders that board the bus at the facility that was advertised with VMSs. This is a payment for all riders at the facility because it would be impossible to determine which riders decided to use the facility because of the VMS advertisement. This type of advertising generates revenue for the New Jersey Highway Authority; at the same time, it decreases the traffic volume on the Garden State Parkway. This is not, by definition, “advertising” because the VMS does not display the name of the busing service.

These advertising methods are considered to be dynamic advertisements, which are described further in the following section. Messages regarding the Garden State Parkway Art Center and bus services are only displayed during non-incident conditions.
TYPES OF ADVERTISING WITH VMSs

Dynamic advertising was mentioned in the previous section, Existing VMS Advertising Applications, but other means exist to decrease the cost of purchasing VMSs or to generate revenues from publicly owned VMSs. Three forms of integrated VMS advertising are considered within this paper:

- Dynamic advertising
- Adopt-a-Sign
- Traffic messages on privately owned VMSs

Variable message signs which provide traffic information are typically owned by state or local departments of transportation. Federal and state laws restrict what can be mounted or displayed on signs within highway right-of-way. Dynamic advertising may or may not be permitted in certain areas depending on the type of advertising and regulations governing advertising within that region.

Dynamic Advertising

Dynamic advertising refers to the type of advertising applied to VMSs on the Garden State Parkway. Advertising and traffic messages appear on the VMS display with the TMC controlling the display of both types of messages. The messages can change quickly to flash information, or the message can be the same for a consecutive time period. These advertising displays would be regulated by the same standards as those set for public service and incident messages on VMSs. Variable message signs could advertise for local businesses or for upcoming special events. Their applications are discussed further in the following paragraphs.

Dynamic advertising is appropriate for announcing special events since the events change perhaps more than once a week. Many cities currently use VMSs for traffic management of special events; however, the TMCs do not receive funding for this service. By advertising for special events on the signs prior to the event, TMCs may be able to receive payments. As with the Garden State Parkway, by announcing special events before the date of the event, drivers can reroute around special event traffic and the number of unnecessary trips can be reduced. The information displayed regarding special events may be regulated by federal, state, and local laws. For example, it may be illegal to advertise the business or product which sponsors the event. Advertising the date and time of concerts and other special events may be permissible, but it is unlikely that the facility holding or the group sponsoring the event will want to fund this type of advertisement. It will vary whether the guest appearing at the concert could be mentioned on the sign; it is arguable that knowledge of the popularity of the guest may help drivers to realize the impact of this event on traffic. These applications are questionable regarding funding purposes.

Promoting commercial products and businesses with dynamic advertising within the right of way is generally illegal, unless it provides useful information to the traveling public (3). For example, official signs typically guide drivers to public attractions such as large amusement parks and stadiums of professional teams with directional signs. Currently, logo signs direct travelers to
service stations, lodging, food, and camping, and transportation departments receive funds for erecting and maintaining the signs. Logo signs are more common in rural areas, and VMSs are typically found in urban areas. Therefore, VMSs could essentially be used as logo signs in urban areas during non-incident situations for businesses in the vicinity.

Directional advertising would be limited to displaying the names of the businesses and the exit number to access those businesses. The selection of which businesses may advertise on the signs should be similar to the requirements for logo signs, and the department of transportation would receive payments for this service. The guidelines for this type of signing should specify that the VMSs will not display directional advertising messages during incident situations. A feasible method of implementation is to allow the businesses to buy a certain amount of time on the sign per month. Since this information is most useful to travelers who are unfamiliar with the area, the best time to display the directional advertisements may be during the weekends when many people travel long distances. This information would not be as important to commuters who drive the same routes daily. They would begin to ignore messages that advertise daily, and they might also ignore important traffic information. Therefore, a set of guidelines may permit businesses to buy advertising time during non-peak afternoon periods and during weekend travel times. Hotels may be interested in buying more advertising time at night when drivers are ready to find a place to rest. With this method, a number of businesses could get involved in buying advertising time on the signs.

The cost for a business to display their logo on a logo sign ranges from about $500 to $800 per year, generally in rural areas (4). However, departments of transportation could increase the cost for directional signing, considering that the traffic volumes are higher in urban areas and VMSs are more expensive. A typical billboard advertisement in an urban area is considerably more expensive with a cost of about $24,000 per year (5). Billboards are much more elaborate than a logo sign or directional VMS. However, considering that all of these methods increase the number of customers, the cost difference should not be so substantial. Possibly departments of transportation could charge $5,000 per year to advertise for 50 hours per week; that is equal to $2 per hour. The times which these messages can be displayed is dependent on incident messages. A computer could record the amount of time that a directional message is displayed so that businesses will receive the proper amount of display time on the VMS.

**Adopt-a-Sign**

The second application is an Adopt-a-Sign program. This is similar to Adopt-a-Highway programs, but the groups that adopt VMSs would provide financial contributions for purchasing and maintaining publicly owned VMSs. The groups would still receive recognition for their service with a static sign that displays the group’s name or acronym. These signs, however, would be on a smaller relative scale than those erected for Adopt-a-Highway projects. The reason for this is so that the signs do not detract from the VMS while incident messages are displayed and to reduce sensory overload in drivers. Adopt-a-Highway may apply to freeways or rural roads; however, typical Adopt-a-Sign applications would be on freeways because VMSs are typically in urban areas. As with Adopt-a-Highway, profit and non-profit groups could participate in the Adopt-a-Sign program. However, because contributions are likely to be expensive for Adopt-a-Sign, it is likely that most participants would consist of large nonprofit or profit groups. Considering that the cost of a single VMS is about $120,000, departments of transportation may want to charge $10,000 per year to adopt-a-sign. This amount will depend on the number of people that view the sign daily.
Adopt-a-Highway does not currently restrict the type of participating group, but it may in the future. Departments of transportation may want to create Adopt-a-Sign provisions which restrict the type of participants to avoid controversy. For example, the department of transportation would not want a beer company participating in the program because it would appear to encourage drunk driving. By limiting the types of groups which participate, this type of unwanted connotation can be avoided.

**Traffic Messages on Private VMSs**

The third method of integrating commercial advertising with variable messages for traffic incidents is to display emergency traffic information on privately owned VMSs. Typically, amusement parks, car dealerships, casinos, shopping centers, and some hotels have VMSs which they use to inform motorists of special events and rates. VMSs at amusement parks are often placed at high altitudes, providing excellent visibility from the highway. Traffic management centers could display emergency incident messages on these privately owned VMSs, and the private business would receive some payment which would be defined within a contract. This could benefit transportation agencies because they could potentially reduce the number of VMSs that they have to purchase. It could reduce their costs and increase revenues for the private agencies.

There are also negative aspects of this type of application, with regard to connecting private VMSs with TMCs. Since most private VMS messages are changed daily or weekly, it may be difficult for the TMC to communicate with the private VMS operators to generate a traffic message during an emergency. It may be possible to connect the private signs to TMCs, but this could potentially be expensive. Furthermore, the computer systems are likely to be incompatible. On the other hand, these signs can be used as supplemental traffic message displays during periods when the message programmers are available.

An assessment of these applications can be conducted by evaluating laws and regulations which govern outdoor advertising and by examining safety issues that are involved with signing. The following sections will discuss these issues and implementation of these alternatives will be assessed.
LAWS AND REGULATIONS REGARDING OUTDOOR ADVERTISING

Federal Regulations

Regulations regarding outdoor advertising are provided in Title 23, Section 131 of the United States Code (6). This section of the paper defines and discusses national legislation regarding outdoor advertising which indirectly relates to integrated advertising with VMSs. It also defines current regulations regarding advertising on highways.

Bonus Program (7, 8, 9)

Through the Federal-Aid Highway Act of 1958 (10), the Federal Government made its first attempt to control outdoor advertising. According to this Act, states which agreed to regulate outdoor signs that were adjacent to Interstate highways would receive a bonus of one-half of one percent of construction costs of those highways. Eligibility to decide to participate in this program expired on June 30, 1965. Through this program, 23 states became “Bonus States,” including California, Colorado, Connecticut, Delaware, Hawaii, Illinois, Iowa, Kentucky, Maine, Maryland, Nebraska, New Hampshire, New Jersey, New York, Ohio, Oregon, Pennsylvania, Rhode Island, Vermont, Virginia, Washington, West Virginia, and Wisconsin.

Highway Beautification Act of 1965

During President Lyndon B. Johnson’s term, he signed the Highway Beautification Act (11). This law mandated that states control the location and type of commercial signs within 660 ft of the interstate and primary highway systems in order to enhance safety and preserve the natural beauty of the highways. Under this law, states which did not comply with the regulations receive only 90% of their annual Federal-Aid Highway Apportionment. The Highway Beautification Act defined and permitted the use of the signs which are described in this section (7, 8, 9, 12, 13, 14).

On-property sale or lease signs (8, 9, 14) Sale and lease signs are not federally controlled if the sign is within the property boundaries. Bonus States, however, are restricted to having signs which are 150 square feet, and only one visible sign for each highway direction is permitted.

On-premise signs (8, 9, 14) Signs which are located within the property boundaries of a business do not have size or spacing restrictions, except in Bonus States. Federally, on-premise signs do not require control when they advertise activities that occur on the premises; however, states may create individual provisions. According to amendments to Title 23, Section 131 of the United States Code in 1978, states can permit on-property electronic variable message signs; prior to 1978 electronic VMSs were not permitted in Bonus States.

Directional and official signs (8, 9, 14) Five sign types fall in this category. The first kind, official signs, include signs which government officials erect by authority of the law. Directional signs include those signs which provide directional information to an area of interest. Directional signs are restricted to federal, state, or local government agency locations and public places which are owned by such governments; natural phenomena, historic, cultural, scientific, educational, and religious sites; and scenic areas. Directional signs can be no larger than 150 square feet.
The three remaining types of directional and official signs are more specific. One type is a public utility sign which warns or informs the public of the existence of public or private utilities within that area. Utility signs have no size, lighting, or spacing restrictions. Another type included in this category is a sign which identifies the sponsor of school bus stop shelters, with more than half of the sign being covered by a public service message. These signs are limited to 32 square feet. The last type of sign within this category includes service club and religious notices which cannot exceed 8 square feet.

**Landmark signs** (8, 9, 14) These signs are permitted for preservation purposes. Landmark signs may include signs on farm structures or natural surfaces which are either historically or artistically significant.

**Free coffee signs by nonprofit organizations** (8, 9, 14) The Surface Transportation Assistance Act of 1978 (15) permits erection of free coffee signs. There are no spacing, lighting, or size restrictions, but the signs must be outside right of way and must be advertised by nonprofit organizations.

**Signs in commercial or industrial areas** (8, 9, 14) Size, lighting, and spacing requirements are limited for signs within commercial and industrial areas with federal and state agreements.

**Economic hardship signs** (8, 9, 14) Some nonconforming signs will not be removed if it can be proven that removal of the sign will economically impair the region.

An Adopt-a-Sign program would be similar to that of the signs which identify school bus stop shelters; with both programs, the sponsor provides funding for the service - a bus shelter or a VMS, and they receive recognition for it with a sign. The difference with these signs is that the shelter signs are outside of right of way, but Adopt-a-Sign recognition signs would be within right of way. Also, signs for bus shelters would typically be found on minor streets, whereas Adopt-a-Sign would apply to freeways. The private VMSs discussed within this paper refer to on-premise signs.

The Highway Beautification Act does not apply to traffic control signs. The principles governing traffic control signs are defined in the Manual on Uniform Traffic Control Devices (3).

**Federal-Aid Highway Act of 1974** (7, 8, 9)

This law extended control of outdoor signs from 660 ft beyond the right-of-way to any sign which is visible from the highway. This only applied to signs which were erected for the purpose of being read from the highway.

**Federal-Aid Highway Act of 1976** (7, 8, 9)

The Federal Highway Act of 1976 advocated prioritization of removing nonconforming signs which did not provide necessary directional information. While some directional signs may be nonconforming, they may also benefit travelers. Implementation of this law encouraged states to alter their programs to encompass this effort.
Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 (8, 9)

With regard to outdoor advertising, the ISTEA (16) allocated funds from the Highway Trust Fund, rather than the General Fund, for nonconforming sign removal. With the availability of these funds, states are required to remove nonconforming signs. Illegal signs must be removed by the owner at the owner’s expense. If the owner fails to remove illegal signs, the state must remove the sign at the expense of the owner.

The ISTEA also prohibited the erection of certain types of new signs on designated scenic byways. A scenic byway can be designated as such by the states. A scenic byway should be scenic in terms of its natural, scenic, cultural, recreational, or archeological qualities. New signs which are permitted on scenic byways include directional and official signs, sale and lease signs, on-premise signs, and free coffee signs. Prohibited signs include new signs in zoned or unzoned commercial and industrial areas abutting scenic byways.

Manual on Uniform Traffic Control Devices (MUTCD)

Title 23, Section 655.601 of the Code of Federal Regulations (17) states that the MUTCD shall be used as the national standard for traffic control devices on federally funded highways. The MUTCD defines the basic principles controlling application and design of traffic control signs, specific interest signs (logos), and tourist oriented directional signs (TODS) (3).

According to the MUTCD, “no traffic control device or its support shall bear any advertising or commercial message, or any other message that is not essential to traffic control.” While this statement prohibits general advertising, restaurants, hotels, campgrounds, and service stations, which are located within a specified distance of the highway, can essentially advertise their locations to the traveling public on logo signs. As these businesses advertise, the signs provide directional information to drivers. At the same time, the departments of transportation receive funding for the operation and maintenance of these signs. The MUTCD states that logo signs may be used on any class of highway, but they are intended for use in rural areas. It also suggests that implementation of such signs should be determined by the need of this type of signing by the traveling public. These logo signs may identify businesses with symbols, names, brands, trademarks, or combinations of these (3).

When logo signs are erected near interchanges, they should be located between the previous interchange and 800 feet before the exit direction sign at the interchange from which those services can be accessed. The MUTCD states that these service signs should be erected at interchanges where motorists can easily reenter the freeway and continue on their original route (3).

The MUTCD mentions variable messages, but currently does not provide guidelines regarding VMSs. There are no standards regarding what the content of a message on a VMS, except that the message must not conflict with laws regarding traffic control devices (3). With research on this subject, perhaps guidelines will be created for the MUTCD.
The goals of programs such as the Highway Beautification Act and the Federal-Aid Highway Acts were to reduce the number of billboards and other types of outdoor advertisements, as well as to standardize these signs. Dynamic advertising on VMSs would not oppose these efforts; the VMSs are already in place, and they would only be used for the additional purpose of advertising. Dynamically advertising directional information may even help to eliminate billboards in the vicinity of the VMSs which display some of the same information as the billboard. Using private signs for emergency traffic information also would remain in accordance with these standards because it does not require additional signs. Implementing an Adopt-a-Sign program would not significantly affect the beauty of highways by erecting signs to recognize the sign adopting agency. These signs would be mounted on the top of the VMSs such that the adoption signs would effectively increase the size of the VMSs.

**State Laws**

In the United States, the transportation laws regarding outdoor advertising and traffic control devices are generally similar among states. Each state has the authority to create its own provisions, but they must also follow Federal Highway Administration standards, those outlined by the MUTCD, and other national regulations. The laws within four particular states are discussed in the following sections.

**Texas**

The Texas Traffic Laws state that “No person shall place or maintain nor shall any public authority permit upon any highway any traffic sign or signal bearing thereon any commercial advertising (18).” However, Texas does permit logo signs which alert the driver that the next exit has specific food, gas, camping and lodging establishments. These are directional signs which advertise the corresponding exit to access particular businesses. The Texas Department of Transportation receives $550 annually for each logo which is displayed on a sign (19); this payment funds the erection and maintenance of the signs. This amount varies among states.

Texas has an Adopt-a-Highway program, where groups may adopt a section of highway to remove trash from the roadway. The Texas Department of Transportation will erect a sign stating the group’s name or acronym for each end of its section of adopted highway, according to Title 43, Section 25 of Texas Regulations. These groups may be profit or nonprofit organizations (18, 19).

**New Jersey**

The New Jersey Highway Authority governs the New Jersey Garden State Parkway, which is a separate organization from the New Jersey Department of Transportation. However, the Highway Authority is still required to follow the state laws regarding outdoor advertising. These laws are similar to those of other states such that they prohibit commercial advertising on official signs (20).

VMSs on the Garden State Parkway can advertise for the Art Center because this is considered to be an on-premise sign. Advertising for the private transit company is also legal because the name of the bus company is not displayed; this message can be considered a public service or traffic management message rather than an advertising message.
Washington

The state of Washington defines a sign type which is not typical of all states. It is the temporary agricultural directional sign. These signs direct persons to the place of sale of the agricultural product being sold. These signs cannot be erected adjacent to interstate highways, unless they are on-premise signs. Erection of such signs within view of the scenic system or the federal aid primary system is permissible (21).

According to Washington’s Highway Advertising Control Act, the State Department of Transportation may erect logo signs. Logo signs are mentioned within this Act as “roadside area information panels or displays.” Contracts with participating businesses should state the amount of compensation provided to the Department of Transportation for erecting and operating this sign. The Act does not specifically state where these signs may be placed (21).

The Washington State Department of Transportation permits on-premise electronic signs to advertise activities, goods, and services which are available on that property. These signs may also display public service information (21).

New York

As with other State Departments of Transportation, New York cannot commercially advertise on a traffic sign or signal. However, the state’s Highway Law permits directional advertising with logo signs, which may display the name or trademark of selected eligible businesses (22). Logo signs may be erected within rural areas to direct travelers to camping, lodging, food, and gas, but the logo signs must not distract drivers from other official traffic signs. Guidelines state that gas, food, lodging, and camping logo signs must be within 3, 6, 9, and 12 miles, respectively, of those facilities. Businesses must meet certain requirements for acceptance into the logo sign program; facilities offering the most of services will take precedence in obtaining a place on a logo sign. Those businesses which are accepted in the program are responsible for erecting and maintaining the signs. In addition, each business on a sign must pay a yearly permit cost of $100.00 (23).
A variety of safety issues exist regarding advertising on VMSs. Generally, opposition exists because the advertisements may distract motorists from their driving task, and driver workload would exceed acceptable levels. Driver workload is higher in metropolitan areas because there are generally more exits, signs, traffic, lanes, and development to observe. VMSs are more prevalent in urban areas because of the amount of traffic congestion and incidents that occur, especially during peak periods. VMS placement must consider driver overload; VMSs should not be placed within a section with a significant number of static signs or exits if it can be avoided. However, VMSs are typically placed immediately preceding exits so that motorists can exit if they expect congestion according to the VMS message. If the VMS is placed in an area with an abundance of signs, it is unlikely that it would be appropriate to advertise on that sign. The driving task is most important, and VMSs should not confuse drivers when they should be thinking about what lane they need to be in or which exit they need to take.

Currently, many states are attempting to reduce the number of billboards on highways because they are distracting to drivers. Permitting certain types of advertising on VMSs would oppose this effort to remove advertising from highways. Because dynamic advertising displays are within highway right-of-way and are easily viewed, drivers may be more distracted with this type of advertising than with billboards. On the other hand, dynamic advertising on VMSs could help to reduce the number of existing billboards.

There are differences of opinion regarding how often VMSs should display messages. Some state officials believe that VMSs should only display messages regarding traffic conditions during heavy congestion and incident situations. Displaying trivial information and safety slogans may eventually divert drivers’ attention from the VMS when they expect to see the same message on a daily basis (24, 25). Others believe that it is better to display messages so that the public knows that the VMSs are operable, typically displaying public service messages. However, frequent displays require more maintenance and more funding. Problems may develop with this method if drivers start ignoring the displayed messages. The messages may become trite, and drivers may lose interest in the signs. Some officials argue against this idea, stating that drivers will notice the signs when incident messages are displayed because the messages will flash on the sign. If the VMS displays messages at all times, it may be better to include advertising messages, as well as public service messages, because it will keep drivers’ attention; if drivers are continuously interested in reading the messages, they are apt to notice messages related to incidents or congestion as well.
CASE STUDY

A case study was performed in Houston, Texas to assess implementation of the three funding applications to VMSs in the Houston metropolitan area. Of the 50 state-owned VMSs in Houston, 33 were evaluated to examine the applications of Adopt-a-Sign and advertising on those signs. Some privately owned signs were also examined to determine the feasibility of displaying traffic messages on their signs.

According to Texas state laws and federal regulations, state signs cannot display commercial advertising. Logo signs are permitted in Texas, but they are not allowed in the area of Houston that was evaluated (4). By providing directional information on VMSs, such as corresponding exit information for businesses, the Texas Department of Transportation could receive revenues for this service. However, this application is currently illegal. By modifying the standards for logo signs, it could be possible to include certain VMS messages as standard logo signs. The applicability of directional advertisements on VMSs was assessed by evaluating the number of static signs around each VMS, the businesses located at exits following the VMS, and other associated factors. Adopt-a-Sign applications were based on sign locations, while the application of traffic message displays on private signs were determined by sign types and sizes.

The field study was conducted during the off-peak period on a weekday. Only one of the 33 signs displayed a message during the study. This sign was alerting travelers of a closed exit ahead. All other signs were blank. These signs do not currently display public service messages during non-incident situations; they are used strictly for traffic management purposes (26). The 33 signs have three lines, which provide a significant amount of space for traffic messages or directional displays.

Sign Placement

Figure 2 shows general placement of the 33 signs which were evaluated in Houston. They are designated as signs for park and ride, HOV, and general purpose according to the symbols shown on the Figure. Signs 1-13 are located on I-45; I-610 VMSs consist of numbers 14-20. I-10 signs are listed within this paper as numbers 21-25, and signs on US-59 include numbers 26-33. Of the 33 signs that were examined, 17 are for general traffic use, 11 are used in High Occupancy Vehicle (HOV) lanes, and the remaining 5 are for park and ride facilities.

The signs for general traffic are commonly placed beside the freeway, prior to major interchanges and entrance or exit ramps between the freeway and frontage road. These interchanges are typically diamond or X-configurations. Frontage roads are parallel to the freeway, and they can be commercially developed along the whole road, not just around the interchanges. With a diamond configuration, it is easy for a motorist to exit and immediately return to the freeway. However, an X-configuration requires the driver to reenter the freeway at the next interchange. With large interchange spacings and X-configurations, it is inconvenient for drivers to exit and reenter the freeway. Therefore, depending on whether a VMS is placed before an X or diamond interchange, it may be a simple or difficult maneuver. Each sign and following interchange must be evaluated individually.
Figure 2. Houston Area Map with Variable Message sign Locations (not to scale)
VMSs for High-Occupancy Vehicle Lanes

Houston has HOV lanes on many of its freeways which radiate from the center of the city, including US-59, I-10, and I-45. These median HOV lanes are barrier separated, and they are reversible for morning and afternoon peak traffic periods. Access to and egress from the HOV lanes is provided by slip ramps or by ramps which typically access park and ride lots and bus centers. Slip ramps allow vehicles to enter or exit the HOV lane from the main freeway lanes; these ramps are opened and closed with gates. There are generally a greater number of entry points during the morning peak, with more exit points for the afternoon (27).

The map numbers corresponding to HOV signs from the case study include 5-8, 10, 13, 22, 24-25, 28, and 32. The 11 HOV VMSs are mounted directly above the HOV lanes. These signs alert HOV travelers of future dates when the HOV lane will be closed for maintenance or holidays, display HOV regulations, and display emergency traffic messages for the main freeway lanes if other VMSs are not located in the vicinity (26). Since vehicles exiting the HOV lanes from slip ramps need to cross 3 or 4 lanes of traffic to exit the freeway, it would not be useful to provide directional information to HOV travelers for businesses at nearby exits. Directional advertisements would also be inappropriate because HOV lane users are commonly commuters who do not need such information. Directional advertising is applicable to highways which serve travelers who are unfamiliar with the area. Adopt-a-Sign, however, would be an appropriate application for funding HOV VMSs. The HOV areas are generally densely populated with businesses that could be potential adopters.

Park and Ride Signs

Five VMSs exist for park and ride facilities within the case study area, including signs 9, 26, 27, 29, and 30 from the map in Figure 2. These signs are typically placed at the facility, off the freeway, to provide bus information such as departure times and delays. It would be inappropriate to provide directional information on these signs because people viewing these VMSs are typically commuters who are preparing to board a bus (28). Adopt-a-Sign could be applied in this case, too.

VMSs for General Traffic

Houston’s highways are typically 6 or 8-lane freeways which are either at-grade or elevated, with frontage roads. Frontage roads in Houston are generally well developed with car dealerships, malls, restaurants, service stations, and hotels. These businesses often advertise with tall signs which are visible from the freeway. However, frontage road designs often force travelers to make u-turns to access businesses whose signs they noticed from the freeway. With directional signs, travelers are prepared to exit, and the number of vehicle-miles traveled can be reduced. Directional sign displays on VMSs are more appropriate on highways which are more likely to serve non-local travelers; therefore, directional displays may be more appropriate on I-45, I-10, US-59 and parts of the I-610 loop. Plus, the Astrodome and Astroworld, which are located on I-610, may draw patrons from many places.
Table 1 is a compilation of the available services which can be accessed by the exit(s) immediately following general traffic VMSs. It also states whether directional advertising or Adopt-a-Sign is more appropriate based on the VMS location and its surrounding area. In some cases, neither application was selected as being more desirable; this is denoted as "either" in Table 1. The following paragraphs describe how each application was selected.

### Table 1. Directional Signing and Adopt-a-Sign Applications to Houston VMSs.

<table>
<thead>
<tr>
<th>Sign</th>
<th>Route</th>
<th>Direction</th>
<th>Restaurants</th>
<th>Lodging</th>
<th>Gas Stations</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I-45</td>
<td>South</td>
<td>1</td>
<td></td>
<td>2</td>
<td>Either</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>South</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>Either</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>North</td>
<td></td>
<td></td>
<td></td>
<td>Adopt-a-Sign</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>South</td>
<td></td>
<td></td>
<td></td>
<td>Adopt-a-Sign</td>
</tr>
<tr>
<td>11</td>
<td></td>
<td>North</td>
<td></td>
<td></td>
<td></td>
<td>Adopt-a-Sign</td>
</tr>
<tr>
<td>12</td>
<td></td>
<td>South</td>
<td>2</td>
<td>1</td>
<td></td>
<td>Either</td>
</tr>
<tr>
<td>14</td>
<td>I-610</td>
<td>East</td>
<td></td>
<td>2</td>
<td></td>
<td>Directional ad</td>
</tr>
<tr>
<td>15</td>
<td></td>
<td>West</td>
<td></td>
<td></td>
<td>2</td>
<td>Directional ad</td>
</tr>
<tr>
<td>16</td>
<td></td>
<td>West</td>
<td></td>
<td></td>
<td></td>
<td>Adopt-a-Sign</td>
</tr>
<tr>
<td>17</td>
<td></td>
<td>South</td>
<td>1</td>
<td></td>
<td>1</td>
<td>Directional ad</td>
</tr>
<tr>
<td>18</td>
<td></td>
<td>East</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>Directional ad</td>
</tr>
<tr>
<td>19</td>
<td></td>
<td>West</td>
<td></td>
<td></td>
<td>2</td>
<td>Directional ad</td>
</tr>
<tr>
<td>20</td>
<td></td>
<td>East</td>
<td>1</td>
<td></td>
<td>2</td>
<td>Directional ad</td>
</tr>
<tr>
<td>21</td>
<td>I-10</td>
<td>East</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>Directional ad</td>
</tr>
<tr>
<td>23</td>
<td></td>
<td>East</td>
<td>1</td>
<td>1</td>
<td>1</td>
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</tr>
<tr>
<td>31</td>
<td>US-59</td>
<td>North</td>
<td>2</td>
<td></td>
<td>3</td>
<td>Either</td>
</tr>
<tr>
<td>33</td>
<td></td>
<td>North</td>
<td></td>
<td></td>
<td></td>
<td>Adopt-a-Sign</td>
</tr>
</tbody>
</table>

As stated in the MUTCD, logo signs should only be placed at interchanges where drivers can easily access the freeway and continue their travel; directional displays on VMSs should be used under the same circumstances. Guidelines should be developed, defining a distance from the freeway exit or VMS, such that only businesses which are near the sign and easily accessible from the freeway can advertise with directional signing. The directional VMS messages should guide travelers to safe and convenient services.

Directional signing is inapplicable to some signs in Houston because they do not precede an exit providing access to food, lodging, or service stations; this situation occurs with signs 3, 11, 16,
and 33. A park and ride lot immediately follows sign 11 which could advertise for this service; however, it would not directly generate revenue from the VMS. Signs 3, 16, and 33 are placed immediately before major interchanges which require driver concentration. However, the Adopt-a-Sign program could be appropriate for these signs.

Signs 12 and 31 provide access to restaurants and gas stations; however, these businesses are located far downstream of the signs. While these signs may be appropriate for directional advertising, their locations may lie outside the area defined by guidelines set by Houston for this type of signing.

**Signs 1 and 2**

These signs on I-45 could display directional information for the businesses located downstream of each sign, with rather convenient egress from and access to the freeway. However, since these signs are in areas with a significant number of billboards, it may be more appropriate to use these signs in an Adopt-a-Sign program.

**Sign 4**

This sign would be a good candidate for the Adopt-a-Sign program because it does not provide direct access and egress between the frontage road and the freeway which are necessary for logo signing. Also, it does not have appropriate commercial development for directional signing.

**Signs 14 and 15**

Sign 14 displays information to eastbound travelers while sign 15 displays information for westbound drivers. These signs precede the same interchange which accesses two service stations. The signs are appropriate for directing travelers to these service stations because there are few commercial advertisements, and travelers can easily exit and enter the freeway, to and from these service stations.

**Sign 17**

This sign is located in a residential area; therefore, there are not many other extraneous advertisements. It can advertise directional information for a restaurant, service station, and the Meyerland Plaza mall. The geometry of the highway provides convenient access to and from the freeway.

**Sign 18**

This VMSs is appropriate for directional signing, as it precedes an exit which accesses lodging, restaurants, and service stations. Furthermore, this VMS could display advance directional information for the Astrodome athletic facility, the Astroworld amusement park, and the Waterworld water park. Signs directing drivers to these attractions do exist, but they are close to the facilities. Since these facilities generate a significant amount of traffic, it is appropriate to direct drivers to these attractions a few exits in advance. Another positive aspect is that this sign is located in an area which does not have too many billboards or other signs.
Sign 19

Directional signing is appropriate for certain areas near sign 19, but not others. Directional signing should not advertise for the exit immediately following the VMS. This exit does not provide convenient access from the freeway to the businesses. However, the VMS could provide appropriate directional advertisements for service stations at the following exit, which is still close to the sign. This VMS could also display information for the Astrodome, Astroworld, and Waterworld which are located a few exits downstream of the sign.

Sign 20

This sign on I-610 East is appropriate for directional advertising for service stations and restaurants. This location does not have a significant number of signs, and the interchange geometry allows easy access to the businesses. With 4 lines available on the variable message display, the sign could direct vehicles to the businesses with a sign such as that in Figure 3.

![SHELL WHATABURGER EXIT 33](image)

Figure 3. Example of directional advertising display on a VMS.

This sign is simple, yet informative. It provides similar information to that of a logo sign, but it does not specify whether these businesses are restaurants, service stations, or hotels. Also, the VMS cannot display complex logos.

Sign 21

Service stations, restaurants, and lodging are available at the exit following sign 21. The conditions are generally good; however, some drivers may become confused because this exit also provides access to Beltway 8. Signing is sufficient for drivers to follow to return to I-10.

Sign 23

This sign has good conditions for directional advertising, with gas, food, and lodging provided at the following exit. The diamond interchange for the exit following sign 23 creates a simple path to and from the businesses located at that exit.

Based on this analysis, revenues were estimated. From Table 1, any sign which was designated “neither,” was considered to be implementing directional dynamic signing for estimate purposes. For each business that could advertise directionally, an estimated cost of $5,000 per year was used for this analysis. The estimated Adopt-a-Sign cost for each adopting organization was
$10,000 in this evaluation. However, for park and ride signs, businesses would only pay $5,000 per year to adopt because these signs are not viewed as often as those on freeways. Based on these costs, the annual revenue from the 33 signs evaluated in Houston would be as follows:

- **Directional:** ($5,000 per business)(42 bus.) = $210,000
- **Adopt-a-Sign - Freeway Lanes:** ($10,000 per sign)(16 signs)  = $160,000
- **Adopt-a-Sign - Park and Ride:** ($5,000 per sign)(5 signs)  =  $25,000

**Total** = $395,000

If all 50 of Houston’s signs were evaluated for advertising implementation, the revenues would increase even more. While $395,000 is not a significant amount of money considering that a single VMS costs $120,000, over a number of years it could help maintain TMCs. This would significantly reduce the amount of funding needed from the federal government for all TMCs if all cities with TMCs implemented such programs. Perhaps these funds could help TMCs to expand the number of VMSs to improve service to motorists.

These costs were estimated by the author and mentors. It is unknown whether businesses would be willing to pay this amount for directional advertising or Adopt-a-Sign in urban areas. Departments of transportation would have to perform their own evaluations of businesses to determine how much they would be willing to spend for these types of advertising. It may even be possible to receive greater revenues than what is discussed within this paper.

This paper does not define how long or how frequently these directional messages should be displayed. This should be outlined within the guidelines regarding this type of advertising.

**Private Signs**

Travelers on Houston’s highways view numerous private VMSs which are owned by a variety of businesses. The majority of them are owned by car dealerships, typically displaying the time, temperature, and sales for their business. One car dealership has a VMS which is visible from Southbound I-45, with sufficient capacity to display an appropriate emergency traffic message. Coincidentally, it was located a few hundred yards downstream of a state owned VMS.

Other private VMSs on I-45 include a sign for Foley’s department store and a sign for a carpet store. Each of these displays were only capable of displaying one line of messages; however, these would be sufficient to display an emergency message such as “ACCIDENT AHEAD.” These signs are on opposite sides of the highway at about the same location. Therefore, these signs can alert drivers of traffic congestion for both directions.

The southern side of I-610 also has some private signs that could be used for traffic messages. One sign displays messages for the Astrodome to announce future events; this sign would be excellent for emergency traffic messages, with five lines of text available. Since this sign is located inside the loop, it would be more appropriate for messages for westbound vehicles. Another sign on I-610 at a car dealership can be viewed by westbound travelers. On the date of the case study, it was displaying the current temperature; this large sign could provide a message that drivers could easily read. Since this sign is located near the Astrodome on the west side, it could be used to manage traffic leaving the Astrodome facility after major events.
It is possible that this application could be costly depending on the type of system used for each private sign. For example, it is possible that these signs are only updated on a daily or weekly basis. This would either require a staff member of the private business to create an emergency traffic message during emergency situations, or the sign would have to be connected to the TMC. Connecting the private signs to TMCs could be costly because it is likely that the private and TMC computer systems would not be compatible. This paper did not evaluate the computer systems or the message updating processes of these private signs, but it would need to be considered.

Other private VMSs exist in the Houston area which could be applicable to traffic management. The signs which were mentioned within this paper include major signs which were viewed during the case study.

It may not be as appropriate to use private VMSs in Texas for emergency traffic messages because they are typically on the far side of frontage roads. Although they can be seen and read from the highways, they are not as noticeable as the state owned VMSs because they are not very close to the freeway. The nearest private signs may be about 50 ft from the right lane of the freeway.
CONCLUSIONS

Of the three applications discussed within this paper, a specific type of dynamic advertising, directional advertising, seems most applicable and cost-effective. By including a clause within federal regulations for logo signs which permits the use of VMSs as logo signs, it could be implemented. However, this would require development of standards regarding how often these messages should be displayed to maintain driver attention and when to display these messages to reach a target group of travelers. It seems that it would be more appropriate to display directional messages during off-peak hours and weekends, and more frequently in the summer when there are more travelers on highways. Transportation departments could receive a significant amount of money by implementing this program; possibly they would receive $5000 annually from each advertising business.

Directional advertising would be easier to implement than general dynamic advertising because it is difficult to limit the types of businesses and products which are advertised on the VMSs. It is possible to create Adopt-a-Sign programs; however, this requires development of standards and regulations. While it is feasible, it will take significant federal and state efforts to create such programs. While displaying traveler information on private signs sounds simplistic, it is complex in terms of computer systems and connections. Initial implementation may be costly, but long-term benefits may be beneficial. Plus, it is more legally simplistic than the other alternatives. With implementation of one or all of these strategies, TMCs could receive a significant amount of funding.
RECOMMENDATIONS

Before a state or local agency attempts to implement any of the strategies discussed within this paper, a formal evaluation of laws and the implementation area must be conducted. They should assess the need for directional advertising within the TMC’s jurisdiction; they should also assess the financial benefits of such a program by determining whether these businesses would be willing to pay for this type of advertising. In addition, each area should be evaluated, as within the case study, to determine if the VMS sizes and types are appropriate for advertising purposes and to determine if their locations are appropriate for directional advertising. For the purpose of displaying traffic messages on private signs, a cost analysis should be performed to determine if it is financially beneficial to use existing private signs rather than erected government owned VMSs. In terms of implementing an Adopt-a-Sign program or displaying directional signs on VMSs, agencies should also consider the financial benefits of these programs. While they may generate revenues, it may be expensive to operate such programs depending on the size and development of the area. Most importantly, guidelines must be developed so that these applications can be implemented.

Future research could involve determining whether private signs on Texas highways are easily detectable and read by Texas drivers considering their distance from main freeway lanes. Other research could investigate the expense of the integration of private VMS computer systems with computer systems at TMCs. Another area of research involves advertising on state vehicles (28). Many TMCs have service patrols to quickly respond to incidents; these patrols typically monitor highways by traversing the traffic management area. Just as businesses can advertise on buses and cabs, states could sell advertising space on their service patrol vehicles to raise funds.
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Rudy Umbs           Federal Highway Administration
Robert Dale         New Jersey Turnpike Authority
Vincent Nichnadowicz New Jersey Department of Transportation
Carlton Allen       Houston Interim Control Center
Gerald Ullman       Texas Transportation Institute
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22. New York State Highway Law. Section 88 Control of Outdoor Advertising.


26. Telephone interview with Mr. Carlton Allen of the Texas Department of Transportation, concerning current VMS applications in Houston.


28. Personal interview with Gerald Ullman of the Texas Transportation Institute, concerning VMS applications in Houston.

29. Telephone interview with Mr. Rudy Umbs of the Federal Highway Administration, concerning federal regulations regarding outdoor advertising.
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